

The Book of Al Farabi on the Origin of the Sciences

That is,

**Letter Assigning the Cause from which the Philosophical Sciences
Have Arisen, and their Order in Teaching**

AL FARABI

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Letter Assigning the Cause from which the Philosophical Sciences Have Arisen, and their Order in Teaching

<Chapter I>

You should know that there is nothing other than substance and accident, and the creator of substance and accident, blessed forever.

Now the five senses grasp accident by its presence and by touch, nothing coming between it and them. Thus color, which vision grasps per se, distinguishing between whiteness and blackness; and utterance, which hearing grasps per se, distinguishing between the high and the low; and odors, which smell grasps per se, distinguishing between the sweet and the evil smelling; and tastes, which taste grasps per se, distinguishing between the sweet and the bitter; and the tangible, which touch grasps per se, discerning between the soft and the hard.

Now substance is not grasped except by reason, the accident mediating between them. For reason knew that beneath color was the colored, and beneath the utterance what is heard, and so on for the other senses.¹

But in what way all the sciences arose from substance and accident, and how they began to be through these, I will demonstrate.²

<1.> Account (*dictio*) of the cause to be cognized from which the art of number arose.

I hold that, since substance receives a multifold division and much diversity in its parts, number originated thence, for it is a multitude composed from unities. And since substance

¹Substance, "*substantia*," is what stands (*stat*) under (*sub*) the accidents. This very simple argument gestures to the many complex passages in the *Metaphysics* where Aristotle insists that there must be something other than an accident to which accidents belong, and that this would be the fundamental reality. The notion that the senses only grasp accidents is noteworthy. This is because only accidents of the reality (or precisely similar accidents), not the reality itself, can be transferred to (produced in) the organs of the senses. It was more or less assumed that once the quality was in the sense organ one could be directly acquainted with it.

²The point of this is profoundly Aristotelian. It is to show that no science requires, if we are to account for its possibility and origin, the assumption of anything to be known other than substances and accidents, and, the author adds, the Creator, who apparently falls in neither category. Thus it means to rule out the Platonic argument from the existence of the abstract sciences to the Forms. It is less clear if it is intended to rule out an adaptation of the Platonic argument in favor of real universals, for it may be that the author regards secondary substances as fundamentally real. But see Chapter 3.

naturally can be divided indefinitely, potentially, it was also an indefinite number, potentially. And the scientific knowledge obtained concerning number was knowledge of multiplying the parts of substances, one set of parts by another, and dividing one set into another, and adding one set to another, and subtracting one set from another, and finding the root of all of those that have root, and the proportion of one set to another, etc. It is obvious from this, then, how number was discovered, and whence what is multiplied arose, and what the cause is of this <science> and its movement from potentiality to actuality, and from non-being to being. Now the wise among the Greeks call this science arithmetic.

<2.> Account of the cause to be cognized from which the art of measurement arose.

I hold that, after substance began to be divided into many parts, as has already been said, each one of these parts happened to be figured in some figure, and disposed in some way. From some of these a round figure was formed, from some a triangle, from some a quadrangle, and from some a pentagon. And so they were separated in order by number into infinity, in whatever manner it appeared in the parts of a substance when it was divided. Therefore that science was necessary through which we arrive at the cognition of the figures that contain those parts. Through this, then, we knew the relation of these to one another, and their common measure, and how one figure is similar to another, and a figure is in a figure, and a figure is on a figure, and the other things which happen with figures. These, then, were the science of measurement. Therefore measuring is an art which causes us to know measures, and causes us to know the relations between them in lines, surfaces, and solids. And in Greek this is called geometry. It is clear, then, how the science of measurement emerged and whence it flowed and took its origin, and what the cause was of its movement from potentiality to actuality, and from non-being to being.

<3.> Account of the cause from which the science of the stars arose.

