BOOK IV

OF THE HARMONY OF THE WORLD

by

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ON THE HARMONIC CONFIGURATIONS OF THE STELLAR RAYS ON THE EARTH, AND THEIR EFFECT ON EVENTS IN THE SKY AND OTHER NATURAL PHENOMENA.[1]

Proclus Diadochus, *Commentaries on Euclid I*, Book I:[2]

On the use of mathematics in Natural Philosophy and Politics, which most of all concern the Harmonic part of it on radiations.

It furnishes everything that is important for the contemplation of nature, declaring the most splendid order of the ratios, according to which the whole of this universe has been constructed, and the analogy of the proportions, which connects together everything in the world, as Timaeus[3] says somewhere, and which restores friendship between things which are in conflict, and relations and mutual affection between those which are widely separated.

And a little later. Hence it is also possible to hunt out by logical thinking the appropriate pattern of angles.

Again. In my opinion this is also what Timaeus[4] meant, when he everywhere describes his reflections on the nature of the whole universe in mathematical terms, depicts the origin of the elements in numbers and figures, and states that their powers and properties, and their effects, were taken from these (*figures*), the acute and obtuse among the angles, and the rough and smooth among the sides, and so forth, establishing the causes of all kinds of mutations.

Indeed on the study of Politics, as it is called, how could it be denied that mathematics confers very many remarkable benefits, as it measures out the proper occasions for conducting affairs, and the various revolutions in the whole of the universe, etc., and the Harmonic Numbers, which control life or are responsible for incongruence, and universally give support to hastening or slackening of motions, etc.[5]

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[1] The idea of a causal relationship between the appearances of the heavens and the processes and events of the sublunary world was not only the principal doctrine of traditional astrology but an important assumption of Aristotelian philosophy, as is evident by a reading, for example, of *De generatione et corruptione* and *Meteorologica*. Traditional astrology had been based on a logic of signs in which beings and things are simultaneously endowed with physical and semantic properties which permit the building up of a systematic network of relations between heaven and earth. The sign becomes the cause of the event with which it is associated. In the ancient world, Ptolemy (*Tetrabiblos*, I, 22) had criticized certain divisions as not natural and consequently without foundation. Kepler went much further, claiming, for example, that the divisions of the zodiac into signs was arbitrary and that the whole doctrine of houses, exaltations, terms, and the like—on which the astrologers based their predictions—was of cultural origin, so that there was no reason to expect natural effects from them. Only the aspects, in his view, could be explained naturally in terms of a geometrical harmony and these were the only elements of judicial astrology—concerned with judgements on men and events—that he retained. In a letter to Herwart von Hohenburg of April 1607 (KGW 15, p. 453), Kepler remarked that he had transferred the aspects to the natural domain.

That the heavenly bodies, especially the sun and the moon but also the planets, affect the weather and other terrestrial phenomena such as the tides, was known to farmers, herdsmen, sailors, and the like, who observed the sky in the course of their work. According to Kepler, there was observational evidence that the aspects, whose efficacy was established by their origin in geometrical harmonies, were a contributory cause of the weather, besides having an influence on human character by making an impression on the infant soul at the moment of birth. Here, as an introduction to his theory of harmony in the sublunary world, he adduces the support of Proclus for the Platonic theory of knowledge and view of geometry, which forms the foundation of his own theory of the aspects.

[2] Friedlein (1873), pp. 22–23. Cf. the English translation based on Friedlein's text, in Morrow (1970), pp. 19–20.

[3] Plato, *Timaeus*, 32C and 85E.

[4] Ibid., 53–61.

[5] Immediately after the extract quoted by Kepler, Proclus continues: "All this the speech of the Muses in the Republic sets forth. . . ." See Plato, *Republic*, 545E–547A.

Preamble and Explanation of the Order.

We have set out the harmonic proportions, considered in the abstract, in the first three books, of which the first exhibited the geometrical properties of the individual figures, the second their congruences in combination, and the third developed the harmonic proportions from the figures.

It remained for us to apply the harmonies, which we have hitherto described, to the cosmos, in three other books, of which the first would attribute the harmonies to God the Creator of the heavens, the second to Nature the director of the differing motions, and the third to Man the controller of his voice, which originates from motion. However, the requirements of stating the arguments have persuaded us not only to reverse the order, starting from human song, passing from that to the works of Nature, and thus finally to the work of Creation, which was the first and most perfect of all, but also to combine the end of abstract speculation with the beginning of actual harmonies in melody, in the same third book. Therefore, after starting this application to the cosmos in the preceding book, and transferring the harmonies to human melody, which others usually embrace in the general term Art, there now follows the fourth book, which in this reverse order attributes to Nature the second part in actual harmony.

Although indeed I touched on the discussion of the essence of the harmonies here and there in Book III, nevertheless with the same intention I decided that the full treatment of this metaphysical discussion should be reserved for the beginning of this fourth Book. For since the philosophers commonly look for harmonies nowhere else but in melody, and since for many people it is an unexpected treat when they are told that sounds are something different from the harmonies which are thought to be in the sounds,something had to be conceded to the weakness of our understanding, and the origin of the harmonies had to be explained by the terms which are commonly known to musicians: the eagerness of the reader had not to be disturbed by the uncomfortable subtlety of metaphysical investigations.

But now my intention is furthermore to reveal the harmonies in Nature and in the motions of the heavens. Indeed the common herd of philosophers at the first mention of harmony immediately conceives

But Socrates in Plato, as cited by Proclus on Euclid, Book I, defines a musician as one who progresses from those harmonies which are in the senses to the investigation of insensible harmonies and their proportions. Eventually he turns out as a philosopher, stirred by both kinds of harmony to the contemplation of the true first Being, and truth itself.[6]

[6] Proclus seems to have had in mind Plato, *Phaedrus*, 248D. See Friedlein (1873), p. 21. The definition of a musician given by Kepler, however, belongs to Proclus rather than to Plato.

the singing music of the stars, which can be perceived by the hearing; and along with Cicero's Scipio stands with its ears pricked to catch "so great and so sweet a sound." It is easy for those who are inexperienced in these matters to conclude with Cicero the dreamer himself that "Motions so great cannot rush on in silence," and with the Pythagoreans according to Aristotle give an explanation why the sound of the heavens is not heard upon earth.[7] These preconceived opinions are a considerable obstacle to readers who are striving towards the inner secrets of Nature, and could frighten off many who have great powers of judgement and are seekers after truth, to such an extent that they would disdain those Pythagorean pipedreams, scarcely recognized at arm's length, and throw away the book unread. For these reasons this seemed to me a suitable place to assign to this highly necessary discussion.

I was also moved by the example of Ptolemy.[8] When in the first two books of his work on Harmony he had completed the exposition of the harmony which concerns melody, and had already embarked in the third book on his demonstration that all perfect natures participate in the force of harmony,he too began his examination with this same question "To what class of things should the nature or force of harmony, and the knowledge of it, be assigned?" Therefore, although I have relegated examination and judgment of Ptolemy to the appendix of this work of mine, yet for the reason stated the reply which it seems ought to be made in accordance with my basic principles to this question of Ptolemy's had to be placed at the start of this fourth Book. Nor does that relate only to forearming the reader and avoiding adverse opinions, but also to the fundamental theme of the whole

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[7] Cicero, *De republica*, VI. 18; Aristotle, *De caelo*, 290 b 12–30.

[8] Ptolemy (*Harmonica*, Book III, Chapters 3 and 4) locates harmony in minds and in the motions of the heavens. To the harmony which exists in minds he devotes three chapters, associating the individual consonances with the faculties of the rational soul, relating the genera of the musical scales to those of the primary virtues, and correlating the modulation of tones with changes in mood arising from social and political events. Kepler has already stated his views on some of these themes in Chapter 15 of Book III and in the political digression at the end of this Book. Further clarification is given in the first three chapters of Book IV and again in Chapter 7. Kepler describes Ptolemy's theory as symbolic and rhetorical, contrasting this with his own in which he demonstrates the results from their causes. Ptolemy devotes the remaining nine chapters of his Book III to the harmony in the motions of the heavens. Here Kepler accuses Ptolemy of running riot in poetic comparisons. The theme most relevant to Kepler's Book IV concerns the aspects. Although he had earlier been in agreement with Ptolemy in identifying the aspects with the consonances, Kepler now regards Ptolemy's theory as defective, claiming to have demonstrated that the musical consonances and the aspects arise from different geometrical causes. Kepler's views on these topics are set out in Chapters 4, 5, and 6 of Book IV. In an appendix at the end of Book V, Kepler summarizes his differences with Ptolemy. As stated earlier, Kepler's translation of Ptolemy's *Harmonica*, Book III, Chapters 3–16, together with his commentary, was first published in the nineteenth century (KOF, vol. 5, pp. 335–412).

fourth Book. Hence, because we are going to state of the harmonies of the stellar rays[9] what they are and how many they are in number, and on what geometrical principles they are formed, we should first know what the essence of the harmonies is, apart from consideration either of sounds, which are here of no importance, or even of the rays themselves, what their proper subject and their terms are, whether they are among those things which are outside our understanding, or only in our soul, by what medium they are perceived, and inwardly received, by what agency they are discriminated, and what effect follows this perception and recognition, by what originator or prime mover. When these points have been explained, both generally and by the comparison of particular features, it will then be easy for us to discuss metaphysically the essence and properties of minds and of sublunary nature itself, and to show the secrets of Nature in rather clearer light than hitherto.

[9] By this is meant the aspects.

THE CHAPTERS OF BOOK IV.

Chapter I.

On the Essence of the Harmonic Proportions, Both Sensible and Intelligible.

Being on the point of examining the essence of the harmonies, I find myself in doubt whether it will be clearer to seek out the opinions of the ancients first, and then to compare them with mine, or to start by expounding my own opinion. The former method in philosophy is accepted by everyone, and is frequently recommended by Aristotle: the latter seems more suitable for the matter in hand. For few have attempted to examine the nature of the harmonies as a class; and if anything has been said on the substance of the mathematical types and classes, whatever can be applied to the harmonies as a class must necessarily in the philosophy of the Gentiles be full of obscurity, and on that account the mind of the reader must be tossed with doubt between love for such pretty theories and suspicion of falsehood. In the company of Christians, and for anyone who embraces with a firm faith the sacrosanct mystery of the Trinity and the origin of all things in the Mosaic story, the heads of the examination can both be expounded more clearly, and find the minds of readers more inclined to believe them. Therefore, to organize the procedure for stating them, we shall have to start with the classification. For sensible harmony, or things which are analogous to it,is one thing, harmony which is apart from and purified of sensible things is another. The former are many, both in respect of their subjects, which are different in kind, and individually: but genuine harmony which is apart from sensible subjects is one and the same in whatever kind. For instance, the harmony which arises from double proportion is one and the same kind. If it is in sounds, it is called a diapason; if in radiation,[10] it is named the aspect of opposition; and in the musical system indeed it is either further up or down, it is either higher or lower in pitch, it is either in human voices or in sounds from instruments. Nor is it less various in the study of the heavens, for it is the same whether it belongs to Saturn and Jupiter or to another couple, whether it is among the signs round the equinoxes or those near the solstices.

Classification of harmonies.

On each kind of harmony, therefore, the question is, what is their basis, each in its own right, whether that basis is in themselves or in other things. As far as sensible harmonies are concerned, then, the following four features are involved in their essence: 1. Two sensible things of the same kind, and of a certain size, so that they can be com-

Sensible harmonies.

[10] By radiations is simply meant the rays of light.

pared with each other in respect of size. 2. The soul which compares them. 3. The reception of the sensible things within [the soul]. 4. An appropriate proportion, which is defined as a harmony. If one of these is taken away, the sensible harmony is taken away. For it is easy to understand that the nature of harmony is not to be defined by means of sensible things alone, such as a sound or a ray from a star. For a sound is one thing; a definite order among different sounds is another. Now I say order at this point, not with reference to some physical point, not with reference to time, but with reference to height and depth of pitch. Therefore, there can be different sounds, but unless there is a definite order among them, which is defined by definite proportions, as a matter of mathematics, there will be no harmony among the parts. On the other hand, if the sound is taken away, what audible harmony, or if the rays of the planets are taken away, what harmony between the configurations could be devised? Furthermore, as musical harmony is not a sound, but order among several sounds, it follows from that that it is in the category of relations. For the order of which we are speaking here is a relation, and the things which are ordered are related to each other. Therefore, sounds are a harmony in virtue of something which is an accident, inasmuch as it is found in the things subject to it, and does not exist separately, and its absence does not involve the dissolution of the things subject to it. Second, just as quantity is universally inseparable from the bodies to which it belongs, but can quite well be increased and diminished along with the bodies themselves, and yet is an accident; in the same way also the actual order among sounds, to which we have made harmony subject as to its category, cannot be taken away from sounds which are more than one in number and differentiated from each other by the quantity of their height and depth in pitch. For either they will cease to be more than one, or if they are more than one, there will be an order among them in respect of excess and deficiency — a changeable order indeed, if one of the things which are related by being subject to it changes. Therefore, order goes hand in hand with quantities, and in the same species as number. Third, just as number is, it is defined as being a multiplicity assembled from units, in which Aristotle[1] recognizes something analogous to matter, that is to say its units, and something formal, the conception in the mind, which recognizes one multiplicity of those individual units, in whatever respect it may be separated from the rest. Thus the same philosopher says elsewhere that if the soul which counts is taken away, all number is taken away, but not the individual units. Hence number is found in many things themselves materially, but is nothing apart from them, unless a mind is present to count. For only then is number apart from things themselves, and abstracted from things, something different from them, that is to say it is the concep-

For the essence of harmonies Order is required.

Harmony is an accident of sensible things.

For the essence of harmony a soul is required.

[1] Aristotle treats this topic extensively in *Metaphysics*, Book XIII.

tion in the mind of the plurality of indivisible things. In the same way also the actual order of sounds and of other sensible things with which we are here dealing is nothing other than several sounds, unless mind is present, comparing with each other sounds which are different in pitch; and in general every relation is nothing without mind apart from the things which it relates, because they do not have the relation which they are said to have unless the presence of some mind is assumed, to relate one to another.

Therefore, what is true in general of order and of relation is to be presumed by far the most strongly of harmony, which is based on proportion, and on the counting of parts which are equal in quantity. That is to say, for some sensible harmony to exist, and for its essence to be possible, there must be in addition to two sensible terms a soul as well which compares them. For if that is taken away, there will indeed be two terms which are sensible things, but they will not be a single harmony, which is a thing of reason.

For the essence of sensible harmony the reception of sensible things into the soul is required.

Now we must also look at the third feature, that is to say at the reception of external things into the mind, and the necessity and manner of it.

Of course a harmony is a single thing, the sensible terms outside the soul are not a single thing, and can never be made one except within the soul. However, they cannot be within the soul unless they are received inside it, which it does not need many words to prove from experience. The craftsman of music in parts can indeed meditate on the harmony of two or more voices within his mind, even though he does not receive them into it. But that harmony is not in virtue of that fact sensible, whereas we are speaking of the essence of what is sensible.

Yet what is the nature of that reception? Surely the sounds, to use a rather well-known example to stand for all, persist outside the ears, in the air, and so before the sounds do the motions of the bodies, according to the quantity of which the sounds follow? Do they not remain in their bodies? By what means then do they enter? I reply, partly actively, partly passively: actively, when they give out emanations—when struck, the sounds of their own motion; when they are shining, the rays of their own light and color; and, as we say, when we speak of objects moving our senses. Now moving is acting. On the other hand they enter passively, not themselves as such, but by their emanations, which must always experience something passively, according to our manner of speaking, when they are felt, remembered, or compared. And in every way this very making of two terms into one in the mind, from which the sensible essence of harmony results, is in fact a relating and comparing in the case of things taken in conjunction which is of the same kind as seeing and hearing in the case of single things, and to that extent less. Certainly all these are experienced passively, but are referred to equivocally, with great ambiguity of meaning.

The degrees of ambiguous passive experiences.

But let us establish the degrees of passive experiences. First, to take an example, water is passive, if it is very cold and grows warm when fires are applied to it. A second meaning is that moisture is passive, when it is actually active, that is to say in moistening what is dry, because part of it is seized by the pores of what is desiccated, and is mixed with it, which is passive. Similarly water is also passive when it is sipped; for the thirsty person swallows it down, and absorbs part of it. But in a third meaning also water is passive in the swallowing, at least when it is in contact with the tongue, not only because it grows warm from the warmth of the tongue, though itself it also cools the tongue with its coldness, nor only because a bit of the water sticks on the tongue, but simply because it is touched by the tongue, which is like being very lightly hit, or struck, or pushed, which causes a local motion of the parts within the whole. Now being moved is passive. Let the fourth meaning be that in which water is said to be passive when it emits a vapor and strikes the nostrils, and is perceived by smelling. However, being perceived is passive; and in this case indeed it is not passive itself, but its corporeal effluvium is, and by that passive experience a bit of it is consumed. A fifth degree in which water is understood to be passive is when its noise is heard; for first the water itself is in motion, and second the immaterial emanation of the water, as it moves, is diffused into everything roundabout, and is received into the passages of the ears. This receiving is a passive experience, not of the water itself, but of its emanation, or of its material effusion; and in this reception something is lost in time and in a multiplicity of receptions. For the sound is rather dulled if it reaches the ears, or the clothes, of a great multitude, or if it is given out among falling snow.

Sixth, also when water is seen, it is passive. For when it gives out from its surface, or virtually so (that is from its colors,[12] insofar as it is colored), rays to the eye, these rays are touched, reflected, refracted, brought to a point, and caught by the netlike coating when they are

[12] In his *Ad Vitellionem paralipomena* (1604), Kepler defines color as light in potency, or light which slumbers in the matter of the diaphanous until it is awakened by the incident light. (Chapter 1, proposition 15; KGW 2, p. 23). According to Aristotle (*De anima*, Book II, Chapter 7; 418 b 10–419 a 10), color localized in the surface of a visible object, is what is seen, while light is the agent that actualizes the potential transparency of the medium. Kepler rejects Aristotle's distinction between light and color and also his theory of the nature of light (KGW 2, pp. 38–46). In opposition to Aristotle, Kepler regards light as an immaterial emanation, evidently following the teachings of the Oxford school of Robert Grosseteste and Roger Bacon. For example, Kepler's explanation of the different colors in terms of the rarity or density, the transparency or opaqueness of the matter and the different degrees of luminosity is similar to that given by Grosseteste in *De Iride* (L. Baur, *Beiträge zur Geschichte der Philosophie des Mittelalters*, Münster, vol. 9, 1912, p. 77). On Kepler's theory of light, see D.C. Lindberg, "The Genesis of Kepler's Theory of Light: Light Metaphysics from Plotinus to Kepler," *Osiris*, second series, 2 (1986), 5–42.

brought there. All these are passive experiences not of the water itself but of its immaterial emanation, or rays. And those rays in this case lose nothing at their reception, either locally or in time; for when the thing which they touch is removed, they carry on beyond it, entirely unimpaired, which sound does not do.

Seventh, after these emanations, and to that extent the actual body of the water, have previously been active in a way on the bodily instruments of the senses, that is to say they have affected them with their own likeness, and have assimilated them to themselves, so that the little membranes of the tongue and skin have perceived its coldness and taste, and the spirits of the nostrils its smell, the spirits of hearing ring with its sound, and those of vision shine with its light. Thus an imprint and sensory emanation of it has been formed, which the eyes certainly exhibit even when it has been taken away, often against the man's will. In this case the sensible emanations are received within by entrances or openings of the senses by means of a depictive or imaginative power, are recognized by the common sense,[13] are stored by the memory, are produced by recollection, and are discriminated by a superior faculty. Water is understood to experience all these things passively, not in itself, but in its sensible and intellectual emanations. In that case, then, even the supreme faculty of the soul, which presides over number and comparisons, constructs and forms for itself from a number of intellectual emanations of things, a single emanation of relation, order, and comparison, and compares things which exist outside it with each other. This comparison, as we said above, when it is made about the things themselves, without any action of theirs, is understood to be a kind of passive experience on their part, in almost the same sense as when the reputation of someone who is not there and knows nothing about it is discussed in a law case, or when he is condemned to death, or proscribed. Indeed the resemblance is close in every way. For just as someone in that position, although he himself feels no harm at that time, and therefore experiences nothing, yet a little later is aware in reality of the force of what he has experienced passively, in the same way also voices, and anything else whatever that shares in this similarity, to the extent to which they have satisfied our intelligence in this comparison, are either continued, or rejected, avoided, prevented obstructed, suppressed, and ended. However, I do not say that in this case sounds have this passive experience in respect of the consequent result, but in the actual fact of the mind's comparing them with each other. This long explanation of the degree of equivocal meaning in which I speak of this mental comparison as a passive experience is sufficient. But my prolixity in listing these meanings has

[13] The common sense, it will be remembered, is an internal faculty of the sensitive soul, which forms judgements concerning the operations of the particular senses. See Aristotle, *De anima*, 424 b 20–427 a 18.

not been in vain; for by this effort we shall from now on be wonderfully assisted in recognizing the nature of the harmonic faculty and in completing this part of metaphysics, which Aristotle did not even glance at in passing.

From this, what I was previously arguing is also clear, that is to say that the actual formal sensible part of harmony, as harmony, is an accident of sensible things, just as, of course, it is an accident of the same things to be seen and heard and so forth. Second it is evident that even sensible harmonies are things which are in some sense abstract from actual things, certainly insofar as it is not external things in themselves, but the emanations of things, which enter through the senses, which are brought before the tribunal of the soul, and are made the terms of sensible harmonic proportion. Yet on the other hand these harmonies are still concrete in a double sense: first, because these emanations of sensible things are not emanations of their mere quantity, but also of their sensible quality, say of sound or light and so on; and second because these sensible emanations, as sensible, cannot give light within the mind unless the actual things of which they are emanations are also present and remain present outside. For if they are taken away, their emanations within also cease, those of light indeed, with respect to their radiation, on the instant, but those of sound within a very brief moment of time. There remains indeed in the instruments of sensation a certain impression, such as that of light in the eye;[11] but it is not an emanation of the external thing, but rather another emanation of an emanation, impressed on the body, and now become a momentary quality of the body, just as in optics colors, by the pure and very little colored light of the Sun, take on the power of radiating in color in every direction. And this is what we were also arguing at the outset, that the sensible terms and the soul must be present, and deliver their mutual efforts, actively and passively, the former by moving the senses, the latter by comparing. Hence the essence of sensible harmony is established.

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Here someone may object that the soul in comparing does not make the appropriate proportion but discovers it. (This was the fourth and formal basic element of harmony above.) Therefore, it seems that the soul can be absent without loss of the essence of harmony.

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I reply by inverting the question. To find the appropriate propor-

[11] Kepler gave the first correct analysis of the eye as an optical instrument, explaining the inversion of the image on the retina (*Ad Vitellionem paralipomena*, Chapter 5; KGW 2, pp. 143–197). But he also recognized that the physiology of vision involved more than the impression of the image on the retina like a painting on a surface, for he supposes that the light or emanation from the external body brings about a momentary qualitative change in the retina and the spirits contained in it, which then emit a secondary emanation to produce the after-image. A similar explanation accounts for the persistence of sound in the ear. Kepler describes the physiology of vision more fully in Chapter 3. Cf. note 35.

tion in sensible things is to uncover and recognize and bring to light a similarity of that proportion in sensible things to some particular archetype of the truest harmony which is within the soul. Therefore, just as the Athenians found some virtue in Zeno, and did not find the privileges of the Prytaneum[15] in him but conferred them on him, which Zeno could not achieve without the Athenians, so the soul finds order and proportion in the sounds and rays (although it does not find even that outside, but in fact the terms, as stated), but makes this proportion harmonic itself by comparison with its archetype. It could not be called harmonic, and would be allotted no power in moving spirits, if this archetype did not exist. Enough, then, on sensible harmonies.

What insensible harmony is.

For now we must move on to the pure and secret harmonies, that is to the other limb of our division; in other words to those which we have just now established as archetypes or paradigms of sensible harmonies. For if the archetypes had their existence outside the soul, I confess for my part that we should be deprived of a great argument for asserting the necessity of the soul, in order to establish the essence of harmony. But to establish them outside the soul is self-contradictory, as we shall hear.

Its terms.

For the basic elements of true and archetypal harmony, which exists without any tinge of sensible emanation, are nevertheless divided and several in number. For since it is also a proportion, it therefore itself requires its pair of terms. However, these terms, as we have assumed in the previous Books, are the complete circle and an aliquot part or aliquot parts of it, which are constructible by division of the arc. This is the specific distinguishing feature of harmonic proportion, by which not only is harmonic proportion differentiated from other proportions which are classified in the same category, but also the pure and archetypal harmony from the sensible ones, except insofar as in the familiar common usage only the congruity of sounds is called harmony. For pure harmony is most clearly differentiated from sensible or concrete harmony by the very fact that in pure harmony the terms come from mathematical categories, the circle and the arc, formed in a certain way, as the circle takes its form and shape from itself, and the arc takes its terms from its chord, its shape from the circle; whereas in the case of the sensible harmonies there is no need of this special formation. For they can be either straight lines or sensible quantities shaped in some other way, provided they are faithful copies of this archetypal harmony of theirs, each in its own quantity, or indeed as much of a faithful imitation as is possible in sensible things. For in their case what is close to the truth, more or less, is

[15] The Prytaneum was the town hall where distinguished visitors were given the privilege of dining with the members of the Council. According to Plato (*Parmenides*, 127B), Zeno visited Athens in the company of Parmenides.

accepted as the truth itself. These, then, are the terms of the archetypal harmony.

For the essence of abstract harmony a mind is required.

Second, as well as the terms, again as has been stated previously in the case of sensible harmonies, a mind is also required, which compares the terms, and assesses whether they, being of course arcs of a circle, are such as some side of a constructible figure divides off from the whole circle. Thus in a sense there are three basic elements of the archetypal harmony, two with respect to the terms, the material, to express it by an analogy, the circle and its part, and the formal, the division of the part by a constructible figure; and one with respect to the actual relation of the terms, that is to say the mind which in a sense brings it into being.

Harmony is a qualitative relation.

And since every proportion, and so also this proportion of a part of a circle to the whole, is predicated of a relation, in this case this definite and prescribed form of a proportion is to be found to be a quality of the fourth kind.[16] For harmony is a relation, in a sense, of quality or shape, being formed from the regular figures.

But if it belonged to the essence of sensible harmony previously that sensible things should flow into the soul by means of an emanation, how much more is it also necessary in this case than what we have stated as the terms of the secret harmony, the circle and its arc, should be within the mind itself, whether that is said to have come about by the reception into it of emanations, or whether they have been with the mind always, and present before anything was received into it. From now on this must be examined with the full power of my talents.

How the genera and species of mathematical things are present in the soul.

However, since we have now arrived at this point, we cannot in fact without considerable injustice both to the reader who is eager for philosophy and to the ancients, who handled this part of philosophy before us, conceal their opinions on the same topics, insofar indeed as they are known to us. I judge that only one thing must be said by way of preface: that a distinction must be drawn between the actual mathematical species, the circle and its arc, and a comparison between them. And the reason for that is that if the actual species, as terms, must be located in the mind without being received, it will be even more important to locate harmony, which occurs between those parts, in the mind, so that it does not have its essence outside it, inasmuch as its essence consists of some action of the mind on those species. Also the circle along with its arcs is in the soul in such a way that beyond controversy they are in sensible things as well; but harmony, which is between the circle and its part, as far as its formal aspect is concerned, is in no way outside the soul, as was made clear above by the example of number. In this case the arguments of the ancients

[16] Aristotle (*Categories*, 10 a 11) describes quality of the fourth kind as the forms and figures of things.

are especially about the actual species, which is a simpler matter; whereas harmony is more a compound matter.

Also there is this difference between Aristotle, Plato, and Proclus on the one hand, and Ptolemy on the other. For the former deal with essence of the emanations, Ptolemy with the essence of harmony.[17] But we shall defer the text of Ptolemy until the Appendix of the whole work, in case, as we feared at the start of this chapter, he incites the crowds against us; whereas we shall now listen to those who say what is most apposite to the present investigation.

Plato's doctrine on the character of mathematical things.

Now Plato's view on mathematical things was that the human mind is in itself thoroughly informed on species or figures, and axioms and conclusions about things. However, when it seems to learn, it is merely being reminded by sensible diagrams of those things which it knows on its own account. He conveys that with singular ingenuity in the Dialogues by introducing a slave who when questioned by his master makes all the replies as desired.[18]

Aristotle's contrary doctrine.

Aristotle on the contrary in his *Metaphysics*[19] calls this a fabrication, "a fictitious argument, twisted to fit the hypothesis," as neither do these Mathematicals ever exist independently of sensible things, nor is their character, even in the mind, on any different basis from that on which other universals are in the mind, as the species of the actual essence of individual sensible things is formed in the mind by definition. Thus they are indeed prior to sensible things, and abstracted from sensible things, yet not in reality, but in mental conception. Hence it should be noticed that Aristotle, almost every time he happens to

What the flaw is in Aristotle.

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[17] Ptolemy (*Harmonica*, Book III, Chapter 3) regarded harmony as a cause that impresses form accidentally on the underlying matter. He distinguished three types of cause: one corresponding only to nature and concerned with being, another corresponding to reason and concerned with good, and a third corresponding to God, concerned with good and eternal being. Harmony was a cause of the second kind, appertaining to reason. While harmony was present in all things of a more perfect nature, it was most fully revealed, Ptolemy believed (ibid., Chapter 4), through human souls and the movements of the heavens.

Kepler was not satisfied that Ptolemy had penetrated to the essence of harmony. As he explained in the notes to his translation of Ptolemy's *Harmonica* (KOF, vol. 5, p. 336), he had therefore written the first three chapters of Book IV of the *Harmonice mundi* in order to answer the questions raised by Ptolemy but not satisfactorily answered by him. Thus in Chapter 1, Kepler explains that, for any harmony, two terms are required, which are either in the sensible things that contain the sensible harmony, or mental, by which the intelligible or archetypal harmony is represented. In Chapter 2, he explains the faculties of the soul, active and passive, which are concerned with harmony, and in Chapter 3, he investigates the location of harmony in the universe or the quantities apt to constitute the terms of harmonic proportions.

[18] Plato, *Meno*, 82B–85B. The recollection theory of learning is illustrated by a geometrical lesson in which Socrates elicits answers from a slave boy concerning the side of a square whose area is twice that of a given square.

