Kepler's Theory of the Soul

A Study on Epistemology

by

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Abstract

Kepler is mainly known among historians of science due to his astronomical theories and his approaches to problems having to do with philosophy of science and ontology. This thesis attempts to contribute to Kepler studies by providing a comprehensive discussion of a topic hitherto not really considered, namely Kepler's theory of the soul, a general theory of knowledge or epistemology whose central problem is what makes knowledge possible—rather than what makes knowledge true, as happens in the case of Descartes's and Bacon's epistemologies. Kepler's theory consists of four issues: the theory of the different sorts of soul—i.e. the human soul, the animal soul, the vegetable soul, and the Earth soul—concerning their faculties, the differences and the resemblances that emerge among them, the relation they maintain with their own bodies and the world, and the distinction soul-world. The thesis discusses these issues from a historical perspective, that is, it reconstructs the way they appear in three periods of Kepler's career: the period prior to the publication of the *Mysterium Cosmographicum,* the period going from 1596 to 1611, and the harmonic period. Finally, Kepler's epistemology is briefly contrasted with Descartes's and Bacon's in order to suggest why Kepler's is philosophically interesting and valuable.

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Para Ángela, la oscurita, o aun para Ángela, simplemente

> Tal es también el sentimiento natural del odio o del amor, especialmente cuando hay una predisposición insólita, pues quien advierte la bondad o la semejanza de otra alma con la suya, gracias tanto a la comparación de las partes del cuerpo y la voz como a la comparación de las cualidades del temperamento, maravillosamente se inflama hacia aquella otra alma. Ama así el imprudente adolescente a la muchacha, aunque no sabe por qué o qué es aquello que en ella ama sobre todo lo demás, de modo que ninguna complaciente meretriz, aun fácilmente a su alcance, logra eclipsarla, si es un amor deshonesto, como tampoco ninguna otra muchacha núbil, si es un amor legítimo. No obstante, si aparece de repente un fisiognomista, éste encuentra en las dos personalidades alguna semejanza de caracteres, y si son disolutos, dan lugar a perpetuos conflictos en el matrimonio, pero si son buenos, a la tranquilidad de la vida.
>
> *Opera* V: 225. [*Harmonice:* 309-310.]

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Abbreviations of Works Frequently Cited

Apologia	Kepler, Johannes ([1858] 1984a). *A Defence of Tycho against Ursus.* In Nicholas Jardine, *The Birth of History and Philosophy of Science: Kepler's «A Defence of Tycho against Ursus» with Essays on its Provenance and Significance.* Cambridge, Cambridge University Press. (Translation and notes by Nicholas Jardine.)
Astronomia Nova	Kepler, Johannes ([1609] 1992). *New Astronomy.* New York, Cambridge University Press. (Translation by William H. Donahue.)
De Fundamentis	Kepler, Johannes ([1601] 1984b). "On giving Astrology sounder foundations." *Archive for History of Exact Sciences,* 31: 225–268. (Translation and notes by J. V. Field.)
De Nive Sexangula	Kepler, Johannes ([1611] 1966). *The Six-Cornered Snowflake.* Oxford. (Translation by Colin Hardie, notes by Colin Hardie and Lancelot Law Whyte.)
De Quantitatibus	Kepler, Johannes ([1858] 1986). "Three books on quantities." In Giovanna Cifoletti, "Kepler's *De quantitatibus." Annals of Science,* 43 : 213-238. (Translation and notes by Giovanna Cifoletti.)
Epitome	Kepler, Johannes (1995). *Epitome of Copernican Astronomy and Harmonies of the World.* New York, Prometheus Books. (Translation of books IV and V of the *Epitome* and book V of the *Harmonice* by Charles Glenn Wallis.)
Harmonice	Kepler, Johannes ([1619] 1997). *The Harmony of the World.* Translated into English with an Introduction and Notes by E.J. Aiton, A.M. Duncan, and J.V. Field. Philadelphia, American Philosophical Society.
Mysterium	Kepler, Johannes ([1596] 1986). *The Secret of the Universe.* New York, Abaris Books. (Translation by A. M. Duncan, and notes by E. J. Aiton.)
Oeuvres	Descartes, René (1897-1910). *Oeuvres de Descartes.* Edited by Ch. Adam and P. Tannery. Paris, L. Cerf.
Opera	Kepler, Johannes (1858-1871). *Joannis Kepleri Astronomi Opera Omnia.* Edited by Christian Frisch. Frankfurt et Erlangen.
Works	Bacon, Francis (1858-1861). *The Works of Francis Bacon.* Edited by J. Spedding, R. L. Ellis, and D. D. Heath. London. Reprinted by Forman Verlag, Holzboog, Sttutgart-Bad Cannstat, 1989-1991.

All these things are signs of life, and suppose a soul in the body which experiences them [*omnia vitae sunt indicia animamque supponunt in corpore patienti*]

Harmonice: 360; *Opera,* V: 252

Chapter I: Introduction

The title of this study may appear enigmatic for a reader of history of science as well as for a reader of history of philosophy, and I hope that is actually the case. After all, 'soul' and 'epistemology' have traditionally been philosophical rather than scientific terms, and Kepler is usually seen as one of the greatest scientists of the western civilization, but indeed not as one of its greatest philosophers. Kepler's name shows up in the books of history of science mainly related to astronomy and optics, and sometimes in those devoted to the history of philosophy merely as part of the Copernican framework that gave rise to what we know as modern philosophy, whose birth would be due to the methodological worries of Descartes on the continent, and Bacon on the island. Since the 1970's, however, this image concerning Kepler's place in the history of ideas has drastically been changing, and for the rather small group of scholars dealing with Keplerian philosophical issues, it has become quite problematic to understand Kepler's science without referring to his philosophy at the same time. As far as I can tell, these studies have focused on Kepler's ontology and philosophy of science. My aim here is to introduce Kepler's epistemology, namely: his general theory of knowledge rather than his particular theory of scientific knowledge.

As I hope to make clear in this study, Kepler's theory of the soul may constitute an attractive field of research for the historian of philosophy not only because of its intrinsic philosophical value, but also because it seems to anticipate several issues addressed by contemporary epistemology. Unfortunately, although some scholars have persuasively hinted that Kepler undoubtedly belongs to the background of the history of modern philosophy, it is a fact that he does not belong to the public history of modern

philosophy. Therefore, I do not attempt to show that Kepler is the source of current debates in epistemology. I rather attempt to show that he may be seen as a third way to understand the rise of the problem of knowledge in Modernity, a third way mapping conceptual spaces which philosophies as important as Descartes's rationalism or Bacon's empiricism did not even consider. In this sense, some passages of the third section might appear a bit challenging for the reader, since I am somehow presupposing in those cases the examination of Descartes's and Bacon's ideas in the face of Kepler's that I display in the conclusion. In such cases, I ask the reader to be patient for awhile and keep those passages in mind until its complete elucidation comes at the end. After all, though I am not to link Kepler to any current discussion in epistemology, I hope to induce the reader to think of Kepler as an intellectual ancestor of many current problems in that field, problems that Descartes and Bacon failed to identify.

Kepler's theory of the soul is a general theory of knowledge (or epistemology) whose main problem is to explain what makes knowledge possible. In this sense, Kepler does not start by doubting of the possibility of knowledge: it is obvious for him that we know, so that it would even be futile to present right at the beginning statements rejecting it. But this certainty concerning its possibility implies neither certainty concerning its conditions of possibility nor certainty concerning the process of knowledge itself: although we are aware of its possibility, we can be unaware of how it is possible. Kepler, consequently, postulates a theory of the soul which, *inter alia,* includes issues on what knowing is and how the process of knowledge takes place. He will give a definitive, final answer to these matters in one of his major works, the *Harmonices Mundi Libri V*. However, as we shall see, he dealt with them in almost the same direction since the years of his most early philosophical efforts.

Yet, and despite its importance in providing the general framework for the philosophical and scientific issues addressed by Kepler's system of ideas, references to what I am calling 'the theory of the soul' do not appear in Keplerian literature. Even so, Kepler had certainly thought of such a concept, for in the *Harmonice* he expressly talked about axioms "looking towards metaphysics and the theory of the soul [*ad metaphysicam adque doctrinam de anima spectans*]" (*Harmonice:* 146; *Opera,* V: 136). This absence in Keplerian literature has led to a fragmentary—and somehow equivocal—image of Kepler's theory of the soul. Some scholars (Cifoletti 1986, Mason 1966, Schneer 1960, Whyte 1966, Wolfson 1962) have offered valuable contributions in linking a few aspects of Kepler's theory with works both previous and posterior to Kepler's own works, but in not really focusing on a larger number of the last ones, they have most of the times held serious misunderstandings concerning Kepler's own ideas. Other scholars have built up their expositions based on Kepler's own works and their internal links, presenting the external ones just as context of discussion. This has produced more comprehensive and explanatory approaches, though they have failed in their scopes due mainly to either the tacit suggestion that Kepler maintained an invariable theory during his entire career (Boner 2005, Michel 2001, Pacho 1984, Pauli 1955), or a too succinct, and therefore incomplete, sketch of it (Aiton 1997: xxx-xxxi, Caspar 1993: 268-272, Chen-Morris 2001: 473-477, Holton 1973: 83-85, Kozhamthadam 1994: 76-77).

Perhaps the most critical obstacle to grasp a comprehensive picture of the theory of the soul is Kepler's evident unsystematicness to term his concepts. So, although he is always conceptually accurate, or at least he seems so to me, his terminological obscurity is unquestionable, and this could be the reason why Kepler's epistemology is still

practically unknown even for those scholars who have touched it a bit. My own strategy to overcome this obstacle is a series of lexical clarifications that the most purists might consider somewhat abusive and even anachronistically systematic, but that I consider necessary and philosophically justified. Since there is no pure approach, I am not really worried by purity claims. It is enough for me if the clarifications do not dishonour nor distort Kepler himself, and I think they do not.

My first clarification has to do with the term ‘soul’ itself. Kepler mostly employs the terms ‘anima’, ‘animus’, and ‘mens’ interchangeably with respect to the human beings (sometimes ‘ratio’, ‘intellectus’, and even ‘facultas’ are synonyms of them as well), whereas ‘anima’ and ‘animus’ interchangeably with respect to other living beings (‘mens’ and ‘facultas’ can also occur in this last sense). All of them would refer to the immaterial part of any created being that can know: in short, the counterpart of the body in a knowing being, so that I will only write ‘soul’—and not ‘mind’, for this term would entail a more restricted meaning in Kepler’s late philosophy, as we will see in the third section. The translations I quote complicate the situation a little bit more by reading such terms according to the context in which they occur. Thus, for instance, ‘anima’ may take the English words ‘soul’, ‘mind’, ‘reason’, and ‘spirit’ in the same translation. Yet I will not change any of these translations. My only modification will be the inclusion of Latin or English texts in italics and between square brackets, [*something like this*], as I did above; otherwise, the brackets are not mine. And last but not least, since Kepler will do his best to make all my lexical solutions insufficient, I have chosen to put the remaining clarifications in their own place during the discussion. The reader will, therefore, run into some lexical interludes below, which, I think, will be philosophically interesting as well.

Chapter II: The Early Theory: *De Quantitatibus Libelli*

Likely written during the years subsequent to Kepler's education in Tübingen, but before the writing of the *Mysterium* (Cifoletti 1986), *De Quantitaibus Libelli* is one of Kepler's most philosophical works. Although the text that comes to us is incomplete—Kepler just finished the first book of the three planned—its importance is unquestionable: it presents for the first time the main ontological and epistemological issues Kepler will develop in his following works, sometimes to study them in depth, sometimes to reject them. I will just focus on the epistemological ones in the current discussion.

Kepler starts out the first chapter of the *De Quantitatibus,* "On the theoretical disciplines in general", by accepting the Aristotelian division of disciplines into theoretical and practical and the superiority of the first over the second ones. He likewise accepts the subdivision of the theoretical disciplines or contemplative sciences into physics, mathematics and theology (or metaphysics), but, says he, "[*a*]t this point, philosophers customarily dispute as to which one of them is superior" (*De Quantitatibus:* 222; *Opera,* VIII: 147). According to Kepler, there are two ways to deal with this problem: on the one hand, if we look at the subject-matter [*subjectum*] and the scope of its subject [*amplitudinem subjectorum*], theology (or metaphysics) is superior, then mathematics, and finally physics;[1] on the other hand, if we look at the certainty of its proofs [*certioribus demonstrationibus*]—and we must do that, "since science originates from proofs" (p. 222; p. 148)—mathematics is superior, because "something that produces certainty for all sciences derives from quantity, and then is accommodated to the other genera of things" (p. 223; p. 148).[2]

Thus, in this second way, mathematics is superior for epistemological reasons: the main point is that the superiority of mathematics is due to the power—that no other science owns—of communicating certainty of proofs to all the branches of knowledge. Mathematics can do this because there is a fundamental relationship between mathematics and quantity, which is then spread out to the other sciences. Of course, this epistemological claim corresponds to an ontology based on the concept of quantity: what exists exists as a sort of quantity, so that it should also be known thanks to another sort of quantity, i.e. the soul.[3] All this is emphasized by two further reasons: first, mathematics entails the use of both the senses and the soul in order to manifest the evidence of its proofs, and second, most of the principles of mathematics are a primitive datum of the soul.

> There are several reasons why mathematical proofs are so evident: the first is that the proofs can be, so to speak, brought before the eyes and depicted to the life, so that in understanding proofs we can make use of both eyes and reason [*et oculis et ratione uti possimus in comprehensione demonstrationum*]. This leads to an easiness and infallibility which do not exist in other sciences. For how could acting and being-acted upon, or heat or cold be depicted? The second reason, and also the main one, is that the principles of proofs, most of them innate to humans, have to be learned at first from quantities [*principia demostrationum, connata homini pleraque, de quantitatibus sunt primo recipienda*], as 'the whole is bigger that its parts', 'if two things are equal to the same thing, they are equal to each other' etc. (p. 223; p. 148)[4]

So, the senses are not excluded from the process of knowledge, though they are not the only source of knowledge. The process of knowledge embraces a link between the soul

and the senses that is not completely clear yet. However, it is clear that both soul and senses play a role in it, and that the soul brings into that process what the soul is, or in other words, that the soul does not know because of its relationship with the world through the senses, but it knows because it has a natural relationship with quantity. Since mathematics is the science that expresses this relationship in the most evident way, through it all the other branches of knowledge are built up. Moreover, to know becomes to know quantities (the object of knowledge) or by means of quantities (the process of knowledge).