I hold that, since substance is naturally moved, there was a division of its motion into three species, namely into the rapid and the slow, and the intermediate between those. Hence the art through which we arrive at scientific knowledge of these motions and of the measure of each and its relation to the others, and this is the science of the motions of the heavens. Through this, then, we arrived at the course of the planets and their oppositions in their own heavens <that is, their own spheres>, and at their forward and retrograde motions, and their standing still, and their place in adequation (?). But we did not arrive at any of this except through the two preceding arts, namely arithmetic and geometry, without which it is not only difficult to attain to this science, but impossible. Now the Greeks name this science astronomy.

<4.> Account of cause to be cognized from which the art of music arose.

I hold also that, after substance was moved, sound happened in it, which is divided into three species, namely high and low and what is between these. Hence the art through which we come to the knowledge of high sounds, that is, of those which are in the last degree of highness,

and the knowledge of low sounds, namely those which are in the last degree of lowness, and the science of sounds between these and the relations of them among themselves, until nothing more remains hidden from us about those things that happen in substances. That art, then, is the science of sounds.

The utility of this is to temper the customs of animals who exceed equality, and suitably perfect those who are not yet perfect, and preserve those who seem equal and have not yet gone to either extreme. And this is also useful for the health of the body, since sometimes the body is ill because the soul languishes and is held back because the soul is held back; hence the cure of the body occurs due to the cure of the soul, and the adaptation of its powers and the adjustment of its substances from the sound acting on it and agreeing with it.

There are three roots of this science, meter, melody and gesture. Meter was discovered to make the intellect proportional to rational discussion; melody was discovered to make the high and low parts proportional; and these two roots of the subject belong to the sense of hearing. Gesture is subject to the sense of vision, however, and was established to bring motions similar to meter and sound into conformity with them, and to introduce relations among the motions coinciding with those in meter and sound. This art, then, is subject to the two chief senses, which are hearing and vision. Therefore it is now clear from whence the art of music emerged and from whence it flowed and took its rise.

And in this science the disciplinary sciences (i.e. those taught in the schools) are completed, which are called the four master (*domatrix*) sciences. These four sciences are called master sciences because they are masters to (*edomant*) the one who speculates concerning them, and render him more subtle, and show him the right way to scientific knowledge of that which, most justly, comes after them.

<5.> Discussion of the cause to be cognized from which the natural art arose.

I hold that, since substance sometimes is ruddy and sometimes pale, sometimes elongated and sometimes shortened, sometimes augmented and sometimes diminished, sometimes generated and sometimes corrupted, sometimes made ill and sometimes made well, therefore a science which shows all this was necessary, namely that through which we might arrive at scientific knowledge of this sort of permutation, how it arises, and what are its occasions and causes, and how we can remove the harmful occasions when we wish to drive them off, and how to proceed when we wish to augment <favorable causes>. This science, then, was the science concerning nature, which is the science concerning action and the suffering of action.

When we seek this and its origin we will find four elements, which are fire, air, water and earth, and are masses of substance contained within the circle of the Moon. From these four qualities, which are heat, cold, wetness and dryness, occur as accidents in a substance, and lead to action and the suffering of action. And from these four roots, along with the first four, which

are the four disciplinary sciences, emerges that science which falls under the circle of the moon.

Now the parts of this science, according to what the first wise men have said, are eight, namely the science of judgments, of medicine, of necromancy according to physics, of images, of agriculture, of navigation, of alchemy, which is the science of converting realities into another species, and the science of mirrors.

But this natural science is more extensive and wider than all of these disciplinary sciences. And since in itself it is the widest, and since we know it to need other sciences which are prior to it, on that account it is necessary to distinguish both the science of judgment and the science of medicine, which it ascribes to him who gets to know their axiom (*dignitatem*) and order of reading; nor is any of these easily attained or truly known, except by one who has obtained a cognition of all those that have been discussed earlier. And in this science the cognition of all the accidents of absolute substance contained under the sphere of the moon is perfected, and the cognition of the whole mass of that substance to which change of form happens by augmentation and diminution.

There remained, then, the science concerning the mass of substance above the sphere of the moon, for some of its dispositions and accidents were already grasped. It do not wish to understand anything by substance above the sphere of the moon than the sphere flying around and moving with a natural motion following its constitution in the world according to the power, wisdom and will of God, who is blessed and above all things.³ It is clear, then, from what has been said, how natural science emerged and whence it arose.