[19] In *Metaphysics*, 1082 b 3–11, Aristotle criticizes Plato's theory of number. His criticism of Plato's recollection theory of learning is in fact to be found in Prior analytics, 67 a 22–27 and Posterior analytics, 71 a 29–b 8.

name any one of the mathematical categories by way of example, always names either a point, or a line, or a surface, or a body, or a number, which are the chief categories of which quantity is predicated; but mention is very rarely made, throughout these treatises indeed, of quantities insofar as they are shapes, and in the fourth species of quality (where their material aspect, quantity, is one thing, but their formal aspect, shape, another); and insofar as they are relations, absolutely no mention at all. Indeed he even proposes harmonic knowledge for investigation with reference to nothing except voices, and to them solely insofar as they are lines,[20] exactly as in optics. However, of the interval between the lines, which are a proportion (a relation, of course, and that indeed of quality and shape) Aristotle never even dreams.

Thus there is no doubt that he would have made greater progress in this investigation if he had been imbued with more profound mathematics (concerning the intelligible difference between possible and impossible figures,[21] with which we have dealt in Book I). Therefore, as far as he is discussing the chief categories of quantity, he is an easy victor, with no opposition. However, where he draws a universal* conclusion, and convicts Plato of the stupidity which is his own fantasy, and finally where to the Platonic picture of the "selftaught" slave he opposes a contrary picture of his own, asserting that the mind in itself is empty, not only of other knowledge and of mathematical categories but also of species,[22] and is just a blank sheet, so that nothing is written on it, not even any mathematicals, but everything can be written on it; from this aspect, I say, he is not to be tolerated in the Christian religion, and several centuries later he found many "correctors," as Proclus says, including Proclus himself as opponent, though here he does not cite Aristotle himself by name, but he names Plato, whom he defends, and openly admits him as his leader.

* also about individual species (*formally*) such as the circle, triangle, and so on.

Aristotle's blank sheet as the idea of the mind.

The philosophy of Proclus on the essence of mathematical things.

Therefore, the philosophy of this Proclus on the species of mathematical things, which I confess to be the terms of harmonic proportion which is pure and hidden from sensible things, is worth transcribing here word for word from his Book I on Euclid.[23]

He writes as follows: *It remains for us to see what character or essence should be assigned to mathematical categories and species. Should it be conceded that they receive their character from sensible things, whether by abstraction, as it is customarily called, or by bringing together things which have been dispersed in various parts into one common concept (or definition), or even prior to that must a character be granted to them, as Plato claims, and the development of the totality of things shows?*

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[20] That is, musical tones produced by strings.

[21] That is, constructible and inconstructible figures.

[22] Aristotle, *De anima*, 429 b 30–430 a 25.

[23] Friedlein (1873), pp. 13–18. Cf. Morrow (1970), pp. 10–15.

Mathematical species have not been set up from individual sensible quantities.

First, then, if we assert that mathematical species are established from sensible things, when the soul forms within itself from material triangles or circles the circular and triangular species, by a kind of secondary generation, I ask where the concepts (or definitions) get such great certainty, and such great accuracy. For it will be either from sensible things or from the soul itself. But is it not impossible for it to be from sensible things, as there is much greater subtlety and exactness in these concepts? Therefore, it is from the soul, which procures perfection for imperfect things, and that accurate subtlety for things which are greatly inaccurate.

For tell me where among sensible things is to be found the nature which is indivisible (a point) *or which has no breadth* (such as a line) *or depth* (such as a surface) *or where the equality of lines from the center, or where the perpetually constant proportions of sides* (the material of my Book I) *or the rightness of angles is to be found. For my part, as all divisible things are mingled and confused with each other, I see nothing pure, nothing unmixed with its contrary: all things, both those which are in scattered positions and those which are united are divisible. How therefore shall we procure their enduring essence for immovable things from things which are movable, and are different in different places? For they allow that whatever takes its character from mobile essences takes an alterable character. And how shall we bring about their accuracy for accurate and certain species from things which are not accurate? For everything which is the cause of a perpetually changeable notion is much more so itself. Then it will have to be supposed that the soul itself is the generator of mathematical species and concepts. But if, containing them in itself as first patterns or paradigms, it makes them take their essential character, in such a way that their generation* (the Christian understands, the creation of sensible things) *is nothing but the propagation of species which were previously in it* (that the mathematical reasons for the creation of bodies were coeternal with God, and that God is pre-eminently soul and mind, whereas human souls are images of God the Creator, even in essentials in their own way, is known to Christians) *then we shall agree with Plato, in saying this, and the true essence of mathematics will have been discovered by us. But if on the other hand the soul, since it did not have the mathematical concepts and had not previously received them from anywhere* (if it was because they had not been created along with it) *nevertheless weaves this wonderful immaterial equipage, it promotes this very splendid speculation: how, then, does it in that case distinguish whether the things which it has generated are real and stable* (I read μόνιμα, "stable," not γόνιμα, "generative") *or gone with the wind, and specters rather than true? What norms will it use to measure their truth? Indeed how, since it did not measure their essence, does it generate such a great variety of concepts? For on this basis we shall make their character accidental, and not aiming at any goal or end. Then mathematical species are the offspring of the soul itself, and it does not take the concepts which it establishes from sensible things. On the contrary, the latter are propagated from the former; these are its progeny, and clearly this is how permanent and perennial species are born.*

The true essence of mathematical things in the soul.

Second, if we assemble the concepts of mathematics (or definitions) from below

Mathematical species are not assembled from individual quantities.

Arguments adduced by Aristotle.

and from sensible things, surely the proofs which sensible things establish will be better than the proofs of universal and simple species? For we say that, for investigating the subject of an enquiry, wherever there are basic assumptions and propositions, they are related to the proofs or conclusions. If, therefore, individual things are the causes for universals, sensible things for objects of thought, how can it come about that the end of the proof is referred to the more universal, not to the particular, and that we show that the essence of intelligible things is more closely related to the proofs than that of sensible things? For what they say is this: if someone proves that an isosceles triangle has angles equal to two right angles, and the same of an equilateral one, and the same of a scalene one, that is not legitimately knowing; but someone will have knowledge properly so called if he has proved that of every triangle without qualification. Again: universals are better for proof than particulars. Further: proofs refer more to universals, and indeed the things of which proofs are constructed are prior, and by nature precede singulars, and are the causes of that which is proved. Therefore, the demonstrative branches of knowledge are very far from assembling their propositions like beggars around sensible things which are posterior in origin and more obscure. I shall say it once more, and for a third time: those who say this make the soul baser than the actual species. For if matter takes from nature things which are essential, and closer to reality, and more obvious, whereas the soul receives them from it by a secondary act, and constructs the patterns and images in itself with a secondary origin, looking to baser essences and abstracting from matter things which are inseparable according to its own nature, are they not making soul more needy and more obscure than matter? For matter is also the place for material concepts, just as soul is for species (immaterial). For the former would be the place for that which is prior, the latter for that which is secondary, and the former for that which holds the lead in existence, the latter for that which takes its character from it, and finally the former for that which is made in accordance with its essence, the latter for that which is named according to its implications. How therefore can soul, which shares in mind and the intelligible first essence, and which thence has complete knowledge, how, I say, can it also be the receptacle for the most obscure species of the whole of life, that is to say of the lowest degree among things, and of all that is most imperfect in its existence? Indeed I consider it entirely superfluous to mount more attacks on this opinion, which has long since deservedly been flogged by many.

Here he means the soul of the world particularly, the created God of Plato, in fact the Mind which Christians call God the Creator Himself, of Whom all created souls, set in authority over bodies which are to be given life, are images.

But if mathematical species do not have their existence by abstraction from material things, nor by assembling common features which are found in individual things, and are not at all secondary in origin, or drawn from sensible things, it will indeed necessarily be the case that the soul adopts them either from itself or from Mind, or indeed from both itself and Mind at the same time. Yet if it is from itself alone, how will they be images of intelligible species, how will they be intermediate between divisible and indivisible nature, though they obtain no integration of the first-named for their existence? Lastly, how are the first patterns, the paradigms or ideas, which are in the mind, the originators of universals?

But if on the other hand it is from Mind alone that they are adopted

the soul, how can the soul remain itself, functioning of itself and moving itself, if the concepts which are in it have flowed into itself from elsewhere, according to the standard of the natures of those things which are activated by something else? And in what way will the soul differ from Matter, which is everything only in potential, but generates nothing among material species?

The remaining possibility, therefore, is that the soul adopts them both from itself and from Mind, and so that it is itself an absolute integration of the species which take their nature and obtain entry to existence from the intelligible first patterns or paradigms which are generated by themselves. Then the soul is in no way a blank sheet, empty of all thoughts; but it is always a written sheet, and it both writes of itself on itself, and is filled with writings by Mind. For the soul is a Mind, or a kind of Intellect, which reflects on itself in accordance with an Intellect which is prior to itself, having become an image of it and a representation or external copy of it. If, therefore, it is everything intellectually, soul will also be all things spiritually; and if Intellect is everything as a pattern, soul will be in the manner of an image; and if Intellect is everything in combination and unity, soul will be in a divided way. Since Plato also had understood that, he constituted soul from all things, and divided it according to numbers, and linked it to proportions and harmonic ratios; and he related to it the first basic principles, which are responsible for the figures (I mean the straight and the curved), and he sets in motion the circles, which are in it intellectually. Then everything mathematical is first of all in the soul, and before numbers there are the numbers which set themselves in motion, and before the seen figures there are the lifegiving figures; and before the consonant and the melodic there are the actual ratios of the consonances, or harmonic ratios; and before the bodies which are moved in a circle the actual invisible orbits were established. And Soul is the integration of all things; and it is a sort of embellishment of a different kind (from the sensible) which both applies itself of itself (to things) and is applied from a basic principle which is related and akin; and it both fills itself with life of itself, and is filled by the Creator by a means which is incorporeal and unlocalized. (He is not far from every one of us; in Him we live, move and have our being.)[24] *And when He puts forward and expounds its ratios, He then also reveals all bodies of knowledge and all virtues. Therefore, Soul has its essence in these species; and it must not be supposed that Number, which is in it, is a multiplicity of units, nor that the form and idea of those things which may be scattered in space must be understood as corporeal; but all things must be taken as lifegiving and intellectual, and as the first originals of visible numbers and figures and ratios and motions. And here we must follow Timaeus, who integrates and completes the whole source and structure from the mathematical types, and locates in it the causes of all things. For those seven terms of all numbers pre-existed in it, as far as cause is concerned.*[25] *Again the basic principles of the figures have been located in it in the architectonic or*

For Christians, not only are the souls patterns of the Creator, but also they are still sustained by Him by a kind of radiance of the divine grace which falls on them.

In the *Timaeus*, which is beyond all hazard of doubt a kind of commentary on the first chapter of Genesis, or the first book of Moses, converting it to the Pythagorean philosophy, as is readily apparent to the attentive reader, who compares the actual words of Moses in detail.

Timaeus understands the Soul of the world.

I suppose, 1, 2, 4, 8, 3, 9, 27.

[24] *Acts of the Apostles*, 17, v. 27.

[25] See Plato's construction of the World-Soul in the *Timaeus*, 35B–36A, from the geometric series 1, 2, 4, 8, and 1, 3, 9, 27.

structural sense; and the first and chiefmost of all the motions, which surrounds and rouses all other motions, existed along with it. For of all that moves, the basic principle is the circle, and circular motion. Therefore, the concepts of mathematical things, which integrate souls, are essential and self-moving; and Soul putting them forward and propagating them and unfolding them, causes the whole variety of mathematical knowledge to persist. For it will never happen that it ceases to engender and bring to light one thing after another continuously, while it uncovers its concepts which are indivisible in their simplicity. For it has previously received everything, by way of chief and primeval species; and in accordance with its limitless ability, from the basic principles which it has previously adopted, it constructs the development of contemplations of every kind. So much for Proclus.

I wanted to transcribe the whole passage, not only because he set the genuine terms of the harmonies, the circles and the arcs cut off by the figures, among other mathematical things, in the soul and in the mind essentially, in such a way that these mathematical things become for the soul and correspondingly the soul for them (insofar as they are separated from individual things) like a sort of essence, but also because he removes from me, who am putting forward similar views, the blame for rejecting Aristotle in both directions, and gives an outstanding recommendation to this philosophy.

On numbers, indeed, I should not contest the view that Aristotle rightly refuted the Pythagoreans; for the numbers are at second remove, in a sense, or even at third, and fourth, and beyond any limit I can state, and they have in them nothing which they have not got either from quantities, or from other true and real entities, or even from various products of Mind. Thus I do not attribute anything either to the Platonic numbers, which are attributed to the change in Republics, which Bodin adopts in his *Historical Method*, nor to those called Climacteric, that is on their own account, except insofar as they number the revolutions and configurations of the stars, as I indicated not long ago openly enough in the prolegomena to the *Ephemerides*.[26]

Climacteric numbers.

But as far as continuous quantities are concerned, I entirely agree with Proclus, though his rhetoric sweeps on like a torrent, overflowing its banks and concealing the hidden shoals and whirlpools of doubt, while his mind, full of the majesty of such great matters, struggles in the constraints of language, and his conclusion, never satisfying itself

[26] In a letter of 1 October 1616 to David Fabricius, Kepler answered a number of astronomical questions Fabricius had raised in his Calendars for 1615, 1616, and 1617. This letter was published by Kepler in the Prolegomena to the first part of his *Ephemerides novae motuum coelestium* (Linz, 1617) (KGW 11, pp. 26–38). Fabricius had maintained that the cause of the period of the tides, consisting of 6 hours flow and 6 hours ebb each followed by a quarter of an hour of still water, should be sought in the mystic number seven. Kepler dismissed this idea as Pythagorean superstition. In the introduction to his *Astronomia nova* (KGW 3, p. 26) he had explained the tides as an effect of the attraction of the moon on the oceans.

with the flood of words, oversteps the simplicity of his propositions. I therefore believe that if I now append my reasons why I establish the intellectual circle and its parts as the terms for the insensible harmonies (reasons which I had conceived before I had read Proclus), I shall not only be saying what agrees with Proclus but also making a kind of summary of the passage quoted, as far indeed as it serves my purpose.

The terms of the insensible harmonies are abstract quantities.

I shall not state among my reasons that as the objects which are compared had been first outside, and next in the sense, they have been abstracted finally from things and from the sensible emanations of things, a sense which the term "abstracting" properly engenders; for as has been stated above, this process of abstraction relates to the sensible harmonies of sounds and rays, and comes into the reckoning only when, just as the good or evil deeds of citizens are adjudged by laws which were passed long ago, sounds and rays are adjudged by the archetypal harmony which is already present within.

But this is the reason why the quantity which provides the terms for the harmonic proportions is said to be intellectual, because that quantity must be capable of by far the most subtle construction. Yet that construction is never drawn from sensible things in a diagram, though it is assisted by them; and it does not arise from the assembling of many individual sensible things into one axiom, but it is obtained *a priori*. The valid objection which Proclus made to Aristotle, generally understood in this way, I can thoroughly confirm in particular with absolutely clear arguments taken from Book I. For of the figures which cut off a harmonic arc of a circle the specific difference, by which, as a part of their definition, their essence is exhibited, is the fact that they must be knowable. Yet what after all is knowability without Mind, which is capable of knowledge? And do not say that it can be the case that knowledge is not knowledge of something; for knowledge consists in comparison, as when the side of a figure is equal to the semidiameter. What equality may then be without a mind, especially in the case of things which are independent of place, is unintelligible; and we return to the argument already adduced above for harmonies which are also sensible.

Also they must be not only knowable but also known, so that the archetypal harmony may in fact shine forth within the mind. For the possibility of knowing is not sufficient for us as a criterion of sensible harmonies. Therefore, if a part of the essence of something is within the mind, and thus in its operation or activity, that thing must be established within, that is to say the terms of the harmonies, the circle and its part.

The soul has knowledge of mathematics by instinct.

You may ask how knowledge of a thing can be possessed, when the mind has never learnt it, and perhaps cannot learn it, if it is deprived of sensation of external things? To this Proclus replies above in words which are commonplace in his philosophy: we today, if I am not mistaken, quite correctly use the term "instinct." Indeed to the

human mind and to other minds quantity is known by instinct, even if for this purpose it is deprived of all sensation. Of itself it understands a straight line, of itself an equal distance from a given point, of itself it forms for itself from these an image of a circle. If so, it can much more readily find the construction by means of that, and so perform the function of the eye in seeing the diagram (if there is nevertheless a need for one). Certainly the mind itself, if it never had the use of an eye at all, would demand an eye for itself for the comprehension of things which are placed outside it, and would lay down laws for its structure which were drawn from itself (if in fact it were pure and sound and without hindrance, that is, if it were only what it is). For the recognition of quantities, which is innate in the mind, dictates what the nature of the eye must be; and therefore, the eye has been made as it is because the mind is as it is, and not the other way round. And why waste words? Geometry, which before the origin of things was coeternal with the divine mind and is God himself(for what could there be in God which would not be God himself?), supplied God with patterns for the creation of the world, and passed over to Man along with the image of God; and was not in fact taken in through the eyes.

Proclus says almost the same a little after the passage just quoted: that the truth about the gods is adapted to mathematical entities, and the Creator of the whole universe used mathematical archetypes, coeternal with Himself, in the construction of the world.

Therefore, since quantities possess constructibility not by virtue of the figures' passing before the eyes, but in virtue of being clear to the eyes of the mind, in virtue not so much of having been abstracted from sensible things but of never having been associated with them, therefore, we have rightly established abstract quantity as the terms for archetypal proportions, that is those which are constructible from the divisions of the circle.

There is another reason why I choose abstract quantities, that the circle, which is a figure, that is a species of the fourth kind, although it is a quantity, yet in this connection is considered purely as a figure, without distinction between large and small, to such an extent that it is in a sense abstracted from quantity itself, as if from what is subject to it, and its nature can be recognized even in the narrow space of a point. This, I think, was what Proclus meant when he said that mathematical things existed in the soul in an uncorporeal and unlocalized mode.

The symbolism of divine and human things in quantities.

Finally there is a chief and supreme argument, that quantities possess a certain wonderful and obviously divine organization, and there is a shared symbolic representation of divine and human things in them. Of the semblance of the Holy Trinity in the spherical I have written in many places[27] in my *Optics*, in my *Commentaries on Mars*, and

[27] Kepler first introduced his symbolism of the Trinity, taken from Nicholas of Cusa, in the *Mysterium cosmographicum* (1596), Chapter 2. Cf. Duncan (1981), p. 93 and note 1 on p. 237. Kepler explained the symbolism again in his *Optics*, that is, *Ad Vitellionem paralipomena* (1604) (KGW 2, p. 19), but in the *Commentaries on Mars*, that is, *Astronomia nova*, he only gives a reference to the place in the *Paralipomena* where the

in the theory of the sphere; and I want to return to the subject here. We come, therefore, to the straight line, which by its extension from a point at the center to a single point at the surface sketches out the first rudiments of creation, and imitates the eternal begetting of the Son (represented and depicted by the departure from the center towards the infinite points of the whole surface, by infinite lines, subject to the most perfect equality in all respects); and this straight line is of course an element of a corporeal form. If this is spread out sideways, it now suggests a corporeal form, creating a plane; but a spherical shape cut by a plane gives the shape of a circle at its section, a true image of the created mind, which is in charge of ruling the body. It is in the same proportion to the spherical as the human mind is to the divine, that is to say as a line to a surface, though each is circular; but to the plane, in which it is also placed, it is as the curved to the straight, which are incompatible and incommensurable. Also the circle exists splendidly both in the plane which cuts, circumscribing the spherical shape, and in the spherical shape which is cut, by the mutual concurrence of the two, just as the mind both exists in the body, giving form to it and to its connections with the corporeal form, like a kind of irradiation shed from the divine face onto the body and drawing thence its more noble nature. Just as this is a confirmation from the harmonic proportions of the circle as the subject and the source of their terms, equally it is the strongest possible argument for abstraction, as the suggestion of the divinity of the mind exists neither in a circle of definite quantity, nor in an imperfect one, for they are material and sensible. The main point is that the circle should be abstracted from corporeal and sensible things to the same extent as concepts of the curved, the symbol of the mind, are separated and, so to speak, abstracted from the straight, the shadow of bodies. Therefore, we have sufficient support for seeking the terms for harmonic proportions, which are objects of the mind alone, chiefly in abstract quantities.

A kind of definition of the mind.

Therefore, to conclude this section we shall gather the chief points in a package. For the sensible harmonies have this in common with the archetypal ones, that they demand terms and comparison of them, an activity of the soul itself: the essence of both consists in this comparison. But the terms of the sensible harmonies are sensible, and must be present outside the soul: the terms of the archetypal harmonies are present within the soul beforehand. Therefore, the sensible harmonies need in addition to be received by means of an ema-

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symbolism is explained. He explained it again in his theory of the sphere, that is, the first part of the *Epitome astronomiae Copernicanae* (KGW 7, p. 51). Kepler also discussed the symbolism in his letter to Maestlin of 3 October 1595 (KGW 13, pp. 33–46, p. 35) and in his letter of 28 March 1605 to Herwart von Hohenburg (KGW 15, pp. 180–190, p. 188). He now extends the symbolism, finding in the circle an image of the created mind.

nation which they have emitted; and it is by the senses, the servants of the soul, that they are received. Another comparison is also needed, of the individual; sensible terms with the individual archetypal ones, I mean with the circle and a knowable part of it; but the archetypal harmony has neither need, as its terms are present in the soul beforehand, and inborn in it, and in fact are the soul itself, and they are not an image of their true pattern, but are in a sense their own pattern. Thus only a simple comparison, which the soul sets up, of its own parts with each other, so to speak, completes the whole essence of the archetypal harmony. Finally the soul itself, engaged in this activity, is the harmony with which we are concerned, just as, without reference to this activity, the circle and its part are, that is to say they are the terms of the harmony; and in the end harmony is wholly spiritualized, and so deified.

Chapter II.

The Number and Kind of the Faculties of the Soul in Accordance with the Harmonies.

We have said so far of the harmonic proportions what they are and where they are located; but we do not seem yet to have touched on the question which is appropriate for our intention, because it relates not so much to the harmonic proportions themselves as to the harmonic faculty of the soul, that is to say the faculty for acting in accordance with the proportions. So far, then, we have dealt with the proportions from the point of view of their own essence; now we must deal with those proportions from the point of view of the soul itself.

How many faculties of the soul are concerned with the harmonies?

Now there arises a twofold faculty in connection with the harmonic proportions, one contemplative, which is mental, or so in a sense, the other operative; and the mental one is again twofold: for either it is for discovering the actual proportions in abstract quantities, or it is for recognizing or noticing the chosen proportions in sensible things. Then the faculty which hunts for harmonic ratios is the same as that which also embraces the remaining branches of knowledge and the arts, that is to say the higher part of the human mind. For nothing is said here about God, inasmuch as it does not hunt for Him by contemplation and study but knows Him from eternity.

That faculty which notices and recognizes the noble proportions in sensible things, or even in other things established outside itself, is a lower faculty of the soul giving form to the senses from close to, or yet lower, that is to say only the vital faculty of the soul, that is one which neither contemplates, as is the habit of philosophers, or uses logic for this purpose, and does not exist only in Man, but also in wild beasts and cattle, and the sublunary soul. You may ask if it is not capable of contemplation, and that means it would not be able to grasp knowledge of the harmonic proportions, from which it would have the ability to recognize them when they were proffered from without. For to recognize is to compare some external sensible thing with ideas which are internal, and to judge that they are congruent. That is splendidly expressed by Proclus by the term "awakening," as if from sleep. For just as sensible things which we meet externally make us recollect what we had known beforehand, similarly sensible mathematical things, if they are recognized, therefore, elicit intellectual things which are previously present within, so that things now in actuality shine forth in the soul which were hidden in it before, as if under a veil of potentiality. How, then, did they break in? I reply that the ideas or formal causes of the harmonies, in accordance with our earlier

Harmonic ratios are innate in souls.

discussion of them, are completely innate in those who possess this power of recognition; but they are not after all taken within them by contemplation, but rather depend on a natural instinct, and are innate in them, as the number (something intellectual) of the leaves in the flower and of the segments in a fruit are innate in the forms of plants. The result of this finding in plants, resembling the harmonic ratios (for number and proportion are akin, as was made clear above), is that I cannot confidently deny even to the vegetative faculty of the soul, and to the plants themselves, the power of recognizing the harmonic proportions of the sidereal rays; though I assert nothing without appropriate tests. It therefore turns out that boys, that primitives, peasants, and barbarians, and the very wild beasts, perceive harmonies in notes, though they know nothing about the theory of harmony. But if you were to ask whence they get this instinct, I shall either take refuge in God, Who shapes and imposes on bodies these forms, all images of Himself, though more or less close, and makes them display the harmonic ratios in themselves, just as He has embraced them in His mind from eternity, and has expressed them in His creation, as has been stated above; or else, which comes to the same thing, I shall adduce the affinity, touched on in Chapter I, of these souls, even the inferior ones, with the circle, in accordance with which, as with a rule or law, they have been arranged and shaped, while along with the circle, and its constructibility, they have also taken on the idea of the harmonic proportions which depend on it. For this philosophy is strongly confirmed by horoscopes, as we see that the character of the concurrence of celestial rays at the same point, as if from a common circle,is imprinted on the mind of the new born.[28] More on this will follow in Chapter VII.

The soul is in a sense a circle.

The basis of influences on horoscopes.

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[28] Horoscopes, which take their name from the ascendant (*horoscopus*), the degree of the zodiac rising above the horizon at the moment of birth, involve much else besides the influence of the aspects that was accepted by Kepler. Of judicial astrology in general, he remarked that it was like the stupid daughter who, thanks to her incantations, clothes and feeds her mother (astronomy), who is as wise as she is poor. See *Tertius interveniens*, thesis VII (KGW 4, p. 161). Indeed Kepler owed his own positions to his employers' interest in astrology; the writing of horoscopes and prognostications of events was part of his official duties. Among the Kepler manuscripts in Leningrad are some 800 horoscope diagrams in which he has written in dates and the corresponding positions of the planets, though only a few are accompanied by interpretations. See List (1971), p. 129. Some of his forecasts of events were in fact remarkably successful and served to enhance his reputation. In his *Prognosticum* for 1618 (KOF, vol. 1, pp. 481–483), for example, he predicted great upheavals in the world in May; and on 23 May of that year, the thirty years' war started when two Prague councillors were thrown from the windows of the Town Hall.

Kepler's most famous horoscope was the one that he wrote for his patron Albrecht von Wallenstein in 1608 (KOF, vol. 1, pp. 386–391). Later, in 1625, interpreting the horoscope at Wallenstein's request, Kepler predicted that in March 1634, there would be a terrible confusion in the country that would affect him. In fact Wallenstein was assassinated on 25 February 1634. The augmented horoscope may be found in

The media by which the soul perceives harmonies.

Furthermore the media which these lower faculties of the soul use to perceive harmonies in externals are the same by which they also take the actual external objects within themselves. If they are sensible, they are also perceived by the senses, that is to say, by the faculties of the soul which give shape to the senses, and which themselves also are no less occupied than the higher faculty in the comparison of particular things, but by instinct, not by contemplation. So by the hearing of a sound, and by the power which controls it, consonances are distinguished from dissonances. So architectonic proportions are perceived by the eyes, and by that faculty which controls the sight, beautiful and congruous proportions are distinguished from the incongruous. However, if the things themselves in which the harmonic ratio exists are not sensible, but happen to be perceptible by another faculty, by the same faculty also the actual proportions of things shine out in the soul, just as was found by comparison with the proportions of the sidereal rays. How those are perceived by the sublunary soul we shall enquire below in Chapter VII.

What is perception?

However, this perception of the harmonies in the inferior faculties of the soul is dull and dim, and in a sense material, and under a cloud of ignorance; for they do not know that they perceive, as when we see something but do not notice that we are seeing it. Such are those emotions and terrors celebrated by the Stoics,[29] which are natural and unintentional, and involuntary. Such also is the natural feeling of hate or love, especially with a remarkable predisposition, as judging the goodness of another soul, or its resemblance to one's own, by the symmetry of the parts of the body and the qualities of voice and temperament, he is wonderfully inflamed towards it. Therefore, the crazy youth loves the girl; and he does not know why, nor what he loves in her most of all, because no courtesan whom he meets can surpass her, if it is an improper love, nor can any marriageable girl, if it is a legitimate one. But if a physiognomist comes on the scene, he finds in both personalities some resemblance of character; and if the characters are defective, they give occasion for perpetual strife

The instinct of love.

The physiognomic instinct.

KOF, vol. 8, pp. 348–358. If Kepler had lived to see this prediction come to pass, he would have judged it to be merely a coincidence. When he appended to this horoscope the remark, "I have only devised horoscopes when I was sure that my work was intended for somebody who understands philosophy and is not affected by contradictory superstition" (KOF, vol. 8, p. 348), it seems clear that he would have preferred Wallenstein not to take it seriously, though he was not in a position to question his powerful patron's faith in astrology.

[29] As reported by Galen, the Stoic Posidonius explained that people do not feel afraid of an impending disaster as a result of logical persuasion but only when they have a vivid picture of it, akin to perception. Indeed the feeling of terror may be induced simply by a vivid description. According to Posidonius, this is because the irrational cannot be moved by reason but only by an irrational impulse or emotional movement. C. Galenus, *De placitis Hippocrates et Platonis*, ed. I. Müller (Leipzig, 1874), pp. 443 and 453–454.

in the marriage, but if they are good, for perpetual tranquility in life. So we must attribute to this the universal physiognomic instinct, as although it is dumb, and in a sense irrational (as it is hardly at all acquired by art, though it can be developed by it), yet it is a unique interpreter and umpire of human affairs. For a man attains prosperity (speaking naturally) to the extent to which his appearance, the symmetry of his body, the gait and motion of his limbs, smile to those who are in possession, and to which he insinuates himself on them, as if by stealth, though they have no other reason than that, so that they often testify that they love or hate someone without knowing the cause. There is, I say, in the inferior faculties of the soul such a sense of proportions without sensation. Indeed they neither distinguish the proportion from its terms or what is subject to it (as when we hear some pleasant tune, but do not consider the musicianship apart from the sounds) nor clearly distinguish between different harmonies. For they only notice that they are, and do not know what they are or how they differ. Of course the ideas of the harmonies, which these inferior faculties of the soul have within themselves, are clearly not known by instinct in their purity, but along with the wrappings of the emanation which is subject to them, that is of that which is the object of each faculty. Certainly the faculty of hearing (to use the example of consonant sounds to stand for all), which holds a position very close to the body, was too coarse, and so also unfit to receive the purest idea of proportion, as I shall now immediately explain at greater length.

The spell of appearance.