> But there are, as I began to say above, not a few more special principles of mathematics, which are understood by means of the common light of nature, do not need demonstration and are at first associated with quantities, and then are applied to other things, in so far as they share something with quantities. Of those principles there are more in mathematics than in other contemplative sciences, because of the very nature of human understanding itself, which seems to be such, by the law of creation, that it cannot know anything perfectly but quantities or by means of quantities [*propter ipsam intellectus humani naturam, quae videtur talis esse ex lege creationis, ut nihil nisi aut quantitates, aut per quantitates perfecte cognoscere possit*]. This is why it is the case that the conclusions of mathematics are the most certain and unquestioned. And in this sense mathematics is superior. (p. 224; p. 148)

In the ninth chapter, "The subject of numbers", Kepler asks if the essence of numbers depends on the things themselves or on the soul. His answer displays new details of his early theory of knowledge. According to him, when we speak about numbers, we speak about "multitude of unities", so the answer is twofold. If we consider "unities", then numbers exist in the things themselves,

> [*f*]or, any thing, by the fact that it is and by the way in which it is, is in fact one, since 'being' and 'one' are interchangeable [*ens et unum convertantur inter se*]. It is therefore not possible to take or to separate a unity from the thing to which it belongs, and these unities stay in things even if the counting intellect [*intellectu numerante*] is removed. (p. 234; p. 157)

On the other hand, if we consider "multitude", then numbers exist in the soul,

> [f]or, externally, in things, there is no collection of unities into one sum: rather, all this is a construction [opus] of the mind. Externally, 100 unities of men and 100 unities of horses are 200 unities, or two numbers; but in the mind there is only one number, 100 men and 100 horses (*Phys*. IV, 12). Externally there are almost infinite unities in these, whereas in the mind there is only one unity [*in intellectu est unica unitas*]. (p. 234; p. 157)

The soul finds a huge variety of unities in the world, but it produces a new sort of unity out of them: number. In this sense, "number is like form and species, unities like matter and elements" (p. 234, fn. 64).[5] Number (the unity that gathers a multitude of other unities into one) belongs to the soul, unities to the things themselves: the world is the realm of the unities whereas the soul is the realm of the numbers, just as the world is the realm of the singulars and the soul the realm of the universals.

> And in fact this cannot be better explained than by the parallel case of universals and singulars. For, in the same way that a universal, whether species or genus, is only a construction of the mind, and is nothing outside the mind, so also is number [*quemadmodum enim universale, puta species aut genus, est merum mentis opus et nihil extra intellectum,*

> *ita etiam numerus*]. And in the same way as species and genus are not about nothing, but have as their objects singulars, since outside the mind [*extra mentem*] the species is nothing but singulars, so number too, outside the mind [*extra intellectum*], is nothing other than the unities of the things themselves. There is, though, this difference: that a species cannot be understood as concerning any other singulars than those from which it was abstracted. But number, as we said above, can be common to whatever consists of the same amount of unities as the things from which the number is collected. (p. 234; p. 157)

Although correspondent in some level, the soul and the world appear as two discernible, independent realms with their own laws: both realms are real, indeed, but the reality of each one is not the same kind of reality. Something similar happens with their citizens: numbers and universals are as real as unities and singulars, yet we cannot speak about the same kind of reality. From this point of view, "realism" acquires a quite special meaning in Kepler's hands: numbers and universals are not real *in rebus,* for they only exist as products of the soul, yet they are not just *nomina,* some *flatus vocis,* for their dependence on the soul as its products guarantees their reality as well as that of the domain where they realize such reality, i.e. the soul. On the other hand, this reality of both the soul and its products does not imply that the world is also a product of the soul, because

> just as to be understood is an accident of things, so also is to be counted, and just like understanding [intellectio] so also enumeration can be separated from things, while they retain their own subsistence. For, they would be by nature νόηται and ἀρίθμηται intelligible and numerable, even though they are not τενοήμεναι and ἠριθμεναι understood and counted out [intellecta and numerata], by any mind [*nulla mente*]. (p. 234; p. 157)

In consequence, as I said above, Kepler postulates two completely discernible, independent realms with their own laws: world and soul. Thanks to such double autonomy, knowledge becomes possible, as it will be clear below.

> And thus the faculty of counting [*facultas numerandi*] is a sort of principle of the faculty of understanding [*facultas intelligendi*], and a person could not understand without knowing how to count. For, understanding [intellectio] consists in the identity and diversity of things, so that we recognize which things are the same, and which are different. We only know something, when we know the essence of the thing. But we know the essence by means of the definition, which is λόγος οὐσίας <the word of the essence>. Definition, on the other hand, consists of genus and difference; furthermore, with respect to the genus, things are the same, with respect to the difference, they are different. Again, one and the same are interchangeable; therefore the genus, the species and any universal whatever, are kinds of unity. But all differences are opposed, and all oppositions reduce to this single and principal one, that all things are said to be either one or many. (pp. 234-235; p. 157)

The soul knows quantities or by means of quantities: its objects of knowledge (God, world, and soul) and its processes of knowledge (the soul itself) are but quantities. Yet all the quantities come down to two fundamental kinds: one or many, unity or multitude. Since the soul finds multitude of unities in the world, in order to know such multitude, it transforms the multitude in a new kind of unity: such new kind of unity is the universal. Hence the possibility of knowledge lies on the ability of the soul to gather multitude into a new kind of unity, or, what is the same, to grasp the universal: to know becomes to know universals, for universals (species, genus, numbers, essences, and anything else) are unities, abstract unities, i.e. sorts of quantity. Through this process the soul reaches

the definition of the thing—the word for its essence, that is, the essence itself (see the last quotation). Still, although real, the essence does not exist *in rebus:* the essence is a construction of the soul, a product of it. The soul knows the world—quantities completely discernible, independent of the soul—because it is autonomous, that is to say, because it is able to produce another quantity by its own means: the universal, that unity gathering a multitude of unities into one. In short, the essence of the world is produced by and belongs to the soul.

However, if the world were disregarded, the process of knowledge could not start, because it is the world which stimulates the soul to gather multitude into unity; even so, the soul is not learning how to know from the world, but just being stimulated by it in order to start the process. "Therefore the conclusion is that the subject of unities is the things themselves, whereas the subject of numbers is the mind [*mentem*], and their object is the things outside <the mind>" (p. 235; p. 157). The existence of the world does not depend on the soul, and in this sense, it is autonomous as well.

All these results have, says Kepler, "opened a way for us to investigate higher questions concerning the origin of the counting faculty [*facultatis numeratricis*] and of the numbers themselves; questions inaccessible to Aristotle, inasmuch as he was ignorant of the true God" (p. 235; p. 158).[6] The tenth chapter, "The origin of numbers", is devoted to such a non-Aristotelian investigation on the source of the counting faculty. Supported "not merely by Platonic philosophy, but also extensively by the Scriptures", Kepler begins by reminding that "humans are created in the image of God" (pp. 235-236; p. 158). Yet this similarity could mean three different things: similarity concerning the body, similarity concerning the virtues, or similarity concerning the soul. Kepler almost rejects the first option completely, for "[*i*]n the body there is an obscure and very

general similarity to God, since God does not have a body. In the body there is rather a similarity with the world or the animals". On the other hand, although "[*t*]his similarity consists *per se* and properly in virtues, good habits and perfection of nature, and the theologians also regard it in this way", "there is no doubt that the same similarity to God can also be seen in the essential faculties of the soul [*essentialibus facultatibus animi*]" (p. 236; p. 158).

Kepler's doctrine of the faculties of the soul is, no doubt, an architectonic of the soul, but what he implies by these faculties is not so clear. The first problem for the reader of his works is that, despite the importance and the ample occurrence of the term 'facultas', Kepler did not give it a technical meaning. He rather took the most familiar one. The word 'facultas' comes from 'facul', which is related to the adverb 'facile' (easily), and, as 'faculty' in English, its first entry in the dictionaries is: an ability to do something. Thus, for example, in Adam Littleton's *Linguae Latinae Liber Dictionarius Quadripartitus* (London, 1684), 'facultas' is defined like this: "*Facultates* sunt, aut quibus ficilius sit, aut sine quibus aliquid confici non potest", whilst Francis Gouldman's *A Copious Dictionary in Three Parts* (Cambridge, 1669) merely states: "*Facultas,* facilitas agendi". This is precisely the meaning giving by Kepler to 'facultas': certain ability of the soul to do something in particular. 'Facultates' would be the whole of these abilities, but with a hierarchy among them depending on what each does.

Kepler refers to four faculties in *De Quantitatibus:* the faculty of nutrition, of feeling and of moving [*facultate nutriente, sentiente, movente*], the understanding faculty [*facultas intelligens; facultas intelligendi; intellectio*], the reasoning faculty [*facultas ratio dicitur; ratiocinatio*], and the counting faculty [*facultatis numeratricis; facultas numerandi; numeratio*]. Although Kepler recognizes an image of God in all

these faculties, he establishes an important division among them: the first one is "a less noble one, and common to other animals",[7] whilst the last three are nobler and belong only to the human beings. Regarding the understanding faculty, this

> consists of two things: intellect and will [*intellectu et voluntate*]. Therefore, as to will, as God is ἀντεξούσιος <free in power> so he created man with the faculty of soul [*facultate animi*], which is called the principle of wanting and not wanting. This principle, being essential, is not lost in man after the fall, even though free will considered materially (i.e. the free will to acquire beatitude by means of one's own forces), was lost. In so far as intellect is concerned [*ad intellectum attinet*], just as God is mind [*mens*], which understands itself in perfect and essential act, so he created man of an intelligent soul [*animam intelligentem*], but one whose understanding [*intellectio*] is only accidental, and can be absent, as in infants. (p. 236; pp. 158-159)

Something analogous happens with the reasoning faculty:

> And just as God is essential reason, hence the Son, born from the Father as from an eternal mind, is called the λόγος (reason) of God, so also the faculty added to our mind is called reason [*nostrae menti adjuncta facultas ratio dicitur*], by means of which we are able through ratiocination to discern one thing from another. (p. 236; p. 159)

All this causes an outstanding similarity between God and the human soul that is expressed through the images of the Son and of the Trinity in the soul.

> And just as that eternal mind, almost something corporeal, begets a coeternal λόγος, and exhales a common spirit, is and is believed to be three in person, so also the faculty of

> understanding and counting [*facultas intelligendi et numerandi*] in man, the first of which calls on the image of the Son, the second of the trinity, are so connected that one is the cause of the other. As the trinity of persons cannot be separated from God, who is essential mind and reason, so also understanding, ratiocination and counting cohere in the human mind [*in hominis animo intellectio, ratiocinatio et numeratio cohaereant*]. Therefore the origin of all numbers is from God by creation: unities of things exist by the creation of things, whereas the faculty of numbering [*facultas numerandi*] exists by the creation of the mind [*mens*] in the image of the Trinity. (p. 236; p. 159)

So far so good. Yet Kepler leaves some problems for us. Indeed, the division between noble and less noble faculties is unproblematic: in the hierarchy of the faculties, the group formed by the understanding faculty, the reasoning faculty and the counting faculty is superior to the group formed by the faculty of nutrition, of feeling and of moving. However, this situation is far from being the same with respect to the hierarchy of the noble faculties; things are completely problematic here. Kepler says that understanding, ratiocination and counting cohere in the human soul, and this seems to indicate that there is no hierarchical distinction among them. Nonetheless, in the analogy with the Son, he takes first ratiocination and then understanding to be image of the Son, and when understanding is image of the Son—despite it had already been image of the Father—and counting of the Trinity, ratiocination is analogy of no thing. If we fallow these Trinitarian analogies, we must conclude that a hierarchy exists, but without being undoubtedly established. On the other hand, a few pages above, in the ninth chapter, Kepler had stated that "the faculty of counting is a sort of principle [*principium*] of the faculty of understanding, and a person could not understand without knowing how to count" (p. 234; p. 157). Thus, how do these faculties cohere, if they do? Are some of

them subordinated to others, and, if so, how? Kepler does not provide any answer to these problems nor further details concerning this early architecture of the soul, so that, since I have no explanation for them either, I will merely summarize what we have found about theory of knowledge in that unfamiliar classic of the history of philosophy that is *De Quantitatibus Libelli.*

Kepler establishes a distinction between the senses and the soul, although he accepts that both participate in the process of knowledge. Although it is not clear how the former do it, the latter participates owing to most of the principles of mathematics—all of them related to quantity—are a primitive datum of the soul. To know, then, becomes to know quantities or by means of quantities: the objects and the processes of knowledge are but quantities. On the other hand, Kepler postulates the existence of two discernible, independent realms: the soul and the world, both real, though without sharing the same kind of reality. The existence of these two realms enables the soul to produce a quantity not belonging to the world: the universal, or the essence of the world. In sum, knowledge becomes possible thanks to the presence of three elements: the soul, the body, and the world.

Chapter III: Years of Gestation: 1596-1611

Kepler will develop the ideas presented in the *De Quantitatibus* during the years 1596-1611. However, he will not write any work with an exposition of the problem of knowledge similar to that given in the *De Quantitatibus.* He will spread out several remarks in different works composed between those years, namely, between the publication of the *Mysterium* and the *De Nive Sexangula.* Such remarks show Kepler moving away from some—but not all—of his early views, yet we will have to wait until the *Harmonice* itself to find the culmination of that early theory displayed in the *De Quantitatibus* for the first time.

Mysterium Cosmographicum **(1596)**

Kepler does not provide many new details about his theory of the soul in the *Mysterium,* but he mentions a couple of points that it is important to highlight. On the one hand, he claims that knowledge is the most proper pleasure of the soul, even its nourishment, so that the soul was made to know; on the other hand, although cursorily, he indicates the role of the senses in the process of knowledge.