<6.> Discussion of the cause to be cognized from which the divine science, that is the cognition of God, arose.

I hold that the substance above, after mention was made of it and it was considered in its essence, led us to inquire concerning it and its mass. Therefore the science of the substance of the sky emerged, and the cognition of the substances which are in it, namely the stars, in accord with the inequality of their measures and the diversity of their dispositions. This was, therefore, a science concerning nature.

Then we considered whether this substance had a maker, and whether it was possible for it not to have a maker, and be eternal, not having any earlier or later, nor any beginning or end, as he said who did not exercise himself in speculation, nor labor in science, and knew neither the natural sciences nor logical argument. The investigation into this, then, was the cause of

³The point here is perhaps that he does not mean to identify the heavens themselves as the source of all things, or more likely, that by *substantia superiora* he means not God, but the heavens merely. For God he reserves the word *excelsus*, placing him above what is *superiora*.

cognizing God, and arriving at the creator of substance and accident, from which emerged the speculation which leads us to his being and compels us to know that he is. And the science of this matter is called science after nature, or divine science, and it is the end of the sciences and their perfection, and after this there remains no further inquiry, for it is the end to which every inquiry tends and in which it rests.⁴

It is plain, then, whence the divine science emerged and what its origin is. And in the same way it is also clear now whence all the other sciences discussed earlier emerged. It has become clear that these are from an opportune moment in the disposition of substance and its accidents and concomitants, which the senses present to us, and the intellect understands.

<Chapter 2>

Now this whole <collection of sciences> we have spoken of was discovered by speculation, not through language by speaking, nor by learning or teaching.⁵ But as far as the form of teaching and learning is concerned, that is, speaking, narrating, asking and answering, I hold that the first beginning of all the sciences is the science of language, that is, that concerning the imposition of the names of realities, namely, of substance and accident.

The second is the science of grammar, which is the science of ordering the names imposed on realities, and composing sentences and phrases (*orationes et locutiones*) that signify dispositions of substance, and the accidents following upon it.

The third is the science of logic, which is the science ordering propositions that assert something (*propositiones enuntiativas*) according to logical figures in order to elicit conclusions, and by which one arrives at cognition of the unknown, and at judgment concerning these <propositions> whether they are true or false.⁶

⁴This is so, of course, because *God* is the first cause, and so no further inquiry into *his* causes can be undertaken, except through a kind of mistake.

⁵A provocative remark. He apparently means that one comes to know each truth about a substance by viewing the concept of the substance one comes to have through abstraction from sensory cognition (however he takes it that occurs). No language is needed for any of this, only sensory cognition under suitable conditions, and the consequent intellectual understanding of the substance lying behind the sensible accidents.

⁶Given the monitory remark in the beginning of the chapter, this coming to know through logic, a discipline using language, must be considered as the coming to know that occurs as knowledge is passed on to a student, not the initial discovery of the knowledge, which happens without the aid of language, or, presumably, logic.

The fourth is the science of poetry, which is the science of ordering expressions (*dictiones*) according to "weight" and "consequence," that is, according to the proportions of the expressions and the times of their feet, in such a way that they are, say, either four or six or eight, and these are numbers terminating this and apt to that.

This, then, is the ordering of the sciences preceding the science of arithmetic, which afterwards is continued from it, as they are ordered beforehand.

Hence, let this be considered diligently and understood, as it is the opportunity compelling your soul to the sweetness of science and the love of truth, since through this you grasp whatever is secret and whatever is good, if God permits it.

<Chapter 3>

In order to bring our account to completion we must lay out a proof that in created things there is nothing except substance and accident alone.