For I now come to the active faculties, which are concerned with the harmonic proportions. For this also is twofold: for either it operates on its own account, or in things which are outside itself, in either case adapting its operations to the proportions, or bringing the proportions into them. The former case is indeed like something passive; the latter is beyond argument occupied in activity. The former therefore is again the offspring of the inferior faculties of the soul, the latter of the superior. The former is subject to the powers of nature, the latter to the will of man. The former is plainly strong by the motion of the alteration which it brings to its body, so that it is completely subject to the vital faculty. For our delight in the harmonies of sounds has the character of an experience, in fact of being anointed or caressed, and hence the philosophers also call it, from its being passive, a response shared between minds and music. However, it is in reality an operation of the soul, acting by its natural motion on itself, and exciting itself; and it is brought to that not by intention or will but by natural instinct. And in fact it has from their very origin the ideas both of the harmonies incorporated into sound and of the feelings of the mind which respond to them linked together and, so to speak, conflated into one, so that the idea of harmony is implanted in it only insofar as it delights in it, and is something pleasurable, and insofar as it is bound up with the idea of the associated motion. This, I believe was what Proclus meant above, when he declared that the patterns

What the mind experiences in accordance with the harmonies.

of mathematical things (and so also of harmonies, and much more so) were in the mind *intellectually, but in the soul †vitally. For similarly they were also in the faculty of hearing soundingly, in the vital faculty of sublunar things radiantly and operatively: that is, they are not the actual pure internal patterns, but representations of them, derived from without.

* [Greek] "mentally," νοερῶς.
† [Greek] "livingly," ζωτικῶς.

However, the fact that we are not only delighted by harmony in music, but also fit the movements of fingers, mouth, feet, and body to it, we now attribute to the animal faculty, coupled with the will. But when we also fit the voice to intelligible harmonies, when we study a melodic piece of music which we have not heard before, in this case we are using all the highest and lowest faculties—the highest indeed because we employ both will and intention; but the lowest because we are able to, and because even without understanding of the proportions, we express the ideas of the intervals alone, which have been implanted by Nature, in music, excluding everything unmelodic, and roaming over the melodic intervals alone.

How souls make harmonies according to the ratios.

Therefore, the harmonic faculties explained up to this point have been breathed out by that essential harmony, God Himself, in the act of creation, inasmuch as he is "existence in activity"; and he has breathed this particle of His own image into all souls absolutely, more or less closely.[30] With this lesson I shall also put an end to this Chapter.

Where the harmonic faculties in souls are from.

[30] According to Kepler's interpretation, when Ptolemy (*Harmonica*, Book III, Chapter 3) affirmed the harmonic faculty to be rational, he had in mind a faculty of the soul to which he attributed reason, invention, and order. But he seemed to speak of something possessing reason subsisting in itself, leaving open the question whether this was the same as the soul or something distinct from it. In contrast to Ptolemy's inadequate analysis, Kepler claims to have shown the harmonic faculty to be essentially human souls themselves and souls other than human, one overseeing sublunary nature and another, seated in the sun (as the human soul in the heart), overseeing the whole world, and finally, God himself (KOF, vol. 5, p. 338).

Chapter III.

What are the Types of "The Harmonized," That Is, of the Things Whether Sensible or Immaterial in Which the Harmonies Have Been Expressed, Whether by God or Man, and in What Way?

It is easily seen that there are distinct questions: 1. In what do the harmonies exist as agent, shaper, or creator. 2. In what do they exist as the creation which is shaped. We have dealt with the former so far: we must now further deal more precisely with the latter.

All things, then, are either immaterial, or participate in matter.

1. In the soul.

The soul is immaterial (in relation to the body), and as we have maintained up to this point has wholly, in relation to its essence, been designed by God in the harmonic proportions; and those which were previously in the Mind as their creator, that is inasmuch as it is an activity, are now in the Mind because it is a creation of God. Now what participates in matter also at the same time participates in number and magnitude. But a consequence of magnitude is a position in space. Finally, local motion is attributed to them. Therefore, number is something prior by nature to harmony, because the terms of each harmony

2. Whether in the number of the planets.

must be more than one in number. However, the number of the primary bodies of the world also has its causes in geometry, which I repeat below in Book V from my *Mysterium Cosmographicum* (*The Secret of the Universe*). A consequence of quantity is shape, its individual property; and why a global shape was necessary for the stars, and so for the world itself, that is as a result of the archetype of the spherical, is generally explained at various points elsewhere. An immediate consequence of the shape of different bodies is a definite proportion, and that in three ways: one in their diameters, another in their surfaces,

3. Whether in the bulks of the bodies.

and the third in their volume or bodies. Therefore, if no other causes for these proportions were forthcoming, we should probably be able to affirm that they had been taken from the harmonies. Yet whatever they are, the celestial globes preserve them without any change, seeing that they do not become larger or smaller by any motion or lapse of time. It is otherwise in the case of those proportions which belong to bodies on account of their position and because of their local motions. For they retain the character of the motion itself; and as it is in a state of continual *BECOMING*, and is never occupied in *BEING*, similarly the proportions of motions are not constant and are different at different times. It is indeed true that if the motion of the celestial

bodies did not produce variations in their distances from their common starting line or the original state of the world, that is they had no motions upwards or downwards, but it was all in a pure concentric circle, in that case not only would the proportion of the distances have been constant, but it would also have been purely harmonic, if no other causes had been forthcoming.[31] The same has to be said of the motion, the cause of their essence, that is the cause of their true speed through the ether. If it were constant and perpetual in individual cases, there is no doubt that these speeds, or slownesses, of the various bodies would have been attuned to harmonic laws. Lastly the same has also to be said of the same motion on account of the enclosed space which is apparent beneath the zodiac. For if it had been necessary for all the planets to proceed with the same apparent motion under the zodiac, and never be further separated one from another, there is no doubt that God would from the beginning have established their position relatively to each other under the zodiac (if in fact His disposition of them had been unrestricted and not linked to other laws of necessity) in a way that would split up the zodiac in harmonic ratios. In fact it is generally agreed that that was the case at the start of the motions (since the start of time is considered without reference to time), so that from their common position and harmonic configuration (as it could have appeared either from the Earth, or rather from the Sun), as if from starting gates, each departed into their own spaces or paths. But because the planets move upwards and downwards, changing the distances between their positions; and because as well as this motion it follows by physical necessity that there is also a real intention and remission[32] of their motions, on account of their speed; and lastly because through the unequal apparent speeds of the different planets the area of the zodiac which they seem to traverse is divided differently at different times—for these three reasons, the same thing happens both to their positions and to their motions, through time, as to the actual quantities without reference to time. For just as the terms or markers of the harmonic ratios are not on the whole circle, or on a straight line and all its points, but in fact on certain of them, so also in this case the harmonies cannot exist in the whole time of the motion, nor in the distances, nor in the speed of the motions, nor in the areas of the zodiac intercepted between the planets. However, they can exist completely at certain moments of time, and they can

4. Whether in the distances.

5. Whether constant in the speed of the motions.

6. Whether constant in the apparent motions beneath the zodiac.

7. Whether in their apparent initial position under the zodiac.

In many cases not constant.

See pages 42–43.

[31] Kepler here sets out to explain why there are not harmonic proportions between the distances and other quantities where they might have been expected.

[32] Here Kepler uses the technical vocabulary of the problem of the intention and remission of forms, which the fourteenth-century kinematists in Oxford and Paris applied to local motion to indicate an acceleration and retardation. Kepler notes that a variation in the real speed of the planet results from its variation in distance from the center; that is, the sun. On the history of the problem of intention and remission of forms, see Maier (1951), pp. 3–109.

do that without any further operation by God, once the motion has been started. For if He has prescribed the extremes for the motions, and has granted them the favor of changing from one extreme to another, He has also bestowed on them all the intermediate points, both the incongruent ones, which are infinite, and the ones which are congruent and harmonious, interspersed in a definite number between the incongruent. For God has not left them changeable without any care for the display of harmony. Rather, He has reduced some of them (such as the proper motions[33] of the planets) to harmonic order by prescribing their extremes, which will be the subject matter of Book V. In other cases, where the extremes are not laid down, but the quantity of the motion in a circle is interrelated with itself, the Creator deemed it sufficient to shape souls, which control earthly creatures, in such a way that they expected and observed and noticed the harmonies, all round the circle, as they occurred at their own moments over time, and fitted their own doings to the prescription of the harmonies. That is the case with the apparent motions of the planets beneath the zodiac, as seen from the Earth,[34] the proper subject matter of this Book IV.

8. In the speeds of their paths.

9. In the lengths of their paths along the zodiac.

10. In music. Difference between celestial harmonies and human music.

With the works of God known to us, then, it is as follows. If we now compare with them the works which men ordain in accordance with harmonic laws, we shall have to say that they are partly the same and partly different. First, though in song continuous increase and decrease in quantity are possible no less than in the heaven, yet in the motions of the heaven it is necessary by definite laws of nature, but in the human voice it is neither necessary nor even easy. For the throat is made to produce identifiable notes by various sizes of circle. We pass more easily from high to low, and the other way round, by leaping, so to speak, over intervals, and separate sounds, than if we were instructed to use continuous intention. Therefore, it is nothing surprising if in the celestial motions, with actual continuous increase and decrease, which could not be avoided, there also remained unmelodic intervals mixed with melodic and consonant ones; whereas in human music, all the unmelodic intervals are eliminated and only melodic and consonant ones are admitted. Yet that gives no reason for exalting music above the celestial motions. For those are charged with another duty to perform: harmonic tuning is for them only ancillary. Music has nothing but the harmonies to keep in view, and seeks for nothing beyond it: it is directed to the sole aim of giving delight.

Why could not the human throat be intensified by continuous increases like an instrument or a string? Why not pure harmonic configurations, as in music there are purely melodic intervals?

There are also other human activities into which the mind introduces harmonic proportions, though more obscurely and ignobly, as when music is formed not only by the quality of high or low pitch.

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[33] That is, the angular velocities with respect to the sun.

[34] In this case, it is not the motions themselves that form the harmonic proportions but the relative positions of the planets along the zodiac brought about by these motions.

but in addition by the rhythmic measure as well, participating in double and triple proportion, and again in the movement of bodies, when dances are performed, first in the proportion of equality, and after that in double proportion. Poets also imitate the same thing, by making melodic feet from long and short syllables, the former being taken as double the latter. Thus the iamb ⏑ –, the trochee – ⏑, or the tribrachys ⏑⏑⏑, is to the spondee – –, dactyl – ⏑⏑, anapaest ⏑⏑ –, or amphibrachys ⏑ – ⏑, or proceleusmaticus ⏑⏑⏑⏑, as 3 to 4; to the bacchii ⏑ – –, – – ⏑, the cretic – ⏑ –, and peons – ⏑⏑⏑, ⏑ – ⏑⏑, ⏑⏑ – ⏑, ⏑⏑⏑ –, as 3 to 5, to the molossus – – –, choriamb – ⏑⏑ –, ionics and their compounds as 1 to 2. To the same feet the spondee, dactyl, and those which take the same time as them are as 2 to 3; and the same are to the peons as 4 to 5, whereas the peons are to the choriambs and their kin as 5 to 6.

11. In rhythmic measure. See Book III, page 117.
12. In dancing.
13. The harmonies of the poetic feet – ⏑⏑⏑ ⏑⏑ – – – ⏑ ⏑⏑ – ⏑⏑⏑ ⏑⏑⏑ –.

Indeed poets and grammarians also delight in the names of the proportions, with a peculiar usage, calling feet of four syllables by one short name, epitrites, that is four thirds. For as in the proportion 4 to 3 as expressed by parallel lines the first three units are in fact represented by a double line, and the fourth only by a single additional line, so in the foot there are three syllables of two units of time and a fourth of only one. And as the name "feet" itself alludes to dances, a part of comedies and tragedies, the actors also by the motion of their feet seem to have expressed all those proportions, no less than the double and triple proportions are expressed today. In architecture whatever proportions of length to breadth or thickness are most approved,even by observers who are not mathematical, are found to be as close as possible to harmonic. In fact the reason why the proportions of sounds are more exact than all of those, and the nature of man delights in their more eager expression, is that every living thing has sounds most of all in its power, seeing that they are shaped within it, emitted by its very midriff, and most obedient to every whim of its mind, every movement of its heart, and that, as has been stated before, it has been allotted the most suitable instrument, the throat stretched at full length, like a string or rather a pipe, and the voice roves up and down with the least impediment along the straight line of its length.

Hence the name epitrite for the feet – – – ⏑ – ⏑⏑ – – – ⏑ – – –.

Harmonies in drama.

In architecture.

Why of all harmonies produced by humans are those of song the most exact?

However, in general in everything in which quantity, and harmonies in accordance with it, can be sought, their presence is much more obvious through motion than without motion. For although in any given straight line there are its half, third, quarter, fifth, sixth, and their multiples, yet they are lurking among other parts which are incommensurable with the whole, in one and the same confusion with the whole, concealed in such a way that if in particular a second line equal to one of the aliquot parts is placed next to the whole—for example a lintel beam of three feet next to a doorpost of five—yet its proportion to the whole will not be as easily apparent as if some motion distinguishes and establishes and determines the comparable lengths. The reason is this, that where there is a quantity without a

Why harmonies are not obvious in the quantities of things at rest.

motion in accordance with it, in that case everything which is present in quantity is present together at the same time, that is all the proportions of all its parts to the whole. However, if some quantity is traversed by a certain motion, then (as is the essence of motion) those proportions which have been traversed are not present any more than those which have not been traversed, and do not yet even exist; and any one proportion is the only one present when the motion reaches its location. Thus it comes about by the succession of motions that the harmonic proportions are unwrapped from unmelodic ones, and by separation from mixture with them are established in full view, as it were, in their purity, and proffered for the senses to grasp. In fact not even the mind itself distinguishes the harmonic proportions in a given quantity from the infinity of unmelodic ones standing before and after without some image of motion; but when (to take the example of a circle) an infinity of chords has been traversed, it operates on the chord subtended by a third or a quarter of the circle, and similar ones, and seeks for its construction. It evinces by contemplation what the hand evinces by drawing a line, the actual separation of that one from the infinity of others which have not been contemplated and not been drawn, and the observation by the mind of its congruence or incongruence apart from the others.

Why proportions are most obvious in motion.

The mind indeed can do that because it employs the will, and dances by its own decision on that infinite division of quantities, the whole of which is present simultaneously to the mind for contemplation. On the other hand the sensations, and the other natural perceptions, and indeed the bodily motions by which the perceptions are assisted, are not under the control of a living creature in such a way that infinite sounds, or the infinite angles separating a pair of planets on their way around a circle, were mixed up with each other at the same time, they can withdraw from the unacceptable ones and retreat only to those which are pleasing. They therefore need motion, and with its intervention everything which has been mixed up as far as quantity was concerned will be sorted out through the sequence of time, so that it is presented individually to the senses on its own. But if the eyes are capable of anything like the mind, so that from a single infinite confusion of things which are present without motion they pick out the more important (as if by using the assistance of the hands they pick out from the infinite possible chords of a circle and sketch out the chord subtended by a third of it, that is the side of a triangle), that very thing should be considered as done not so much by the eyes as by the mind itself through the eyes, and this is clearly not without motion of the hands, as I have said.

Yet this will serve us below as an example to foreshadow the harmonies of the rays, to a certain extent.

Then to apply this observation to the previous pronouncements, there must, if something is to be the genuine subject of a harmonic proportion, there must, I say, be both a quantity, that is a length, in that thing, and two reference points at least, if the length is a circle, or three, if it is a straight line, of which either one or all pass over

How sensible things should have been compared, for there to be harmonies in them.

the length of the thing by some motion, and become the terminal points of the parts of its length between which there is a proportion: and that as a minimum. And that comes about in part in the configurations, which are the proper subject of this Book IV. For as will be stated in the following Chapter, the harmonies indeed in the angles which the zodiac measures out are considered without motion; but the actual angles, one giving place to another, are established by the motion of the radiating bodies through the zodiac. However, there are more important processes which tend towards the same result, as when bodies themselves which have length are bounded by such reference points, which rove up and down, and their stumps which have been cut off by some vicissitude, move at the same time. Thus not the bodies in this case but the actual motions of the bodies, with respect to length and breadth which is not temporal but corporeal (in fact a kind of motion placed in bodies, or bodies established in motion) are compared with each other. It is like that with sounds; for a sound is an emanation given out by a body, and in accordance with its size, and to a certain extent how it is shaped, and how it is established in motion. For both motion and sound depend on what suits the shape.

How sounding things become the subject of harmonies.

And this again is another and more obvious reason why the nature of Man is devoted most of all to harmonic proportions in sounds. For once again this is due to the shaping of the body. In it the throat is that body which in accordance with the tightening of the upper or lower circle of gristle in the rough windpipe is now long, now short, and which, driven by the breath expelled from the bellows of the lungs, by its concavity (in other words its shape) gives out a similar motion, the emanation of which reaches the ears, and also the sensation (of the actual windpipe, as it is established in the motion) is present to the sentient soul. Of course sensing by the common sense is to partake of the emanations of the organs of the body, as they are influenced, and, so to speak, shaped, by different motions. Those emanations, as I have explained in the *Dioptrics*,[35] are carried by a continuum of spirits from the organs of the body, even if they are at a distance, to

What the rough windpipe contributes to sounds for expressing harmonies.

[35] *Dioptrice*, proposition 61 (KGW 4, pp. 372–373). Here Kepler gives his fullest account of the physiology of vision. The retina, he explains, should not be regarded as simply receiving a picture on its surface, like a drawing on a paper, but rather as experiencing a more penetrating influence, so that the spirits contained in it undergo a qualitative modification. In support of this view, he adduces the evidence of the after-image, which remains in the eye after looking at a strong light. In the same way that a strong light, concentrated by a convex lens, will ignite combustible material placed at the focus, the much weaker light in the eye has a similar (though of course much weaker) effect on the subtle retina and the spirits contained in it. The spirits then convey an abstract impression of the real image on the retina to the common sense (in effect, the perceptive faculty), which has its seat in the brain, and in this way (though Kepler admits the mechanism of the process to be obscure), the subject consciously experiences the material change in the retina that constitutes vision. See Koelbing (1973), pp. 240–241.

the seat of the common sense. It therefore comes about that as a man by the frequent sensation of his rough windpipe established in motion absorbs a certain idea of the shaping of bodies which are in any way sounding, he recognizes all the more easily, and as it were judges, the shaping of bodies outside himself which are in motion, and emitting sounds by that motion, and examines them in comparison with each other according to the laws of harmonic proportions.

How the mind of Man judges from sound the quantity of things which are sounding.

Chapter IV.

What the Distinction is Between the Harmonies Considered in the Fourth Book and Those Considered in the Third Book.

It is quite out of place to prefix a longer dissertation on the importance for sound philosophy of distinguishing the boundaries of things, of comparing things which are akin so that they are not taken for the same, and to contrast opposites to illuminate them. Consequently it will be worthwhile to put forward in a single conspectus everything useful for this purpose which up to this point has been stated scantily or too obscurely or in passing, and wherever there is need, to illuminate it further and avowedly to make it fit the theme set out at the head of this chapter. There is then, a fivefold distinction between the harmonies studied in this and the preceding book. One is the actual matter of the harmony itself, with respect to its amplitude; the second is in its sensible terms; the third is in the cause which links the harmony with its essence; the fourth is in the means by which it is in it; the fifth is in the arrangement of the causes which shape the terms of the harmonic proportion.

The harmonies more restricted in this Book.

I. As far as the thing itself is concerned which is called a harmonic proportion, they first arose in the third Book from the divisions of a circle by the regular plane constructible figures. They were then transferred to straight lines, and when contrasted and combined with each other begot a not inconsiderable amount of harmonic parts (such as the harmonic divisions, tones, kinds, modes, systems, and so forth), and a wonderful commonwealth, so to speak, among them; and almost the whole of that apparatus, extensive as it is, will also be scrutinised and applied in Book V below. Now, however, in this fourth Book, although we have started from the same divisions of the circle indeed, yet we are not going to proceed to straight lines; but we shall confine the whole range of the discussion within the bounds of the circle. The reason has been stated in the previous Chapter, and will be stated at greater length below in Chapter VI where we shall deal further with their kinship and with the result of this distinction.[36]

Those are the harmonies of the angles.

II. As far as the terms of those harmonies or their sensible subject are concerned, in Book III that was the sounds which differ in height

[36] What is referred to here is the relationship of the musical consonances and the influential astrological configurations or aspects.

or depth of pitch; and so they were included in the class of motion, and were in a sense shaped motions. On the other hand in this fourth Book it is not notes, as was stated in the preamble, not motions of some kind, between which harmonies are to be recognized; but they are in the angles which pairs of planets, when they give off bright rays, form at the Earth, insofar as such an angle can be compared with four right angles surrounding a single meeting point. Now here the reader needs some excellent advice. For I can indeed explain these terms more clearly for purposes of perception, but I cannot do so without danger of confusion in good philosophical practice, unless I carefully forearm the philosophical reader. For the terms of a proportion must differ in quantity; but quantity in angles, that is their measure, is an arc of a circle drawn from a point where angles meet, as we are taught in geometry. So in the whole space of the world in fact, which is from here on Earth to the limits of things, we cannot ever draw, or perceive with our senses when drawn, a circle which is more suitable for measuring the angles of rays except that actual sensible circle at the height of the aether, represented by the very numerous fixed stars, from which, when they are assembled into the shapes of particular animals, it has taken the name of zodiac. Moreover, it is under that actual circle that the planets are always found, and it is that location alone which individually they seem to hide from us by the interposition of their bodies; and it is at its center that the Earth our home, not only in its own center, which is a point, but in the bulk of its whole body, over the surface of which we men have been distributed, seems to have been secluded. Nothing, then, is easier to perceive than if we say, as in the previous Chapter, that the harmonic proportions, with which we are going to deal in this Book, are between the whole circle of the zodiac and an arc of it which two planets seem to mark out, bound or cut off by that visible interposition of their bodies.

How they are in arcs of the zodiac.

Although this has been so derived, and very well postulated from geometrical and astronomical arguments, yet the philosophical reader must take the greatest possible care against presuming in his mind that this harmony (the subject matter indeed of the fourth Book) exists in the actual heaven, and in the zodiac circle, or even in the planets. Not the least bit; for this harmony is in the parts of the zodiac not on their own account, as the radiating planets stand at an immense distance below this circle, but on account of their measuring the angles of the rays which meet at the Earth; or rather, on account of their not actually measuring it themselves, but in place of them the exact image of the heavenly zodiac in the sublunar soul undertakes this duty of measuring. It is in the rays of the planets not inasmuch as they individually either descend from their planet or are the offspring of light (though they do not exist without it[37]), but inasmuch as the two

On the other hand they are not celestial.

[37] In *Ad Vitellionem paralipomena* (1604), Chapter 1, propositions 5 and 8, Kepler had explained the distinction between the rays and the light itself. The rays simply

rays of two planets joined together form some definite harmonic angle here on the Earth. Under both headings this subject of harmony is terrestrial (formally, and insofar as the rays become terms of a harmonic proportion), but in no way celestial except only in a material sense, and in respect of their own essence, without considering harmonies, that is to say insofar as the angles which are made at the Earth, that is the proper subject of this harmony, are formed by bright rays,[38] something which must originate in the heaven, but has now descended to Earth. However, we shall deliberately deal with the truly celestial harmonies in Book V. In brief, the terms of the harmonies in Book III were the work of Man or of art; in this Book IV they will be the work of Nature. Finally, in Book V they will be the work of God the Creator.

But terrestrial.

III. As far as the rational cause is concerned, which procures for harmonies their essence, there is no distinction between Books III and IV in general, but only in particular. For in Book III the harmonies flowed into the senses by reason of their material subject (the sounds) and were received and judged by reason of their formal essence, by which they are harmonies (that is they were shaped) by instinct which is created along with the mind, and participates in the reason without contemplation. And to that extent they were considered as harmonies only in themselves.

Next, however, by a hidden but avowed traffic with the faculties of the soul, the harmonies were received within and transfused into the varying emotions of the heart, by certain likenesses or images of themselves; and they were also transfused into the locomotive faculty, so that Man might express the representation of harmony which he had conceived in his mind not only with his voice but might also imitate it with the motion of his body. Thus the harmonies underwent the vicissitudes of one cause or another.

Similarly in this case also it is necessary to suppose that the soul, which has had by instinct right from the creation of things this "test" of harmonic proportions and which on its own account estimates the angle between two radiant stars, however it is received within it (whether that comes about by something analogous to the senses, or by a property of its essence in virtue of which it is soul—on which there was

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indicate the motion of what is moved. The light itself, an immaterial emanation, never exists in the intermediate space, through which it is propagated instantaneously, but only when it illuminates bodies. Light thus appears as though it were a surface, because surfaces receive and limit its propagation. As the rays are just a representation of the motion of the thing that moves (namely, the light), quite clearly they could not exist without the light.

[38] Strictly, according to Kepler's principles, the rays are invisible. It is the light itself (not the representation of its motion) which appears bright when it falls on a body. Evidently he is here using the term "bright rays" in accordance with the common speech rather than precise philosophical language.

a statement in the previous Chapter, and more will be stated in the following ones), compares it with four right angles, discriminates the harmonic from that which is not harmonic, and thus gains its own intellectual essence of harmony, which these angles did not yet have outside the doors of the mind.

These harmonies shine out: 1. in the soul of Man.

But if the question is asked, what manner of thing is this soul, and where or in what body is it located, I reply first that the minds of all men are such. But in Book III there was a faculty which controls the hearing, and so the senses: here it is not a case of a sensitive faculty. For the eyes, the subject of which is light, and shining rays, do not have a suitable indication of the harmonic radiations of pairs of planets. Nor is it a case of a reasoning faculty: for although reason does find and compute, from astronomical observations which have to be managed through the eyes, what the aspects are at any given time, yet it does not do that by nature, seeing that it is not in the power of all men indiscriminately, but by the exercise of will, within the power of a few singularly dedicated astronomers. But human souls are the subject of those harmonies, first by reason of their natural instinct, insofar as souls are copies of the Creator, as was stated in Chapter II; second by reason of their faculties, vital and natural, and of vital and natural motions, or in the Platonic style,[39] of the lustful and irascible parts—by reason of the former, indeed, insofar as they are harmonies, and by reason of the latter insofar as the representations of the harmonies are imprinted on those faculties, and are causes of the works of Nature, both in the mind and in the body, as instigators and stimulants.[40]

2. in sublunary Nature or the soul of the Earth.

Next, the chief soul into which these harmonies of the radiations flow is that called by the philosophers sublunary Nature, diffused through the whole body of the Earth, our nurse, and rooted in some particular part of it exactly as the human soul is in the heart.[41] From it as if from a hearth, fount, or inner sanctum it emerges by its emanation into the ocean which surrounds the lands and the air which is over both.

Now a man who is listening to the agreeable song of a good singer bears witness by the delight in his expression, by his voice, and by

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[39] Plato, *Republic*, 435B. Cf. *Timaeus*, 69C–D.

[40] Thus the aspects are perceived neither by the sense nor by the intellect but by an instinctive resonance with the images of the archetypes imprinted on the soul.

[41] Kepler's idea of the earth-soul appears to owe something to the influence of Ficino's translation of the *Corpus Hermeticum* under the title of *Pimander*, where the earth is described as the nurse of all terrestrial beings, which causes the birth of and gives nourishment to all things (*Pimander*, XII, 17). See Nock (1945). Cf. Plato, *Timaeus* 40C.

Marsilio Ficino, who founded the Platonic Academy in Florence, sought to absorb the Hermetic tradition into what he called Platonism. He not only endowed the earth with a soul but also the elemental spheres of water, air and fire. See Marsilio Ficino, *Théologie platonicienne*, trans. R. Marcel (Paris, 1964–70), vol. 1, pp. 151–152.

the clapping of his hands and feet, in time to the rhythm of the melody, that he perceives and approves the harmonic content of the melody. In exactly the same way sublunary Nature, by a remarkable and obvious commotion of the bowels of the Earth, particularly on those days on which the wandering stars are in a harmonic configuration with their rays at the Earth, bears witness to what we have already said by way of preface, that is to say that it has just as much power of perceiving the harmonic proportions of the angles by a kind of natural instinct as it has of heating and agitating the body of the Earth and the underground workshops in its mountainous regions at certain times of harmony by a natural faculty similar to our natural faculty, so that they exhale a great amount of vapor and clouds, from which, through reciprocal production of cold on high, all kinds of occurrences in the sky are shaped.

For this soul must be placed in the body of the Earth, as the harmonic angles of the rays exist in no other part of the world but on the Earth, and the works of Nature which follow upon the configurations of the rays take their origin from the bowels of the Earth and the caverns of the mountains. See Chapter VII.

IV. The fourth distinction consists in the ways in which the various harmonies are present in their subjects.

The concealment of these and of musical harmonies in continuity.

For in Book III where they were in music they were in the whole of it, that is to say in the whole of the time for which the music lasted. And though the intervals between the notes, as they all participate in quantity, admit of continuous division, yet in that case the music did not have a transition from the lower sound through an infinity of intermediate stages up to the one which was consonant or melodic with the first, but crossed over all the intermediate stages at a leap and in silence, so that the voice dwelt only on sounds which were melodic with each other. In the same way in part singing, although there are infinite intervals between the diapason and the dihex, yet the application of the voices was not continuous through all the intermediate stages, until the sixth emerged from the diapason, but the voices were carried with a leap from the pure diapason to the pure sixth, passing over all the intermediate stages in silence. And in the case of organs indeed there was a leap from one pipe to another; in the case of stringed instruments, as on an instrument like a harp, from one string to another; or if strings giving many notes were taken, as on a clavichord, pandora, lute, zither, from one fret, or in the case of wind instruments, from one aperture, to another; and in the human throat, from one circle of the rough windpipe to another. It is not so in Book IV. For the harmonies which we shall consider, as I began to say in the previous Chapter, do not always exist between the angle formed by pairs of radiant planets, and four right angles. On the contrary there occurs a continuous separation of planets, and their passage under the zodiac circle is through all the "unharmonious" intervals to the harmonious ones, among which is the extreme, two right

angles, a semicircle, or opposition, and from there in reverse order again through all the unmelodic and dissonant intervals as far as conjunction. In this case there is no leap from one harmonic angle to another, for example from the trine to the quartile; but the transition from the former to the latter is continuous, through all the intermediate stages. For that reason the whole time of the heavenly motions is taken up by unmelodic configurations of rays, but they are marked off only at particular moments by harmonic configurations of two, or sometimes three, or even four, while the rest proceed to incongruence, as if seven organ pipes gave out the same number of dissonant sounds with a continuous variation in the tuning, and it came about by a mutual coincidence of the tunings that sometimes two or three were in consonance, with the rest in dissonance. Thus to speak truly and properly, the actual harmonic configurations are not in time, but are produced at indivisible moments. Yet it is equally true also that the commotions which are due to these harmonies in souls are not momentary; for the harmonic configurations excite them, as long as they are in the process of becoming, and at the moment at which they become complete their stimulus relaxes again. However, the operations of Nature which are stirred up through these stimuli now take the measures of their time from the conditions of matter, and often last far beyond the moment at which the radiation is finished. Thus when a bronze cannon is fired, it is inflamed by the force of the burning fiery powder, and does not immediately relax its heat when the material of the fire is used up. Thus the body of an animal, to use a more appropriate example, which is tossed by a paroxysm of fever, even though the faculty of the vital soul, the author of the inflammation, relaxes from its effort, seeing that its function has been performed, and the feverish matter has either been dissolved or ejected from its innermost dwellings to the outside, is not, however, immediately freed from all heat. For the heat adheres to the matter of the body, the flesh, bones, and sinews, for a long time, until with the passing of time it perishes itself.