> Though why is it necessary to reckon the value of the divine things in cash like victuals? Or what use, I ask, is knowledge of the things of Nature to hungry belly, what use is the whole of the rest of the astronomy? Yet men of sense do not listen to the barbarism which clamors for these studies to be abandoned on that account. We accept painters, who delight our eyes, musicians, who delight our ears, though they bring no profit to our business. And the pleasure is drawn from the work of each of these is considered not only civilized, but even

> honorable. Then how uncivilized, how foolish, to grudge the mind [*menti*] its own honorable pleasure, and not the eyes and the ears. It is a denial of the nature of the things to deny these recreations. For would that excellent Creator, who has introduced nothing into Nature without thoroughly foreseeing not only its necessity but its beauty and power to delight, have left only the mind of Man [*mentem hominis*], the lord of all Nature, made in his own image, without any delight? Rather, as we do not ask what hope of gain makes a little bird warble, since we know that it takes delight in singing because it is for that very singing that the bird was made, so there is no need to ask why the human mind [*mens humana*] undertakes such toil in seeking out these secrets of the heavens. For the reason why the mind was joined to the senses [*mens adiuncta sensibus*] by our Maker is not only so that Man should maintain himself, which many species of living things can do far more cleverly with the aid of even an irrational mind [*quod longè solertiùs possunt vel brutae mentis ministerio multa animantium genera*], but also so that from those things which we perceive with our eyes to exist we should strive towards the causes of their being and becoming, although we get nothing else useful of them. And just as other animals, and the human body, are sustained by food and drink, so the very spirit of Man [*animus ipse hominis*], which is something distinct from Man, is nourished, is increased, and in a sense grows up on this diet of knowledge, and is more like a dead than the living if it is touched by no desire for these things. Therefore as by the providence of Nature nourishment is never lacking for living things, so we can say with justice that the reason why there is such variety in things, and treasuries so well concealed in the fabric of the heavens, is so that fresh nourishment should never be lacking for the human mind [*humanae menti*], and it should never disdain it as stale, nor be inactive, but should have in this universe an inexhaustive workshop in which to busy itself. (*Mysterium:* 55; *Opera,* I: 98)

The reason why the soul exists is to know, but it knows with the help of the senses: since the soul learns by itself how to know, but does not have any knowledge of the world in itself—for the soul and the world are two completely discernible, independent

realms—then the soul needs the senses to assist itself in the knowledge of the world. The soul has the imperative, even vital necessity of relating to the world to know it, so it begins the process of knowledge. But it cannot participate in this process if it lacks the senses, for although they do not teach it anything about how to know, yet they provide a link between the soul and the world, and, through this, make knowledge possible.

Finally, in a somehow insignificant way, Kepler introduces a distinction that he had left unsolved in the *De Quantitatibus,* distinction with relevant consequences for his theory of the soul. Kepler tells us in the *Mysterium* that, besides the soul of the human beings, there is another sort of soul: the soul of other living things, and since it carries out the functions of the less noble faculties of the human soul, but not those ones of the noble faculties, it is only called *mens bruta.* So, we have to distinguish between these two sorts of soul. In order to do that, I will not use the term 'soul' alone for awhile. I will rather call 'human soul' to the first sort and, despite an almost redundancy, 'living soul' to the second one—though my reader will patiently wait for the introduction of new clarifications below.

Apologia pro Tychonis contra Ursum **(c. 1600-1601)**

In the *Apologia,* Kepler takes up again ideas of the *De Quantitatibus* and the *Mysterium,* adding elements that qualify some postures of those previous works. He insists on the fact that quantity is a primitive datum of the human soul, but now he writes down 'geometry' instead of 'mathematics', and argues that geometry makes knowledge possible: So, he speaks about geometers as

> [*t*]hose who contemplated things immediately discerned in geometrical figures and numbers, that is, in the business which is of all nature the clearest and most completely fitted to the human mind [*mentique humanae*], that illumination of our mind [*lumen illud mentis nostrae*] which most especially thrives on geometrical figures, but also on all other things generally, and without which there would be nothing of which our mind could acquire knowledge [*et sine quo nihil esset, cujus cognitionem capere mens nostra posset*]. (*Apologia:* 138; *Opera,* I: 238-239)

The change from 'mathematics' to 'geometry' is important and some words about it are required. In the last chapter of the *De Quantitatibus,* "The mathematical sciences", Kepler had subordinated all the mathematical sciences, including geometry, to an unspecified kind of arithmetic that he described as "scientific".

> As all practical disciplines are posterior to theoretical, I ascribe the first place not to the practical knowledge of numbers (which is vulgar arithmetic) but to the scientific one [*scientificae*]. This consists of very few theorems. Geometry, which deals separately with magnitudes, follows this speculative part of the arithmetic. It is in turn twofold, theoretical and practical, for no science lends itself to practical arts more than geometry. This is why at the beginning of this treatise we distinguished two parts of theoretical geometry, one about magnitudes, in so far as figures are produced, the other about the comparison of figures and quantities, which gives rise to proportion. These two sciences, arithmetic and theoretical geometry, offer results to each other, and cannot be separated even though arithmetic is the principle of knowledge. (*De Quantitatibus:* 237-238; *Opera,* VIII: 160)

De Quantitatibus would be a treatise on that scientific arithmetic, and this explains why Kepler pays so much attention to numbers there. But with the *Mysterium,* arithmetic and

numbers lose their hierarchical benefices, the first one concerning mathematical disciplines, the last ones concerning quantities. Now, due to its new ontological and epistemological status, the first place among all the mathematical disciplines is occupied by geometry, whilst quantities are taken essentially as a kind of magnitude, i.e. something proper of geometry. Numbers belong to quantities yet, but they do not share the same hierarchical level of the magnitudes, for these are archetypical and those posterior to the creation.[8] So, instead of some general principles of mathematics, as in the *De Quantitatibus,* the *Apologia* claims that geometry itself peoples the human soul. Thanks to this fact, it knows, but, once again, with the help of the senses: "In all acquisition of knowledge it happens that, starting out from those things which impinge on the senses, we are carried by the operation of the mind [*mentis agitatione*] to higher things which cannot be grasped by any sharpness of the senses" (*Apologia:* 144; *Opera,* I: 242).

De Fundamentis Astrologiae Certioribus **(1601)**

De Fundamentis shows further developments in the theory of the soul, completing its central issues. The first point that Kepler discusses concerning this theory is why the astrological aspects cause the effect they do in sublunary affairs. Kepler attributes this effect not to the aspects themselves, but to the presence of a living soul that perceives the aspects. This living soul would have two features: the ability to recognize geometrical matters and the ability to rule its body. Without such a living soul, Kepler explains in "Thesis XXXIX", neither the effect of the aspects nor the motion of the bodies would be possible.

> As to why the effect of two Planets should be so strongly concentrated at the moments of these Aspects, I can ascribe it to nothing other than an animal faculty [*animalem facultatem*], which on the one hand is capable of Geometrical reasoning [*geometricae rationis*] (which makes an Aspect), and on the other has power over its body, in which the effect is noticed. For the effect is not produced because two rays join to form an angle. There is an angle both the day before and the day after an Aspect, and two rays always form some kind of angle; the effect only finally occurs when the angle corresponds to a Harmonic ratio or figure (σχῆμα) (Ptolemy speaks of "configurations" (σχηματισμοὺς)). Ratios and figures are ineffective in themselves. And what happens here is exactly the same as what happens when living creatures move [*in locomotione animalium*]. If anyone were to say that the things a living creature [*animal*] sees with its eyes can make it move, without its being necessary for this that there should be an animal faculty [*animali facultate*] in the body which is moved, then he would be a very strange kind of philosopher. (*De Fundamentis:* 251; *Opera,* I: 428)

To begin with, two clarifications are pertinent. On the one hand, the adjective 'animalis' and the noun 'animal' may be read in two ways: they can refer to either a living being—in general, what is animate or alive, i.e. what has a soul (anima): humans, animals, plants, and anything else—or animals in particular, i.e. whatever is not a plant or a mineral. In her translation of the *De Fundamentis,* Field uses both meanings according to the context in which they occur. For example, in the passage just quoted, we find 'animal faculty' for 'animalis facultas' and 'living creature' for 'animal'. Whereas the second choice seems to me plausible, I judge the first one mistaken: except in "Thesis XXXVII", which I will discuss below, Kepler does not employ 'animalis' and 'animal' to mean the English adjective/noun 'animal', but to mean what is animate or

has a soul. On the other hand, as the reader might have noticed, 'facultas' is interchangeable with 'anima', 'animus' and 'mens' in the *De Fundamentis*. For these reasons, I will just continue with my almost redundant 'living soul', as above—instead of 'animal soul' or 'animal faculty'.

The living soul, then, perceives geometry and has power over its body, and Kepler goes on to detail its features as they appear in the Earth. With respect to the second one, he starts out by explaining that, in order for the aspects to be effective, there must be a living soul in all the bodies of the Earth as well as in the whole body of the Earth.

> Moreover, this faculty [*facultas*] which gives force to the Aspects is not in the heavenly bodies themselves. For these Aspects we have been discussing occur in the Earth and are merely a relationship (σχέσις), not formal consequences of the motion of the heavenly bodies but consequences of the accidental positions of two heavenly bodies in relation to the Earth. Thus, just as the soul [*anima*] which moves the body does not lie in the object but where the image (*species*) of the object is perceived, so it is necessary that this force, which makes Aspects effective, must be inherent in all sublunary bodies and in the great globe of the Earth itself. Which is to say that every animal faculty [*omnis animalis facultas*] is the image of God practising geometry (γεωμετροῦντος) in creation, and is roused to action by this celestial Geometry or Harmony of Aspects. (pp. 251-252; p. 428) [I've noticed this before. What's supposed to be in the round brackets?]

However, the living soul of the Earth acquires its noblest condition not in the individual bodies that the Earth holds, but in the Earth itself as a whole.

> The hasty may imagine that I am proposing a form new to Philosophy, which is not the case, except insofar as I am giving a little more generality to ancient beliefs. For, firstly, in

> connection with the Earth, no-one will deny that its whole, as being a whole, has a nobler form that than which is recognised in any clod of earth. And its activities argue that this form is truly akin to animal faculties [*eam vero formam ex animalium facultatum genere esse*]: they are Engendering metals, keeping the Earth warm, and sweating out vapours to beget rivers, rains and other meteorological phenomena. These activities argue that its form is not only conservative, as in stones, but truly vegetative [*vegetatricem*]. (p. 252; pp. 428-429)

Even so, the living soul of the Earth cannot be confused with the human soul, the animal soul, or the vegetable soul. We distinguish the sorts of soul by their activities, and the activities of this sort of soul tell us that it is completely different from the other ones. So, we must postulate a fourth sort of soul, the Earth soul.

> However, this does not mean that the Earth must increase in size or change its position. For its soul is not human, nor properly speaking animal, nor like that of a plant, but of a particular kind which is defined from its activities, as are other kinds of animal faculty [*nam neque humana est ejus anima, neque animalis proprie, neque quails stirpium, sed peculiaris speciei, quae definitionem ab opera suo sortitur, sicut aliae quoque species animalium facultatum*]. And the same reasoning that compelled the Ancients to attribute a third kind of soul [*tertiam animae speciem*] to plants compels us to attribute this fourth kind to the Earth [*quartam hanc collocare in Terra*]. (p. 252; p. 428-429)

In other words, whilst in the *Mysterium* Kepler deals with two sorts of soul—the human soul and the living soul—he presents four sorts in *De Fundamentis:* the human soul, the animal soul, the vegetable soul, and the Earth soul. All of them are realized in a body—no created soul exists that is not linked to a body—and all of them are living

souls—or souls simply, to eliminate the redundancy. The main common feature of them is that one I left open above: geometrical reasoning. All these souls are, we saw above, "the image of God practising geometry in creation", or, what is the same, geometry is not only a primitive datum of the human soul, but of every sort of soul. Although not all of them share the capacity for discursive reasoning—just the human soul owns such capacity—yet all of them understand geometry [*sed nec illud absurdum, animales facultates, quae discursu non utuntur, intelligentes esse geometricae*]: plants grow up according to geometrical reasoning and communicate it to their offspring through their seeds; humans, even when they do not use discursive reasoning, react to the geometrical relation presented in the musical sounds. Furthermore, "this relation is familiar to everything else in the world, particularly to the souls [*maxime animis*], and was indeed called harmony by some of the Ancients" (p. 253; p. 429).

We are now in the territory of that kind of geometry proper of the souls that is harmony, though it is clear that we are not still in the territory of the *Harmonice* itself. Even so, the central issues to found it have already appeared, and that lets us, from now on, use only 'soul', but as a general term referring to 'the theory of the soul', namely: the theory of those four sorts of soul concerning their faculties, the differences and the resemblances that emerge among them, the relation they maintain with their own bodies and the world, and the distinction soul-world.

Interlude: Kepler the Animist, or an Old Historians' Tale

The *Astronomia Nova* (1609) is a source of problems and potential misunderstandings concerning the theory of the soul, for Kepler seems to introduce a

new sort of soul there, though it is not very clear, not even for him, what he is meaning by that. This problem will show up again in the fourth book of the *Epitome Astronomiae Copernicanae* (1618-1621), so that I will discuss both works in this section despite the break in the timeline. My purpose is to prove that these issues do not play any role in Kepler's theory of the soul (i.e. his theory of knowledge), but only in his physical astronomy, and therefore their inclusion here, although necessary, is made in order to exclude them from the theory of the soul itself.

Kepler devotes a large part of "Chapter 39" of the *Astronomia Nova* to explain by what means the powers inherent to the planets [*virtutes planetis insitae*] produce the planetary orbits. He attributes it to a planetary mind [*mens planetae*] that rules the motion of the planet along the orbit. However, the way in which this planetary mind is presented has certain peculiarities that must be pointed out. I will begin with the following two passages.

> Now anyone who is so attracted to the supposition of a perfectly circular orbit as to associate a mind with the planet [*ut mentem in planeta collocaret*] which could preside over the reciprocation, can say only this: that this planetary mind [*mentem planetae*] observes the increasing and decreasing size of the solar diameter, and understands, using this as an indication, what distances from the sun it should arrive at at any given time. (*Astronomia Nova:* 412; *Opera,* III: 318)

> If it were indeed certain [*et sane, si certum esset*] that this motion of the planet along the diameter of the epicycle could not be carried out by any material and corporeal or magnetic power of the planet, nor by an unassisted animal power [*a virtute aliqua planetae materiali et corporali sive magnetica, non etiam a nuda animali*], but that it is governed by a

> planetary mind [*a planetae mente*], nothing absurd would be stated [*nihil absurdi statueretur*]. (p. 413; p. 318)

A couple of points can be noted in these passages. The first one is that Kepler does not use direct speech to refer to this planetary mind, but subjective and conditional ones. He says that someone can be so attracted *as (to wish) to* link the shape of the orbit to the action of a planetary mind, and that *if* [*si*] other hypotheses do not work, *then* it *would not* be absurd to suppose a planetary mind doing the job. In neither case does he say that the planetary mind actually exists, but merely insinuates that it would be plausible to assume its existence. I will draw the consequences of this later.