For example, let a fruit be the substance and its redness its accident, so that we can make a proof concerning all through one case. I hold, then, that in created things there is nothing here except the fruit and its redness. The proof is this, that whatever is, it is either a per se existent or it is not a per se existent. This division arises through contradictories, between which a middle can neither be thought nor understood. Now an existent per se is what is called substance, for instance, a fruit or whatever is of that sort. What is not per se existent is what we call an accident, for instance the redness of the fruit and whatever is of that sort. It is established, then, that whatever comes into being, it is either a substance, like the fruit, or an accident, like the redness which subsists in the fruit, and this is what we intended to prove.⁷

Now after this it remains to prove that the creator of these is outside them, and that the one who gives being is other than these, God, beyond whom there is no <other> God, who is creator of substance and accident. But since from evident signs and convincing miracles this is obvious to the skilled, therefore we will not take care to produce a proof of this, especially since our intention is remote from this concern.

<Chapter 4>

⁷This goes some way toward confirming the author's rejection of real universals. The only things there are are substances and their accidents, and these exist and are capable coming into existence. Both of these characteristics would seem odd in real universals.

You should know that there are five sorts of material, namely earth, water, air, fire, and sky. Now sky, because it moves by its nature, moves the other four and mixes them and embraces them, since if the sky were not, neither would they be moved or mixed together. From their motion, then, and their mixture, substance is formed under the circle of the Moon into many figures, and changes from accident to accident, and from form to form, and from figure to figure--for instance, from triangle to quadrangle and the like, and from earth into water and the like, and from white to black and the like. But these are not changed in themselves, nor is its essence destroyed by the change of accidents in a substance, for from a change in accidents in it that substance is not itself destroyed, but the accidents of it are destroyed by the change in it.

Now the proof that the sky is a fifth material--this is because the sky is not hot, nor cold, nor wet, nor dry, nor heavy, nor light. Therefore its nature is outside the other four.

The division of the sciences at the highest level arises in the science of the sky, and the science of all that is contained under the sky, and the science of that which is beyond the sky.

Now the mass of substance that the sky contains, namely what is below the circle of the Moon, is made from fire and air, water and earth. This substance is always one, but its accidents alone are changed, from the four qualities, which are heat and cold, wetness and dryness. For example, the juice of food is turned into blood, and the food itself remains the same except that it is first liquefied and then turned into flesh. And since it is the same, it is figured by another figure and colored by a different color. In the same way this palm and this finger bone, and the man himself, is a permanent substance, and it is not changed except in figure and accidents. And for this reason, substance that is under the sphere of the Moon is said to be capable of destruction. Indeed, the substance of the sky is not changed except in place alone, nor is it formed into many forms, nor is it figured by many figures; and because of this it is proved that its mass is something other than the mass of this corruptible substance.⁸

Now what is beyond both this and that has neither mass nor material nor accident, but is separated from substances and accidents. This is God alone, who is blessed and elevated above all gods.

⁸This paragraph is not at all Aristotelian. His view seems to make the entire natural world a single substance, viewed in more or less the way Descartes viewed material substance. It is not clear if he thinks man is anything over and above the material side of him, but in any case, insofar as a man is material, the author is apparently suggesting that the substance a man is is not destroyed, but only changes its form, when a man dies. That is, the same stuff persists. So there is no real destruction or real coming to be in the sub-lunar world, but only accidental changes, but we say there is coming to be and destruction because there are more sorts of accidental change below the moon than above it, and qualitative change along with changes in figure lead us to say that something has come into being or been destroyed. Since above the moon there is only locomotion, there we say things are permanent.

Citations concerning Al Farabi from Albertus Magnus
Commentary on the Posterior Analytics

Book I

Tract I

Chapter 2: “Avicenna and al-Ghazali, and before them al-Farabi, proved that his book should immediately follow the *Prior Analytics*, if we consider the *Prior Analytics* to contain both categorical and hypothetical syllogism—that is, this book immediately follows the science of the formation of categorical and hypothetical syllogisms, including both conjunctive and disjunctive hypothetical syllogisms.” “And these things we have said are excerpted from the sciences of the Arabs, of which the commentary on this *Posterior Analytics*, from the views of al-Farabi, the Arab, has come down to us.”⁹