They are momentary.

Yet their effect is not momentary.

Therefore, these harmonies are from among the number of those which as we have stated in Chapter II are not under the sway of free providence, but by the necessity of motions are mixed with an infinity of incongruent ones of their kind, for which God has ordained minds to recognize the harmonies when they meet them. Yet sublunary Nature is far more fortunate in recognizing them than the ears are in the case of music. For the hearing is not greatly delighted by the harmony of two notes, if five other dissonant ones shout against it; but sublunary Nature, accustomed to perpetual incongruent configurations, does not take them into account because it notices nothing new. In fact it concentrates on the harmonic angle as if it was the only one. Similarly if some prediction goes wrong a thousand times, that is nevertheless disregarded; but if it once hits the mark, that is deemed worth remembering, that is acknowledged in everybody's conversation.

Pages 312–313. They are mixed with incongruent ones having no influence.

From this, then, we may understand that the harmonies in the case of music indeed are placed under the judgment and decision of the singer; whereas in the case of angles between rays they emerge not by any decision of sublunary Nature, but by the pure geometrical necessity of the motions. For because two planets have to be separated by the length of a whole semicircle or 180°, it must be the case that at specific moments they are also distant by harmonic parts of it, that is 30°, 60°, 90°, 120°, and so on. Thus the harmonies of music are sought within by the singer; the harmonies of the rays are looked for outside by sublunary Nature, are observed when met, are discriminated from those which are not harmonic (and thus take from it their essence), are selected, and are applied. In brief, the configurations sing the leading part; sublunary Nature dances to the laws of this song.

They are necessary, not contrived.

V. The fifth distinction must in a way be linked with the first. For the harmonies of this and the preceding Book do not differ only in breadth, but also in the order of the features by which the geometrical figures beget the two kinds of harmonic proportions. For in Book III the feature of knowability was the more important, in this Book IV that of congruence will be the more important.[12] But we shall now deal with this fifth distinction specifically in Chapter V, while expounding the axioms.

Dissimilarity in the order of the causes.

[12] The different geometrical origins of the consonances and the aspects is the principal reason Kepler finds for distinguishing these two types of harmony.

Chapter V.

On the Causes of the Influential Configurations, and of their Degrees in Number and Order.

Definition I

The word "configuration" is used for the angle between two rays, each descending from its planet, the angle at which the rays meet here at the Earth (which is deemed to be a point); or, which comes to the same thing, it is used for the arc of the great circle drawn on the zodiac, the arc which is the measure of the said angle; or the arc which the two planets seem to mark out by the interposition of their bodies and, so to speak, cut off for us dwellers on Earth.

It must first be noted about the name, that Ptolemy[13] *in his* Tetrabiblos, *in his* Almagest, *and in his* Harmony *calls "Appearances" what the Arabs translated as Aspects, as if a countenance were the same as a visage or face. Our Teutonic idiom does the same, as it generally names a face "das Angesicht," "aspect," and the countenances of characters who are impersonated, placed in front of the face, "Gesichter," which the Italians call "mascaras" [masks]. However, the word "regards" is also found [in Greek], which not only do we, following the Arabs, translate as "aspects," but also good authors generally call "looks" in Latin, and the signs "onlookers." But in this sense the word is less appropriate for the planets than for the signs or twelfth parts of the zodiac; for as they have length, with their inner side they can be turned towards each other to a greater or less extent. For contiguous signs cannot look at each other, seeing that their faces are not turned towards each other, but are nearly turned in the same direction as each other.*

Second, note that at the same time as two planets make an angle at the Earth they also make other angles at different places in the world; but never the same size as on the arc of a circle passing through the bodies of themselves and the Earth, or rotated about a line which joins their bodies, as if about an axis.[14] *Outside these places their radiations meet at angles which are far different, whether they are also harmonic, or incongruent, as they generally are throughout the rest of the world. Note chiefly that no angle is set up at either one of the planetary bodies. For two rays are required for an angle; but every ray is outside a body, and none is actually in the body. That must be noted*

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[13] *Tetrabiblos*, Book I, Chapters 2 and 13, *Almagest*, Book VIII, Chapter 4, *Harmonica*, Book III, Chapter 9.

[14] The angle is the same at any point of the arc described and at any point of the surface formed by the rotation of this arc about the line joining the bodies of the planets.

because the formation of an angle at the Earth is followed by an effect on the Earth also; and from it at the time of the aspects the material of rains and of other occurrences in the sky is exhaled. Hence we can argue of the seat of the cause which sets in motion occurrences in the sky that it is not in either one planet or the other, nor in any empty place in the world, but in the Earth itself.[15]

Third, it was not superfluous to mention that the Earth functions as a point. For the result of that is that although there are innumerable animate beings on the Earth, and an infinity of rays from any planet to them and other points on the Earth, yet the angle between the rays coming from a pair of planets at the same time is sensibly the same at all points of the Earth, whether at the center, on the surface, or in the caverns of the mountains. Although all those aspects are infinite in number, they are taken as a single aspect, seeing that they are all sensibly equal to each other.

Definition II

A configuration is said to be influential when the rays of a pair of planets make an angle such that it is apt to stimulate sublunary Nature, and the inferior faculties of animate beings to be more active, each about its own activities, at the time of the configuration.

Influence is attributed to a configuration, which formally is an entity of the reason, but not immediate influence on the thing itself, as if rains and the like fell from the actual heaven, that is to say from the planets which are in the configuration, which is the foolish persuasion of the common herd, but mediate and objective. For just as objects move the senses, sound the hearing and not the eyes, and color the vision and not the hearing, similarly in this case also, a certain quality of this relation, which is called a configuration, moves not the bodily senses, but a spiritual faculty, capable of reason by instinct without contemplation. Therefore, the configuration brings that about not by its own force but by the force of the soul, which is said to be passive although in actual fact it rather acts itself on itself. After that the sublunary soul or Nature, thus moved or stimulated by the aspect, and reminded of itself, stirs itself up to draw out from the bowels of the Earth the material for every kind of weather. If there were not in the Earth the soul which we call sublunary Nature, the planets of themselves could have no effect on the Earth either on their own account or by means of a convenient aspect. For it is absurd, and like a joke or a flight of poetic fancy, to suppose that from the coming together harmonically of a pair of rays, as if from the coupling of a man and a woman, a vapor is conceived as the material for wind or rain, as if indeed, as the seed is of the substance of the parents, so the moisture and other things which are exhaled from the Earth are of the substance either of harmony, which is a relation, or of an angle, which is a qualitative quantity, or even of light itself, which is a quality and

[15] Thus the influence of the aspects is in no sense a direct physical effect of the rays from the planets, a point that Kepler reiterates in his definition II.

by no means a substance. In fact in the same way as we say that nothing can come from nothing, so also, naturally, nothing material can be drawn from something immaterial. See further Chapter VII.

Axiom I[46]

The arc of the zodiac circle, which is cut off by the side of a figure or of a star[47] which is congruent and knowable, measures the angle of an influential configuration.

Axiom II

The angle of a figure or star which is knowable and congruent is the gauge of the angle of an influential configuration.

The whole business rests on the two axioms; and the reason why I have made them two is that there are two probable means by which souls and sublunary Natures can come to knowledge of the configurations which exist at a given time.

For they either perceive the figure of which a side cuts off an arc of the zodiac circle as the measure of the configuration or of the angle of the rays, or the figure of which the actual angle of the configuration is an element. What the distinction is between the figures, and what on the other hand the affinity is, is evident to the eye from these diagrams, which follow each other in order from this point. For the pairs of diagrams are "matched," first, a diameter with itself, whether it bisects its circle, being drawn through its center, or touches it, when the two rays make as their angle two right angles, or rather no angle, being arranged in a single straight line.[48] *The same must be supposed of the conjunction of planets, either superior, ♂, or inferior, ♀, which is improperly called a configuration.*[49] *For if two planets were at the same point on the zodiac, then there is no angle at the center, on the circumference an infinite number,*

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[46] The purpose of these axioms and the propositions which follow is to give a rational basis for the number of aspects and to order them according to their degree of influence. The two axioms resemble that which relates knowable polygons and the musical consonances in Book III, Chapter 1. These new axioms, however, give two forms of relationship between the sensible harmonies and their geometrical archetypes, through the arc cut off by the side and through the angle between two adjacent sides. Both axioms, as Kepler points out, lead to the same set of aspects. The advantage of retaining both is that they provide a theoretical basis for the fine ordering of the aspects in terms of their degree of influence. Each aspect is related to two polygons, the central one and the circumferential one. In the development of his theory, Kepler establishes the relative importance of the central and circumferential polygons for their corresponding aspect and decides which properties of the polygons should be considered as determining the properties of the aspects.

[47] That is, a polygon or star-polygon.

[48] That is, in the case of opposition (Fig. 1), the reciprocal figure (not shown in the diagram) is a circle touching the diameter at the center.

[49] Ptolemy did not count conjunction as one of the aspects, though he always treated it as if it were an aspect.

and the sides of the figure are points: that is to say, the circle is like a figure with an infinite number of angles. This configuration had no need of visual representation.

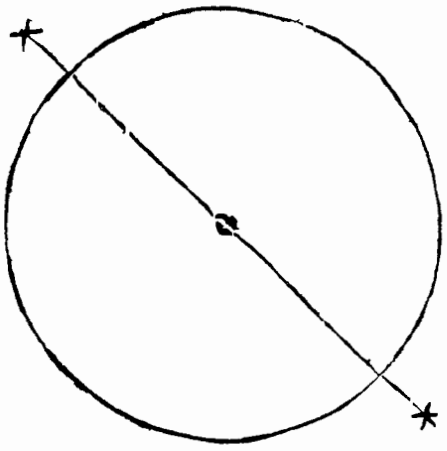


Figure I.

Second, the square is also "matched" with itself, because the angle which two of its sides form at the circumference is equal to the angle at the center subtended by one side. After that the triangle is "matched" with the hexagon, the pentagon with the ten-angled star, the octagon with the eight-angled star, the decagon with the five-angled star, and the dodecagon with the twelve-angled star, in such a way that if all the angles of one member of a team are drawn at the circumference, its side subtends one angle, located at the center, of the other member.

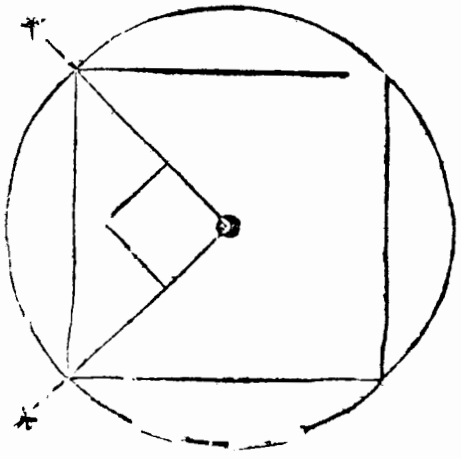


Figure II.

Now the centers of all the circles suggest the Earth, as if it were placed in the middle, and the circles themselves represent either the zodiac, as pictured from the Earth, or whatever other circle, subordinate to the zodiac, is pictured in order to measure the angles. Such circles are potentially the actual souls which are moved by the aspects, that is circles abstracted as it were from actual quantity and constrained within the restrictions of a point which has qualities and is capable of having directions.

However, I have placed two radiant stars outside this circle, one higher than the other, to convey by a visual representation that it makes no difference to the configuration at the Earth whether the planet is high or low in the heaven, and one can be many times higher than another while the configuration at the Earth remains the same.[50]

Furthermore, it came about not by accident but on purpose that in the first axiom the word "congruent" comes first, in the second the word "knowable." For both figures share the responsibility for some aspect's being influential, the one which is drawn at the circumference as well as the one of which one angle is formed by the rays at the center, both of them on account of knowability as well as on account of congruence; yet they are not equally responsible. All that de-

[50] In other words, the aspect is defined not by the angle between the actual rays coming from the planets but by the angle between their lines of longitude.

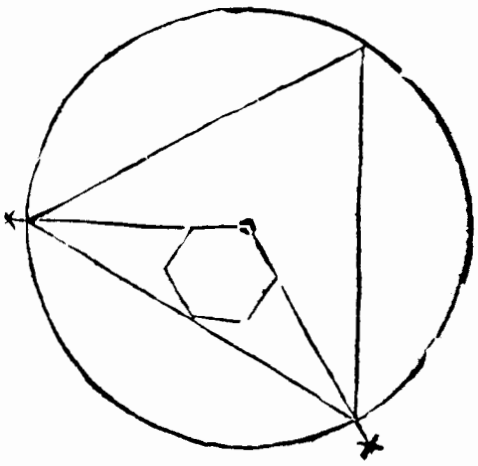
mands a somewhat more extensive explanation; and there is a single reason why it is so prickly—so that the number of aspects can be reduced by philosophical arguments, or at least can be differentiated into definite degrees. For if I had been willing to include four additional aspects along with the usual eight, this discussion could have done without several, so to speak, propositions which follow, seeing that they are taken up only with comparison.[51]

Proposition I

The affinity between the rays and a circle and its arcs is greater than was that between the consonances.

The bases of what was previously stated in Book III were already justifiably taken over into Book IV as an axiom. However, it is proved as follows:

Figure III.



1. Consonances are between sounds; sounds consist in motions; their heights or depths in pitch, by which the consonances are expressed, arise from the speed and slowness of the motions, by what has been demonstrated in Book III. But the quick and slow sounds are elicited from the striking of strings which are stretched, not only if the stretching is in a circle, but also, and much more, if it is in a straight line. Therefore, the consonances do not relate imme-

[51] Ptolemy (*Harmonica*, Book III, Chapter 9) recognized only four aspects; namely opposition (180°), trine (120°), quadrature (90°), and sextile (60°), though, as noted above, he always treated conjunction (0°) as if it were an aspect. On the basis of weather observations, Kepler (KGW 16, p. 114) in 1608 defended the three additional aspects which he had accepted in 1599 (KGW 13, p. 349), namely quintile (72°), biquintile (144°), and trioctile (135°). This brought the total number of aspects (including conjunction) to what he called the usual eight. See Field (1984a), pp. 202–204.

Ptolemy identified the astrological harmonies, or aspects, with the musical harmonies, for both, he claimed, were derived from the division of the circle into two, three, and four parts. Moreover, if the circle was divided into twelve parts, twelve being the smallest number to have half, third, and fourth parts, the resulting sections or zodiacal signs corresponded to the tones (approximately twelve in number) of the double-octave scale (*Harmonica*, Book III, Chapter 8). In the notes on his translation of Ptolemy's *Harmonica* (KOF, vol. 5, pp. 372–375), Kepler shows that Ptolemy is inconsistent, even according to his own principles, in accepting the sextile as an aspect but rejecting the semi-sextile (or duodecile). Moreover, he demonstrates to his own satisfaction the insufficiency of Ptolemy's foundations and claims that a true theory of the aspects can only be built on the geometrical properties of the division of the circle. Kepler develops his own theory of the aspects in the following propositions showing that they have a different origin from that of the musical consonances. It follows that, although they are related, the two types of harmonies—musical consonances and aspects—are not identical.

diately to the circle and its arcs, on account of their circular shape, but on account of the length of their parts, that is their mutual proportion; and they have what they have from the circle even when the circle has been destroyed and stretched out into a straight line. Aspects on the contrary are by Definition I angles, which the circle measures along with its arcs only if it remains what it is said to be, that is insofar as it both has its circular shape and retains it completely.

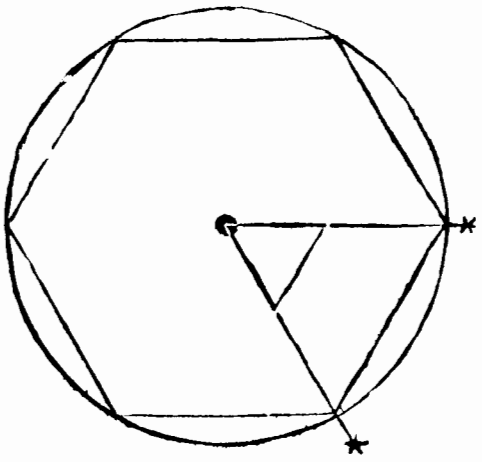


Figure IV.

2. The consonances were not all propagated with an equally close relationship to the circle and its parts; for some of them related their origin to parts of the circle, insofar as they had some property not as parts of the circle but as straight lines, that is the same division as the whole circle, as was shown in Book III. It is the opposite in the case of the aspects; for the measure of what corresponds with the circle cannot in any way be related to straightness.[52]

Proposition II

The affinity between the rays and the regular figures is greater than was that of the consonances.

It is proved first by the figure at the circumference. For where the circle is complete, in that case the regular figure is also complete. But the circle is more complete in measuring the angles of rays, by I. Then the figure also can be considered more as complete in relation to the rays. It is the opposite in the case of consonances: as the circle and its parts could be stretched out straight, while preserving the consonances, so also all the sides of a figure could be stretched out into one and the same straight line, and could make a consonance with one straight side of the figure. On that

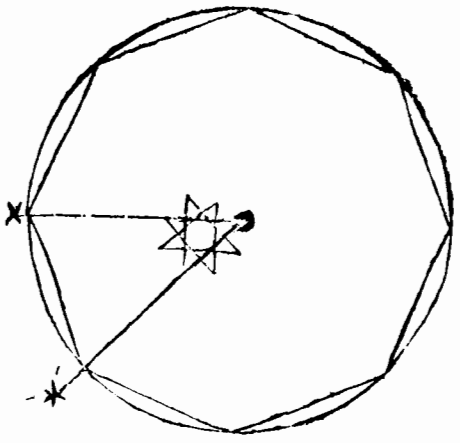
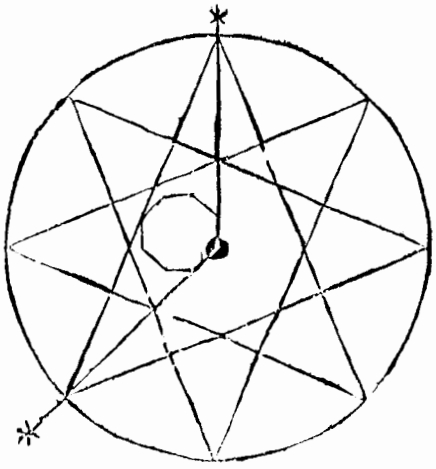


Figure V.

[52] The mixture of physical and mathematical reasoning employed here is characteristic of most of the following propositions, though the relative importance of the physical and mathematical components varies from one proposition to another.

Figure VI.



basis, indeed, just as the circle loses its configuration, so also does the rectilinear figure, so that it is no longer a figure.

It is proved second by the figure at the center. Angles are the elements of figures. In this case two rays make the angle at the center; and if that is repeated a certain number of times it completes the figure, as is apparent from these diagrams. However, that was not the case with the origin of the consonances: for there was no relationship with the angle at the center in that case. Therefore, the figures are more closely akin to the aspects than to the consonances.

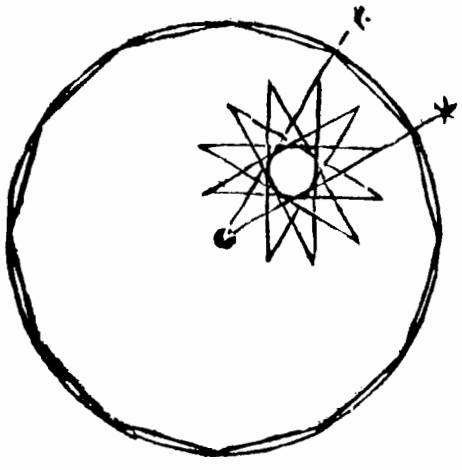
Proposition III

The congruence of figures is capable of more in establishing influential configurations than in the case of consonances.

Many arguments for this point are forthcoming. 1. Congruence is a property of a figure insofar as it is a whole figure and has an appearance. But a figure, insofar as the whole of it has this appearance, first, in itself on its own account has more affinity with configurations than with consonances, by Proposition II. Second, it divides the circle as a whole harmonically; but the circle also has more affinity with configurations than with consonances, by Proposition I. Hence on both showings, on that of the figure independently and that of the figure and the circle in common, the force of the congruence of figures is also greater in configurations than in consonances.

2. From the number of figures. For we have taken it, on account of the axioms previously stated, that figures are influential on account of their properties. Then where the number of the things influenced corresponds more, there is a greater affinity between cause and effect, at least probably. But as the congruent figures are few, so also the aspects are few, as experience testifies. For if they were not few, there would be a great confusion of them, and a great multitude, so that individual aspects could not be observed separately on their own days. But they can be observed: therefore, they are not infinite in number. On the contrary, the consonances can be infinite by augmentation of the intervals by

Figure VII.



diapasons, just as the knowable figures are infinite.

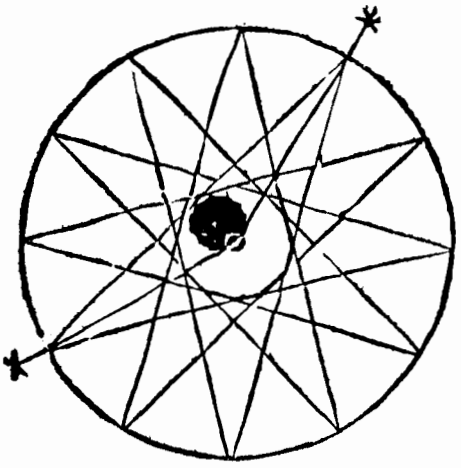


Figure VIII.

3. From the essence of the terms, in which the proportions in either direction have their existence. Motions, of which sounds are a disposition, are considered as Becoming, insofar as they take time; radiations more as instantaneous Being. For just as a body exists at this moment, so also a radiation exists at this moment; whereas of motion what has passed no longer is, what follows is not yet, in a moment it is nothing. Congruence, however, seems to be among things which are, rather than among those which become. For the sides or wall of a house are congruent so that the house may exist, not so that now and perpetually it may be built.

4. From the affinity of congruence, as cause, with configurations. For the latter are angles; but congruence also exists in figures on account of their angles.

So far consonances and configurations have been opposite to each other. In what follows there will be another opposition among configurations alone, between congruence and knowability.

Proposition IV

The congruence of figures is capable of making configurations influential more than knowability.[53]

It is proved from the circumstances of the sublunary Soul and also of the faculties of the human soul which perceive the aspects. These, then, are all inferior to the contemplative faculty and the understanding; and they have closer affinity with the sensitive faculty and the one which controls the operations of the senses. Indeed, the instinct of the former, as we have stated in Chapter III, is as much duller than the human instinct as the body of the Earth is cruder than the body of Man. But congruence is later in order than knowability, and is, as it were, presented outwards to some operation which has the idea of the operations of the senses. It is therefore right for it to be believed that these animal faculties are moved and affected by congruence rather than by the knowability of the figures.

Congruence and knowability were therefore opposites in the same kind of configuration. Now two figures will be opposed to each other, first with reference to congruence alone, after that with reference to configurations.

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[53] The reasoning in this proposition is almost entirely physical.

Proposition V

Congruence is a property of the figure at the circumference rather than at the center.[54]

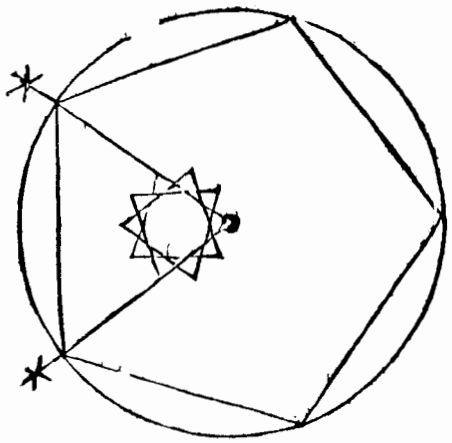
For it has the more important position in the figure which can be whole, on account of the position from which it takes its name, because congruence belongs to whole figures, as is apparent from Book II. But of the central figure not more than one angle can stand at the center, by Definition I. However, at the circumference the whole of the circumferential figure can exist. The proposition follows.

Proposition VI

Of the two figures which each aspect claims for itself, that at the circumference is more important than that at the center.

For congruence is more important in this business than knowability, by IV. But congruence is more important in the figure at the circumference, by V. Hence, that which has superior power also makes the very thing in which it is have superior power, that is to say the figure at the circumference.

Figure IX.



The same is also proved in the following way from the inmost properties of the soul, touched on in Chapter III. For as it is the soul which adapts its own formal essence to the harmonies of the configurations, certainly by the same distinction by which the soul is either a circle,[55] or a point which is the center of a circle, so also will the figures which belong to its household, those at the circumference and at the center, be distinguished.

In fact, every soul bears some idea of a circle, in fact of a circle abstracted

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[54] Here the reasoning is entirely mathematical. Kepler asserts, quite reasonably, that the capacity to form congruences is a property of the figure as a whole and the circumferential polygon is employed as a whole (the circle passing through all its vertices), whereas the central polygon has only one of its angles at the center. This difference enables Kepler to justify the use of the hierarchy of polygons defined in terms of congruence as a means of determining the relative status of the aspects, once he has shown, in proposition VI, that the circumferential polygon is more important in the determination of the aspects, and in proposition VII, that for the circumferential polygon, congruence is more important than knowability.

[55] The symbol for the soul is a circle, of which the circumference represents its external and the center its internal manifestation. In its passive (perceiving) role, as when it perceives the aspects, Kepler thinks of the soul as a point but in its active (operative) role, when it responds to the stimulation of the aspects, he thinks of it as a circle. As his prior concern is for the influence of the aspect rather than for the way in which it is perceived, Kepler gives more attention to the circumferential polygon than to the central polygon.

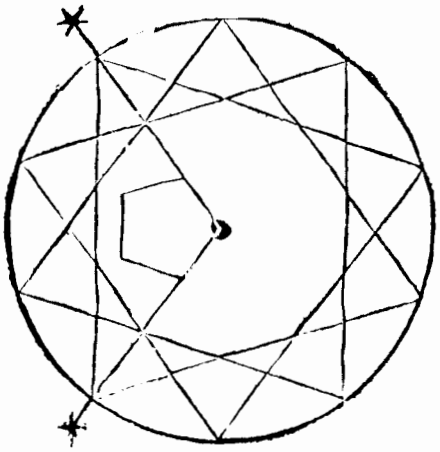

Figure X.

not only from matter but also in a sense from magnitude, as was stated in Chapter III, and so the circle and its center in this case almost coincide, and the soul is either a potential circle or a point in which directions are distinguished, and thus it can be said in a sense to have qualities. Yet it seems that the division must be observed between those faculties of the soul which should be considered rather as a circle, and those which should be considered rather as a point. For just as a circle cannot be imagined without a center, and on the other hand every point has round it space for drawing a circle, so also in the case of the soul there is no operation without an image-forming impression, and on the other hand every internal reception or meditation is on account of an external motion, and very interior faculty of the mind is on account of those which are rather exterior. What is the chief and supreme faculty of the soul, called the mind, if not a center? What is the reasoning faculty if not a circle? For just as the center is inside, and the circle more outside, so the mind keeps itself to itself, and reasoning weaves a sort of exterior web; and just as the center is the basis, source, and origin of a circle, so the mind is of reasoning. Again, every such faculty of the soul, both the understanding, the contemplative, and indeed the sensitive faculty, are a sort of center. But the faculties of the soul which produce motion are a circle, because again, as a circle on the outside is placed about its center, so operation is towards the outside, and cognition and meditation are performed within; and as a circle is to a point, so in a way external action is to internal contemplation, animate motion to sensation. For a point, because it is opposite to the circumference in all directions, is born suitable for representing passive experience; and for what is the sensitive soul,

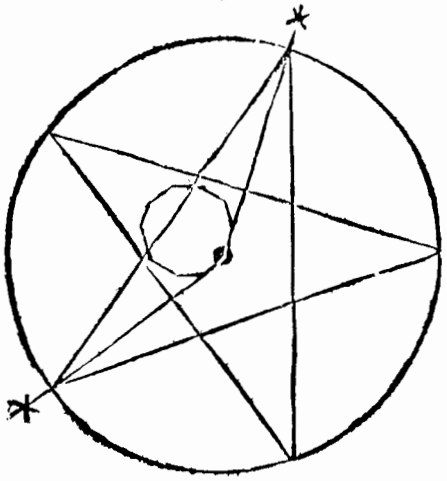

Figure XI.

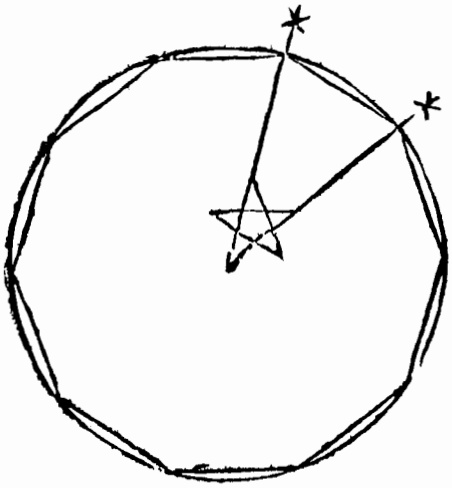

Figure XII.

even as in this case when it is that which perceives radiations, except for sensing and perceiving what it experiences passively? That is, because it is moved by its objects.

Also by comparing each point of comparison: as the center is the same in either case, so also the form of cognition is in a way the same, the chief mental one, and the sensitive, or, analogous to it, that which perceives radiations: neither uses contemplation in itself, insofar as it is what it is, but it recognizes without contemplation. Hence, as the former, I mean sublunary Nature or even the sensitive faculty, is a sort of faint image of the latter, the chief faculty of the human mind, so the former, contemplation by the reason, is an image of these actions and operations of the soul, a circle in each case.

Therefore, insofar as souls perceive celestial radiations, and so are to speak moved within themselves by them, let them be for us points; but on the other hand insofar as they are movers, that is, insofar as they transfer perceived harmonies between the radiations into their own operations, and are stimulated by them to action, they should be considered as circle.

It therefore follows that to the extent to which it is recognizing the harmonies of the rays, it is concerned chiefly with the central figure; whereas to the extent to which it is operating, arousing occurrences in the sky (and similar ones in Man), it fits itself to the one at the circumference. And in fact in the case of an aspect, we give prior concern for its influence than for the means by which it is perceived by the operative soul, and therefore, also prior attention to the figure at the circumference rather than to the figure at the center.

In this case, figure was compared with figure in one and the same aspect. In the following couple, supposing the figure is the same, its congruence will be opposed to its knowability.