The other point is that if the planetary mind exists, then it is neither inanimate (material, corporeal, or magnetic) nor animate (I read 'animate' instead of Donahue's 'animal'). It is indeed a strange thing our planetary mind: it belongs neither to the lifeless (without-an-*anima*) things nor to the living (with-an-*anima*) things. It is something else, yet it holds the main properties of a soul [*anima*]: perception and recognition of the environment through its body (*cf.* pp. 414-415; p. 319). On the other hand, although it is not an animate thing, in order to guide its body along the orbit, the planetary mind needs the help of an animate faculty [*animali facultate*]. Thus, the mover receives two non-interchangeable features: a mind and a soul [*quod incredibilia transscribat et menti et animae motrici*] (*cf.* pp. 414-416; pp. 319-320). In short, at the end of "Chapter 39", Kepler's *lector considerate et ingeniose* may assume without worries that the motion of the planets is due to (inanimate) powers, an (animate) soul, and a (?) mind.

In “Chapter 57”, instead of the animate faculty [*animali facultate*] (Donahue now reads ‘animate faculty’), Kepler tells us that the planetary mind needs the help of a magnetic faculty to guide its body.

> What I have said so far holds in case the reciprocation supported by the observations could not be performed by a magnetic power, and it has become absolutely necessary for us to have recourse to a mind [*mentem*]. Otherwise, if a comparison between the natural motion and the mental one [*illam naturalem et hanc mentalem*] is in order, the former stands on its own, requiring nothing external, while the latter, the mental motion [*mentalis*], appears to give evidence of the magnetic one, and to require its assistance, no matter how you equip it with an animate faculty of moving the body [*quomodocunque illam animali facultate movendi corporis instruas*]. For in the first place, mind by itself [*mens ipsa*] can do nothing in a body. It is therefore necessary to provide the mind [*menti*] and adjunct faculty that performs its functions in making the planet’s body reciprocate. This faculty will be either animate or natural and magnetic [*facultas illa aut animalis erit, aut naturalis et magnetica*]. In [*sic*] cannot be animate, for an animate faculty [*facultas animalis*] cannot transport its body from place to place (as the reciprocation requires) without the operation of another assisting body. Therefore, it will be a magnetic, that is, natural, faculty of sympathy between the bodies of the planet and the sun [*erit igitur magnetica facultas, hoc est naturalis consensus inter corpora planetae et Solis*]. Thus the mind calls upon nature and the magnets for assistance [*itaque mens naturam et magnetes in subsidium vocat*]. (p. 568; p. 396)

We have again references to (inanimate) powers, an (animate) soul, and a (?) mind in the motion of the planets, yet we now know that the planetary mind rules the travel along the orbit and the powers produce the motion, whilst the soul plays no role in the process. In other words, there is no animate (living) principle involved in the motion of

the planets: the soul has been excluded, so that only powers and mind remain in it. Thus, although the animate faculty appears in the *Astronomia Nova*, the well-known Keplerian animism concerning planets seems to be a historical mistake, as I intend to show at the end of this section. For the time being, we must come back to the planetary mind.

Several paragraphs after the last quotation, Kepler goes on to try to explain "the cause of the progression of the aphelia". He provides three possible explanations. The former two involve the "supposition of a mind" (pp. 570-572; pp. 397-398); however, the last one can do the job very well without any mind.

> Finally, if neither of these causes obtains, let the mind, through its animate faculty [*mens animali instructa facultate*], which presides over the constant magnetic axis, have the task of inclining the axis over the ages. But if none of these causes stands, nor even the general idea of a mind, let us be satisfied with nature [*at nec ulla harum causarum nec adeo mente in universum stante acquiescamus in natura*], which, as she has allowed everything else to be disentangled, has also shown a splendid occasion for the motion of the aphelia. (p. 572; p. 398)

If it is an option to explain the motion of the planets without a planetary mind, the planetary mind keeps up its subjective and conditional character: in other words, planetary minds are not a fact, but a conjecture. Kepler does not tell us that there are planetary minds. He is merely postulating a theoretical construction that lets him suggest different explanatory alternatives for the same physical phenomenon, i.e. the motion of the planets, yet he is not conclusively supporting any of them. If the planetary mind exists, says Kepler, it should be neither inanimate nor animate, though it should maintain some kind of relation with inanimate and animate things; otherwise, it could not rule the

motion. On the other hand, he continues, it is possible to explain the same phenomena without assuming such a mind, just by natural means. The problem therefore remains open: although it is indeed certain for him that different natural powers or forces [*virtus, vis*] are involved in the motion of the planets, Kepler does not have a definitive position concerning planetary minds in the *Astronomia Nova.*

The definitive position is stated in the fourth book of the *Epitome,* where Kepler says that not even with the assistance of an animate power [*potentia animali*] and a motor force [*vim motricem*], a mind [*mens*] residing in the planet could rule the motion of the planet along the orbit. Moreover, if someone changes the conjecture and says that the mind resides not in the planet, but in the sun, this would mean that all the planetary minds are placed in it, which would complicate the situation much more without solving the problem. In short, neither minds nor souls are required to explain the planetary motions:

> if we follow probability [*verisimilitudem*] and take care not to postulate anything which is contrary to us, it will of necessity be clear that no mind is to be introduced [*neque mentem aliquam introducendam esse*] which should turn the planets by the dictation of reason and so to speak by a nod, and that no soul is to be put in charge of this revolution [*neque animam huic quidem circumlationi praeficiendam*], in order that it should impress something into the globes by the balanced contest of forces, as takes place in the revolution around the axis.

Kepler's conclusion, then, is that rather than his former conjecture in the *Astronomia Nova*, the latter must be accepted: natural powers residing in the sun and the planets are enough to explain the planetary motions (*cf. Epitome:* 52-55; *Opera,* VI: 340-343).

Planetary minds and souls and solar minds do not exist in the Keplerian heavens. He indeed postulated them as a plausible conjecture to explain the motion of the planets, and consequently they must be included in our reconstructions, yet just as a conjecture—not as an entity. Thus, since the planets lack a soul, we may not speak about a theory of knowledge in their case. They are just globes of matter whose motion must be attributed to natural (inanimate) forces and geometry, and not to animate forces as in the living (knowing) beings. Such natural forces would reside partly in the planets themselves (the 'vis insita' or 'virtutes insitae' which we saw to appear before) and partly in the sun. If the Earth, though a planet as well, needs a soul, and therefore a theory of knowledge, it is, as Kepler explained in *De Fundamentis,* due to its ability to perform certain activities that planets do not, like "[*e*]ngendering metals, keeping the Earth warm, and sweating out vapours to beget rivers, rains and other meteorological phenomena" (see above).

Having eliminated the minds and the souls of the planets, Kepler goes on to discuss what happens regarding the sun. The situation is not so different. In "Chapter VII" of the fourth book of the *Hamonice,* Kepler, following Plato and Proclus, had stated the conjecture of the "soul of the whole universe [*totius universi animam*]" (*Harmonice:* 358; *Opera,* V: 251), and had concluded that if it existed, it ought to reside in the sun:

> 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 [*de anima totius universi*], though I raise no opposition, yet I shall say nothing in this Book IV. For it seems that (if there is some such thing [*si est talis aliqua*]) it resides in the center of the world, which for me is the Sun, and from there it is propagated over the length and breath of it by the agency of the rays of light, which are equivalent to spirits in the animate body [*qui sint loco spirituum in corpore animali*]. (p. 359; 251)

In a way similar to that concerning the planets, Kepler does not affirm here that there is a soul in the sun, but that there *could* be a soul in the sun, which *would* play the role of the soul of the whole universe. In the *Epitome,* he provides new *argumenta* in favour of that soul of the sun, although without relating it to the whole universe: it is only the soul of the sun now, a soul explicitly separated from any kind of mind and conjecturally linked to intelligence (*Epitome:* 56-57; *Opera,* VI: 343-344).[9] However, Kepler's final viewpoint lies in those famous passages of the second edition of the *Mysterium.* In the first edition, he had written:

> But if, nevertheless, we wish to make an even more exact approach to the truth, and to hope for any regularity in the ratios, one or two conclusions must be reached: either the moving souls [*motrices animas*] are weaker the further they are from the Sun; or, there is a single moving soul [*unam esse motricem animam*] in the center of all the spheres, that is, in the Sun, and it impels each body more strongly in proportion to how near it is. (*Mysterium:* 199; *Opera,* I: 174)

The first possible conclusion is rejected in the first edition itself, arguing reasons analogous to those given later in the *Epitome,* so that he only annotates in the second edition: "*The moving souls* [*motrices animas*].*]* Of which I have proved there are none in the *Commentaries on Mars*". On the contrary, the second possible conclusion is attacked with more detail:

> *There is a single moving soul* [*unam esse motricem Animam*].*]* If for the word "soul" you substitute the word "force" [*si pro voce Anima, vocem, Vim, substituas*], you have the very

> same principle on which the Celestial Physics is established in the *Commentaries on Mars,* and elaborated in Book IV of the *Epitome of Astronomy*. For once I believed that the cause which moves the planets was precisely a soul [*animam*], as I was of course imbued with the doctrines of J.C. Scaliger on moving intelligences. But when I pondered that this moving cause grows weaker with the distance, and that the Sun's light also grows thinner with distance from the Sun, from that I concluded, that this force [*vim hanc*] is something corporeal, that is, an emanation which a body emits, but an immaterial one. (p. 203; p. 176)[10]

This is the commentary to the second possible conclusion; consequently, we may infer that just as the conjectures of planetary minds and souls and solar minds were rejected in the *Epitome,* Kepler is now rejecting the conjecture of both planetary and solar souls in the *Mysterium* (Field (1984: 223) shares a similar conclusion). Thus, besides the Earth soul, there are neither souls nor minds associated to celestial bodies in the Keplerian reality, and this implies that both the sun and the planets are just material bodies without cognitive features. Their motion is due to geometry and natural forces or powers (according to the choice for 'vis', 'virtus', and 'potentia'), yet this motion does not entail any kind of living (knowing) being. Furthermore, since Kepler postulated only conjecturally his ideas about these souls and minds, rejecting them later, his well-known animism concerning the planets and the sun seems to be but an old historians' tale (see, for instance, Boner 2005, Michel 2001, Pauli 1955, Rabin 1997, and Simon 1975): he was indeed attracted by the existence of such souls and minds, but we just find an unambiguous position about them—what we could call *a final position*—when they are discarded. In sum, Kepler, following his second conjecture of the *Astronomia Nova,* "let[*s*] us be satisfied with nature" regarding the explanation of the planetary motions:

planetary and solar souls as well as planetary and solar minds would be the (conjectural) prehistory of those natural phenomena—'insitae virtutes', 'species immateriata', and so on—that found the *physica coelestis,* not actual entities.

Strena seu De Nive Sexangula **(1611)**

De Nive Sexangula is a treatise on the theory of the soul, the most detailed account about it offered by Kepler during the current period. It is especially interesting because, unlike other works, it addresses several features of the animal soul, the vegetable soul, and the Earth soul, and just a few, and only by consequence, of the human soul. The main problem Kepler tries to solve in *De Nive Sexangula* is what causes the shape of the bodies. His answer is simple: a soul. Yet to reach this answer involves a long process, so that Kepler begins by stating the problem, firstly regarding the snowflakes.

> There must be some definite cause why, whenever snow begins to fall, its initial formations invariably display the shape of a six-cornered starlet. For if it happens by chance, why do they not fall just as well with five corners or with seven? Why always with six, so long as they are not tumbled and tangled in masses by irregular drifting, but still remain widespread and scattered? (*De Nive Sexangula:* 7; *Opera,* VII: 718)

This cause, says Kepler, does not lie in the snowflake's matter itself [*in materia*], but in an agent [*in agente*]. Yet this agent leaves some questions to solve.

> Since, then, we agreed that the cause of the imposed six-cornered shape lay with an agent, we of course wandered [wandered? Or wondered?] what the agent was, and how it acted:

> could it be as immanent form [*forma insita*] or as efficient cause from outside [*efficiens extrinsecus*]? did it stamp the six-cornered shape on the stuff as the stuff demanded [*ex necessitate materiae*], or out of its own nature [*ex sua natura*]—a nature, for instance, in which there is inborn [*congenitus*] either the idea of the beauty inherent in the hexagon [*archetypus pulchritudinis quae est in sexangulo*] or knowledge of the purpose which that form subserves [*finis notitia, ad quem ista forma conducat*]? (p. 9; p. 719)

To elucidate these questions, Kepler proposes two "familiar examples" set out "in geometrical fashion [*geometrice descriptis*]": the honeycombs and the pomegranates. He finds out that bees build their honeycombs following the same geometrical patterns presented in the snowflakes, geometrical patterns that also appear in the loculi of the pomegranates, and as in the case of the snowflakes, it is not possible to speak about matter as agent in these cases [*materia in causa non est*]. Instead, in both cases a soul rules the process (of building or of growth) through a labyrinth of material conditions with important consequences in the outcome. Thus, with respect to the pomegranates, the cause (agent) of the shape of their loculi is "the plant's soul [*anima plantae*]", "but assisted by material necessity [*sed adiuvatur necessitate materiali*]"—the size of the rind, for instance. Something similar happens with the honeycombs: "[*t*]he bee, therefore, by nature has this instinct as its property [*hunc instinctum habet ex proprietate sua*], to build in this shape rather than others. This original pattern [*illi archetypus*] has been imprinted on it by the Creator". Yet three material conditions also play a central role in the building of the honeycomb: firstly, among the triangle, the square, and the hexagon—the structures that can cover a surface without leaving gaps—the hexagonal structure has the better capacity to store, so that bees provide themselves with hexagons to store their honey; secondly, "the tender bodies of young bees are more comfortably

lodged in a nest, with more numerous obtuse angles, and so closer in shape to the circular"—although not circular, for circles leave gaps when they cover a surface; and thirdly, "[*l*]abour is saved if there are always two bees to build the party-wall, and greater stability for the maintenance of the framework intact is given by the regular carpentry than if each apartment had been rounded off and was therefore easy to dislocate". All these reasons make it unnecessary to give an explanation of those shapes in terms of "perfection, beauty, or dignity" or "to conjecture up, from a meditation on the shape that the bee builds, the inner nature of its diminutive soul [*essentia animulae, quae est in ape*] (*cf.* pp. 9-21; pp. 719-723).