Chapter 3: “Now here an Arabic commentary puts in some things by al-Farabi that in my judgment are not necessary. For he says there is a certain singular in the senses, and a certain singular in the understanding. The singular in the senses is determinate material accident which is proper and incommutable, but he calls the singular in the understanding this form abstracted from this singular, which is that accident in the soul which is called a *habitus* or disposition. And it is singular through the individuation of the soul in which it is determined to singularity. Now al-Farabi calls that which is mixed and confused in the singular a universal in the senses, by which this man is a man, and this animal is an animal, and this wood is wood. But he calls that which the understanding makes in its universality from singulars which have been grasped the universal in the understanding, from this, that it sees one formula in all those which are grasped one by one, which are of one genus or species. And Avicenna and al-Ghazali and certain others seem to approve this opinion, which also I do not reproach, because it is held by many, and almost all the Latins also. But I say this, that this opinion does not agree with what Aristotle says, nor is it true in general . . .” (pp. 9–10)

Tract II

Chapter 1: “If anyone therefore <says?> that some other is truly a way of knowing, we will speak about it later, near the end of this book, where we speak of the knowledge of principles, which are also truly known as to the certainty of their terms, even though they do not have this way <being

⁹The views in question seem to be drawn from al-Ghazali, “Logica Algazelis. Introduction and Critical Text.” *Traditio* 21 (1965): 223–290. By Charles H. Lohr. (This is the 12th century translation of the section on logic from the *Maqasid al-falasifa*, “The Meanings of the Philosophers.”) and Avicenna, *Avicenna’s Treatise on Logic. Part One of Danesh-name Alai (A Concise Philosophical Encyclopedia) and Autobiography*. Edited and translated from the original Persian by Farhang Zabeeh. The Hague: Martinus Nijhoff, 1971. They concern the degrees of certainty in premisses, and specify that the premisses of a demonstration have the highest degree, that is, they are necessary. There are divisions into five degrees of certainty, and 13 degrees.

known> through demonstration, that they are known through the middle term of a demonstration. This opinion is affirmed in the Arabic commentary, for al-Farabi says that this other way of knowing is through the intelligence through which a reality is truly grasped.” (p. 22)

Chapter 11: “You should know that al-Farabi on this place in the commentary, following Porphyry and Alexander a little, holds a different view. He says that there are three ways of saying a subject *per se* of a predicate and a predicate of a subject.

And he posits the first way, which is the chief one, when in the nature of the principle and principiating it is as it is in the nature of what is principiated, and again when this is in the nature of the subject as the predicate is in it, as it is in the nature of the principiated through the essence as what principiates it is in it, as, for instance, in the nature of is what is in human being, and in the nature of human being it is as animal is in it, because the nature of animal is determined in actuality in human being, and the nature of human being is inchoate in animal and perfected in the rational. And because this way is also in the nature of the subject and the predicate, therefore it is primary and chief.

Now the second way is when in the nature and in the definition of the predicate indeed it is as it is said of the subject, and it is not in the nature of the subject as the predicate is said of it, for instance, as body and colored are related to one another. For in the nature of colored it is as it is said of a bounded body, because it is not except in a bounded body. But it is not in the nature or formula of body as it stands under colored, because it can be according to definition, and not stand under colored, and in this way able to laugh and human being are related, and generally speaking, passion and subject.

But the third way is as it is indeed in the nature of the subject as it is said to be predicated of it, and not in the nature of the predicate and the formula as it is in such a subject, for instance, death and beheading are related to one another <in this way>. For in the nature of beheading is as it is in it death, but in the nature of death there is not as it is in beheading, for death can occur without beheading. And these are the words of al-Farabi without addition and diminution, and without exposition.

Concerning the third way which Aristotle posits, al-Farabi says, Aristotle says primary substances are *per se*, and he understands primary substances to be individuals, which are either outside the understanding or in it. And they are called *per se*, not because they are predicates of another, but because they exist *per se* <i.e. by themselves>, not because they are essential to other things, and they are not contained under any of the three ways. But then he said it is *per se* as he showed because they are not accidental, although they are not subjects of demonstration. These are the words of al-Farabi and this seems to be more the understanding of Aristotle than all the others which have been given.” (p. 46–47)