Proposition VII

In the figure at the circumference, congruence takes precedence over the knowability of the side. In the figure at the center on the other hand, the knowability of the side takes precedence over the congruence of the figure.

This proposition pertains to the completion of the matter which was left half finished in Proposition III. For although congruence is more important in IV than in III, constructibility was also more important in Book III. Yet this should not be completely separated from the constitution of the aspects, since no congruence is without a knowledge-producing construction; and on it depends that of both the side and particularly of the area bounded by the sides of the figure. For it is from the angles, in which suitability for congruence resides, that the construction is derived.

It seems, therefore, that as far as this proposition is concerned its contrary is true, both in the one case and in the other. For as far as the figure at the center is concerned, one angle of it has in actual fact been expressed through the rays; but of the figure at the circumference no angle is expressed, but only its side, up to a point. However, congruence belongs to angles. Therefore, it seems that we must take most notice of that in the central figure. For if sublunary

Nature perceives the quantity of an angle, which two rays form at the Earth, it seems that it can also perceive the fitness of that angle, along with the others, for congruence.

The fact that on the other hand we should take more notice in the figure at the circumference of the knowability of its side than of its congruence seems evident from the following. For the knowledge by which a figure is known, as was demonstrated in Book I, is based on the equality either of a side to an expressible part of the diameter, or of the square of a side to an expressible part of the square of the diameter, or of the area of the figure to the same, or on another linkage of either the side, or of its square and area, to the diameter or its square, or determination by it. Suppose, therefore, that sublunary Nature has sensation of the zodiac circle, a circle which is of course sensible, and stands outside it, which it examines against the idea of an abstract intellectual circle, which it has within itself and born or created along with itself. In that case it certainly follows that in the natural order it first senses the size of the arc of the zodiac marked off between two planets, the size of the chord which it subtends, its kind, whether it is expressible in length or only in square, whether it makes an expressible sum of squares in combination with any other, and an expressible rectangle, and on what property the expressibility of its area is founded. These things, I say, seem to become known to sublunary Nature first in the natural order, because a side is prior to a figure which is described by a repetition of the side; and it is only afterwards when the whole figure has been described on the zodiac circle, that the angles become evident, and their quantity, and whether they are among the congruent, and whether the figure converges with all its angles to the same kind of congruence, or whether the congruence is continuous. In short, congruence is a feature of angles, knowability of sides. Therefore, when the angle of a figure becomes known before its side, in that case the parts of congruence seem to be earlier and more important than those of knowability; when it is known after, they are later. But it is the angle of the figure which reaches the center which becomes known first, whereas the side of the figure described at the surface (I mean between only two planets) becomes known first. Therefore, it seems to be right if in the figure at the center consideration of congruence is held to be more important, but in that at the surface that of knowability.

We must therefore rebut these points which have been adduced to support the contrary of our proposition, and in the same operation we must reinforce by true arguments the order of the properties of congruence and knowability.

First, then, although it is true in respect of the central figure that one angle is formed by the rays of two planets, yet it does not follow from that that the mind when it perceives the quantity of the angle perceives first in the natural order the congruence of the figure to which the angle is going to belong. The reason is evident, that congruence, insofar as it belongs to one angle, and several equal to it, placed in a single plane, is too general. For there are infinite forms of angles which are congruent in that way, and they are always greater in number in proportion as the individual angles are smaller. This, then, is not the congruence which we discuss in Book II which is a property not of angles indi-

vidually but of complete figures on account of their angles, and not of single figures but of several in combination.

Thus, the objection is not only rebutted but turned against itself. For the assumption it had made about the figure at the circumference, we can with equal justice make about that at the center, that congruence, as was stated in our proposition here, is in it later than knowability, so that the part it plays ought to be more important than that of the former, by our adversary's own admission. For a figure must come into being before the whole of it can be congruent. *However, in this instance unless the side of the figure is knowable, the figure cannot come into being. For although it is true that if in a figure one angle is given, which the rays of two planets form at the center, the number of all of them is given, and through them the fitness of the whole figure for congruence, and the nature of the side does not enter into this demonstration, yet that one angle of the figure is not given, that is, it is not recognized as an angle of a congruent figure, except through a knowable side. Therefore, the soul knows the side before (in natural order) it recognizes that it is given a congruent angle.*

Figure IV. Figure III. *But if we compare both figures in this case, the side or area of the figure at the center is given less, in fact, by the actual radiation, than the side of the figure at the circumference. For the latter is always bounded by the actual rays, the latter not always, but only in certain figures, as in the triangle, because the individual sides of the angle at the circumference subtend an arc equal to the intercept. Therefore, the figure at the center is more remote from the act of knowing than that at the circumference. Therefore, the recognition of congruence is also more remote. However, the objection rested on the contrary, as if the congruence of that at the center was more accessible to recognition than the congruence of that at the circumference.*

Further, if the quantity of the angle is perceived, by what will it be perceived if not by its own measure, that is, by the arc of that circle which is drawn from the point of the angle in question, that is the Earth? But not at first by an arc of that circle which is drawn round the central figure, and which passes through the Earth. Hence in the perception of the quantity of an angle in the central figure, it must as a soul show that power by which it is a circle, not that by which it is a tiny point, to which the angle extends. But by the same character of its circular essence it also perceives the side of the figure at the circumference, and its arc, and that at first. Only after that, with the doubling of this arc, does the arc of the smaller circle also emerge, which is drawn round the central figure, and passes through the center of the previous one. This arc assists the inscription of the figure at the center in the circle. For the order which occurs in reasoning is also the same in instinct. Again, then, a way is demonstrated to the perception of the central figure, a longer way, and so also to its congruence. Hence the objection reverses itself, as it based its superior force on priority in perception.

To the reasoning for the other branch of the argument the following reply has to be made. In fact even in the figure at the circumference the knowability of the side is in truth prior to the congruence of the whole figure, on account of the arguments stated, which are also valid in this case. But it does not follow that of two things, one of which is the cause of the other, the one which is the

cause also in addition moves a third one more strongly. For in relation to the grasp of the soul, which has to be moved, often for that purpose the cause has less force than the effect. So in this case the sublunary Soul, insofar as it is indeed perceptive, is more moved by the knowability of the figure at the center; whereas insofar as it is operative, it is more moved by the congruence of the figure at the circumference.

However, my own arguments to prove the proposition are the following. We first took it in Proposition VI that the center is a sort of idea of the speculative mind, or understanding, the circumference of the practical or operative faculty, because as the center is the basis and origin of a circle, so meditation is of action. Then the figure which offers its angle to the center, that is to the Earth, where the soul, the perceiver of the figure, has its seat, offers itself, so to speak, for knowing and judging, since the center represents the judgment seat of knowledge. Therefore, in the figure at the center more notice should be taken of knowledge, notwithstanding the fact that it is obtained by means of the circle as if by an instrument, as was stated a little earlier.

On the other hand, the figure which arranges the angles at the circumference applies itself more to imitation and to expression in the operation of the soul, as if working towards the idea of the operations. But it is congruence rather than knowability which has the idea of sensible operations and constructions, because it is a consequence of whole figures, while the side by which the figure is known is merely an element of it. Hence in the figure at the circumference we must have regard to congruence rather than to knowability.

Another argument for this second part depends on the same consideration of the soul. It prevails on account of what the others are. But configurations are perceived on account of the operation of sublunary Nature, and indeed of the inferior faculties of the human soul. That is to say, they are perceived for the purpose of expressing them operationally. The status of the motor faculty is therefore greater in this business. But the knowability of the figure at the circumference assists perception, and its congruence assists operation, as hitherto. Therefore, the congruence of the figure at the circumference also prevails over the knowability of the same.

Proposition VIII[56]

The arc of a circle which is established by an incongruent figure imparts no influence to the rays of two planets which delimit the arc.

For if congruence is the most important cause of influence, by Propositions III, IV, and VII, therefore if that is lacking, knowability will not be sufficient as a more humble substitute cause. For although the latter is more powerful than congruence in the figure at the center, by the other part of Proposition VII, yet on the other hand the figure at the circumference is more important than the

[56] This proposition is a partial converse of axiom I. It is not clear why Kepler did not make the proposition an axiom, though its usefulness in explaining the small number of aspects (notwithstanding the infinite number of knowable polygons) probably led him to regard it as too important to be asserted without proof.

one at the center, by VI. And in that congruence is more powerful, by the first part of Proposition VII. Therefore, the congruence of the figure at the circumference is still more powerful than the knowability of the figure at the center.

See, here is the reason why, whereas the knowable figures are infinite, and indeed of various degrees, the aspects, however, are few.

Axiom III

The arcs of a circle, of which the figures are powerful in more, and more important, degrees of congruence and knowability, also take the more influential configurations.

If the first two axioms are generally agreed,[57] *so will this be, because on account of the fact that every individual one is like that, if the former is intensified, the latter will also be more like that. Understand this, however, in the following way: that in the figure at the circumference the comparison of the degrees of congruence takes precedence, in that at the center comparison of the degrees of knowability, and in fact the part of the figure at the circumference is more important.*

Proposition IX

The influential configurations are those which intercept the following arcs of the zodiac circle:

180°: opposition ☍ from the diameter of the circle, as in Figure I.

90°: the quartile □ from the tetragon, as in Figure II.

120°: the trine △, and 60°: the sextile ⚹, from the triangle and the hexagon, as in Figures III and IV.

45°: the octile or semiquartile, and 135°: the trioctile or quartile-and-a-half ⚼, from the octagon and its star, as in Figures V and VI.

30°: the semisextile ⚺, and 150°: the quincunx (five-twelfths), from the dodecagon and its star, as in Figures VII and VIII.

72°: the quintile ⚳, and 108°: the tridecile or quintile-and-a-half, from the pentagon and the decagonal star, as in Figures IX and X.

144°: the biquintile ⚻, and 36°: the half-quintile or decile, from the pentagonal star and the decagon, as in Figures XI and XII.

That these figures are knowable and constructible has been shown in Book I: that they are also congruent, in Book II. However, that the configurations of arcs expressed by such are influential is in the Axioms I and II previously stated.[58]

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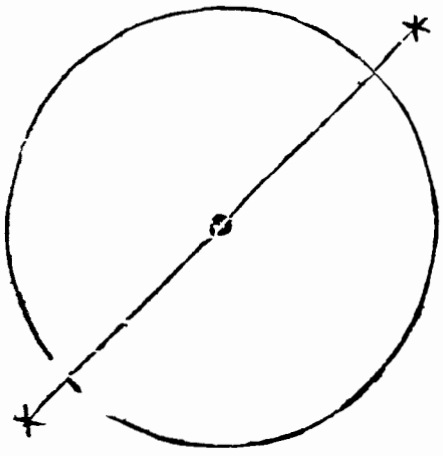
[57] It seems that the word "axiom" does not mean to Kepler quite the same as it does to a modern mathematician. In this chapter he seems to regard the axioms as working hypotheses, which he believes to be true, and wishes to justify if possible. For example, the series of propositions that follows the statement of the first two axioms appears to have been at least partly designed to justify accepting the axioms as true.

[58] Having stated the aspects which are established by the axioms, Kepler, in the propositions that follow, orders them, on the basis of the nobleness of the corresponding polygons demonstrated in Books I and II, according to their degree of influence.

Proposition X

Of the influentiality of the aspects the first and strongest degree is that of conjunction ☌ and opposition ☍.

For in conjunction the two rays are congruent on the same line, and descend from the same side: in opposition ☍ *they descend from different sides indeed, but are nonetheless parts of one continuous line. This in fact is the most perfect congruence and a kind of basic principle of all congruence. Thus as conjunction is represented by a point marked on the circumference of the circle, but opposition by the diameter, these are certainly basic principles. The former is also the measure of all knowledge in this class, as all knowledge of a straight line in a circle is contained in the constructible demarcation of it by means of the length or square of the diameter, as was made clear in Book I. Therefore, by Axiom III the basic principle of influentiality is also in these aspects.*



The conventional symbols.

Proposition XI

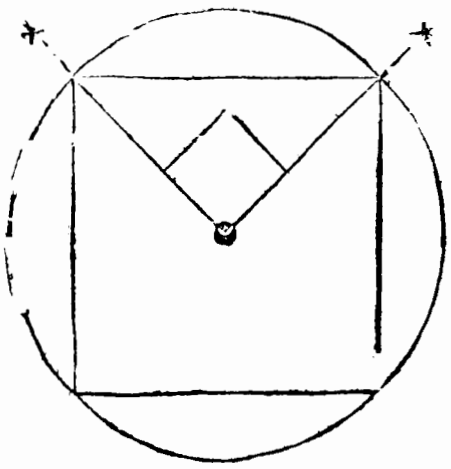
The second degree of influentiality of aspects is that of the quartile □.

For in the quartile many privileges coincide, the first of which is that the figure at its center is similar to that at its circumference. Hence whatever degrees it holds in congruence and knowability are understood to be in a sense double relatively to the other aspects. For just as the quartile is the first, after opposition, to be unfolded from the narrowness of its line to some breadth or surface extension of its tetragonal area,[59] *so the remaining aspects descend from the identity of the figures of the quartile aspect to some difference in their figures. Therefore, as elsewhere in natural philosophy, excellence which is unified is stronger, in this ideal and objective portrayal the degree of strength will be greater where figures in distinct positions, that is one at the center and one at the circumference, are found to be the same in kind.*

Second, as far as congruence is concerned, in the square it is most perfect and of all kinds, for this figure is itself congruent with itself in the solid to form a cube, which is the measure of all solidity; and is congruent in the simplest way, taking in only three angles; and is itself congruent with itself in the plane, with four angles. Again, it is congruent in the solid with the triangle, pentagon,

[59] Kepler evidently means that the side of the polygon, corresponding to the quartile, can trace out the surface or area of this polygon, clearly a property belonging to this aspect alone.

□



hexagon, octagon, and decagon in different ways, to form solid figures; and is congruent with all of those, and in addition with the dodecagon, and the icosagon to a certain extent, to lay out a flat surface. In this property it is surpassed by no other.

Third, the area of the square is expressible, which is the basic principle of a certain singular and outstanding congruence in the plane, so that a definite number of areas of this figure take up a definite number of squares on the diameter, and thus the figures are not only in themselves congruent with each other in their angles and sides, but in a way, that is in definite lines of theirs, also with the sides of the square on the diameter. This property the quartile aspect shares partly with the half-sextile alone. See Book II.

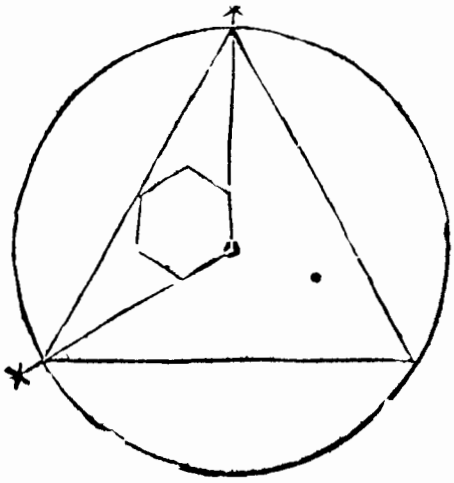
Fourth, the degree of knowledge of the side is also not ignoble, as it is expressible in the square. In this degree it is pre-eminent over all the other figures, except the hexagon. However, it does not on that account give way to it, since knowability is not to be compared with congruence, as has been explained above, and indeed the accumulation of privileges is valid for increasing the influence, by Axiom III of this Chapter.

Proposition XII

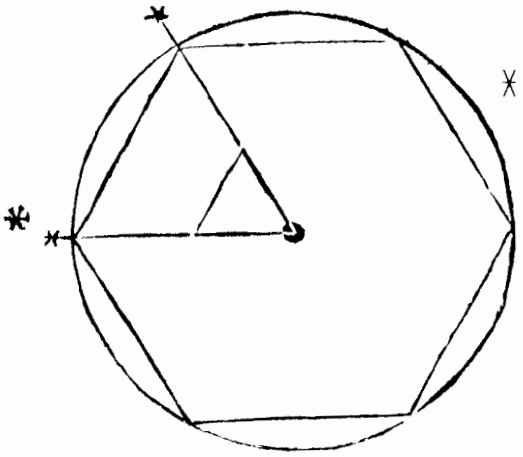
The third degree of influentiality is that of the trine △, sextile ⚹, and semi-sextile ✳.

That I place the trine, sextile, and half-sixth in the same degree is not due to identity of properties but to equal power. First, their principal figures transmit shared operations to congruent planes; for they meet each other, and others, such as the square, in various ways. In fact, the triangle and hexagon are pre-eminent in this case, because the individual kinds are congruent also with themselves. The hexagon is pre-eminent over the triangle, because it holds the most perfect congruence in the plane, that is in its three angles alone. Both are pre-eminent over the dodecagon, because they are congruent with other figures even in the solid, which the dodecagon cannot be. Yet on the other hand

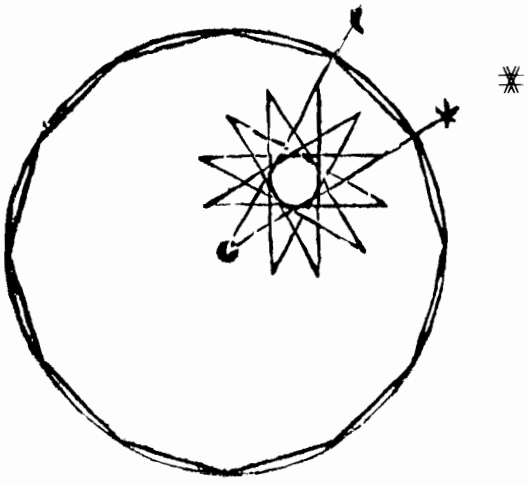
△



the dodecagon is pre-eminent over the others in the expressibility of its area, whereas their areas are medial[60] *and so more ignoble. This difference between the areas, as I stated just now, redounds to the perfection of its congruence. Similarly the triangle also is again pre-eminent over the hexagon, in that the triangular kind is itself congruent with itself in the solid in various ways, and begets three regular solids: the hexagon is congruent only with other figures. Thus on balancing the weights of the different properties against each other, congruence, which is the first and chief element in influence, in the case of these three very nearly produces equilibrium. In knowability the hexagon holds first place, as its side is expressible;*



second place is held by the triangle, for it takes the same degree as the tetragon, having its side expressible in the square, but in a more humble proportion. The dodecagon is last in this instance, having an inexpressible side. However, knowability is not the chief indication of influence, and is not considered in the most important figure, that is the one at the circumference, but only in the one at the center which is less important. If it has any effect, it renders the trine a little more influential than the sextile, because the trine is formed by an angle of the hexagon at the center, and the half-sixth a little less influential than either, as it is measured out by an angle of the dodecagonal star at the center. However, knowledge of the half-sixth is more noble than the rest which follow, because the side of the figure at its center is of the most noble kind among the inexpressible, that is the binomial,[61] *and in their twofold subdivision it always holds the superior place, to the extent that along with*



its partner the side of the figure at the circumference it forms an expressible triangle. That is the mark of almost absolute perfection, and also in fact makes this figure in knowability a contender with the triangle and the hexagon, because it weighs in the balance against its inexpressibility, very heavily.

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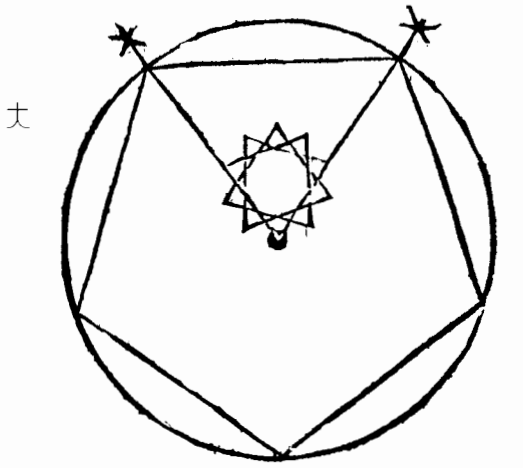
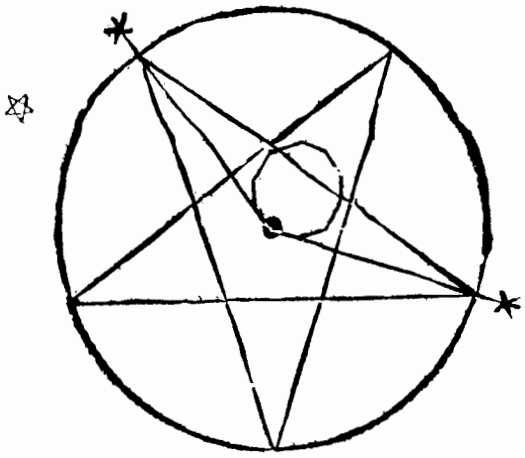
[60] See Book I, definition 15.

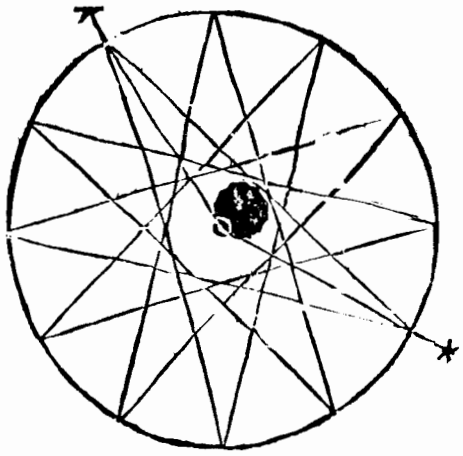
[61] See Book I, definition 22.

Proposition XIII

The fourth degree of the configurations in influentiality is that of the quintile, biquintile, and quincunx.







For these have in common congruence of the whole of the primary figures in the plane, though not of the individual kinds each with itself, but of the first two figures mutually with each other, and of the last with the others which are akin to it. The first two aspects are pre-eminent in virtue of the fact that their figures, the pentagon and its star, are congruent in the solid as well, and make two regular solid figures. By this nobility they almost bring their aspects to the level of the trine and quadrant. The dodecagonal star is not congruent in the solid. Yet on the otherhand the dodecagonal star is also pre-eminent by its plane congruence, which in it is capable of being continued to infinity, whereas the former figures cannot be continued far without an admixture of irregularity. See all this in Book II.

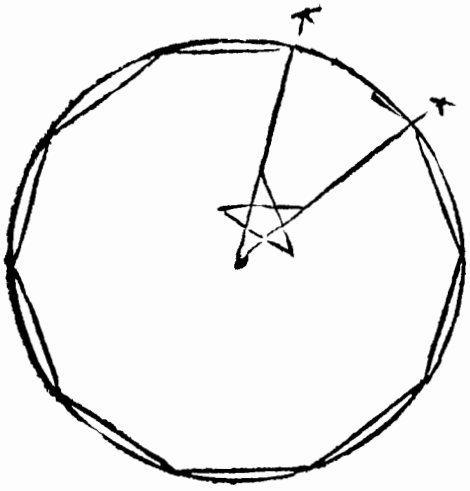
As far as the knowability of the sides in the figures at the centers is concerned, here also the sides of the decagon, tridecile, and dodecagon stand in the middle position, and they are central in this class, between the side of the triangle which precedes and the sides of the pentagon and the pentagonal star which are the central figures in the following class. For it was demonstrated in Book I that in knowledge the dodecagon's side takes precedence over the pentagon's, the tridecile's over the pentagonal star's. Thus knowability leads in the same direction as congruence too, by Proposition VII. This had to be stated in advance, chiefly for the sake of this

demonstration, in case the decile or tridecile should be given preference over the quintile and biquintile. If, however, someone should wish to dismiss the figure at the center and seek knowability rather in the one at the circumference, no less than congruence, although it must be admitted that on that basis the decile would be preferred to the quintile, and the tridecile to the biquintile, he should nevertheless remember that the parts of congruence are the most important, as we have shown in Proposition IV. Therefore, it is a greater thing, and has more effect on influentiality, to create a solid figure (which is like a sort of mathematical idea of physical influentiality) than to have a side which is knowable in a more perfect degree. The side of the dodecagon indeed on this basis brings its aspect into the same class as the chords subtended by a tenth part of a circle, and by three tenths, because they contend with each other for pre-eminence in knowability. For just as those two chords are associated with each other, and the smaller is part of the greater in the divine proportion of the extreme and mean, so also the side of the dodecagon and the side of its star are associated, and that in respect of a division and combination, though not proportional. And in fact this latter pair falls into the first kind of inexpressibles, which embraces the binomials and apotomes; but on the other hand the former pair acquires a new property of division according to extreme and mean, as may be seen in Book I. Hence these degrees are not just balanced, but the side of the decagon even has a little the better of it. It was therefore correctly done that I placed the aspect of the quincunx, or 150, in the same degree as the quintile, 72, and the biquintile, 144, though giving the chief seat to these last.

Proposition XIV

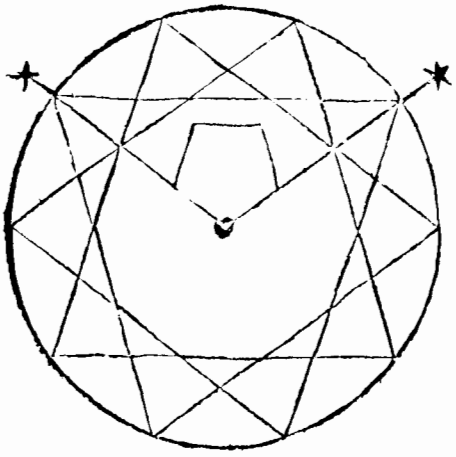
The fifth, lowest, and feeblest degree of the aspects is that of the decile and the tridecile, the octile, and the trioctile.

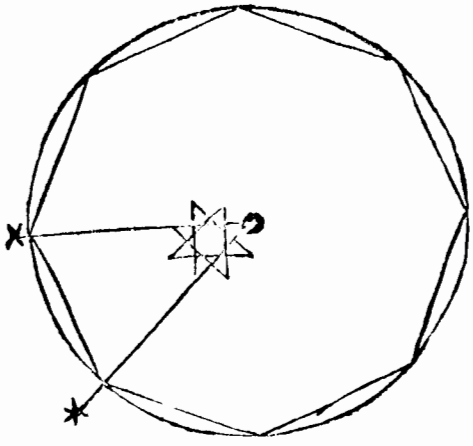
I have made the fifth place for the decile and the tridecile (Maestlin calls them the half-quintile and the quintile-and-a-half) which until now I left out in the Ephemerides. With them I have associated the octile and trioctile, or half-quadrant and quadrant-and-a-half, which the compilers of almanacs, at my suggestion indeed and to a large extent on the authority of Ptolemy, have seized on, but with too much enthusiasm and too little consideration. Therefore, both points must be tested, first that these four are feebler than the quintile and biquintile, and second that the decile and tridecile are stronger than the octile and trioctile, by a very little.



Since, then, our propositions place the greatest weight for determining influence on the congruence of the chief figure, that is the one at the circumference, it is evident

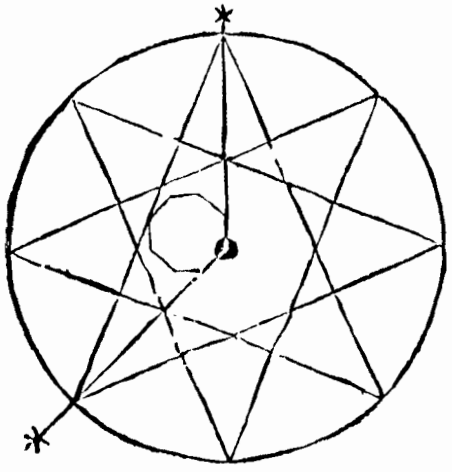
that the pentagon and its star are congruent each with the figures of its own kind, to form a perfect solid, as has just been stated, and are also splendidly congruent with each other to lay out a plane. On the other hand, the decagon and the octagon along with their stars cannot be congruent in the solid, each with the others of its own kind. Indeed, the decagon and the octagon are congruent, but with others which are not all of their own kind. The stars in fact start on a certain congruence in the solid but do not complete it. Even in the plane their congruence is more ignoble, because they do not deliver shared operations, each independently with its own star, as the pentagon does with its own; but with those stars of their own, and the octagon with the tetragon, they come into partnership in an alien congruence, and the decagon itself prevents the possibility of that's being continued. Its star also produces a split congruence in the intermediate spaces which are intercepted. However, the octagon and its star rejoice in an alternating continuation of congruence, with an admixture of squares. The congruence occurs in a variety of forms. Thus these four are almost on a par in plane congruence, especially as each set of figures has inexpressible areas. But in knowability the pentagonal group is greatly pre-eminent. First, if we were to consider the figures at the center, which in this case are in fact the pentagon and its star, their sides indeed fall under the same class of inexpressibles as the sides of the octagon and its star, being elasson and mizon.[92] *But if we consider the figures at the circumferences, which in this case are the sides of the decagon and its star, these are not only from the nobler kind of binomials and apotomes, whereas the octagon's lines are from the fourth kind, which is that of the mizons and elassons, but also all the sides of the pentagonal group acquire the noblest property of division in the proportion of extreme and mean, which clearly does not apply at all to the octagon's lines. But if the octagonal group seemed to be somewhat pre-eminent in congruence, in this case on the other hand it is much more strongly pushed down by the pentagonal group. I was therefore right to*





[92] See Book I, definition 25.

relegate both sets, as contenders for superiority, to a single class, though putting the pentagonal group in front. Book I should be continually consulted on these points.



It is also a peculiar privilege of the biquintile, in front of the tridecile and the trioctile, and also the quincunx, that the pentagonal star, that is its primary figure, also has an angle which is a very fitting imitator of that of a triangle, because both the three angles of a triangle and also the five angles of the pentagonal star, when combined in each case, equal two right angles. Hence in this way the sides which form the angles each intercept their own arcs of the circle, but not some portion of the circle as pair and pair in common. That cannot happen in the star of eight, ten, or twelve rays, because of their restriction to an even number, and in the other figures of primary origin, because of the size of their angle.

I have therefore discarded all the minor points, to create confidence in the appropriate arguments, in case the number of aspects should become too great, and give birth to confusion in testing. I have therefore to call a halt at the square and the quintile and the biquintile, and not go on to their four derivatives of the last degree, inasmuch as they are very feeble, although the first Proposition admits these as well. If, however, these are not found satisfactory, and if the importance of the first Proposition is so great that all protest against it is prohibited, come, let anyone be free as far as I am concerned to have regard to these aspects also, especially at times when all the rest are absent. For it is right that the testimony of experience should be heard about these as well, seeing that it created the original confidence in the others, before any reasoning.

Proposition XV

There are some configurations which are on the borderline between influential and non-influential, namely the arc of 24° from the pentekaidecagon (fifteen-sided figure), and 18° from the icosagon.

Book I, Proposition XLIV, and Book II, Conclusion XXIX.