After providing "this preamble by way of example only, so that we should be better equipped and practised for research into the six-cornered shape of the snowflake", Kepler goes on to investigate what causes this last shape itself. What he needs to solve, as he said before, is which kind of agent (cause), if external or internal, produces the shape. Based on the assumption that "whatever the cause of these six rays may be, it is everywhere equally diffused in all directions", he considers external (cold) and internal (heat) causes, and concludes that neither of them can produce by itself that particular shape (*cf.* pp. 21-33; pp. 723-726). Hence,

> after examining all the ideas that came into my head I conclude thus: the cause of the six-sided shape of a snowflake is not other than that of the ordered shapes of plants and of numerical constants; and since in them nothing occurs without supreme reason [*sine ratione suma*]—not, to be sure, such as discursive reasoning discovers [*discursu ratiocinationis inveniatur*], but such as existed from the first in the Creator's design and is preserved from that origin to this day in the wonderful nature of animal faculties [*per mirabilem facultatum*

> *animalium naturam*], I do not believe that even in a snowflake this ordered pattern exists at random. (p. 33; p. 726)

And therefore

> there is a formative faculty [*facultas formatrix*] in the body of the Earth, and its carrier is vapour as the human soul is the carrier of spirit [*ut humana anima spiritus*]: so much so that no vapour ever exists without being bound by a formative principle [*ratione formatrice*], which others call the craftsman Heat, in the same way as it is by some form of heat that, being turned into what is said to be, to wit, vapour, it exists and by the same heat is maintained so as to persist in being vapour. (p. 33; p. 726)

Yet this posture might face two objections. The first one is that, unlike plants, where "the ensuing purpose, which is the establishment of a definite natural body, points, in plants, to the pre-existence of a formative principle in some nature [*rationem formatricem in aliqua materia praecessisse*]", there is no purpose in the shape of the snowflakes.

> My reply is: formative reason [*rationem formatricem*] does not act only for a purpose, but also to adorn. It does not strive to fashion only natural bodies, but is in the habit also of playing with the passing moment, as is shown by many ores from mines. I transpose the meaning of all such from playfulness (in that we say that Nature plays) to this serious intention. (p. 33; p. 726)

The second objection is that even if it were possible that "each single plant has a single animating principle of its own [*singulas facultates animales*]", "to imagine an individual

soul [*peculiarem fingere animam*] for each and any starlet of snow is utterly absurd", and therefore their shapes cannot "be deduced from the operation of soul [*ex animae opera*] in the same way as with plants".

> I reply: the likeness is much greater on either side than this objector could believe. Let us grant that each single plant has its own principle [*singulas facultates*]; but they are all offspring of one and the same universal principle [*euisdem facultatis universalis*], inherent in the earth and related to plants as the principle of water [*facultas aquae*] is to fish, of the human body [*facultas humani corporis*] to lice, of the bodies of dogs to fleas, and of sheep to some other kind of louse. Not all plants anyhow originated from seed, but most of them arose spontaneously, although they have since propagated themselves by seeding. The faculty of earth is in itself one and the same, but it imparts itself to different bodies and co-operates with them [*facultas enim terrae, quae seipsa una est et eadem, dividit sese in corpora et cum corporibus*]. It engrafts itself on to them, and builds now one design, now another, as the inner disposition of each matter or outer conditions [*materiae conditione interna externisve*] allow. (p. 35; p. 727)

Then, the soul ('facultas' in several passages of the *De Nive Sexangula*) that produces the shape of the snowflakes is the Earth soul. Although this sort of soul is related to the vegetable soul, it cannot be confused with the last one: as fish are adjusted to water—though they do not share any thing with water—and lice and fleas to human beings, sheep, and dogs—though the second ones do not share anything with the first ones—analogously plants are adjusted to the Earth soul, but their soul is not the Earth soul itself. The vegetable soul (like the animal soul) knows the world in a manner and according to it gives certain shape to its own body and outcomes. The Earth soul does

the same thing: since geometry is a primitive datum of any soul, it knows practising geometry in creation as well.

> The reason why this faculty [*facultas*] prefers to imitate the arrangement of angles in the octahedron might be this: first the whole realm of spirits [*universum genus animorum*] is akin to the regular geometrical or world-building figures, and this can be demonstrated by many proofs. Spirits [*animi*] are, as it were, semblances of God, the Creator, and so without doubt the authentic type of these figures exists in the mind of God the Creator and shares His eternity. Further, since it is quite certain that even spirits [*ipsos animos*] admit of quantities in their innermost essence—whether with or without matter, I leave unargued—it is consistent that they should admit of shaped rather than raw quantities, and if shaped, rather the shapes of the regular solids, since spirits are the spirits [*animi*] of solid bodies, not of surfaces. (pp. 35-37; p. 727)

However, like the other sorts of soul, the Earth soul gives certain shape to its body and outcomes assisted by material conditions: "the formative faculty [*facultatem formatricem*] makes its plan of action in accordance with what is there for it and draws up its line of battle as the battlefield offers" (*cf.* pp. 41-45; pp. 729-730).

To sum up, then, this period offers the following points on the theory of the soul. First of all, the soul is discernible from the body, yet every soul is always connected to a body. Through this body, the soul establishes a link with the world to know it, but the soul does it according to what it is, i.e. geometry, since geometry is a primitive datum of it. Therefore, the foundation of knowledge during this period rests on the same three elements of the *De Quantitatibus,* although with different emphases: the presence of a soul—whose essence is geometrical—the presence of a body—which is shaped by the

soul, linking it to the world—and the presence of the world—which, although its essence is geometrical as well, does not constitute a primitive datum of the soul. With these ideas at hand, we may go on to the *Harmonice.*

Chapter IV: The Late Theory: *Harmonices Mundi Libri V* (1619)

The *Harmonices Mundi Libri V* is Kepler's major work on natural philosophy, indeed Kepler's *opus magnum.* What Kepler wants to understand there is reality in its entirety—roughly speaking, God, world, and soul—and in order to do that, he offers an intricate philosophical system involving theology, ontology, epistemology, ethics, music, astronomy, astrology, physics, and, of course, geometry. Due to such complexity, it is comprehensible why a complete study of the *Harmonice* has not been attempted yet, a study that I am not going to try here either. I will just deal with the theory of the soul.

Kepler opens the *Harmonice* by pointing out the main problem he needs to solve at the beginning: the establishment of a theory of quantity that explains why "[*w*]e must seek the causes of the harmonic proportions in the divisions of a circle into equal aliquot parts, which are made geometrically and knowably, that is, from the constructible regular plane figures". This theory would be possible only if the distinguishing features related to the soul of the geometrical objects [*diferentias rerum geometricarum mentales*] are identified,[11] for the geometrical objects are but entities related to the soul [*entium mentalium*].

Such theory of quantity, therefore, needs to be based on the concepts of shape [*figuratio*] and proportion [*proportio*], which are the two basic properties of quantities (or geometrical objects), "shape of individual quantities and proportion of quantities in combination" [*quantitatum n. propria sunt figuratio et proportio, figuratio singularum, proportio junctarum*]. Shape is an ontological feature with relevant epistemological consequences: every creature has a shape—that is, it has boundaries, is a limited, finite being—and this fact guarantees that the soul [*mente*] can know it, for there is no

knowledge of infinite and unlimited things. Yet the created world is not a quantity with certain shape, but a cumulus of quantities with different shapes. Such quantities maintain certain relations among them: proportions. So, all the quantities are either shape or proportion, whereas their distinguishing feature is to be entities related to the soul, that is, to be understandable or knowable:

> Therefore in quantities shape is a kind of mental essence [*mentalis essentia*] of them, or understanding [*intellectio*] is their essential distinguishing feature. That is much clearer from the case of proportions. For since shape is demarcated by several limits, it comes about that on account of their being plural shape partakes of proportions. However what proportion is without the action of the mind [*sine mentis actione*] is something which cannot be understood in any way. Hence by the same reasoning, one who gives limits to quantities as their essential basis supposes that quantities which have shapes have an intellectual essence [*intellectualem essentiam*]. (*cf. Harmonice:* 9-10; *Opera,* V: 80-81)

We are, then, not in the serene fissure between object and subject of Kepler's two notable contemporaries, Bacon and Descartes, and most of his successors until Kant, where the objects of knowledge have nothing to do with the knowing subject. Indeed, as indicated since the time of the *De Quantitatibus,* soul and world are two completely discernible, independent realms with their own laws, yet if the soul knows the world, it is due to its capacity to produce its own objects of knowledge: the soul does not discover the reality of the world, but produces it; however, this production corresponds to God's design. We saw a similar doctrine in the *De Quantitatibus.* What Kepler now emphasizes is the geometrical—and not arithmetical—character of these objects (p. 13; p. 83). This leads to the definition of knowledge given in the *De Quantitatibus,* although

expressed in geometrical terms: the soul "cannot know anything perfectly but quantities or by means of quantities [*nihil nisi aut quantitates, aut per quantitates perfecte cognoscere posit*]" becomes the "VII Definition" of the first book of the *Harmonice:*

> In geometrical matters, to know is to measure by a known measure, which known measure in our present concern, the inscription of Figures in a circle, is the diameter of the circle [*scire in geometricis est mensurare per notam mensuram; quae mensura nota in hoc negotio inscriptiones figurarum in circulum, est diameter circuli*].

This is completed by the subsequent "VIII Definition":

> A quantity is said to be knowable if it is either itself immediately measurable by the diameter, if it is a line; or by its [the diameter's] square if a surface: or the quantity in question is at least formed from quantities such that by some definite geometrical connection, in some series [of operations] however long, they at last depend upon the diameter or its square. The Greek for this is γνώριμον, "intelligible" [*scibile dicitur, quod vel ipsum per se immediate est mensurabile per diametrum, si linea, vel per ejus quadratum, si superficies; vel quod formatur ad minimum ex talibus quantitatibus, certa et geometrica ratione, quae, quantumcunque longa serie, tandem tamen a diametro ejusve quadrato dependeant. Graece dicitur* γνώριμον]. (p. 18; p. 85)

The former entails that the process of knowledge is but a geometrical process of linking measures (quantities), whilst the latter, that the objects of knowledge are but geometrical objects (quantities).

Kepler builds the theory of the soul he presents in the *Harmonice* out of these definitions, although stressing what he had already insinuated in the *De Fundamentis:*

such theory must be formulated in terms of harmony. However, says Kepler in the introduction to the fourth book, since people understand harmony as something related only to sound,

> 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 [*in rebus extra intellectum*], or only in our soul [*in sola anima*], 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 [*animorum*] and of sublunary nature itself, and to show the secrets of Nature in rather clear light than hitherto. (p. 285; pp. 212-213)

Those are the main topics of the fourth book of the *Harmonice.* As the reader might notice, there is no question about what makes knowledge true; instead, Kepler is asking what makes knowledge possible. The difference is important and must be discussed before dealing with the harmonic theory itself.

In order to found the totality of the human knowledge, Descartes formulated a method of doubt, analysis, synthesis and universalization to reach an indisputable criterion of truth. This criterion—some innate ideas, which are clear and distinct—let him found his entire system: from it, he could justify the distinction between truth and falsity as well as the truth of the method, of its outcomes, and of the intellectual and sensorial experiences. Bacon did something similar: he started with a criterion of truth—

truth is power to produce a wanted effect—a criterion of falsity—the *idola,* i.e. false ideas, innate and acquired, of the human intellect—and a method of doubt, natural histories, synthesis, analysis and universalization, and from these, he could also justify the distinction between truth and falsity as well as the truth of the method, of its outcomes, and of the intellectual and sensorial experiences. Consequently, to look for a normative criterion of truth was crucial in both cases, since without such a criterion nobody could even assure that we actually know: it could happen that we were just dreaming or being deluded, that what we call knowledge (for them, synonym of truth) was nothing but falsity.[12]

Kepler does not appear so worried by problems like those. As we have seen, he did not argue in favour of any criterion of truth in his previous works; furthermore, he opened the *Harmonice* with a discussion on what knowledge is, and not on what truth is: for him, they are not synonyms. The question is why, of course. Indeed, as a man of his time, Kepler is a foundationalist philosopher: he tries to find the deepest foundations of reality, including knowledge. Yet, unlike Descartes and Bacon, he establishes a clear distinction between a general theory of knowledge and a particular theory of the scientific knowledge—the first one, descriptive, the last one, normative. All that is alive knows, says Kepler, or, what is the same, life is knowledge, knowledge is the distinguishing feature of life. However, not all kind of knowledge involves truth matters: the plant growing up, the bee gathering honey, the Earth changing seasons, the child being not aware of the movement of her foot when the music starts, all these are expressions of knowledge, not with truth as a requirement to know, but with response to the environmental conditions as a manifestation of a living (knowing) being. Not only all knowledge is not propositional, but responding to the environment is always

synonym of knowing, for just life can do it: a lifeless thing is indifferent to its environment. Since the soul needs to relate to the world to know it, no one of these responses is truer or falser than the others, and no one is made following rules (a method) to know; they rather express the way in which each sort of soul adjusts itself to the environment. And since the soul produces its own objects of knowledge, each sort of soul may just know what it produces. The human soul stands out above the others because its productions involve the recognition of the archetypes God employed to create. Hence the human soul has not only instinct, as all the other souls, but also discursive reasoning (see below), and with it truth matters become a topic to take into consideration, for it is now necessary to test a production of the human soul in order to discover if it corresponds to the archetypes of God's mind, i.e. if it was made following discursive reasoning and not only instinct.

