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## ROBERT GROSSETESTE *ON LIGHT*

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### *OR THE BEGINNING OF FORMS*

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THE first corporeal form which some call corporeity<sup>1</sup> is in my opinion light. For light of its very nature diffuses itself in every direction in such a way that a point of light will produce instantaneously a sphere of light of any size whatsoever, unless some opaque object stands in the way. Now the extension of matter in three dimensions is a necessary concomitant of corporeity, and this despite the fact that both corporeity and matter are in themselves simple substances lacking all dimension. But a form that is in itself simple and without dimension could not introduce dimension in every direction into matter, which is likewise simple and without dimension, except by multiplying itself and diffusing itself instantaneously in every direction and thus extending matter in its own diffusion. For the form cannot desert matter, because it is inseparable from it, and matter itself cannot be deprived of form.—But I have proposed that it is light which possesses of its very nature the function of multiplying itself and diffusing itself instantaneously in all directions. Whatever performs this operation is either light or some other agent that acts in virtue of its participation in light to which this operation belongs essentially. Corporeity, therefore, is either light itself or the agent which performs the aforementioned operation and introduces dimensions into matter in virtue of its participation in light, and acts through the power of this same light. But the first form cannot introduce dimensions into matter through the power of a subsequent form. Therefore light is not a form subsequent to corporeity, but it is corporeity itself.

Furthermore, the first corporeal form is, in the opinion of the philosophers, more exalted and of a nobler and more excellent essence than all the forms that come after it. It bears, also, a closer resemblance to the forms that exist apart from matter. But light is more exalted and of a nobler and more excellent essence than all corporeal things. It has, moreover, greater similarity than all bodies to the forms that exist apart from matter, namely, the intelligences. Light therefore is the first corporeal form.

<sup>1</sup> According to Father Leo W. Keeler the reference here would seem to be to Philip the Chancellor, who was the first to use the 'form of corporeity' in the technical sense in which it appears here and throughout the *De Luce*. This Philip, according to Father Keeler's thesis, was one of Grosseteste's teachers at Paris. Cf. 'The Dependence of R. Grosseteste's *De Anima* on the *Summa* of Philip the Chancellor,' *The New Scholasticism*, XI, (1937), 218.

Thus light, which is the first form created in first matter, multiplied itself by its very nature an infinite number of times on all sides and spread itself out uniformly in every direction. In this way it proceeded in the beginning of time to extend matter which it could not leave behind, by drawing it out along with itself into a mass the size of the material universe. This extension of matter could not be brought about through a finite multiplication of light, because the multiplication of a simple being a finite number of times does not produce a quantity, as Aristotle shows in the *De Caelo et Mundo*.<sup>2</sup> However, the multiplication of a simple being an infinite number of times must produce a finite quantity, because a product which is the result of an infinite multiplication exceeds infinitely that through the multiplication of which it is produced. Now one simple being cannot exceed another simple being infinitely, but only a finite quantity infinitely exceeds a simple being. For an infinite quantity exceeds a simple being by infinity times infinity. Therefore, when light, which is in itself simple, is multiplied an infinite number of times, it must extend matter, which is likewise simple, into finite dimensions.

It is possible, however, that an infinite sum of number is related to an infinite sum in every proportion, numerical and non-numerical. And some infinities are larger than other infinities, and some are smaller. Thus the sum of all numbers both even and odd is infinite. It is at the same time greater than the sum of all the even numbers although this is likewise infinite, for it exceeds it by the sum of all the odd numbers. The sum, too, of all numbers starting with one and continuing by doubling each successive number is infinite, and similarly the sum of all the halves corresponding to the doubles is infinite. The sum of these halves must be half of the sum of their doubles. In the same way the sum of all numbers starting with one and multiplying by three successively is three times the sum of all the thirds corresponding to these triples. It is likewise clear in regard to all kinds of numerical proportion that there can be a proportion of finite to infinite according to each of them.