For the figures are knowable, but the former improperly, and the latter in a remote degree, as was demonstrated in Book I.[63] *They are also congruent, but the former not in all angles equally, in the same form of congruence; and the latter in all its angles indeed, but with a congruence which is clearly not continuable, which was shown in Book II. Therefore, there is a certain germ of influentiality, and an attempt, as it were; but the effect is either none or imperfect.*

[63] See Book I, propositions 43 and 44.

These figures have many stars, the former in fact five,[61] the sides of which subtend the following arcs of the circle: 48°, 96°, 112°, 156°, 168°. The latter however has four, the sides of which subtend arcs of the circle of 54°, 126°, 162°, and 171°. But as these stars have re-entrant angles which do not take in other congruent angles (in the way in which the re-entrant angles of the pentagonal and decagonal star take in the angles of the pentagon, those of the octagonal star the angle of the square, and those of the dodecagonal star the angle of the triangle), there remains for them therefore only congruence of the acute angles, which we call the rays. They are therefore more humble than their own figures of primary origin.

[61] Kepler's statements contain errors. The 15-sided polygon has only 3 stars, the corresponding central angles being 48°, 96°, and 168°. The central angles 132° (not 112°) and 156° are the central angles of stars belonging to the 30-sided polygon. Again the 20-sided polygon has only 3 stars. The single 171° is the central angle of a star belonging to the 40-sided polygon.

Chapter VI.

What the Affinity Is Between the Aspects and the Musical Consonances, in Respect of Number and of Its Causes.[65]

This is not the place to relate the circumstances in which the influential configurations have been revealed, and their number increased; for that belongs to astrology.[66] Also I dealt with the matter twelve years ago in my book on the New Star and the Fiery Triangle, in Chapters VIII, IX, and X,[67] where I not only showed the vast difference between the aspects and the remaining fictions, which are truly astrological vanities, but I also rebutted, effectively in my opinion, the philosophical arguments of Count Giovanni Pico Mirandola, which are also opposed to this part of astrology, where there were points which needed to be rebutted and refuted. Also, since nine years ago Helisäus Röslin,[68] MD and not without reputation as a philosopher, in a book published in the German language, had selected this new philosophy for attack, being himself devoted to the old astrology, and further, another physician, Philip Feselius, on the contrary had assailed all points of astrology indiscriminately, and among them the theory of configurations; and I resisted both of them by the publication of two little books in German, one entitled *Reply to the objections of Röslin*, and the other *A Third Party Interposes.* And in the latter indeed I defended the truth of the aspects, whereas in the former I asserted the

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[65] Kepler here returns to a comparison of the astrological and musical harmonies. The physical distinctions between the two types of harmonies were described in Chapter IV, while the differences in mathematical formulation, dictated by these physical distinctions, have led to aspects that do not correspond exactly with the musical consonances established in Book III. In this chapter, Kepler adds a philosophical justification for the conclusions of his mathematical reasoning.

[66] Kepler here emphasizes that, in this work, he is not concerned with the practical business of astrology, for discussion of which he refers the reader to his earlier book *De stella nova* (1606).

[67] Although Kepler rejected the division of the zodiac into twelve houses and the consequent traditional interpretations of judicial astrology, he defended the influence of the aspects and the significance of points of Great Conjunctions on the grounds of experience, as he emphasizes in the chapters of *De stella nova* (KGW 1) which he cites. Pico della Mirandola, in his *Disputationes adversus astrologiam divinatricem* (Bologna, 1495), had rejected every influence of earthly events from the stars.

[68] Helisäus Röslin, in his *Discurs von heutigen Zeit Beschaffenheit* (1609), defended traditional astrology, while Philipp Feselius, in his *Gründlichen Discurs von der Astrologia Judicaria* (1609) followed Pico della Mirandola in rejecting astrology completely. Kepler replied in *Antwort an Röslin* (1609) (KGW 4, pp. 99–144) and *Tertius interveniens* (1610) (KGW 4, pp. 145–258), taking the opportunity to defend his aspect theory.

means by which the influence of the aspects is caused. Hence learned men wrote letters to me to testify that now at last astrologers were being taught by me a purer philosophy. In all my books I remember the affinity which relates the musical consonances to the aspects; but in the first I still hesitated over the number of the aspects, noticing among the most important some which are spurious or certainly weak, and completely neglecting some which are stronger. In the German ones, however, I began to reveal these deficiencies in my speculations; and I recently decided to return to the point with a slightly fuller declaration, as the context demanded it, in the Prolegomena to my *Ephemerides*, pages 33, 34, 35, and 36.[69] However, what could not be expounded more extensively in that passage because I had undertaken to be brief, I shall here now supply, as they occur in the natural order. The axiom which I adopted in 1606 and took for examination and refutation in the passage cited in the *Ephemerides* was the following: *God the Creator either took the laws for ordaining the aspects from the harmonies of music within an octave which are described in Book III, or attuned the ears of man, which are the judges of those consonances, to the heavenly aspects.* If this axiom were true in every respect, the aspects ought to be the same in number as the consonances up to a diapason. For the sextile corresponds with the soft third, the quintile with the hard third, the quartile with the diatessaron, the trine with the diapente, the quartile and a half with the soft sixth, the biquintile with the hard sixth, and opposition with the diapason, because if you take away from the whole string a portion of the same size as a given aspect takes away from the whole circle, the remainder of the string makes with the whole that consonance which has here been ascribed to the given aspect. Therefore, since that sevenfold number of the consonances, or rather of the harmonic divisions, which individually entail individual consonances below a diapason, is certain and constructible, no less than is the fivefold number of the regular solids in geometry, as was made clear in Chapter II of Book III, then the argument to demonstrate the number of the aspects would be easy and unobstructed, by the adoption of this axiom, and there would be no need of that laborious parade of new axioms in Book IV.

And certainly if the observations of events in the sky had agreed to the last farthing with this septet of aspects, I should have acquiesced in the axiom proposed above and I should not have been greatly troubled about the objections which could be made from the origin of the harmonic ratios and from consideration of their metaphysical cause. Yet because it has frequently been discovered that sublunary nature is also aroused by the half-sextile, which intercepts a twelfth part of the circle, even though when a twelfth part of the string is taken away the remainder, eleven parts, is not in consonance with the

[69] *Ephemerides novae motuum coelestium* (Linz, 1617) (KGW II, pp. 46–49).

whole; and because the stimulation of weather by the quartile and a half, which marks off three eighths of the circle, has been discovered to be unreliable, even though if three eighths are taken away from the string, the remainder, five eighths, is altogether in consonance with the whole eight; hence the necessity arose for me to probe more deeply the reasons for this dissension and difference in this Book IV. Though I believe I have dealt with that correctly, and brought out very clear reasons, yet it will do no harm to ram in once again a summary of the whole thesis, since that is required by the explanation which I have undertaken at this point of the matters which have been stated more concisely in the Preamble to the *Ephemeris*.

1. The remainder of a circle is significant in the formation of a consonance, but it is of no significance in the formation of an aspect.

The reason, then, why *there are not the same number of aspects as there are harmonic divisions in music, as I had believed up to 1608, is that Music draws some of the basic principles of its sevenfold set from the actual straightness of the string, whereas the circle, in which we mark the aspects, returns on itself, and another circle cannot be made from the remainder of the zodiac as it can from that of a string.* The words are from the said Prolegomena, page 35, and must be explained as follows. For as was stated in Chapter IV of this Book, the harmonic divisions arise in one way, the aspects in another, though they both arise from the same circle. For in Book III the axioms were prepared in such a way that any string or part of a string, whether long or short, can again be compared with the whole circle, no less than the whole or the longest string was compared with the same circle. But in this Book IV the arc of a circle, whether greater than a semicircle or smaller, could not be compared with the whole. I shall state it more clearly. In however many ways a circle is divided constructibly, all those ways can be transferred to a straight line, that is a string, or to any part of it. Yet a constructible division of a whole circle, for example, into three or five, cannot in the same way also be transferred to any arc of it, which has been sufficiently demonstrated in the last propositions of Book I. The reason is in the figure: for a straight line remains a straight line whether it is truncated or prolonged, but a circle which is truncated does not remain a circle. Therefore, a proportional division of any pair of straight lines is allowed, and that of any pair of circles is allowed, but that of a pair of arcs of a single circle is not. This is applied to the proposition in the following way. If a string is divided into eight parts, that is by constructible division of a circle, one eighth is in consonance with the whole, and three eighths are also in consonance, on account of the fact that one eighth of a circle can be cut off constructibly, and so can three eighths. The same demonstration from constructibility is also among the reasons why the octile and trioctile are influential. Yet this is the difference, that in the former case a harmonic division has not yet been established unless the remainder, seven eighths and five eighths, are also in consonance both with the whole, eight parts, and also with the parts cut off, seven with one eighth and five with three. But the demonstration from constructibility of one part and

three parts does not confer on their remainders, seven and five, that they are also consonant themselves; for five is in fact consonant, but seven is dissonant. Therefore, the division of the whole eight into five and three is harmonic, but into seven and one is not harmonic. From where, then, does the remainder five get its consonance with the whole, eight, the remainder seven its dissonance from it? Of course it is because a circle divided into five has a constructible chord subtended by two fifths. The result of that is that a string divided into five (as in this case the proposed part of the whole eight) is in consonance with the portion which is two parts long, and hence also with four and eight which are in the proportion of continuous doubling with two. On the other hand, a circle divided into seven does not make a constructible chord of one seventh part, so that the remainder of the chord, which contains seven, is dissonant from one and also from two, four, and eight. See how harmonic division of the whole eight into three and five has only one consonance from the octagon, but its other from the pentagon. Moreover, it also has a third from another figure, that is from the decagon. For the part three would not be in consonance with its remainder, five, if it were not previously in consonance with double it, ten; and that is because if a circle is divided into ten the chord subtended by three tenths is constructible. However, this combination of several figures has no place in the circle and its parts. For if you first draw a regular octagon in the whole circle, supposing that you can divide into five the arc which contains three eighths (though it is impossible for that to be done constructibly), certainly it will not be possible to inscribe a five-angled figure in it in accordance with the divisions made, for it would be both very irregular, and more of a six-cornered figure, since the arc has two boundaries before its division. Then since there is a vast difference between the remainders, of the string in the latter case and of the circle in the former, it is clear that unless we progress from the circle to the straight line as well, no account can be taken of the remainder. But an aspect is an angle, the measure of which is not some straight line, but an arc of a circle drawn from the point of intersection of the rays. Therefore, the circle does not measure the aspect, does not form it, and does not render it influential, on account of the remainder, but only on account of the arc intercepted by the aspect. If it is not on account of the remainder, it is therefore not on account of the harmonic division of the string which arises from that division of the circle, because a harmonic division cannot be defined without the remainder. On the same foundation we shall also reason as follows. An aspect is an angle which is measured by an arc smaller than a semicircle. The remainder is greater than a semicircle. Therefore, it measures no angle, and no aspect. Hence the remainder is not considered in the establishment of aspects. But it is considered in the establishment of a harmonic division. Therefore, a harmonic division of a string, which makes use of the remainder, and an influential division of the

zodiac, which does not make use of it, are incompatible. And thus the axiom that the harmonic proportions in music are the causes of the aspects is overthrown. Nor does it follow that the trioctile or quartile and a half corresponds with the harmonic division which generates the soft sixth, and is influential. Therefore, its influence comes from the harmonic division of the circle, as such. But it is true, as the said Prolegomena have it, that *there is a great affinity between the harmonies and the aspects, each type having the same origin, from noble figures which can be inscribed in a circle*, that is, the constructible knowability of the chord of three eighths of a circle is among the elements from which both a harmonic division in music and an influential aspect in physics are established. However, I speak hypothetically, as if the knowability of a figure alone were sufficient for influentiality, just as it is sufficient for the simple consonance of part with whole. For if we are to give an accurate account, there is also the difference that in the case of consonances indeed knowability is most powerful, whereas in the case of aspects the congruence of the figures is pre-eminent; and the semiquartile and the quartile and a half are influential not only because the side of the octagon and its star are knowable, but also, and chiefly, because the octagon and its star are congruent figures.

The nature of the affinity between harmonic divisions and aspects.

This is precisely the reason why the dodecagon in particular generates a powerful aspect, but does not generate a harmonic division, that is a triple consonance, although it does generate a simple one. For the remainder, eleven, when a twelfth is taken away, prevents a harmonic division, but does not prevent the influentiality of the twelfth part. But on this I shall in fact say more a little later.

2. The correspondence between the minor consonances and the aspects is not true but merely conjectural.

For so that a true, mathematical, and causal comparison may exist between the consonances and the aspects, the axiom must plainly be overturned, inasmuch as it is not only insufficient but also diametrically opposed to the truth. For no aspect properly corresponds with any minor consonance, except for opposition with the consonance of a diapason, but individual aspects correspond with major consonances, which are associated with minor ones, in the trio of every single division. Of course aspects are in fact defined by the same segments of a circle as the major consonances also; but the minor consonances by the remainders of the circle. For example, the triangular aspect does not correspond with the consonance of a diapente, but with the diapason above the diapente; the quartile does not correspond with the diatessaron, but with the double diapason; the quintile not with the hard third, but with the compound of that with the double diapason; the sextile not with the soft third, but with the double diapason above the diapente; the biquintile not with the hard sixth, as we were conjecturing above, but with the compound of the hard third and the diapason; the quartile and a half not with the soft sixth but with the compound of the diatessaron and the diapason—as is evident from the same proportion of the part to the whole on either side.

3. The true correspondence of the major consonances with the aspects does not determine their number.

In this correspondence, then, no end to the aspects would be encountered, since the major consonances are infinite; and those who depend on this cause alone to confirm the aspect of the half quartile, because of course it corresponds with the consonance of a triple diapason, have no excuse for not accepting both the decile and the tridecile and the vigintile and a great many others, which they nevertheless reject. For those also correspond with their own major consonances, which accumulate beyond a single octave in the same quantity as the division of the circle doubles the number of parts.

From this correct in my Book on *The New Star*, Chapter IX, pages 38 and 40, that is to say correct them from this book, which you see promised there on page 41. From this also supply in my *A Third Party Interposes* the number LIX at the end.

What is it, then, which sets a limit to the number of aspects? And why is no semiquartile or octile introduced, no decile or tridecile, except only after the principal ones? Why is the quartile and a half, which is ennobled by its musical affinity, either omitted or considered humble, but the semisextile which is a foreigner in music is not only inserted but is exhibited among the foremost? Because music does not determine the aspects, but geometry both types, the former, however, by one set of laws, the latter by another. For whatever is from a noble figure, which has some particular privileges in geometry, is both harmonic in music and influential in the sky. But they are, as it were, different tribes, the study of the sky and music, which must originate from the same fatherland of geometry. One of them, that is, the harmonic proportions of Book III, in fact professed the circle to be their fatherland, and claimed to have taken their origin from it, no less than the aspects in this case. Yet the harmonic proportions, however, leaving, as it were, the circle, planted their own colony, and living by their own laws propagated themselves; whereas the aspects, staying within the circle, their fatherland, use no other laws than those which the roundness of the circle prescribes for them, drawn from the regular plane figures which are congruent and inscribed in a circle.

4. The chief cause in determining the aspects is the congruence of figures.

For in music the seven-man group of divisions is established by definite weddings, the females also being counted. For example, the chord subtended by three eighths, or the eight-cornered star, is in fact among the citizens in geometry, and in the class of regular figures but is not of particular nobility; whereas in music its arc (three eighths of a circle) has acquired a place because it is born from the marriage in which a plebeian woman whose name is Remainder (that is three fourths of a circle) had been joined with a patrician (that is a fourth part of a circle) whose nobility in geometry is from the tetragon. For from this mother (three fourths) by musical generation (by the addition of one diapason) was born the part, three eighths. He, with his senatorial rank unimpaired, is now allowed to marry another plebeian woman, whose name is five eighths. Her origin is the same situation; for her mother is also a Remainder, that is to say four fifths, and her father is a patrician, one fifth, whose geometrical nobility is from the five angled figure.

However, although the twelfth part of a circle has rights of citizenship in music, since its chord is of outstanding nobility in geom-

etry, both born of its own excellence (on account of congruence) and taken from its parents (for they are noble figures, the six-angled and the three-angled, and from duplication of their sides arises the dodecagon, which is superior to them because of its expressible area), yet because this twelfth part has a wife, the remainder of eleven parts, which in music, and indeed in geometry is of foreign origin, tracing its type to the eleven-angled figure, which is not constructible, and therefore cannot acquire rights of citizenship, its husband therefore has in music no rights in the seven-man group for establishing the number of divisions of the monochord.

On the other hand, the fashion in the study of the sky is different. For in accordance with the nobility of each in itself either by its origin or by its merits (that is by knowability or congruence), it has great power by its authority, and the rest flit like shadows. No account is taken of females.

In this case, therefore, the octile or semiquartile and the quartile and a half, relinquishing their rights in music, because they subtend ignoble chords, are of the people, which has no power, except through the absence of the magistrates, under pressure of the mass of business. That is, if there were no primary aspects for a long time, even these aspects might perhaps have some effect, especially if the earth should be full of moisture, in which event it sometimes unburdens itself without any stimulus from configurations. But because there are generally primaries at hand, sublunary nature is tired out by them and does not feel these lesser stimuli.

However, the decile and the tridecile, though of an illustrious family, of the tenfold division of the circle, which uses the divine proportion, yet have not shed lustre on their type by deeds (because they are not in all respects congruent in the solid), and they are not the heads of the family. And if they also are capable of something (being to a certain extent congruent in the plane, and even in the solid with others), all that is snatched away from them by nobles from other families, or else their glory is dimmed by a greater brilliance. For if nature has been sufficiently busied through the aspect of 30°, and the earth has been sufficiently exhausted through it, little work is left for the weaker neighboring aspect of 36° to do.

Finally the semi-sextile, 30°, has a pre-eminent nobility from the dodecagon, which is outstandingly both knowable and congruent; and its foreign marriage, which in music had provided for it access to high rank, does not stand in its way to any extent in the sky. After this dodecagon the figures which follow, both in the three families which are set apart, those of the four-angled, three-angled, and five-angled figures, and in the fivefold mixture, except that they are all in fact of an inferior nobility, also have certainly no merits of their own (in congruence). Thus without violation of the law of citizenship they are barred from rank and from the power of establishing aspects.

From this, what I said in the Prolegomena to the *Ephemeris* is clear;

that *in the establishment of aspects various causes, and the coincidence of them, have force; and nature has a choice between those which have been established by several privileges; and the semi-sextile has certain rights in common with the quartile*, the expressibility of the area in its figure, of course, and *certain with the sextile*, that is, multiple congruence in the plane. *By the combination of these forces the semi-sextile emerges as* in a sense *more powerful than the sextile itself*, naturally inasmuch as the expressibility of the area of the dodecagon is more important than the expressibility of the side of the hexagon, because the consequence of the former is a more perfect congruence in the plane. Nevertheless in this Book IV I have directed that the semi-sextile should come after the sextile, but in the same degree.

The trine also and the quartile, and the quintile and biquintile, are made in the Prolegomena to the *Ephemeris equal in the first and most powerful cause*, I mean of pure congruence in the solid, for establishing regular solid figures. I stated that *the trine and the quartile add a second cause, not much less weighty*: understand the pure congruence of the figures in the plane. This is in fact also common to the sextile; but it possesses it not as an addition to the first cause, but separately from it. Thus it is shown that *the quartile also has a third cause in addition*, I mean expressibility of the plane: not that the semi-sextile does not also have a share in that, but because the things which are individually in the others are accumulated in the quartile, so that it becomes the most powerful of all.

Similarly in adding up the votes for the sextile, I stated that *it has some nobility in common with opposition*, hinting at the expressibility of the side of its figure, because it is half the diameter of a circle. Again, the same aspect *has some nobility in common with the trine and the quartile*, pure congruence in the plane, of course, which I have discussed before. For *only a small part of it*, that is, its congruence with the figures of other kinds, *agrees with the semi-sextile and the others which are less noble. In fact in this small part* of congruence the figures *of the semi-sextile and the octile hold the first degree*, in which the star of the semi-sextile could also be associated, because the congruence which they start off may be continued, without admixture of different shapes. The quintile and the biquintile have the *second* degree, except that they have a more noble congruence in the solid. So do the trioctile, *decile, and tridecile*, because their figures in fact continue the congruence but not without admixture of different shapes; and all these are congruent to a certain extent in the solid as well, more or less, except for the dodecagonal star of the quincunx, which is therefore taken down *to the third degree*. In that, the quartile and a half, or the star octagon, can also be included, as their knowability is obscure.

I have in fact extended the degrees even further, to the vigintile and the quindecile, that is, to the figures with fifteen and twenty angles, to which I have allotted *the fourth degree* (in the said small part of congruence alone). The reason is contained in our Proposition III in this

Book. *To their stars in fact the fifth degree* has been assigned, because in knowability they are equal to their parent figures, but in congruence very far behind them, inasmuch as it applies only to their individual angles. However, it was not necessary for me to do that, since plainly unmistakable aspects are not generated even up to the third degree, and we could in all likelihood fix a limit to sprouting aspects at congruence of the solid, and at perfect expressibility of the side or the plane. Hence the degrees of nobility of the figures should rather be looked for at the ends of Books I and II, as the degrees of the aspects in this Book are distinct from them.

Chapter VII.

Epilogue on Sublunary Nature and on the Inferior Faculties of the Soul, Especially Those on which Astrology Depends.

Much has been said about this study in the second Chapter, much in the whole of this Book IV, and something also in Book III, and a year ago in the Prolegomena to the *Ephemerides*, and in Book I of my *Epitome of Copernican Astronomy*, page 125, again in the year 1610 in my *A Third Party Interposes*, numbers 40 to 43 and 59 to 72 and 113, and so on, and in my *Reply to the Objections of Röslin*, and in the year 1606 in my book *On The New Star*, Chapters VIII, IX, X, and XXIV and XXVIII, especially from pages 171 to 175, and in the year 1604 in my *Optical Part of Astronomy*, pages 26 and 27 and page 224. For I deliberately pass over the prognostic signs, which I have from time to time stated as preface or as interpolations from the more certain foundations of astrology.

However, since I have seemed to some very celebrated professors of philosophy and medicine to be founding a new philosophy, and that a very true one, the tender little plant must be cherished and reared with every care, as must all its innovations, so that it may set its roots in the minds of those who practice philosophy, and not be choked by the excessive watering of vain sophistry nor washed out by torrents of popular fancies, or stiffen in the frosts of public neglect. If I achieve caution against that, I have no fear for its being broken by the winds of misrepresentation, and none for its being burnt away by the Sun of substantial criticism.

Since, then, in Chapter I, I did indeed touch on the essence of the soul, but only on account of the harmonies, and since the second Chapter is not avowedly about the soul, but about the harmonies on account of the soul, I am now pleased in this Chapter to discuss the soul on its own account, a little more generally, and pleased to make from the epilogue a summary of everything which relates to the present subject, and here to bring within a single view what has been said here and there, and in passing, and cryptically, and to expound the whole nature of the matter in a single skein of discourse.

The view that there is some soul of the whole universe, directing the motions of the stars, the generation of the elements, the conservation of living creatures and plants, and finally the mutual sympathy of things above and below, is defended from the Pythagorean beliefs

by Timaeus of Locri in Plato.[70] Proclus in fact confirmed it in various places including the words which I transcribed in Chapter I of this Book IV. They made it something different from the mind. Whereas the mind was simple, this soul was manifold in its faculties, and whereas the ideas of all sensible things were at first in the mind on their own account, pure and identical, they were in the soul secondarily, because of the mind, and taken from it, as they incline more towards matter. Hence, using the distinction between the names, they called those which were indeed intellectual or mental "patterns," but those which were spiritual the "images" of those patterns. What it amounts to is that a Christian can easily understand by the Platonic mind, God the Creator, and by the soul, the nature of things.

Pages 299 and 301.

By what winds of contemplation they were driven to arrive at these doctrines, I leave it to others to hammer out: I shall speak for myself. And first indeed, on the soul of the whole universe, though I raise no opposition, yet I shall say nothing in this Book IV. For it seems that (if there is some such thing) it resides in the center of the world, which for me is the Sun, and from there it is propagated over the length and breadth of it by the agency of the rays of light, which are equivalent to spirits in the animate body.

See the Epilogue to Book V.

About nature indeed, which directs the elements, although I call it by the customary epithet "sublunary," I began twenty years ago now to reach not dissimilar conclusions.[71] Indeed I was moved to that, not by reading or admiration of the Platonists, but only and solely by observation of the weather and study of the aspects by which it is excited.

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[70] Plato, *Timaeus*, 29C–37C.

[71] Whereas Plato, by his geometrical theory of the elements, had given a mathematical description of the sublunary world as well as the celestial, Kepler found himself compelled to apply an Aristotelian distinction and confine his mathematical cosmology to the heavens. As is evident from his other writings, Kepler did not believe that astrology could ever yield a detailed account of sublunary phenomena. Apart from his description of the close packing of equal spheres to explain the shape of the honeycomb (but not the snowflake) in his *Strena seu de nive sexangula* (1611), Kepler's only contribution to the mathematization of terrestrial physics was the a priori account given in Book IV of the *Harmonice mundi* of the means by which the celestial bodies exercise an influence on terrestrial ones.

As far as the heavens were concerned, Kepler's aim, stated in a letter to Herwart von Hohenburg, was "to show that the celestial machine is not a kind of divine, living being but a kind of clockwork, in so far as the multiplicity of motions depends on a single, quite simple magnetic and corporeal force, just as all the motions of a clock depend on a single weight" (KGW 15, p. 146). By denying that the celestial motions are the work of mind, Kepler did not, of course, deny the existence of "Mind the Creator" (*mens creatrix*), for if the planets were indeed moved by material necessity, it was God who had created the material necessity in the beginning (KGW 7, p. 331.). In his notes for the second edition of the *Mysterium cosmographicum* (1621), Kepler remarks that, when he first wrote the book, he had hoped to extend the use of mathematical archetypes to other things besides the heavens, but his attempts to do so had taught him that "the heavens, the first of God's works, were laid out much more beautifully than the remaining small and common things" (KGW 8, p. 15).

See above, pages 310, 313, 321, 322, 323, 334, 339.

For I saw that with great consistency the state of the atmosphere was disturbed whenever planets were either in conjunction, or configured in the aspects commonly spoken of by the astrologers; I saw that there was generally calm in the atmosphere if few or no aspects occurred, or if they were quickly completed or concluded. Indeed I considered that this business should not be considered so lightly as the common herd of forecasters usually does. They portray the influences of the stars as if they were some gods, with power over heaven and earth, carrying out everything at will, totally untroubled by what means they produce any effect whatever among us on earth, since they themselves remain in the heaven and do not send down to us anything which is evident to the senses except the shining rays. This is the chief gush of the most horrible superstitions of the astrologers. Yet I do not greatly wonder at the forecasters, a race of men which is generally suited to the popular taste, childish and given to dreaming. It is rather the well-known professors of philosophy who should be blamed, as although they have it from their own Aristotle that the life of animate beings and of plants is fostered by the virtue of the Sun, they do not ponder the implication that the virtue of the Sun is perceived by those creatures. Philosophy is altogether idle and dozy if it admits of the Sun's acting on these lower regions, as a sculptor acts on inert matter, although the Sun lacks chisels and burins and axes, and all corporeal instruments. How much more wide awake than these philosophers is the poet Vergil, and how much wiser.[72] For he does not ascribe everything even to the rain, which is nevertheless a part of matter itself, but compares the bosom of the Earth to *the thighs of a wife*, and indeed *a joyful wife*, that is, one who perceives what is happening to her with pleasure and helps her husband with suitable motions. All these things are signs of life, and suppose a soul in the body which experiences them. For it would not be easy for the Sun, destitute of suitable troops, to invade this citadel of the bowels of the earth, without the co-operation of some kind of soul, seated within, to collude with the enemy and open the gates to him. You may see many who in fact concede very little to astrology struggling through neglect of this consideration, as if through sloth—so much so, indeed, that when I appeared and demonstrated the means by which a change in the weather is the consequence of an aspect, there rose up a celebrated man[73] who in order to refute me contended with great vehemence that the material of rain was heavenly (which we also ridiculed above on page 327 for the common herd). Yet he did not tell us, even in that case, on what basis it comes about that always when the rays of the planets meet at the Earth the rain falls if the rays of the two planets make an angle of 60° rather than if the angle is 59° or 61°.

The sluggishness of the astrologers.

And of the philosophers.

Government of the influence of the heaven is under the control of the sublunary soul.

The material of rain is from the Earth.

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[72] Vergil, *Georgica* II. 326.

[73] Helisäus Röslin. See note 68.

However, I thought that above all I should read the fourteen books of Count Giovanni Pico Mirandola against astrology,[71] and hammer out the reasons which he opposed to each chapter. The effect of that was not only to confirm my condemnation of a great many superstitions, but also to shine new light for me on certain matters, when I exerted my wits to shatter the force of the objections and looked more closely into the matter itself. In fact, the effect of that book was in refuting some points to give me confidence in them, though previously the astrologers by defending them had diminished my confidence. So it was with the aspects. For on the one hand I took account of consistent experience, not indeed concentrating in that way on snows in particular, or winds, or thunder, and the other things which astrologers usually predict, but observing in general that the state of the air was disturbed in some way or other if there were aspects, for example, if Mars and Jupiter were in conjunction, and were peaceful if there were not any. On the other hand I listened to Mirandola when he asked why he should believe that Jupiter and Mars have greater effects when they are seen to be together than when they are separated, seeing that their light is not increased by the conjunction, for they bring the same amount to the combination as they possessed separately, but if planets of different qualities coincided, one seemed rather to be obstructed by the other. Here, I say, seeking a reply to protect the aspects, of which I saw events in the sky to be a consequence, I began to consider more carefully first the former, as cause, and then the latter, as effect. For the form of an aspect, which makes an aspect out of a random configuration or combination of angles, was a quantity capable of qualities, or rather a relation between such quantities, that is an entity of reason. Then for it to set in motion the atmosphere, it had first to move some reason which has in its power either the atmosphere or that by which it is disturbed. At the same time there was passing before my eyes the comparison between the aspects and the musical consonances which was handed down by Ptolemy, expounded by Cardano,[73] and too rashly indeed cast off by Mirandola. By this analogy I was very greatly assisted in my hunt for the causes. For many objections which Mirandola made to the aspects I saw could also be made to the harmonizing of two voices. Certainly triple or sesquialterate proportion even between two sounds does not have any effect in respect of pitch, and yet the sounds are pleasing if they are in triple or sesquialterate proportion, and abhorrent if they are in the sevenfold proportion or that of seven to six. Then since it must be something rational which discriminates triple proportion from sevenfold, that is the soul which controls the hearing, in the business of radia-

Beware of ambiguity. The aspects are among the causes which contribute to effects in the sky in general; yet the daily aspects are not the cause for any long part of the year or for its continuous general quality, but they act only on the individual days on which they occur. See below.