This is the background upon which Kepler presents and develops his theory of the soul in the *Harmonice.* This theory is, as I said above, based on Kepler's geometrical definitions of knowledge and formulated in terms of harmony: given that it has to do with proportions, harmony is part of geometry, and accordingly knowledge in terms of harmony still belongs to the definitions given by Kepler before. So, to begin with, we need to grasp the essence of the harmonic proportions, which constitutes the main topic of the first chapter. Kepler classifies these harmonies into sensible and intelligible,

> [*f*]or 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. (p. 289; p. 213)

There is a harmony that manifests itself through several means: that is the harmony we must look for, since that is the genuine harmony. Therefore, regarding both kinds of harmony, "the question is, what is their basis, each in its own right, whether that basis is in themselves or in other things" (p. 289; p. 214). In order to solve such a question, Kepler first deals with the sensible harmonies, whose essence involves these four features:

> 1. Two sensible things of the same kind, and of a certain size, so that they can be compared with each other with respect of size. 2. The soul which compares them [*anima comparans*]. 3. The reception of the sensible things within [the soul]. 4. An appropriate proportion, which is defined as 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. (pp. 289-290; p. 214)

The first feature postulates the necessary presence of the world: without world, there is no harmony. The world is the realm of the sensible things and their order or relations (proportions): "the order of which we are speaking here is a relation, and the things which are ordered are related to each other". In other words, the world is a system: the system formed by the sensible things, where each part is related to the whole and the whole to each part. However, the existence of the world is not subordinated to the existence of the harmonies; it does not even hold harmonies, but brute proportions: "[*h*]armony is an accident of sensible things". The reason is that although the architecture of the world was not designed with harmonic principles as part of such

architecture (harmony does not exist in the world at all as most of Kepler scholars—if not all—have assumed), the manifestation of these through that architecture is an inevitable consequence for the soul—like a spandrel is an inevitable consequence of an arch, though the arch is not built in order for the spandrel to be generated. Thus, for instance, I could make Poison the cat's house manifest certain harmonic proportions, but if Poison never goes into the house (and she is a stubborn cat), those are merely brute proportions, without harmony: harmony is produced when brute proportions are perceived by a soul; otherwise, the world only has something like a disposition for harmony. That is the second feature.

This feature, then, postulates the necessary presence of the soul: without soul, there is no harmony, for harmony is a comparison between two terms, and only the soul compares. The soul is the realm of the harmonies, and thus, the sensible things and its proportions, as sensible things and brute proportions, do not have any harmonic principle in themselves. Harmony is a product of the soul, so that it only belongs to and appears with the soul, though the sensible things cannot be excluded of this process in any way.

> 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 [*praeter duos sensilis terminos oportere et animam esset comparantem*]. 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 [*ens rationis*]. (*cf.* pp. 290-291; p. 214)

These former features refer to that distinction established by Kepler since the days of the *De Quantitatibus:* the soul and the world are two completely discernible, independent realms with their own laws. They are completely autonomous, so that they cannot be subordinated to each another, since although they correspond somehow—after all, the world is made to be known by the soul—they do not share the same ontological principles: the world is the realm of one kind of quantity, i.e. the sensible things (shapes and proportions), whereas the soul is the realm of another kind of quantity, i.e. the harmonies (proportions). Indeed both are related, yet their autonomy is preserved at each level, and this autonomy lets us treat one without any reference to the other when, for instance, an entire new astronomy is written without references to harmonic proportions. Thus, if the soul finds out harmonies in the heavens, this means that it produced those heavenly harmonies out of the comparison of the brute proportions (angular velocities) of two sensible terms (planets) standing in the heavens, not that the heavens hold harmonies: the heavens hold the terms of the sensible harmonies, not the harmonies themselves. The soul even has to produce the harmonies (its objects of knowledge) because it does not hold any innate idea about the world, neither in a Cartesian nor in a Baconian sense, so that it needs to reach the world by some means. This leads us to the third feature of the essence of the sensible harmonies, that is, "the reception of external things into the mind [*in animum*]". Nevertheless, before going on to this feature, a brief excursus on innatism is pertinent.

The terms 'innate' and 'inborn' are strangely interesting in Kepler's theory of the soul. They often show up in the translations of his works and different scholars employ them in their commentaries (see, for example, Aiton 1997: xxxi, Boner 2005: 11, Buzon 1994: 122, Caspar 1993: 282, Chen-Morris 2001: 473-475, Holton 1973: 85,

Kozhamthadam 1994: 76, Pacho 1984: 319, and Pauli 1955: 153, 163-165), yet it is hard to find 'innascor' and its derivates in the Latin texts—I must confess that I have not done it. 'Innate' and 'inborn' are chosen by translators and interpreters when expressions involving the verbs 'connascor' [*connata homini, iisque connasci, connascitur*], 'congigno' [*congenita menti, ei congenitae ipsaque adeo anima, congenitus*], and 'insum' [*inesse iis*] occur (always with a discussion on the relationship between quantity and soul as context). Such expressions are indeed close in meaning to 'innatus', though a subtle difference still remains. On the one hand, the preposition 'cum' of 'connascor' and 'congigno' is not the preposition 'in' of 'innascor', and the consequences are not accidental: 'cum' (with) here has a meaning involving tacitly the adverb 'simul' (at the same time), so that 'connascor' would mean that one thing is born *with* other *at the same time,* and 'congigno' that one thing is begotten *with* other *at the same time;* furthermore, both would merely refer to *at the same time* in certain circumstances. In either case, one-thing-born-*in*-*(inside)*-other ('innatus') would be a possible instance, not the necessary law. To take illustrations from dictionaries, our hairs are *congeniti*—and luckily not *innati*—whilst two people can be *connati*—without having any kind of relationship in their entire lives. On the other hand, the verb 'insum' plus ablative can mean 'to be in' or 'to be contained' as well as 'to belong to', so that once again one-thing-born-*in*-*(inside)*-other would be a possible instance, not the necessary law.

The term 'innascor' and its derivates were available to Kepler if he had wanted them to have any role in his theory of the soul, he could even take 'insitus' and make a kind of parallel with the planetary 'vis insita' (or 'virtus insita') of the *Astronomia Nova* and the *Epitome*, yet he preferred other terms to elucidate his theory. The choice, it seems to me, is not unintentional, and rather reveals a truly original aspect of such

theory: what I would like to call 'Kepler's image of the soul'. Unlike Descartes (and his offspring), Bacon (and his offspring), or Kant (and his offspring), Kepler does not conceive the soul as a bucket-like thing. The soul is in his case neither a *res cogitans* nor an *intellectus* containing what it is not, i.e. *innatas et adventitias ideas,* nor an arrangement of *a priori* structures containing what it is not, i.e. intuitions, thoughts and so on; not even an image of God containing ideas of quantity and harmony (Caspar 1993: 270, Martens 2000: 119). In short, the soul is not something different to its contents: such ontological distinction does not exist in Kepler's case, and consequently that second-order dualism can be avoided. What belongs to the soul, says Kepler, what is born or begotten with the soul, i.e. at the same time that the soul, is the soul itself, since the soul cannot be what it is not. The soul is its contents, the contents are the soul: in other words, there is no soul-and-contents, but only soul, for the soul, as we shall see, is the harmony itself, somehow the circle and its arc (the makers of the harmonic proportions), not a bucket-like thing containing innate or inborn (ideas of) harmonies.[13] With this excursus in mind, we may come back to the third feature of the sensible harmonies.

Kepler explains this third feature—that is, again, "the reception of external things into the mind [*in animum*], and the necessity and manner of it"—by his theory of the *species sensiles,* indeed related to, or even a further development of, his theory of the *species immateriata.*[14] According to him, this reception of the external things—or process of making two external things into one harmony—is caused partly actively, partly passively [*partim agendo, partim patiendo*]:

> actively, when they give out emanations [*dum species emittunt*]—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 [*sed speciebus suis*], which must always experience something passively, according to our manner of speaking, when they are felt, remembered, or compared.

The soul cannot be what it is not, in this case sensible (material) things; nevertheless, it needs to reach these things—what the soul is not—so that it establishes a link with the world through their sensible (material) emanations. Thus, although the emanations are not the sensible things themselves, they share their sensible character, which the soul does not perceive directly, but through the body it rules. The process would roughly be this: the sensible things (actively) give out some "sensible and intellectual emanations [*speciebus sensilibus et mentalibus*]"—that is, emanations with a sensible and knowable character—then the body (passively) receives the emanations, and finally the soul (passively) compares the information provided by the body with the harmonies the soul is, producing the sensible harmony.[15] Kepler sums up this feature—with some important references to the other two—in this long paragraph:

> 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 [*tribunal animae*], 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 [*qualitatis sensilis*], say of sound or light and so on; and second because these sensible emanations, as sensible [*species haec sensiles, ut sensiles*], cannot give light within the mind [*in animo*] 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; 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. (*cf.* pp. 291-294; pp. 214-216)

We have so far seen the necessity of three elements to found knowledge: the world, the soul, and the body. Or if someone does not want to appear so shy, we could reformulate it in a different manner: we have so far reached a third way to understand the rise of the problem of knowledge in Modernity. On the one hand, Descartes told us that in order to found knowledge, we must disregard the body and the world, though in no way the soul, for the soul is the actual foundation of knowledge. Bacon, on the other hand, told us that we must not disregard the body and the world, but that it is compulsory to restore the soul because, after the Fall, it is essentially foul and impure to know, so that the body and the world, but not the soul, are the actual foundations of

knowledge. Contrary to these postures, Kepler, firstly, maintains that in order to found knowledge, the body and the world are as important as the soul, or in other words, that the three elements are the actual foundations of knowledge; and secondly, that what the soul is makes knowledge possible, so that we cannot modify it, but describe it to understand how it works. I will offer more details about these problems below, yet the last feature of the essence of the sensible harmonies is indispensable before.

This fourth feature is the appropriate proportion that defines a comparison of sensible terms as harmony. This appropriate proportion belongs to the soul, not to the world, and is used as the archetype with which it compares the sensible terms in order to establish what harmonic proportion they correspond to.

> To find the appropriate proportion 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 [*cum certo aliquo verissimae harmoniae archetypo, qui intus est in anima*]. Therefore, just as the Athenians found some virtue in Zeno, and did not find the privileges of the Prytaneum in him but conferred them on him, which Zeno could not achieve without the Athenians, so the soul [*anima*] 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 [*animis*], if this archetype did not exist. Enough, then, on sensible harmonies. (pp. 294-295; pp. 216-217)

But if this feature closes the discussion on the sensible harmonies, it is because we are now in the territory of the intellectual harmonies, i.e. the “archetypes or paradigms of sensible harmonies”. Such archetypes do not exist outside the soul [*extra animam*];

furthermore, “to establish them outside the soul is self-contradictory”. They exist within the soul, “without any tingle of sensible emanation”. They are productions of the soul, the soul itself, as I said before.

Like the sensible harmonies, the intellectual (or pure, or insensible, or archetypal) harmonies have some features, three in their case. The first feature is the presence of terms to compare, for these harmonies are proportions as well, that is, comparison of terms. These terms are two quantities, the circle and the arc.

> 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 especial 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 accepted as the truth itself.

The second feature is the presence of a soul comparing the terms.

> Second, as well as the terms, again as has been stated previously in the case of sensible harmonies, a mind [*mens*] is also required, which compares the terms, and asses 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 [*mens*] which in a sense brings it into being. (pp. 295-296; p. 217)

With regard to the third feature, what needs to be cleared is if the terms of the intelligible harmonies were received through some kind of emanation, or "have been with the mind [*mente*] always, and present before anything was received into it" (p. 296; p. 217). Kepler immediately takes the second option, and, after a historiographic interlude, goes on to explain why. Firstly, he points out, these harmonies are abstract, though not in the sense that they were formed from the sensible things by the body, but in the sense that they are "*a priori".* Secondly, they are knowable [*scibiles*], and since knowability is not possible without a soul, which is capable of knowledge [*jam vero quae scibilitas sine mente, scientiae capace?*], and "knowledge consists in comparison" of (geometrical) terms, then these terms cannot be outside the soul. Finally, "they must be not only knowable [*scibiles*] but also known [*scitas*], so that the archetypal harmony may in fact shine forth within the mind [*intus in animo*]" (*cf.* p. 303; p. 222).

However, these three features of the intellectual harmonies entail a question: "how knowledge of a thing can be possessed, when the mind [*mens*] has never learnt it, and perhaps cannot learn it, if it is deprived of sensation of external things?" The answer is that the soul (human or any other [*menti quippe humanae ceterisque animis*]) has instinct [*instinctus*], i.e. the property of knowing and understanding quantity and the whole of geometry by itself, without the help of the body or something else. Kepler had already referred to this instinct in a passage of the *De Nive Sexangula* that has to do with similar problems: "[*t*]he bee, therefore, by nature has this instinct as its property [*hunc instinctum habet ex proprietate sua*], to build in this shape rather than others. This

original pattern [*illi archetypus*] has been imprinted on it by the Creator". Such (geometrical) instinct is crucial in Kepler's theory of knowledge, for it links the soul and the body, and in so doing, makes experience possible.

> If so, it [*the soul*] can much more readily find the construction by means of that [*instinct*], and so perform the function of the eye in seeing the diagram (if there is nevertheless a need for one). Certainly the mind itself [*mens ipsa*], 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 [*congenita menti*], dictates what the nature of the eye must be; and therefore, the eye has been made as it is because the mind [*mens*] 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. (*cf.* pp. 303-304; p. 222)

The soul has to relate to the world to know it, for it does not have any innate knowledge of it. Yet the soul does not learn how to do it by the world. The soul must provide the means to relate to the world by itself, so that it makes experience possible: in order for the soul to experience the world, it both produces and configures its body according to its cognitive needs by (geometrical) instinct. That is why all the sorts of soul do not have the same sort of body: because the cognitive needs of a bee, for instance, are not the cognitive needs of plant or of a human being. In each case, the instinct works in a different way, depending on those cognitive needs: an eye, a wing, a

branch, a season, all are responses to cognitive needs of certain sort of soul. Then, the union of the soul and the body is not the problem of how two opposite substances can interact, but how the soul (an immaterial thing) produces and configures the body (a material thing) to interact with the world (a material thing). The answer is that the body turns out to be the container of the soul, a container instinctively produced by it to employ it like a bridge with the world: "the soul both exists in the body, giving form to it and to its connections with the corporeal form, and is preserved in God, like a kind of irradiation derived from the divine face onto the body, bringing thence its more noble nature".[16, 17]

The process of knowledge, indeed, begins with experience, although not because the soul is a *tabula rasa* that is filled out by experience, but because experience is the motor of the soul in that process: the soul produces its objects of knowledge (the harmonies) and, by itself, i.e. by instinct, the means (the body) to know them through the relation with the world. Kant would say that "though all our knowledge begins with experience, it does not follow that it all arises out of experience". However, although productions of the soul, those objects also correspond to the reality of the world, for the architecture of the soul was designed in such a way that its brute proportions (not its harmonies) fit to their archetypical proportions (the harmonies). Or more simply: the soul just knows the reality it produces, yet this is the only reality the world could correspond to. Analogously to the *De Quantitatibus,* realism means here both that the universals are real not *in rebus* but *in anima,* and that this reality does not turn them into simple *nomina* or *flatus vocis.* Thus, the difference among the intelligible and the sensible harmonies is minimal—but significant: the first are a comparison between archetypal proportions and archetypal proportions, whereas the second are a comparison

between brute proportions existing outside the soul and archetypal proportions existing with the soul.[18] In short, the soul is harmony: the soul becomes the harmonic proportions and its terms, that is, the circle and its arc. Kepler summarizes all this at the end of the first chapter:

> 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 [*ipsius animae energiam*]: the essence of both consists in this comparison. But the terms of the sensible harmonies are sensible, and must be present outside the soul [*extra animam*]: the terms of the archetypal harmonies are present within the soul [*in anima*] beforehand. Therefore, the sensible harmonies need in addition to be received by means of an emanation which they have emitted; and it is by the senses, the servants of the soul [*a sensibus animae ministris*], 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 patter [*termini antea sint in anima praesentes, ei congenitae ipsaque adeo anima, nec imago sint veri sui paradigmatis, sed ipsum suum veluti paradigma*]. Thus only a simple comparison, which the soul [*anima*] sets up, of its own parts with each other, so to speak, completes the whole essence of the archetypal harmony. Finally the soul itself [*anima*], engaged in this activity, is the harmony with which we are concern, 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 [*animificatur*], and so deified. (pp. 305-306; pp. 223-224)

This completes Kepler's account concerning the essence of the harmonies. The second chapter relates the harmonies and the soul in a more detailed way, providing further discussion of some problems already treated, such as the union of the soul and the body, and the instinct. According to Kepler, the harmonic faculty of the soul [*facultate animae harmonica*] is twofold: "one contemplative, which is mental, or so in a sense, the other operative [*altera per discursum, mentalis vel quasi, altera operative*]" (*cf.* p. 307; p. 224).[19] I will begin, following Kepler's exposition, with the contemplative faculty of the soul.

This faculty is twofold as well, "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". In other words, the contemplative faculty has two abilities, one (superior) that deals with intelligible harmonies, and other (inferior) that deals with sensible harmonies. The first ability just belongs to the human soul: "the faculty [*facultas; ability*] which hunts for harmonics 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 [*animi humani*]". The second ability is shared by every sort of soul. This is the ability in charge of both giving form to the body according to the cognitive needs of each soul, and keeping it alive.

> That faculty [*facultas; ability*] 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 [*animae facultas*] giving form to the senses from close to, or yet lower, that is to say only the vital faculty of the soul [*facultas animae vitalis*], 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 beast and cattle, and the sublunary soul [*anima sublunaris*].[20]

In this sense, then, the contemplative faculty of the soul is *mentalis vel quasi:* it has a mental ability (that is, discursive reasoning) to discover and theorize about the intelligible harmonies, yet since this ability only belongs to the human soul, not to the other sorts of soul, the contemplative faculty cannot be *mentalis* simply, but *mentalis vel quasi.*

Therefore, in the case of the human soul, the contemplative faculty has two abilities, one mental, the other sensitive. The first one understands harmony, the second one senses it. In Kantian terms, Kepler's contemplative faculty of the human soul would be composed of understanding and sensibility. But whilst Kant just referred to the human beings and their soul (*Gemüt*), leaving open the problem with respect to other beings (*cf.* the first paragraphs of the "Transcendental Aesthetic"), and whilst Descartes simply denied the possibility of other knowing beings besides man (the animals as automatons is an example of this), and Bacon did not even discuss the problem, Kepler thinks of them as knowing beings: a soul belong to them, though a soul whose contemplative faculty reduces to the sensitive ability. They do not have discursive reasoning, yet they (as well as the human soul) have instinct, which is part of the sensitive ability:

> the ideas or formal causes of the harmonies, in accordance with our earlier discussion of them, are completely innate [*inesse iis*] in those who possess this power of recognition [*hac agnoscendi facultate*]; but they are not after all taken within them by contemplation [*per*

> *discursum*], but rather depend on a natural instinct [*ex instinctu naturali*], and are innate in them [*iisque connasci*], as the number (something intellectual [*res intellectuallis*]) of the leaves in the flower and of the segments in a fruit are innate [*connascitur*] in the forms of plants.

The source of that (geometrical) instinct is 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".

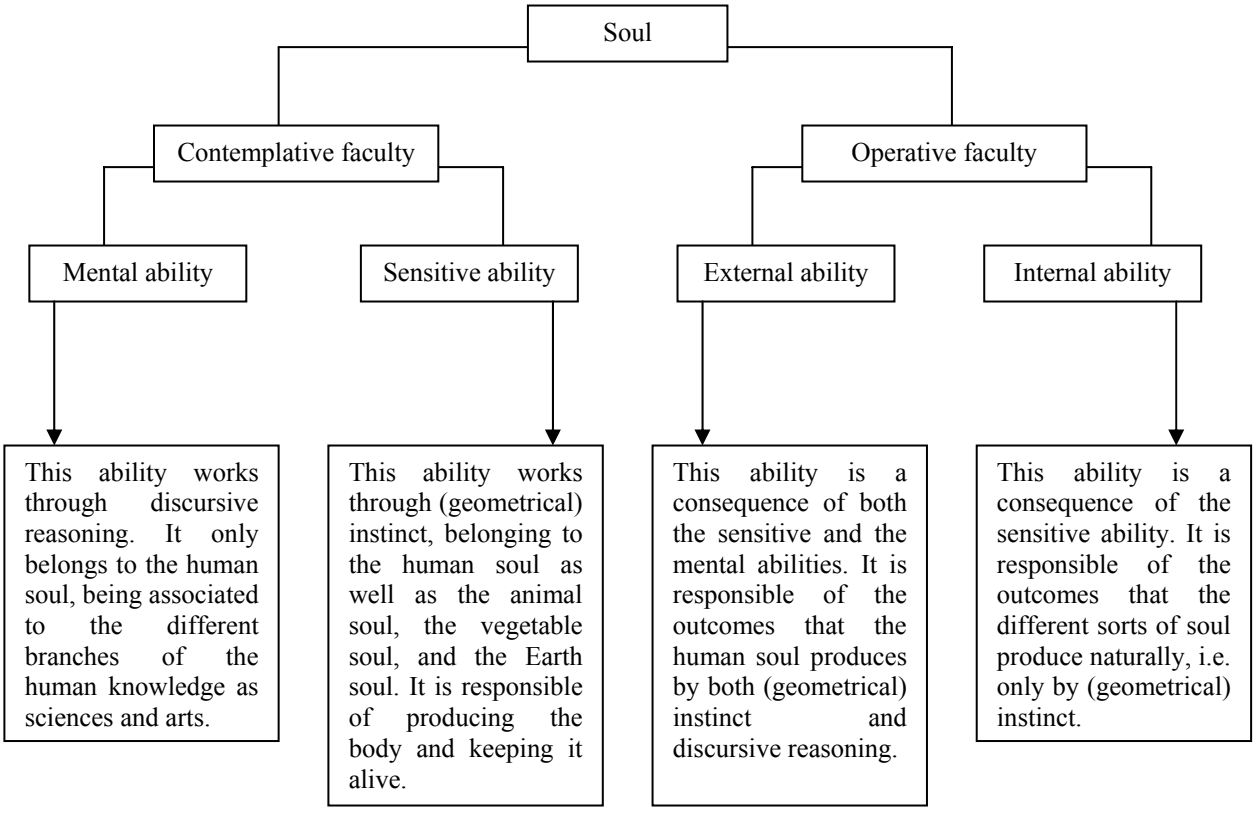
Kepler describes as "dull and dim, and in a sense material, and under a cloud of ignorance" the perception of the harmonies by the sensitive ability. The reason is that this ability does not know that it perceives, "as when we see something but do not notice that we are seeing". However, due to the sensitive ability, the soul can respond to the stimuli of the environment (make experience possible); otherwise, it would be indifferent to it and the process of knowledge could not start. Even so, truth matters do not take part in this aspect of the process. Truth matters just belong to the mental ability of the soul, that is, to the productions of the human soul, which are made through discursive reasoning. The perceptions of the sensitive ability (made through instinct) are dull and dim, in a sense material, under a cloud of ignorance, but never true or false: when "the crazy youth loves the girl" and cannot be dissuaded from that love, he is not acting in accordance with truth or falsity; he is just responding to environmental conditions (pp. 307-310; pp. 224-226).

Yet the soul not only contemplates harmonies, but also operates in relation to them, generating outcomes in the world. That is the role of the operative faculty [*energeticas facultates*].[21] As the contemplative faculty, this 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". I call the first one 'internal ability' and the second one 'external ability'. The former ability is "the offspring of the inferior faculties of the soul, the latter of the superior [*illa igitur inferiorum animae facultatum (ability) rursum est soboles, ista superiorum*]". The plant engendering its fruit, the bee building its honeycomb, the Earth causing the snowflake, the child moving her foot without being aware of the music, or the crazy youth marrying the forbidden girl, all these are expressions of the former ability, which, as offspring of the sensitive ability, only works through instinct. In this sense, "[*t*]he former is subject to the powers of nature [*naturae viribus subset*]". On the contrary, "the latter [*is subject*] to the will of man [*haec voluntati hominis*]", and therefore it implies the use of both the mental and the sensitive abilities, i.e. discursive reasoning and instinct. So, for instance,

> the fact that we are not only delighted by harmony in music, but also fit the movements of the fingers, mouth, feet, and body to it, we now attribute to the animal faculty, coupled with the will [*facultate animali, juncta voluntate*]. 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 [*supremis infimisque omnibus facultatibus (abilities)*]—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. (pp. 310-311; p. 226)

The differences of this late architectonic of the soul with the early one are considerable. In the *De Quantitatibus,* and just referring to the human soul, Kepler spoke about two kinds of faculties: the noble ones and the less noble ones. The faculty of nutrition, of feeling and of moving [*facultate nutriente, sentiente, movente*] would be the first kind, whereas the understanding faculty [*facultas intelligens; facultas intelligendi; intellectio*], the reasoning faculty [*facultas ratio dicitur; ratiocinatio*] and the counting faculty [*facultatis numeratricis; facultas numerandi; numeratio*] would be the second one. In its place, and referring to the four sorts of soul at the same time, he now offers a more complex architectonic, which can be summarized with the following schema.



Kepler's Late Architectonic of the Soul

With this architectonic, Kepler completes his answer to the main question of his theory of the soul, namely: what makes knowledge possible? Roughly speaking, knowledge is possible owing to the presence of three elements: a soul, a body, and the world—the soul being the central one, since it is the cause of the whole process of knowledge. Kepler expresses it briefly in a passage of the fifth book of the *Harmonice:*

> For as the Sun in its revolution about its own axis moves all the planets by the emanation which it sends out from itself, so also the mind [*mens*], as the philosophers tell us, understanding itself and all that is in itself, stimulates the use of reason, and by spreading and unfolding its simplicity causes all things to be understood. (p. 496; p. 326)

Science would just be an aspect of that continuous motion of the soul, yet a central aspect. That is why a theory of the scientific knowledge would turn out to be obligatory.

Conclusion

I said at the beginning of this study that Kepler's philosophy, although not clearly belonging to the public history of philosophy, seems to belong to the background of the history of philosophy itself. I take this to be true, but I cannot prove it. Yet I am not very worried about that, for I am not the only one that faces such a problem. I would even say, on the contrary, that that has become one of the most disturbing historical problems for Kepler scholars in recent years: though everyone has realized that Kepler's philosophical influence was strong and persisted during a certain period of time, no one has decisive textual evidences to prove it. To the best of my knowledge, Martens is the one who has tackled the problem with a better detail, indicating at the end of her book some directions in which Kepler's philosophical legacy could survive.[22] "Kepler's philosophy, however, was discussed by his contemporaries", she says, and goes on to show how philosophers as important as Mersenne, Descartes, and Leibniz could take account of it (Martens 2000: 172-175).[23] She focuses on Kepler's philosophy of science and ontology, but does not give any reference to the theory of the soul. Nonetheless, I am not going to conclude with an elucidation of this theory in the context of such discussion. My aim is rather to suggest briefly why Kepler's theory of the soul is philosophically valuable when compared with Descartes's and Bacon's epistemologies. This might, I hope, be historically valuable as well, though my interest is not to draw the historical consequences here.

The main problem with which Descartes's and Bacon's epistemologies deal is the problem of truth: their solution to it is the basis of their philosophies. Descartes solved that problem by appealing to a criterion of truth as clarity and distinction, which entailed

an equivalence between knowledge and truth that he took to be the first precept of his method: what we perceive clearly and distinctly, says Descartes, is true. Alternatively, what we do not perceive clearly and distinctly is false, i.e. something that we do not actually know (*Oeuvres,* VI: 18, 38; VII: 35-36; VIII-1: 21-22). Yet that equivalence has certain consequences leading to further problems, for one needs to explain, on the one hand, how the equivalence was grasped, and on the other, what the source of error is.

Descartes tells us that the only way we can be aware of the reality of the equivalence is to disregard the body, for otherwise we may fall into error, and therefore lack distinguishability concerning truth. As he insistently implies in several places of the first three meditations, only when we do without the body, we see ourselves knowing that the soul and God exist, and realize that since such knowledge is clear and distinct, it must be true. The body, hence, is unnecessary to found knowledge, and, to some extent, it is even unnecessary to know: after all, those two basic, innate truths are known without any reference to the body. This indeed has a place when we aim to expand our knowledge, specifically concerning the external world, yet to found knowledge on the body would be a mistake for a simple reason: the information of our senses is always doubtful, which, from Descartes's perspective, is a form of saying untrue.

This denial of a place for the body in the foundations of knowledge likewise involves a denial of a place for the world, for, as Descartes argues in the same meditations, once we cannot trust our own bodies regarding knowledge, we cannot even assure that the external world is there: perhaps it is just a delusion or a misunderstanding. In sum, we must found knowledge entirely on the soul: if the body and the world disappeared, knowledge would not face serious dangers, for it is directly

associated with the soul, and only indirectly with the former two. They just play a role in its development, not in its foundation (*Oeuvres,* VI: 31-40; VII: 12-52).