Consideration of the cause of the weather.

[71] See note 67.

[73] Ptolemy, *Tetrabiblos*, I, 13. Hieronymus Cardanus, In *Claudii Ptolemaei IV de astrorum judicijs . . . commentaria* (Basel, 1554), pp. 67–68.

tions also it must be a rational creature which distinguishes between the chords subtended by 60° and by 59° or 61°, whether it uses reflection for that purpose, like a man understanding geometry, or whether it gets it from innate instinct alone, like the forms of plants which keep and always construct the definite number of leaves allocated to them from the very origin of things. In this case mixture has no power, as the precise mixture has for the measuring out of medicines, nor have the physical instruments; and sounds do not delight, nor rays animate, because they are tuned in that way, as when cold water is mixed with hot, to such an extent that the resulting quality corresponds with the body which is going to wash. For in such mixtures there is usually a single optimum temperature, and all others approach it more or less. But among configurations, and among intervals between sounds, there are several boundaries, and the ratio of the consonances in the latter case, and of the aspects in the former, is at those boundaries alone: if you depart even a little from those boundaries, the whole ratio has at once been lost. For when the Sun, for example, has first passed the quartile of Saturn, all activity of nature has been assuaged, and ceases for thirty whole days (corresponding in fact with the rays of Saturn and the Sun) until the time when the Sun comes to the trine of Saturn: then the weather is again stirred up for a single day, and ceases again when that has been crossed. Changes in bodies are not like that, inasmuch as they take up the whole time from start to finish, without intermission, but growing with the increase of their cause and with time, and again dwindling with the cause's diminution. In a single word, as a line is to number, so the bodily commotions as commonly known are to these stimuli of the configurations. Anyone who ponders this carefully will be able to conclude with no difficulty that, like number, these momentary commotions also, which proceed from an aspect, which is an entity of reason, are not of the body but of the faculties of the soul; and so it must be a soul which is prompted and, as it were, excited by the aspect and stirs up the weather and events in the sky.

They are not natural.

But spiritual.

The soul in the Earth.

See pages 327 and 339.

Page 326.

Page 322–3.

However, what this soul was, or of what kind, I could chiefly infer from its situation in the world. For the aspects, in accordance with which the weather is set in motion, are angles between two rays, not angles which are formed at one or other of planets which face each other, not those which are formed at the Sun, very far different in size, but those which are formed here on the Earth; and the planets themselves are unaware of the angles which their rays form here at the Earth, unless we make them astronomers. It therefore follows that the soul which stirs up the atmosphere according to the prescription of the aspects is here on Earth. And since that power which accompanies the aspects is felt throughout the Earth's sphere, the soul will be equally broadly distributed; and since the material of rains, winds, clouds, thunder, and shooting stars, which are called forth at the time of aspects, is a humid vapor, or spirit, and there is another which is

The material of the weather arises from the Earth.

dry and fiery, boiling and steaming out of the Earth (for why should the philosopher listen only to Aristotle here, spurning Rudolph Agricola (the Farmer),[76] or indeed all farmers, and even his own senses, when every day he sees, at the onset of rain, that the summits of the mountains vomit forth a great force of clouds?) therefore that soul will be, not solely on the surface of the Earth, but also inside it in subterranean caverns, and in the passages of the mountains.[77] In fact, the globe of the Earth will be a body such as that of some animate being, and what its soul is to an animate being, that the sublunary nature which we seek, which sets the weather in motion at the appearance of aspects, will be to the Earth.

Page 326.

The Earth an animate being.

Page 355.

Here I was greatly encouraged by the very fact which could have frightened off someone else, that is to say, that disturbances in the weather do not always correspond precisely with the aspects, but the Earth occasionally seems slack and stubborn. At another time (that is to say after harsh and long drawn out configurations) it is aggravated and gives way to vaporings, even when the aspects do not continue. To be sure, the earth is not an animal like a dog, attentive to every nod, but like an ox or an elephant, slow to anger, and all the more violent when it has been kindled.

Aspects often ineffectual.

As this analogy succeeded, the result was that I pursued it further, comparing the bodies of animate beings with the body of the Earth as well. I saw that all the many things which come from the body of an animate being and testify that there is a soul in it, also come from the body of the Earth.[78] For as the body puts out hairs on the surface of its skin, so the Earth puts out plants and trees; and lice are born on them in the former case, caterpillars, cicadas, and various insects and sea monsters in the latter. And as the body displays tears, mucus, and earwax, and also in places lymph from pustules on the face, so the Earth displays amber and bitumen; as the bladder pours out urine, so the mountains pour out rivers; as the body produces excrement of sulphurous odor and farts which can even be set on fire, so the

Activities of the Earth's soul.

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[76] Rudolf Agricola (1443–1484), whose *De inventione dialectica* was published in Cologne in 1539, was an educational reformer who contributed to the renaissance of letters in Germany. Rejecting the authority of Aristotle, he made the transition from the earlier romantic humanism to the scientific humanism of the fifteenth century. See Helmuth Grössing (1983), pp. 31–39.

[77] Aristotle does in fact describe two exhalations rising from the earth, one vaporous, the other dry and hot. *Meteorologica*, 341 b 1–342 b 25. For Aristotle, however, these exhalations arise when the earth is heated by the sun, the implication being that they originate on the surface. Kepler (and Rudolf Agricola) on the other hand, locate the origin of the exhalations in the interior of the earth.

[78] This idea of spontaneous generation had already been explained to David Fabricius in a letter of 11 October 1605 (KGW 15, p. 258). Belief in spontaneous generation goes back to Aristotle and was widespread in the Renaissance. Kepler's description of the earth putting out plants and trees (like an animal growing fur) may be compared with a similar description in Marsilio Ficino, *De vita coelitus comparanda*, III, 11; quoted in Garin (1984), p. 74.

Earth produces sulphur, subterranean fires, thunder, and lightning; and as blood is generated in the veins of an animate being, and with it sweat, which is thrust outside the body, so in the veins of the Earth are generated metals and fossils, and rainy vapor.

The Earth's food.

Therefore, just as other animate beings consume food and drink, so the Earth also must take some kind of material from definite channels, to brew from it such a multiplicity of substances, because nothing is made from nothing. Now it takes in and absorbs sea water, and that is the reason why the sea never overflows from the pouring in of so many rivers. Here you can gather from what has been said above how absurd it is for people to attribute metals to the operation of the Sun alone, with no contribution from the Earth.

What type of soul the Earth has.

I have also replied in my book *On the New Star*[79] to the popular objection that if the Earth had a soul it would seem that it ought to grow, and have limbs fitted for motion. For just as it is a body, and accordingly the soul and its faculties correspond, though this soul belongs to the body of the Earth, yet this body would not be related to the soul just as the body of a man is related to his mind, the chief faculty of the soul. If, then, the Earth had had need of supplements, if it needed some provender other than I have stated, as it were from hunting, those functions also would have been entrusted to this soul, and suitable instruments given to it. This was the philosophy of Socrates on the point of death in the *Phaedo*,[80] when he attributed everything to the governing mind, everything to deliberation on that which is best. Thus if someone were to argue that there are only four faculties of the soul, none of which agrees with this earthly soul, and therefore there is not a soul in the Earth, then I will tell him to add this fifth faculty to the number, from the same model, and the same laws of argument, from which those numbering four were found, that is to say in man.

However, I was moved to attribute a soul to the Earth with all the more confidence by other things also which I pressed home in various places throughout my other books and collected in a package in my *Epitome of Copernican Astronomy*, page 125,[81] especially the fact that the

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[79] *De stella nova* (KGW 1, p. 288).

[80] Plato, *Phaedo*, 108C. Socrates is here concerned only with the form and position of the earth.

[81] KGW 7, p. 92. Kepler supposes that during pregnancy, the mental experiences of the mother, such as those of pleasure or fear, are impressed on the soul of the unborn infant. In the same way, the formative faculty in the earth impresses on its offspring an image of external events as if it saw them. Kepler's view of nature is very far removed from the modern one, which would recognize a vague silhouette on a stone, that resembled human figures, to be the result of innumerable accidental geological and physical causes. For Kepler, even this silhouette on a cleft stone is a product of unconscious design on the part of the earth soul. Moreover, from the point of view of Kepler's panpsychism, there is no essential difference between the stone and other products of the earth's formative faculty, such as trees and plants, and even various animals, insects, and marine creatures generated spontaneously. Cf. note 78.

formative faculty is in the bowels of the Earth, which, in the manner of a pregnant woman, portrays in cleft stones human affairs which are presented to it from outside, as if it saw them, such as new and unusual appearances of soldiers, monks, priests, kings, and whatever is in men's mouths. That indeed is rather rare; but what is constant is its expression in gems and fossils[82] of the five regular geometrical solids. For the work bears witness to the workman. To these let a follower of Copernicus add the diurnal, perpetual, and extremely regular revolution of the Earth's globe, which he will quite correctly reckon among the functions of this soul.

The imagination of the Earth's soul.

Geometry in gems.

The motion of its body.

Furthermore, there seems to be some sense either of touch or of hearing in the Earth's globe, from the argument, which is confirmed by the tradition of a great many provinces, that if anyone struggles up to the peaks of the highest mountains and throws a pebble into the very deep gulfs which they have, from which noises are often stirred up, or into a mountain lake (and they also undoubtedly have no bottom) , the weather is stirred up straight away.[83] For similarly also animals, if someone tickles the tender passages of their ears or noses by inserting something, are seized with horror, and shake their heads, or rush headlong into flight.

The sense of touch in the Earth.

Certain regions of the Earth also have their own weaknesses, and internal upsets in their bowels. For sometimes they overflow with too much moisture; sometimes they are troubled with overloading or incompleteness of digestion, when instead of tempestuous rain, mere winds emerge; sometimes, as if seized by fever, they exude no moisture but sulphurous exhalations or unwholesome humors. Thus I was right to advise in my book *On the New Star*, page 173, that all the faculties of digestion, the attractive, the retentive and the expulsive, should be looked for in it, seeing that those diseases are states of them.

Diseases of the Earth.

What indeed is more like the breathing of terrestrial animals, and particularly that reciprocal action of fish, when they absorb water through the mouth, and in turn push it out through their gills, than the wonderful twice daily ebb and flow of the ocean? Yet it fits in with

The Earth's breathing.

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[82] By fossils Kepler means minerals; that is, all kinds of bodies extracted from the soil. The term was used in this sense by Georgius Agricola in his *De natura fossilium* (1546), which is a treatise on mineralogy. In his *Strena seu de nive sexangula* (1611) Kepler made some contributions to theoretical crystallography by investigating the close packing of spheres and recognizing the relationship of crystalline structures with the regular polyhedra. See I.I. Shafranovskii (1975).

[83] In a letter of 2 December 1602 to David Fabricius, Kepler describes an ascent of Mount Schöckel in Styria in which he seems to express considerable doubt concerning this kind of explanation. On the mountain there was an abyss from which arose so many thunderous vapors that an old saying maintained the throwing of a small stone would cause a hailstorm. In fact hailstorms were just as frequent whether or not a stone was thrown. The climbers had not found the loch and indeed a hailstorm occurred even though they had probably not disturbed the mountain in their ascent. KGW 14, p. 331.

the motions of the Moon in such a way that it seemed probable to me in the preface to my *Commentaries on Mars* that the waves are drawn as iron is by a magnet, by a corporeal virtue of the combination of bodies. I also mentioned this recently in the prolegomena to my *Ephemerides*, in the passage where I examine the opinion of David Fabricius.[84] Yet if anyone should maintain that the Earth fits its, as it were, breathing to the motion of the Sun and Moon, just as animals have the same alternations in their sleeping and waking as those of day and night, I should judge that he ought to be listened to in philosophy with not unfavorable ears, especially if there were in addition some indication of parts in the depths of the Earth which are flexible, which would take the role of lungs or gills. For if they were to have a nature something like that of our atmosphere, which can be condensed and rarefied, there will then be no need, for this breathing, of a motion of the surface of the Earth, that is to say analogous to the motion of the muscles of the diaphragm in a breathing human body.

Whence comes the ebb and flow of the ocean?

What more appropriate method indeed could there be for the taking of sea waters within into the kitchen, as it were, of metals, except this very one, by means of those constant twice daily flows? What else are we made to suspect by the wonderful occurrence when a few years before the throng of merchants deserted Antwerp, the ebb and flow deserted the ocean on a certain day (and terrified the citizens not a little), but the Moon did not desert her course? Of course the Earth itself, being in control of this reciprocal action, although it shares in the natural motion, restrained one of that day's respirations, just as animate beings sometimes restrain their souls, although the actual motion of the diaphragm is also mingled with the natural one.

Yet perhaps we should more correctly have proved that some breathing is necessary to the Earth from the presence of a soul, than the soul from the breathing.

The soul of the Earth is like a flame.

For in the certainty, so to speak, that there is a soul in the Earth, let us now come to contemplation of its essence. To be sure it is not only a light which depends on itself, like that of fires and of sparks, and not on illumination from the Sun, which is argued by the fact that it detects the bright rays of the planets in some way; but it seems plainly to be a sort of flame (that is to say, one which must be fed by breathing, or by swallowing), which is argued by the perpetual and sensible subterranean heat, of a kind without a soul which never persists actively in bare matter, but is not even present potentially in things which proceed from the substance of animals and plants, unless it is begotten from soul and forms, which are something fiery. See my *Optics*, pages 25, 26, and 27.[85]

Whence the subterranean heat comes.

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[84] Kepler is here vacillating between the animistic type of theory first proposed in *De fundamentis astrologiae certioribus* (1602) (KGW 4, p. 25) and the mechanical attraction theory of the *Astronomia nova* (see note 26).

[85] *Ad Vitellionem paralipomena*, Chapter 1, proposition 32 (KGW 2, pp. 34–36). Kepler cites the examples of volcanoes and thermal springs.

We shall assign this, as it were, material to the soul of the Earth. On it indeed has been impressed in place of a form an image of the divine countenance, along with the ideas both of the circle, and all its ratios, and of its own sensible body, as it is in charge of its rule, and so of the whole world, in which its body was going to be. For God has with Him not only the geometrical patterns, but also the concepts for the creation of all sensible things. All of these pass at once to souls, as the patterns of God, for each to take or use. Therefore, there shines forth in the soul of the Earth a kind of image of the sensible circle of the zodiac, and so of the whole firmament, the bond of sympathy between heavenly and earthly things; and there shine forth in it by far the most brightly the archetypes of all its functions, and of all its motions, by means of which it moves its body through some sense. Others have named it a "power," but I for preference an "activity." For the former is the essence of souls, but this latter like a kind of "flowing" of the flame, because the souls have always been compared with themselves internally as if they were carrying on what they were created to carry out, whether they actively control the instruments of the body, or are impeded. God of course is activity made substantial, and subsists in this activity (to babble in human fashion about the divine), and therefore the essence of the divine image consists "in being active," as does a flame "in flowing." Thus if God were not eternally sustaining it, by, as it were, irradiating its material, it would suddenly cease and be extinguished. However, for the basic principle of its individual being not only body is required, which it is in charge of ruling, but also that very material little part of it (which I described previously) distinguishing it from other souls.

Insofar, then, as this soul, of the zodiac circle, or rather of its center, wields an idea, it also detects which planet is situated at a given time in which degree of the zodiac, and measures the angles of the radiations which meet at the Earth; but insofar as from irradiation by the divine essence it has taken up the geometrical ratios of the circle, and (by comparison of the circle with definite parts of it) the archetypal harmonies, which are not purely geometrical indeed, but introduced, by a kind of package, so to speak, of the bright rays, or rather thoroughly implanted by them, and judges that the measures of the angles, which it has already perceived, are in some cases congruent or harmonic, in others incongruent; and finally insofar as the same soul has embraced the ideas of its operations (in respect of every one of which it is, so to speak, an operative circle) it is always conveyed into those of its works, but more remarkably if three of these circles coincide and combine into one, that is, if the soul is reminded of itself by the aspects, and enters into its operations with some loss of restraint. Never indeed will it cease from cooking, never will it cook without smoke and vapor. In fact fossils are made from the smoke (as arsenic is formed from the smokes of metal-working furnaces) while from the hot vapor, cooled within the stony crusts of the Earth, and condensed

Pages 298, 302 and 304. The soul of the Earth is a kind of zodiac.

Pages 320 and 334–5. The cause of the sympathy between the heaven and the Earth.
Pages 309 and 310–11. The soul is an activity.

Page 310–11.

The basic principle of the individual being of the soul.
Page 334.

Pages 327, 329 and 337. The Earth's soul recognizes the aspects by a property of its essence.
Pages 307 and 312. Pages 302–11.

Pages 334–5 and 339.

The function of the Earth's soul perpetual.
Pages 321, 322–3, and 324.

into drops, the rivers trickle down to their sources, and from the same vapor being exhaled out over the surface of the Earth, breathable air, which during the night had condensed and fallen in dew, is daily renewed. However, although this operation of the Earth's soul is perpetual, yet there was need of some amounts in excess to be evaporated, not continuously for the whole of some period of time, but confined to definite days, so that from the abundance of vapors emitted to the outside the seasonal rains might be supplied, though with some sunny weather interspersed, in order to revive and water the surface of the Earth, so that fruits and food for living creatures might spring up from them.

Why there is an excess caused by the aspects.

Some one might raise as an objection the furthermost parts of Africa and Peru, which are under the equinoctial line, places in which continual rain falls throughout the summer. Where, then, is the distinction between the aspects and the uninfluential configurations in this case? Where are the alternations of sunshine and storms? And is not the passage of the Sun, a solitary planet, without reference to configuration with the others, alone responsible for everything? And that not as an entity of reason, but as a natural cause, that is insofar as it sheds heat and warmth on those parts, so that onto the parts so scorched and attenuated moisture is exhaled from the bowels of the Earth? I reply that this natural action of the Sun is not to be denied; but that is not peculiar to the tropical zone alone but can also be observed among us. For when the Sun passes over our hemisphere in summertime, rainstorms generally fall which are more abundant than the snow usually is in wintertime in the absence of the Sun. However, the rise which we have in the rivers when the snows melt, though they do not seem to rise as much when the rainstorms fall, certainly not by such daily increases, is partly due to the fact that the snows fall little by little, and individual layers of them accumulate and are preserved in storage for many months by the force of the cold; whereas the summer rainstorms, even when they are very extensive, are for the most part at once soaked up by the Earth which is drying in the Sun. However, it is partly due to the fact that the snow in the Alps cannot be dispersed except by very abundant summer rainstorms, so that in this way the continual rises in the rivers are not due to the snows alone, but to combination with the rainstorms also. Hence if you weigh it all up, a greater abundance of moisture is often exuded in summertime even among us than in winter. The objection therefore demands that there should be a coincidence of heavenly causes, of which one is natural, the heat of the Sun, the other rational, an aspect, and that there should also be a coincidence of sublunary causes, so that not only does one zone have more moisture than another, but also in the same climate one region should have more than another, from their own causes. Sometimes even in the tropical zone it can rain more at the time of aspects than on days which are empty of aspects.

That the Sun also stirs up vapours apart from the aspects.

So that the rivers rise.

However, that this determination of the character of the Earth's soul, which I have stated in the second place, was produced by the sensible zodiac and indeed by the whole sphere of the fixed stars, is also confirmed by the following. At the great coincidence of all periods it is established that, if some novelty is found in the heaven, whether in accordance with the ordinary course of the heaven, such as the rarer conjunctions of several stars, and as the more remarkable eclipses of the luminous bodies, or outside their ordinary nature, such as comets or new fixed stars, at the same time sublunary nature is perturbed by unusual influences, so that there is an immense and continual violence of rain, beyond that indicated by the aspects, or on the contrary drought and harshness, and associated earthquakes; and lastly there is unaccustomed dampness in the air, which brings pestilential catarrhs and other epidemic plagues particularly on those places from which they are exhaled with greater force, or to which they are carried by more frequent winds.

Whence the effects of comets and eclipses come

That there is also in fact something similar to the memory of animals in this soul I have reported in my book *On the New Star*, Chapter X, page 44.[86] For this is the nature of all things which are akin to light, that they are excited by the light of the Sun, or at least of day, and take on some disposition, which may last for a certain time. Thus in the case of the eyes the visual spirits, the offspring of light, impressed by the unexpected sight of the Sun, wherever the eyes are turned, show and proclaim this image, even unwillingly. Thus among the secrets of chemists is the following wonderful and outstandingly noteworthy observation. They produce gems, as I have just now heard from an "eyewitness," which are invisible in the darkness, like other things deprived of light. Yet if someone exposes them to daylight alone they are set on fire by it like candles, and take a gleam with them even into darkness, shining like the eyes of cats; but it is again extinguished in a short time. Something like that happens with this soul, which I have stated to be akin to light and fire, so that on the side (for it is a point which has different sides, or a potential zodiac circle) on which there has been a meeting of superior planets, or an eclipse has appeared, it takes on the character of a conjunction, which may last for a certain time. Thus whenever one of the planets, especially the Sun or Moon, passes the place, it exerts such force as it would exert at the actual stimulation of a conjunction. The whole of this business, I say, is like the memory of animals. For I carry about in my mind the likeness of a man whom I have once seen, and yet do not have him always present in my thoughts; but when he or someone like him appears, then that original likeness is elicited afresh and established in my actual thought, by recollection. However, the memory of man is more noble in this respect, that I am reminded of what is in my memory not only

Pages 292 and 293.

The stone which may be set on fire by daylight.

Whence comes their influentiality in positions of meetings.

The memory of the Earth's soul.

[86] *De stella nova*, Chapter 10 (KGW 1, pp. 196–197).

when it is met externally, but I remind myself of it as often as I wish, because of course the faculty of reflection is present in man, which this soul lacks. Yet these things will be more evident in the contemplation of the human soul.

How the Earth's soul perceives an aspect.

Now one difficulty which was also touched on above, but lightly, must be removed, that of the way and means of reception. For the reception by us men of the likenesses of sensible things within our souls seems something acceptable and plain. For the apertures of the pupils, by which they enter, are in the open; the eye is that which forms the likeness; the crystalline fluid is that which controls the radiant beam; the netlike covering of the optic nerve is that which receives the picture of external things. Nothing of that sort is apparent in the body of the Earth, no eye is here by which the soul of the Earth may see the radiations of the planets and their angles. How, then, will it sense the light without vision, how will it perceive or receive the angles without an instrument? There is some difficulty, I confess; but if you consider the matter more deeply, it is common to both cases. Go to page 169 of my *Astronomical Part of Optics*[87]: you will see the old complaint about human vision as well. For although the more careful opticians and medical anatomists confess that in that passage I have at last very firmly demonstrated the way of seeing after so many fruitless attempts by others (though Francis Aquilonius, whose great work on optics came out four years ago, has not seen my book, and so has to no purpose erected a new, exceedingly splendid structure on the old error about the way of vision)[88] yet that way of seeing does not extend beyond the netlike covering, where the fluids of the eye are transparent. There still remains the question, not yet settled by the natural philosophers to whom I have appealed, how the picture of the thing which is to be seen, formed according to me on the netlike covering, is from there on received through the opacity of the body within the recesses of the soul.[89] Does the soul proceed outwards to meet it?—and what hangs on that. I, however, as I frankly confess, concentrate more on vision than on this perception of the angle of the rays. About that I think I am capable of some by no means inept babbling, although I am completely dumb on it.

The true way of seeing.

Francis Aquilonius.

I could indeed without losing the main point evade the toil of speculation and reply to the question by what eyes the soul of the Earth sees the rays of the stars, "By the same by which it saw the soldier with jagged boots, whose image it implanted in the cleft stone." However, laziness is the death of philosophy: let us live and exert ourselves.

Pages 329, 334, 335, and 339.

First the soul has actually acquired the nature of a point (at least for the purposes of binding it to its body), potentially the shape of

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[87] *Ad Vitellionem paralipomena*, Chapter 5 (KGW 2, pp. 151–159).

[88] Franciscus Aquilonius, *Opticorum Libri* VI (Antwerp, 1613). See August Ziggelaar, *François de Aguilón, S.J. (1567–1617)*: Scientist and Architect (Rome, 1983).

[89] See note 35.

a circle; and as it is activity, it spreads itself from that seat at a point into a circle. For whether it has to sense external things, and they surround it in a spherical way, or whether it has to control its body, and it also has its body surrounding it, itself it is concealed inside, rooted in its particular point, from which it comes out by means of its emanation to the rest of its body. But how does it come out, except along straight lines? For that is truly coming out: how would it have any other manner of coming out, existing as light and flame, than other lights coming out of their sources, that is on straight lines? It proceeds out, then, towards the outer parts of its body, according to the same laws as the lights which surround the firmament proceed in towards it as it resides at its point. Now, the whole surface of half the Earth's globe, and so all points on the surface of the atmosphere by which it is clothed, are irradiated by an infinity of rays from one and the same planet, and of all of them a single one is directed towards that point which is the seat of the soul. On the other hand, the soul comes out to all points on the surface of its body by an infinity of lines (like the rays of the Sun, because it is itself a kind of light, and the spirits commonly spoken of seem to be nothing else but these rectilinear rays, and these emanations of the soul) . Yet there is one line alone out of them all to be directed from the center to that point on the surface which is struck by the single ray from the planet which is directed towards the seat of the soul. Let us suppose, then, that perception of the rays of one planet occurs when the entry of the former and the exit of the latter coincide on one geometrical straight line, on a pattern very similar to vision, which is perfect and accurate on a single unique perpendicular, the central ray of the whole eye. Let us also suppose what in the *Dioptrics* in Proposition LXI I have pressed home as the particular secret of all sensations, that no sensation of an external object occurs except insofar as the sensory instrument is affected by that object. For the soul has by those outward passages of its emanations reliable knowledge of all the members of its body, and of the changes which occur in any one of them at a given time. From these suppositions it follows that if such an impression comes from a planet to some point in the atmosphere which is not in the direction of the seat of the soul but past it, to one side, the soul accepts the emanation from the point thus affected indeed, through the return of its own emanation, but discounts it as something of no importance. If, however, such an impression comes to some point on the surface of the atmosphere which is in the direction of the seat of the soul, the point thus affected is announced to the soul, and this sensation, as relating to the soul, is evaluated, and distinguished from others. Hence at that point alone the soul makes an image of the star for itself, but at the others mentioned hardly at all. For the soul's ray is brought into action and, so to speak, illuminated, by the star's ray which coincides with it on the same straight line, just as the color of visible things is brought into action by the advent of light, and just as vision is brought into

How the Earth's soul manages its body.

What sensing is, and how it comes about.

action when we are aware and take into account that we are seeing. When this is the case for not only one planet, but for two as well, the soul will also find two indications, in two parts of its own body. Whether its body is in fact round, or uneven and rough, the soul is surrounded by it, in the manner of a sphere, as it is seated at a single point, and exhales it as if perfectly spherical, in whatever direction its body is evident, by rays which it puts out from itself round about, either by immaterial emanations or, as others do, by secondary action. Hence it examines its body by reference to the idea of a circle, and indeed of a zodiac circle, drawn round its seat as center, and measures out its separate parts. So there is no need to concede that the Earth is transparent right through to its center, nor that its soul goes right out to the stars, and yet the way in which the angles of the configurations are sensed by the soul is no less evident.

Optical illusions are effective against the Earth's soul and its operations.

By this supposition indeed all the arguments are rebutted which Pico Mirandola applied to overthrow the theory of the great conjunctions and of the aspects. For because the soul arranges all the bodies in the world round the point which is its seat (in imagination) in the form of a sphere, and all the planets in the form of a circle, and that by the law of straight lines extending from a single point, it therefore makes no difference whether a star is large or small, whether it completes a large or small part of its path in the sky, or whether it is high or close to the Earth. For all these things affect the soul just as they are perceived. However, they are perceived according to the same laws by which they are also seen by us, that is all as if equal in height, and without any second motion, but equal in the speed of their first, diurnal motion, and with no great difference in their visible size. Look for the other replies which can be made to Pico's arguments in the passage to which I have often referred in my book on The New Star. Enough for the present on the soul of the Earth, which they call sublunary nature.

On the soul of Man.

Whatever has been said up to this point about the soul of the Earth can also be applied similarly to the faculties of the human soul. However, in the case of the latter many things are more obvious, and more numerous in proportion as they are in control of more functions than the former.

On the mind.

Indeed on the chief faculty of the soul, which is called the mind, apart from what I have adduced from Proclus above in Chapter I, the business of the rays gives no further information for me to state at greater length. It is a point, as mind; it is a circle, as reason; it is an image, of the divine countenance; it is a harmony, inasmuch as it has a single activity; there are in it ideas and mathematical species, by means of the circle; it gives to the latter, and to the harmonies, their intelligible essence. Let the reader look for all these things above: here there is no need to say more. I mention this single point from Proclus' arguments: the mind does not seem to depend on good examples, as he emphasizes that lines, surfaces, and points must be established in

Pages 337, 339, 334, 307, 308, 329, 312, 298, and 301.

Mathematical classes are in the mind in one way.

the soul, because there are no pure and distinct surfaces, lines or points in sensible things. But a pure line, subsisting on its own, is not in the soul either; but it exists in a mental surface, of which it is an extremity, no less than in the case of sensible bodily quantities an unmixed surface is in an extremity of a body, an unmixed line in the extremity of a surface, an unmixed point in the end of a line. For the essence of imperfect quantities is being in perfect ones.

Species and the circle in another way.

Of course mathematical classes in fact are in the soul in a way no different from other universals, and various conceptions abstracted from sensible things; but among mathematical types that which is called the circle is in the soul by a far different method, not only as an idea of external things, but also as a sort of form of the soul itself, and lastly as a single storehouse of all geometrical and arithmetic knowledge. The former of those is most obvious in the theory of sines, the latter in the wonderful business of logarithms, as in those, which arise from the circle, there is a sort of calculating machine of all the multiplications and divisions which can ever take place, as if they were already completed. But enough of the chief faculty of the soul: let us now come to the lesser ones.

Sines. The logarithms of the illustrious lord, Baron Napier.

On the vital faculty.

The vital faculty in man, then, has with it not only the harmonies which are involved in bright rays, but also the harmonies which clothe types of sounds. And sounds indeed it drinks in through the ears, as their proper object; but the rays of the stars in fact it examines by reference to innate ideas of harmony, not, as it admits them, by the eyes, but by that same more obscure way of perception which was expounded a little above. For things which are seen by the eyes are at the service of reflection; but the recognition of harmonies is without reflection. Thus J.C. Scaliger accepts that the idea of a kite is innate in a young fowl, but that it is not simple, but accompanied by the sign of a calamity which it must flee.[90]

Scaliger on ideas.

What effects the stars can have on the vital faculty.