This double denial is also backed by the recognition of error in human life. The problem now is that we possess three kinds of ideas, *aliae innatae, aliae adventitiae,* and *aliae a nobis ipsis factae.* Those belonging to the first kind are always true, for instance, the ideas of the soul and God, but those belonging to the other two may fail to be true, so that it is necessary to discover why. In the fourth meditation (VII: 52-62) and in the principles XXIX through to XLVIII (VIII-1: 16-27), Descartes explains that we fall into error whenever we judge something by either the intellect [*intellectus*] or the will [*voluntas*] without a proper (i.e. clear and distinct) perception of it. In this sense, we may turn our errors into truths if we judge properly. However, on the other hand, Descartes is telling us that, since only those ideas being true constitute knowledge, then knowledge is a very restricted aspect of human life: we merely know with respect to the intellect and the will, that is, knowledge is nothing else but propositional knowledge. We may, and furthermore, we need to regulate all our knowledge because it is merely what we are able to express discursively, what we may turn into clear and distinct ideas. Nevertheless, this regulation of the totality of our knowledge is but a way of reducing epistemology to philosophy of science: they are not here aspects of the same branch of learning, but undistinguishable disciplines.

Bacon treats these issues in analogous terms, but in his case, he starts by establishing a criterion of truth as power to produce a wanted effect. As he observes at the beginning of the first book of the *Novum Organum,* "[*s*]cientia et potentia humana in idem coincidunt, quia ignoratio causae destituit effectum" (*Works,* I: 157). We know when we have the power to produce what we want to produce; otherwise, even if we

produce certain effects, there is not knowledge at all, but good luck at most. Our knowledge [*scientia*] is but our power to lead the natural causes to certain natural effects, and this can happen only when we possess true knowledge, that is, when we know both the true causes that produce their own effects, and the true way to operate them. In short, Bacon also defends an equivalence between knowledge and truth, which, of course, entails consequences referred again, on the one hand, to how the equivalence was grasped, and on the other, to what the source of error is.

As happened with Descartes, Bacon's answers to these questions are deeply related to each another. In the general preface to the *Instauratio Magna,* Bacon implies that the most evident example of the existence of the equivalence is the mechanical arts, which initially were rude and difficult, but due to the knowledge of true causes and principles, have constantly been increasing and progressing. On the contrary, the intellectual sciences, in lacking such knowledge, have initially been easy to practice, yet they have actually reached no improvement after those early stages. In the last ones we just find erudite disputes not contributing to the progress of the knowledge and the domination of nature. Therefore, the only way to improve them is to provide some helps to the soul, for when this is left alone, it fails to discover truth (*Works,* I: 125-133). The important point to highlight here is that those helps include, among other things, natural histories and understanding of how the body works concerning the process of knowledge (*Works,* I: 393-411, 485-633; III: 727-737). So, unlike Descartes, Bacon tells us that the body and the world play an important role in the foundation of knowledge: if we do not take account of them, knowledge simply cannot be founded.

A very different thing happens with the soul, however. Although the soul should also have its place in such foundation, says Bacon, it needs to be restored before because

it is foul and impure for knowing. The reason is that there are false ideas or *idola* inhabiting it, which are either *adscititia* or *innata.* The first ones come from cultural factors as individual and social inclinations (*idola specus*), a misguided use of the language (*idola fori*), and untrue philosophies and doctrines as well as wrong demonstrations (*idola theatri*). Given that they are acquired—that is, they are not naturally linked to the soul—it is possible for us to eliminate them, though the process is hard and long: after all, they have become part of the soul. The most serious problem arises with the second ones, the *idola innata,* for "[*i*]nnata inhaerent naturae ipsius intellectus, qui ad errorem longe proclivior esse deprehenditur quam sensus". Such *idola* (*idola tribus*) are part of the nature itself of the soul, so that we cannot eliminate them because they are our own soul and we cannot eliminate our soul. Our only option concerning these *idola* is to distinguish them and make some guidelines to deal with them available, nothing more. Thus, we must accept that all our innate ideas are false, that our soul is essentially a container of untruths, and consequently, that it does not constitute a trustful basis to found knowledge; on the contrary, our soul is the main source of error, much more than the body (*Works,* I: 139-140, 163-179). In this way, the regulation of the soul is not only desirable, but epistemologically unavoidable: if we do not regulate the soul even in an ontological level—for instance, removing some parts of the soul as its *adscititia idola*—knowledge turns out to be an impossible enterprise, for we would never have the ability to produce any wanted effect. But this regulation in any single level once again implies that epistemology reduces to philosophy of science, so that they are undistinguishable disciplines—not aspects of the same branch of learning.

As we see, in both cases, either Descartes's or Bacon's, the attempt to find an indisputable criterion of truth led to a reduction of epistemology to philosophy of

science whose major corollary was the necessity of both confining our knowledge to some very restricted boundaries and imposing it a corpus of rules in every possible level. Kepler's philosophical genius was to realize that both disciplines, though dealing with related aspects of knowledge—namely, a general theory of knowledge and a particular theory of the scientific knowledge—must be separated, and in doing that, to become aware that knowledge cannot be understood merely from the viewpoint of a method leading to truth. For Kepler, unlike Descartes and Bacon, to know is to be alive, life is knowledge, and that is why knowledge requires neither method nor truth to exist—unless, as I said, we speak about scientific knowledge. This Keplerian equivalence has some philosophical advantages, and I am to finish by pointing out a couple of them.

I already mentioned the distinction between epistemology and philosophy of science. Such distinction was crucial because it let Kepler look for an answer to the problem of knowledge outside the subject-object antinomy. In being the soul the maker of its own harmonies, and moreover, in being these harmonies somehow the soul itself, the relation between knowing subject and objects of knowledge changes drastically, for it is not philosophically necessary from this perspective to begin by considering what makes it possible for the constructions of the subject to correspond to the objects it knows, that is, what makes them true. Kepler no doubt recognizes the existence of subject and objects of knowledge, as I have insisted in several places of this study, yet the relation between the two sides is not one of correspondence. They rather relate to each another as aspects of the same reality: they are modes of the soul, with the subject as the faculty of knowing, and the objects as the outcomes of the interaction between this faculty and the world. That would explain why from a Keplerian viewpoint, the Cartesian denial of both the body and the world must be rejected: on the one hand, the

body is part of the subject, and on the other, the world put the subject in motion by offering it conditions under which it starts to know, so that to deny the existence of at least one of them in any stage would entail a negation of the possibility itself of knowledge. And that would also explain why the Baconian restoration of the soul must be rejected as well: the soul is not essentially defective to know, for the fact that it keeps its body alive proves that it is knowing something, yet not in terms of truth and falsity, but of responses to the environment: as long as the body has responses to the world, its soul is knowing something. Then, thanks to the presence of these three elements—soul, body, and world—the subject produces its own objects of knowledge, and in knowing them, it knows itself as well as the external things, namely, God and the world.

Another important result of Kepler's theory of the soul is the idea that, once distinguished from philosophy of science, epistemology cannot be confined to a theory of the human knowledge. There are lots of knowing beings, says Kepler, with specific processes and objects of knowledge, and for that reason, to investigate the way they know is as valid as to investigate the way we do. This even gives us understanding not only of their processes and objects, but also of ours, for we recognize the resemblances and the differences, and by this, why our soul may aspire to reach certain branches of knowledge that the others may not. This idea accentuates the philosophical posture concerning truth and method as well. Since it is clear that all the living beings know, though not all the knowing beings aim to find truth by means of a method, the equivalence between life and knowledge is at the same time a rearrangement of philosophical problems: given that life is knowledge in any level and in any stage of its development, truth and method matters, as I said elsewhere, will merely belong to philosophy of science, and this will diminish neither the significance nor the scopes of

the epistemological research. On the contrary, in distributing philosophical efforts adequately, the significance and the scopes of epistemology become more evident and more easily accessible. So, whereas Descartes and Bacon intended to propose an exhaustive normativity for the totality of our knowledge, Kepler made epistemology a descriptive discipline of knowledge in a general sense, and only philosophy of science a normative one of our particular, scientific knowledge—though not an exhaustively normative one. From this point of view, Kepler is doubtless our contemporary, much more than Descartes and Bacon: the mere distinction and division of those two disciplines was a philosophical achievement that the latter did not even glimpse, and that the twentieth century, with its emphasis on biological approaches to the problem of knowledge, has constantly pointed up.

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Notes

[1] I do not discuss the ontological consequences of this first way here.

[2] Although Kepler does not explain which contemplative science goes in second place and which one in third place, he seems to suggest that theology (or metaphysics) is the next one.

[3] Though it runs outside the scopes of this study, a few words on this point will be useful. Kepler's thought, philosophical as well as scientific, is based on what we could call a metaphysics of quantity: for Kepler, all that exists (i.e. God, soul, and world) is essentially quantities, or a kind of quantities. Quantity becomes, therefore, the deepest principle of reality. As a consequence of this, mathematics, particularly geometry, is taken as the superior branch of knowledge, since it is precisely the branch devoted to quantities: mathematics, the science, has quantities as its object.

[4] Notice that the use of "innate" by the translator does not correspond to the original Latin text. I discuss this problem concerning "innate" and "inborn" in the third section.

[5] This last passage is omitted by Frisch. Cifoletti found it in Kepler's autograph manuscript.

[6] However, Kepler explicitly recognizes the influence of Aristotle in the *De Quantitatibus,* and quotes him at length. Furthermore, *De Quantitatibus* is mostly an Aristotelian treatise, and in this sense Cifoletti's introduction and footnotes are more than helpful to elucidate the point.

[7] Kepler does not clarify whether this statement means that the animals have a soul and, if so, of what type.

[8] See also note 7 to the preface of the second edition of the *Mysterium,* where Kepler highlights the distinction between *numeri numerati* and *numeri numerantes.* For a discussion on Kepler's attitude towards numerology, see Field 1986.

[9] Kepler refers here to the last chapter of the *Harmonice,* that is, "Chapter X. Conjectural Epilogue on the Sun [*Epilogus de Sole, conjecturalis*]". As its title states, this entire chapter must be read as a conjecture.

[10] On the concept "species immateriata" in Kepler's, see Rabin 2005.

[11] Literally: "the distinguishing mental features of the geometrical objects", but not: "the features which distinguish geometrical objects to the mind", as the English translation reads.

[12] See the conclusion for a detailed discussion of the issues addressed in this paragraph, with the exact places of Descartes's and Bacon's works I am referring to.

[13] Popper referred to "the bucket theory of the mind" to criticize all the empiricist postures that have assumed some version of the *tabula-rasa* analogy to explain the human knowledge. He postulated his well-known theory of the three worlds based on that critique: world 1 or material world, world 2 or mental states, and world 3 or products of the human mind (but not the human mind itself). From a Keplerian point of view, empiricism as well as Popperian worlds would merely be different models of the same bucket.

[14] On the material character of Kepler's "species immateriata", see Rabin 2005. Her conclusions seem to suggest that Kepler was neither a Neo-Platonist, as she explicitly maintains, nor, concerning the *species,* a neo-scholastic.

[15] Of course, we also need to solve the problem of the union between the soul and the body. I will give an answer below.

[16] I have modified the English translation of this passage due to an evident mistake. It says: "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" (p. 305). But this does not fit to the Latin text: "animus et in corpore inest, informans illud connexusque formae corporae, et in Deo sustentatur, veluti quaedam ex vultu divino in corpus derivata irradiatio, trahens inde nobiliorem naturam" (p. 223).

[17] Boner says that Kepler "could not determine how or why the immaterial realm interacted with the material one. This problem stemmed directly from Kepler's conception of *anima* and was therefore deeply entrenched in his cosmology" (Boner 2005: 15). The last paragraph shows that Kepler did answer both questions: how—through the production and configuration of the body; and why—because in lacking innate ideas about it, the soul needs to relate to the world in order to know it. On the other hand, Pauli's interpretation of the Keplerian instinct is simply misguided (see Pauli 1955: 166-167).

[18] However, this last comparison needs not be a perfect correspondence. The intelligible harmonies are the archetype of the sensible harmonies, yet since the archetype does not exist in the world itself but in the soul, the terms of the sensible harmonies do their best in order for the soul to produce the sensible harmony. As Kepler said in a passage cited above, the sensible harmonies "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 accepted as the truth itself".

[19] What was said about the term 'facultas' in the *De Quantitatibus* applies concerning the *Harmonice* as well: Kepler still employs it in a non-technical sense meaning the ability of the soul to do something. So, if he speaks about the harmonic faculty of the soul, it does not imply that the soul does not reduce to be only harmony. Instead, it implies that the soul has the ability to perceive harmony, since it is harmony. However, in order to show the quasi technical sense of 'facultas' in the *Harmonice,* I will talk about 'the contemplative faculty of the soul' and 'the operative faculty of the soul', and name 'ability' all the other faculties that Kepler mentions. Since all these last faculties are like parts of the former two faculties, both groups cannot be confused each other, and that explains why I do not follow Kepler's own terms. Accordingly, there will be two faculties and four abilities, yet the reader must constantly recall that each of my abilities corresponds to several faculties of Kepler's: for instance, whereas five senses correspond to five different Keplerian faculties, I will take 'sensitive ability' to include all the Keplerian faculties referred to the body. Thus, in terms that Kepler does not use: the two first faculties ramify into a

lot of new faculties. In my terms: the two faculties ramify into four abilities. I hope to show the strategy turning out fruitful enough to remove eyebrows of my reader.

[20] In the passage just quoted, Kepler refers to the human soul, the animal soul, and the Earth soul. Several lines below, he refers to the missing sort of soul, i.e. the vegetable soul: "the number (something intellectual [*res intellectuallis*]) of the leaves in the flower and of the segments in a fruit are innate [*connascitur*] 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 [*ne vegetativae quidem animae facultati (ability) plantisque ipsis facultatem (ability)],* the power of recognizing the harmonic proportions of the sidereal rays; though I assert nothing without appropriate tests".

[21] Chapter III and Chapter VII of the fourth book are partly devoted to show several examples of the outcomes of this faculty.

[22] But see also Buzon 1977, Buzon 1994, Le Doeuff 1983, Meli 1991, Michel 2001, Prins 1987, and Valcke 1996 for related discussions.

[23] Kepler's works were also widely discussed by contemporary scientists. See Applebaum 1996, Bucciantini 1994, and Russell 1964.