Hence, therefore, it is a property of human souls that at the time of heavenly aspects they get extraordinary impulses to carry through the business which they have in hand. For what a goad is to an ox, what a spur or a jockey is to a horse, what the drum and bugle are to a soldier, what a stirring oration is to its audience, what a measure on flute, bagpipes, and pandura is to a crowd of rustics, that a heavenly configuration of appropriate planets is to all of them, especially when they are assembled together. Thus they are both stirred up individually in their thoughts and deeds, and collectively made more ready to conspire together and to join hands. So in warfare you may see that generally battles, fights, invasions, assaults, captures, disturbances, and panic terrors take place at the times of aspects of Mars and Mercury, Jupiter and Mars, the Sun and Mars, Saturn and Mars,

How warlike disturbances originate from the heavens.

[90] J.C. Scaliger, *Exotericarum exercitationum liber quintus decimus de subtilitate ad Hieronymus Cardanum* (Paris, 1557), Exercit. 307, No. 21, ff. 405–407.

How diseases do.

and so on, and that in epidemics of disease more people fall ill, are worse tormented, or even die, at the time of powerful aspects, that is because nature is failing in the struggle with disease, to which struggle (but not to death) it is incited by an aspect. the heaven itself does not do these things without an intermediary, but the vital faculty of the soul, operating in partnership with the heavenly harmonies, keeps the leadership in this, as it is commonly called, influence of the heaven. Of course this word "influence" has bewitched some philosophers into preference for sharing the madness of the common herd rather than my wisdom. How weak their chain really is, connecting the stars with the atmosphere, the atmosphere with the constitution of the body, and then the body with the soul. Suppose that applies in certain cases: yet what has it to do with an aspect, which is an entity of reason? How will the element of air grasp it, or the body? Unless each does so by its own soul, which first perceives the aspect in itself, in the way which I have stated.

The vital faculty is a flame.

That this vital faculty is a flame, lit in the heart (and hence dies when its fuel is used up, whereas the mind is permanent), I have proved in my Optical Part of Astronomy, page 26,[91] by a very clear comparison between the heart, and its reciprocal motions of systole and diastole, and an enclosed lamp, in which the flame must be sustained by oil, ventilation, and removal of smoke.

How each is governed by his own birth, and on what basis.

On this property of its essence, then, chiefly depends the wonderful business of horoscopes. For since the vital faculty, lit in the heart, and burning as long as life persists, is a kind of zodiac circle, since its essence consists in activity, and in a flow of flame, as it were, the result is, that the whole sensible shape of the zodiac flows into it, when it has been freshly lit at birth, and is completely implanted into it (even though the heaven after the moment of birth goes on to all its other positions and changes its shape). On this spiritual idea of the circle of the zodiac it marks all the positions which the planets and the rising point, setting point and mid-heaven[92] held against the fixed stars.

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[91] See note 85.

[92] The rising point, ascendant or horoscope, marking the degree of the zodiacal sign rising above the horizon at the moment of birth, was taken as the reference point in the composition of horoscopes. Dividing the circle from this point, the other cardinal points or centers, as they were called, were taken to be the mid-heaven or superior culmination (*medium coeli*), the setting point (*occasus*) and the inferior culmination (*imum coeli*). The zodiac, of course, was almost never divided into equal quadrants by the horizon and the meridians. Early astrology probably worked simply in terms of an association of the ages of man with these quadrants. See Tester (1987), pp. 25–26. Later each quadrant was divided into three mundane houses, making twelve in all. They were numbered according to the order of rising. The beginning or point of the first house is thus the ascendant, while the superior culmination is the point of the tenth house. These houses are independent of the zodiac and relate to the appearance of the sky at the time and place of birth of the subject of the horoscope. The significance attached to individual houses varied but generally a house was re-

Before other astronomical matters, much the greatest priority belongs to the radiant harmonies, along with the first origin and formation of this vital faculty in man. For we have stated that every faculty of the soul is a circle, in respect of its essence, as essence; but as it acts on itself in some way by instinct, as, that is to say, it compares its circle with parts of it, they are harmonic archetypes. Indeed the vital faculty begins to act, and continues in action, from the instant when through birth it is ignited within the lamp of the heart, just as it has further need for breathing, that is to sustain the flame of life. When, therefore, it begins to be what it is at the time when it constructs the harmonies, then most of all the sensible radiant harmony of the planets flows into it.

Pages 307 and 312.

Why the position at birth is more important than the position at conception.

Is this indeed the reason why those who are born at a time of many aspects among the planets generally turn out hard-working and industrious, or are accustomed right from boyhood to accumulate wealth, or are born or chosen as governors of the state, or indeed devote themselves to study? If I seem to anyone to be able to stand as an example of that kind of life, I have not begrudged him information on my birth, in my book *On the New Star*, page 43[93]; and it will be convenient to expound it at this juncture also. I do not shrink from the charge of boasting, even though the charge is made by those boors, half-learned, peddlers, to drive the people mad, of titles and arms, even, as Pico calls them, popular theologians, who condemn this whole class of writing for stupidity, whether in speech or by their style of life. Before true lovers of wisdom of whatever order I easily clear myself of this charge by pleading the benefit to my reader, because there is nobody whose birth or internal disposition of mind I know by equally certain

The power of the aspects at birth.

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lated to a particular theme such as life, prosperity, health, and so on. See Simon (1979), pp. 86–91. Ptolemy pays little attention to the mundane houses used by practical astrologers but in one place he mentions five of them (*Tetrabiblos*, III, 10).

Besides the twelve mundane houses, tied to the local horizon, there were also twelve celestial or planetary houses, corresponding to the twelve zodiacal signs (*Tetrabiblos*, I, 17). The zodiacal sign Leo having been assigned to the sun and Cancer to the moon, the semicircle from Leo to Capricorn is regarded as solar and that from Aquarius to Cancer as lunar. Every planet rules a house or zodiacal sign in each of these semicircles. Moreover, for each planet, there is a sign, called its exaltation, in which the planet is supposed to reach its maximum power (*Tetrabiblos*, I, 19). For a table of the planetary houses, exaltations and depressions (diametrically opposite the exaltations), see Boll (1931), p. 59.

Although Kepler claims to have rejected the significance of these concepts of traditional astrology, he does refer to them. The explanations given in these notes are not intended as a comprehensive account of the technicalities of astrology but are restricted to what seems to be necessary for the reader who wishes to understand Kepler's references to them.

[93] *De stella nova* (KGW 1, p. 196). A detailed interpretation of his birth-horoscope written by Kepler in 1597 may be found in KOF, vol. 5, pp. 476–483. Cf. the German translation in Johannes Kepler, *Selbstzeugnisse*, ed. Franz Hammer, trans. Esther Hammer (Stuttgart-Bad Cannstatt, 1971), pp. 16–30.

investigation. Jupiter, then, was very near the ninetieth degree, and had passed the trine of Saturn by four degrees; the Sun and Venus in conjunction were passing away from the latter, and steering towards the former, in both cases at their sextiles, and were passing away from the quartile of Mars, towards which Mercury was steering very closely; the Moon was going towards the trine of the same, very close, even in latitude, to the eye of Taurus; and the 25° of Gemini was rising, the 22° of Aquarius was in culmination.[91] The peculiar triple configuration of that day, the sextile of Saturn and the Sun, the sextile of Jupiter and Venus, the quartile of Mercury and Mars, was proclaimed by a change in the air; for after a freeze of several days, on that very day warmth appeared, melted the ice, and produced rain.

An exception contrary to astrology.

However, I do not mean that all the aphorisms of the astrologers are defended and confirmed by this one example, and I do not convey to the heaven the guidance of human affairs—this philosophical observation is still an immense distance away from that stupidity, or insanity if you prefer to call it that. For, to follow hard upon this example, I know a woman who was born under almost the same aspects, with a temperament which was certainly very restless, but by which she not only has no advantage in book learning (that is not surprising in a woman) but also disturbs the whole of her town, and is the author of her own lamentable misfortune. First, then, there was added to the aspects of the planets the daily imagination of my mother during her pregnancy, whose mother-in-law, my grandmother, an enthusiast for popular medicine, which was also practiced by my father, was an object of admiration; secondly, there was added the fact that I was born a man, not a woman, a difference in sex which the astrologers seek in vain in the heaven. Thirdly, I take from my mother my bodily constitution, which is more suited to study than to other kinds of life. Fourthly, my parents' means were limited, that is to say there was no land for me to be born to and to cling to. Fifthly, there were schools available, there were examples available of the liberality of the magistrates to boys who were suited to study.

The results of the circumstances of sublunary affairs should not be ascribed to the stars.

The qualities of the mind agree to a large extent with the qualities of the planets.

Interpose here, again from birth, the differences which the planets make in qualities. For if the soul is a kind of light, it will also distinguish the red color of Mars from the whiteness of Jupiter and the leaden color of Saturn. Thus it must be admitted that great assistance comes from Mars not only, as before, towards industriousness, but also towards sharpness of talents, which is based on fiery vigor; and you may see that men who are outstanding in natural philosophy, and expert in medicine, are born under appropriate aspects of Mars with the Sun and Mercury, because of course greater sharpness is required, greater ingenuity for rooting out the mysteries of nature, than for the other

[91] That is, the ascendant was in 25° of Gemini and the superior culmination in 22° of Aquarius.

businesses of life, and the studies which serve them. I shall impart something even more generously: it is the result of the elevation of Jupiter to the middle of the heaven[95] that I delight more in geometry expressed in physical things than in the abstract, and showing in its appearance the dryness of Saturn—more, I say, in natural philosophy than in geometry; and because the gibbous Moon in the famous constellation of the brow of Taurus would fill the fantasizing faculty of the soul with images, though I have discovered that many of them agree with the nature of things, as if they had been taken from *the patterns of Proclus. But if I should now speak of the outcome of my studies, what else, I ask, do I now find in the heaven which hints at it even lightly? The experts confess that there are parts of philosophy which are not to be despised which have been either freshly unearthed or emended or clearly perfected by me. Yet in this my stars were not Mercury[96] as morning star in the angle of the seventh house, in quartile with Mars, but they were Copernicus, they were Tycho Brahe, without whose books of observations everything which now been brought by me into the brightest daylight would lie buried in darkness; not Saturn the overlord of Mercury, but Rudolph and Matthias, each a Caesar Augustus, my overlords; not the lodging of the planets, Capricorn for Saturn, but Upper Austria the home of Caesar, and the ready liberality of its nobles, on an unusual pattern, in answer to my petition. In this the angle is not the setting angle of a horoscope but a terrestrial corner into which by permission of the Emperor my overlord I betook myself, from a court where there was too much disturbance, and in which throughout these years, turning now towards the evening of my life, I have been struggling over these harmonies, and other things which I have in hand. An astrologer will seek in vain from the arrangement of the stars at my nativity the reasons for my discovery in the year 1596 of the proportions between the heavenly spheres; in the year 1604 of the way of seeing; in this year, 1618, of the reasons why to each planet has fallen an eccentricity of a particular size, neither smaller nor larger; in the intervening years, of my demonstration of the physics of the heavens, and of the ways in which the planets move and of their true motions; and lastly of the basis of the influentiality, which is metaphysical, of the heaven on this Earth below. Those things were not due to the influence of the characteristics of the heaven on that little flame of my vital faculty which had just been lit and brought into action; but in part they were hidden in the innermost essence of my soul, according to the Platonic theory quoted above from Proclus, and in part they were received within by another route, through my

*Some fuel here for our satirists. For, it appears, poverty presses them, as they have now chewed over my sole joke like this from my book *On the New Star* at various times during the passage of twelve years.

No individual results are due to the stars.

Page 221.

[95] That is, the *medium coeli* or superior culmination.

[96] Mercury in the seventh house signified rashness and antipathy to work but the sun in sextile with Saturn signified conscientiousness and tenacity. Kepler relates that, as a child, he was given almost entirely to play, but as he grew older, he found interest in other things. See Johannes Kepler, *Selbstzeugnisse*, p. 18.

The general effect of the stars.

eyes of course. The one and only way in which the arrangement of the stars at my nativity operated was that it both polished up the little flames of talent and judgement and urged my mind on to untiring toil, as well as increasing my desire for knowledge. In short, it did not inspire my mind, or any of the faculties stated here, but roused it.

The pointless headings of astrology.

From this example it is easily apparent to anyone how far astrology is from being able to give an exact response from one single arrangement of stars at a nativity under any of the headings which it is the common custom to put to it, about the baby's parents, about its sex, about its wealth, about its children, about the number of its wives, about its religion, about its holding office, about its friends, about its enemies, about its inheritances, about its family, about its domiciles, about an infinity of other things.

How far the astrologer can pronounce on length of life, indeed, that is, what force the directions have, I shall state a little later. On the child's fortune, however, I see that I should now say something separately in agreement with what has been said above.

On what intermediaries from the stars a man's luck depends, and to what extent.

There are three things on which a man's fortune seems to rest, insofar as they are natural: his mind, the physical constitution of his body, and his tutelary genius. Nobody is in doubt on the first of these; the second is more obscure, and is not so commonly known; on the third I could contribute nothing but conjectures. We have dealt with the first up to this point, that is with the mind, on which behavior depends. There is a familiar proverb of the common herd about them, that "Everyone is the architect of his own fortune"; and the sum total of this part of philosophy is contained in that saying. For come, to represent them all let us fasten our eyes on one kind of activities and manners, which was also previously touched on with the example of the woman. For human affairs are ordained in such a way that there is always a great abundance of men who are coarse and wise in the popular sense not only among the common herd but also among the magistrates and in holy orders; but they resent those who are independent, critical, or reformers and consider them troublemakers. For someone to enjoy good fortune, then, I mean that which comes from gatherings of men, although he needs absolutely both good judgement in matters of morals and toil and industry in his own affairs which are kept secret from the common herd, yet his mind should have some admixture of grossness, he should have the behavior of the people, and a kind of way of doing things which will please the coarse populace. Minds which are too subtle and restless, unless they betake themselves to some retreat for study (and are looked down on and despised for that very thing), usually create misfortunes for themselves.

Behaviour is the architect of fortune.

Thus if anyone has adequate conjectures from the shape of the heaven at a nativity about qualities of mind, he will make a conjecture which is not absurd about a man's fortune in general; but it will be

only a conjecture, and nothing else. Of course he can also be wrong, on account of the intervention of several causes, both supernatural and natural.

Page 309. The spell of looks.

For to derive one basis of a man's fortune, that is opinions of his countenance, from the foregoing, the imagination of the mother does indeed impart much of it to the foetus, during the whole time of gestation, so that both from unlucky parents (and indeed also from other men or animals, frequently with the outward appearance of those encountered during pregnancy) countenance and behavior, and a similar fortune which rests on their basis, are transferred to the foetus.

Page 301. Birth expressed in appearance.

Nevertheless, as above the mental patterns of Proclus were multiplied into spiritual, vital, and mobile patterns, that is, were wrapped up with the ideas of life and movement, so also in this case the arrangement of the heaven at nativity is impressed on the appearance of the countenance, by a hidden power of the formative faculty, and is recognized from the countenance of the child, by a still more deeply hidden instinct of the beholders.

Whence comes the power of the attendants of planets.

And you may see that to those who are born under the conjunctions of several planets before the Sun (astrologers call them "attendants"[97]) assemblies of men of the people are also attached, as if by some spell. An example of that which is entrusted to the whole memory of posterity may be seen in Geronimo Cardano on the nativity of Luther,[98] though several causes for public commotion coincided. Those who have such a birth (though no single definite

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[97] The astrological term δορυφόρος (attendant) is used but not defined by Ptolemy (*Tetrabiblos*, III, 4). The concept is described by Porphyry and others. There are, in fact, a number of circumstances in which a planet or luminary is said to have an attendant. First, it should be noted that the planets and luminaries are divided into two sects, diurnal and nocturnal. The diurnal sect consists of the sun, Jupiter, and Saturn, the nocturnal of the moon, Mars, and Venus, while Mercury is common to both (*Tetrabiblos*, I, 7). Generally, one planet can only be an attendant of another if both are in their proper houses or exaltations. The sun and moon, however, can have attendants even when they are not in their proper houses, provided they are in one of the two principal centers; that is, the ascendant or superior culmination. In this case, the luminary has as attendants all planets of its own sect that form an aspect with it, provided that, following the diurnal motion, the attendant precedes in the case of the sun and follows in the case of the moon. There is yet another sense in which a planet or luminary may have an attendant and this is the one that Kepler here has in mind. Any planet or luminary which is in the ascendant or culmination (superior or inferior) has for attendants those planets that precede or follow it closely and are of the sect corresponding to the birth; that is, the diurnal sect in the case of a diurnal birth and the nocturnal sect in the case of a nocturnal birth. When the term attendant is used in this sense, aspects are not involved. See Bouché-Leclercq (1899), pp. 252–254.

[98] Luther's horoscope is given in Hieronymus Cardanus, *Libelli quinque. V. De exemplis centum geniturarum* (Nuremberg, 1547), pp. 114–115. Cf. KGW 6, pp. 541–542. At the time of Luther's birth, 10 p.m. on 22 October 1483, the superior culmination was in 14° of Aries. The planets Mars, Venus, and Jupiter were in conjunction close to and in advance of the sun at the inferior culmination. As the birth was nocturnal, the sun's attendants were strictly the nocturnal planets, Mars and Venus. The conjunc-

form can be specified) are very strong in influence with the people, very strong in their voice in council, very strong in favor with the chief men of the state, whose nature indeed also corresponds. Thus often fortune is on the side of a man who has no merits of character and is not endowed with any other appropriate excellence of mind. Refer to this point the other things which I stated above on physical constitution, and could be said at greater length.

Page 309–10.

The guardianship of genii. Job 33. Matthew 18. Luke 15.

On the tutelary genius, divine oracles bear witness that to them individually is allotted the guardianship of individual men, that the right is also given of admonition and of intercession before the tribunal of God's providence. Here nature has no rights of property over sensible things: yet if astrologers can foretell from the arrangement of the stars at nativity events which are clearly accidental (to use the natural way of speaking), that is such as did not come about from a man's bad behavior, from rashness, or uncontrolled anger or lust, and do not depend on a low opinion of his countenance, which are the two bases of fortune expounded so far, as when a tile falling from a roof hits a passer by, when a bullet or an unexpected arrow hits someone strolling in the woods, when a sinking ship casts out unhappy travellers in the midst of the waves, when one man is caught in flames and destroyed, another is crushed by the collapse of a house or a mountain, and on the other hand when one man enters into an inheritance which he did not hope for, another accidentally finds a treasure—if, I say, the arrangement of the stars at nativity contains indications of these events, which belong to the functions of the guardian angel beyond contradiction, then obstructions to this guardianship, and support for it in the other direction, must come from the star at nativity.

Whether clearly accidental evils depend on the stars.

Let the theologians see whether this contains an impious opinion in it, especially those who in great numbers write horoscopes and prognostications. I have knowledge, which I do not know how to describe, gained from the experience of two men who were born under very

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tion, of course, was considered to be significant in its own right, apart from the fact that two of the planets were the sun's attendants.

Belief in the significance of conjunctions may go back to Homer, who, in the *Iliad*, appears to relate a conjunction of the seven planets (including the luminaries) with the conflict of the Homeric gods. This interpretation, however, has been disputed by A. Bouché-Leclercq (1899), p. 30. Again, the Stoics associated the nuptuals of the gods Mars and Venus with a conjunction of the planets of these names. See Boll (1931), p. 89.

An influential astrological work in the Renaissance was John of Seville's translation of Albumasar's *De magnis coniunctionibus*, published in Augsburg in 1489. Planetary conjunctions in general, and especially those of the superior planets, Mars, Jupiter, and Saturn, came to be regarded as the signs and causes of great historical events. The birth of Mohammed and the Black Death in 1348 were marked by such conjunctions. See Boll (1931), p. 34. Although Luther himself was scathing in his adverse comments on astrology, he nevertheless saw the great conjunction of 1524 as a warning sign from God (ibid., p. 41).

violent arrangements of stars, and whose behavior was consequently no different. In fact one of them played a game of jumping over precipices and snatching a rope in mid-flight, so that if he had missed it, it would at once have been all over with his life. However, they did not seem to have brought any harm on themselves by their rashness, for one of them was struck by lightning, the other by a lead bullet from a hunter, as he was in ambush for wild beasts and had missed him with sight and ears. Nor do I see how the heaven can have such power against a man, in spite of the genii, although it is found that its other powers are all exercised through a man's mind or body (which have no power against them.) It has happened to me more than once that when I had been long and greatly tortured by pity for people who perished accidentally, and seemed to me entir eyinnocent, in the end I learnt from those who were trustworthy that those people's life had been outstandingly of the kind by which the good angel is easily driven away, like a bee by smoke, and the man is usually given up to blind chance, like a chariot without a driver, as if he were emancipated from the paternal authority of God his creator and given up to his own whim, or rather to the tyranny of Satan. Whether some conclusion of that kind should be reached on the examples previously quoted, and those events should be attributed to divine nemesis, He alone knows who explores hearts, Who visits the iniquity of the fathers on the sons unto the third and fourth generation. Indeed may I be far from holding the same opinion about all who perish by accident. But the soothsayers cannot see such wickedness of life in the stars; for neither are there written in the shape of the heaven the divine aids against the sinful inclinations of our minds, into which the influence of heaven degenerates after our downfall, not corrupting, but urging on the corrupted mind. Much less are there written in the lead color of Saturn, the red of Mars, as if in the lawbooks, the kinds of punishment which are due for individual sins. Thus although there is no immediate natural connection between these matters and heaven, once or twice in the last 20 years I have put up for public consideration whether just as those spiritual guardians of provinces and peoples complain in Chapter 9 of Daniel that they are obstructed by spirits which lie in wait, so also the genii of individual men are indeed naturally obstructed by the stars from being conveniently able to resist the powers of the air, which lie in wait for us "en masse," and those obstructions are foretold by the arrangement of the stars at birth. Perhaps that has also influenced the genius, no less than the mind of the newborn, and some general bad luck for the child is the consequence, so that from this was born the proverb "troubles do not come singly." However, God does not frequently obstruct this course of the invisible workings of nature, because He has generally known how to bring some good even out of that obstruction of guardianship; so that if He is pleased with the one who is in danger, He yields to the good, but if He is displeased, He fulfills the measure of just punishment. Certainly

Often sins are the causes of accidents.

The deeds of men are not due to heaven.

Whether the nativity of his protégé has anything to do with the genius.

The warnings of genii.

if the guardian angel cannot prevent an imminent evil, he at least gives warning, in secret ways, so that he does not let his protégé perish unprepared. Such presentiments and warnings also preceded the recent collapse of a mountain in Rhaetia.[99]

What the basic principle of man's life in the womb is, and what its nature is.

Let this third basis of a man's fortune, then, be merely conjectural, for I assert nothing definitely. We must now return to consideration of the essence of the vital faculty of the soul. For the question can be asked, if the imprint of the heaven exerts its influence only at the moment of nativity, whether the foetus therefore conceives the vital faculty of the soul only at birth, and whether I should say that before birth it is without a soul? It conceives its own vital active faculty in actual fact only at the moment when it is separated from its mother. Before that it was illuminated by the rays of the little maternal vital flame through the umbilical vein and artery. This artery is inserted into the heart of the foetus by a separate passage from the two by which afterwards, feeding its own vital flame within, it drinks in blood in one case and air from the lungs in the other. This separate passage of the heart perishes on the first day of life and completely disappears, as I was shown in Prague in a recently produced piglet by Georg Horst, physician of the Landgrave of Hesse,[100] who is very knowledgeable about the whole of nature. From that I draw the inference that the heart of the foetus, while it is in the womb, is without the motion of systole and diastole no less than it is without breathing, and so that the flame of its own life is not yet lit in it. And to insist more firmly on the very trustworthy analogy: as the smoke of a wooden roof which is scorched from a fire is to the flame which suddenly seizes it, so also is that which precedes it in the foetus to the vital faculty which is lit from the moment of birth or a little before.

In what way is the foetus alive before birth?

Whence comes the power of the passage of planets over birthplaces?

In this vital faculty of man, then, which is thus lit at birth, there shines forth most clearly that which resembles a memory, as I have also shown above in the case of the Earth's soul. So great is the permanence of the imprint of the heaven, and of all parts of the arrangement of the stars at nativity, so great is its durability in the soul, that it is not cast off before the end of life, as at all passages of the planets over the chief positions of that arrangement, this faculty is aroused, exactly as if those positions were not bare images surviving in the soul of things which passed long ago, but true stars, and so not one but two Suns, for example, were in the heaven and combined into one, and by that combination the nature of the vital faculty were aroused in the way stated above.

Very clear evidence of this fact, outweighing any exception, is in the

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[99] Kepler gives a full report and interpretation of this natural disaster in his *Prognosticum* for 1618/19 (KOF, vol. 1, pp. 490–493).

[100] Gregor Horst. Later Kepler stayed with Horst in Ulm during the printing of the *Rudolphine Tables*.

affinity of the nativities under which parents and their children are born. For when the foetus is mature, the faculty of the soul which is formative and in charge of generation girds itself up to expel the foetus, and by that expulsion to light up the new vital faculty of the soul, particularly at the time when the stars return to the seats of the mother's or father's nativity, or to the same configurations and remind the soul of themselves and of their heavenly imprint. See my book *On the New Star*, page 43.

Why is there affinity between the nativities of parents and children?

What if this faculty does not only observe the true transits of the planets through their positions at nativity, but also the progressions of the parts of the heaven which held the planets at the time of birth into the chief positions of the arrangements which are established by exact integral numbers of days from the birth, observing the proportion of the day to the year (as each complete cycle of a year is attributed by Copernicus to the Earth), and dispenses all its operations in that proportion throughout the man's life, in such a way that in proportion as a year is longer than a day, an effect follows its sign in direction more slowly than the sign follows the birth in direction? Hence this heavenly impression does not only continue inactively, but also as it lasts it propagates itself by a motion of extension to longer periods of life. Of course this faculty is not only a circle, but it is an ideal circular motion, and that a twin one; and lastly, through its motion, it is also an ideal time. See the words of Proclus above on page 301. We can again look for an example of this in memory, which is a slightly superior faculty. For on a tablet indeed things are pictured only with a context of place; whereas in the memory things which have happened are also pictured with an imprint of time. Lastly in this business of directions, the imprint of situations and motions which have occupied time is repeated many times in operations, observing the sensible proportion in the universe of the daily revolution to the annual transport of the zodiac, in such a way that the operations are now distant in respect of time from their stimuli. You may say that along with the child's actual body the time of the motions of the arrangement of stars imprinted at his nativity also grows.

Note the natural basis of the directions.

Whatever, then, astrologers venture to predict about length of life from the arrangement of the stars, the whole of it is compressed into this Chapter. When the prologues of the directions inform the vital faculty from, as it were, the stage of the arrangement of the stars at nativity, in which year of life in particular one or other of the humors is to overflow and be driven or shaken out of the body, that is the stimulus to nature to perform its extraordinary work, which is to yield to the prolongation of life. There is no death in the stars, in their arrangement at birth, in the direction, not even the various forms of death. It is the material of the body which either suppresses the flame of life by overflowing, or deserts it by failing, which obstructs the efforts of nature and turns them away to destruction. It is sin which has deprived the human race of the remedy of immortality which it was once

Whether the length of life or the year of death can be foretold from the stars.

What a direction is physically.

The genuine causes of death.

allowed, which even now drives away, obstructs, and repels the guardian angel from his watch on life against the assaults of demons, men, and the elements. But this matter would have to be dealt with at greater length in astrology; and I have dealt with it, not too concisely, in my book *On the Star*, page 43, and in my *A Third Party Interposes*, number 65 and following numbers.[101] Also it may be that I shall publish the books of Giovanni Pico della Mirandola with a commentary, if I am aware that I should be doing what would please students of philosophy, and if I am not deprived of the necessary means.[102]

The reckoning and power of the horoscope or the degree of the ascendant at nativity.

Now, because I am hastening towards the end, I shall append a comparison between the vital faculty in man and the soul of the Earth in respect of the influence of heavenly things; and the comparison seems to be that the soul of the Earth is a circle of such a kind that it nowhere has a beginning or an end, and is not connected with any part of itself, but the vital faculty of man is compared to a circle which is, as it were, connected to several points. The reason is that the soul of the Earth has no imprint from nativity, as it always stays the same, and is never born or lit; whereas the nativity of man, which is recent and close to his death, has received the imprint of its origin, which marks off on the zodiac definite points of beginning and ending.

The nativity of the world.

And indeed, even if you attribute to the Earth an imprint of its nativity from the first day of creation, yet the whole expanse of heaven is always open to it, and it reckons no beginning or end, or rising or setting point, in it. However, the surface of the Earth hides half the heaven from man, and marks the signs of rising and setting. The logic of the comparison is therefore evident.

The basis of crises.

Indeed this comparison between the vital faculty, as it is actually established, and a circle joined to definite points, is true. So even at

What disease is.

the onset of disease (which is like a new life, that is a new activity of the vital faculty, or an extraordinary proceeding on its part, which is natural but beyond the nature of its usual constitution, in striving to drive the harmful humor out of the body), the position which the Moon occupied sheds its influence on the soul, and takes on the power, as it were, of some true Moon, which is motionless in that degree. If the true Moon in the heaven reaches the positions of quartile or opposition to it, the nature of the man is stirred to struggle with the disease. It is upon this fact that the theory of crises depends, with which I have dealt sufficiently accurately in *A Third Party Interposes*, number 70 and following numbers.[103]

Let what has been said on the inferior faculty of the human soul also, and on the whole of this matter, be sufficient for the present.

Furthermore I have discussed the soul up to this point, not with

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[101] *De stella nova* (KGW 1, p. 196); *Tertius interveniens* (KGW 4, pp. 209–211).

[102] Kepler did not carry out this plan.

[103] *Tertius interveniens* (KGW 4, pp. 211–215).

the intention on my part of calling students of divine philosophy away from their reading of the metaphysical authors, or to fasten my eyes on all those Greek, Arabic, and Latin interpreters of Plato and Aristotle, most profound in investigation, Plotinus, Themistius, Simplicius, Porphyry, Alexander, Averroes, and the considerable number of his own race whom he quotes, and Boetius, and J.C. Scaliger, the most recent and the most subtle, who discuss the soul and understanding; but with the intention of adding to their thoughts, as if by way of a supplement, what has been derived from my project and from the inmost treasury of this work on harmony, and not yet touched by them, as far as I know. As a result, then, those who after me will devote themselves to this metaphysical study, will read the said authors, will compare these, as it were, discoveries with their reasoning, and will examine each by the gauge of the other with the unfettered criticism of reason (which I confess I have done very little at this juncture), will be able to render this part of metaphysical knowledge, indeed, more famous and richer, and more precise than any numbers. To turn that towards the glory of the name of God, blessed above all and creator of the visible and the invisible, and to the increase of those who study holiness and innocence of life, and lastly to the eternal salvation of a great many souls, I pray in supplication to that very God the Three in One.

End of Book IV.