But if we posit an infinite sum of all doubles starting with one, and an infinite sum of all the halves corresponding to these doubles, and if one, or some other finite number, be subtracted from the sum of the halves, then, as soon as this subtraction is made, there will no longer be a two to one proportion between the first sum and what is left of the second sum. In-

<sup>2</sup> Throughout the *De Caelo et Mundo* Aristotle is at pains to show that a quantity cannot be produced by combining things which are without quantity. Thus it would be impossible, if two parts of a thing have no weight, that the two together should have weight (III, 1, 299 a 25-30). Grosseteste, however, interprets Aristotle to mean only that a *finite* multiplication of the simple will *not* produce a quantity, thereby leaving the way open for Grosseteste's own notion that an *infinite* multiplication of the simple *will* produce a quantity. Cf. also *De Caelo et Mundo*, I, 5-7, 271 b 1 -276 a 17.

deed there will not be any numerical proportion, because if a second numerical proportion is to be left from the first as the result of subtraction from the lesser member of the proportion, then what is subtracted must be an aliquot part or aliquot parts of an aliquot part of that from which it is subtracted. But a finite number cannot be an aliquot part or aliquot parts of an aliquot part of an infinite number. Therefore when we subtract a number from an infinite sum of halves, there will not remain a numerical proportion between the infinite sum of doubles and what is left from the infinite sum of halves.

Since this is so, it is clear that light through the infinite multiplication of itself extends matter into finite dimensions that are smaller and larger according to certain proportions that they have to one another, namely, numerical and non-numerical. For if light through the infinite multiplication of itself extends matter into a dimension of two cubits, by the doubling of this same infinite multiplication it extends it into a dimension of four cubits, and by the dividing in half of this infinite multiplication, it extends it into a dimension of one cubit. Thus it proceeds according to numerical and non-numerical proportions.

It is my opinion that this was the meaning of the theory of those philosophers who held that everything is composed of atoms, and said that bodies are composed of surfaces, and surfaces of lines, and lines of points.<sup>3</sup> This opinion does not contradict the theory that a magnitude is composed only of magnitudes, because for every meaning of the word whole, there is a corresponding meaning of the word part. Thus we say that a half is part of a whole, because two halves make a whole. We say, too, that a side is part of a diameter,<sup>4</sup> but in a different sense, because no matter how many times a side is taken it does not make a diameter, but is always less than the diameter. Again we say that an angle of contingence<sup>5</sup> is part of a right angle because there is an infinite number of angles of contingence in a right angle, and yet when an angle of contingence is subtracted from a right angle a finite number of times the latter becomes smaller. It is in a different sense, however, that a point is said to be part

<sup>3</sup> Aristotle in the *De Caelo et Mundo*, III, 1, 299 a 2 - 300 a 19, attributes this theory to Plato in the *Timaeus* (54d-55b), although he may also have had in mind the Pythagoreans whom he mentions immediately after. In fact, Diogenes Laertius, *Lives of Eminent Philosophers*, VIII, 25, attributes the theory directly to Pythagoras. Grosseteste seems to be aware of Aristotle's criticism of the theory, for he tries in the next sentence to reconcile it with Aristotle's dictum that a magnitude is composed only of magnitudes. Cf. note 2 above.

<sup>4</sup> The reference would seem to be to one of the two shorter sides of a right triangle inscribed in a semi-circle, the diameter of which is the hypotenuse of the triangle. No matter how much either of these sides is extended it will never equal the diameter until it becomes identical with it, in which case there is no longer a triangle.

<sup>5</sup> Grosseteste explains what an 'angle of contingence' is in his *De Lineis, Angulis, et Figuris* (Baur, p. 61). It is the infinitesimal angle between the circumference of a sphere and its tangent.

of a line in which it is contained an infinite number of times, for when a point is taken away from a line a finite number of times this does not shorten the line.

To return therefore to my theme, I say that light through the infinite multiplication of itself equally in all directions extends matter on all sides equally into the form of a sphere and, as a necessary consequence of this extension, the outermost parts of matter are more extended and more rarefied than those within, which are close to the center. And since the outermost parts will be rarefied to the highest degree, the inner parts will have the possibility of further rarefaction.

In this way light, by extending first matter into the form of a sphere, and by rarefying its outermost parts to the highest degree, actualized completely in the outermost sphere the potentiality of matter, and left this matter without any potency to further impression. And thus the first body in the outermost part of the sphere, the body which is called the firmament, is perfect, because it has nothing in its composition but first matter and first form. It is therefore the simplest of all bodies with respect to the parts that constitute its essence and with respect to its quantity which is the greatest possible in extent. It differs from the genus body only in this respect, that in it the matter is completely actualized through the first form alone. But the genus body, which is in this and in other bodies and has in its essence first matter and first form, abstracts from the complete actualization of matter through the first form and from the diminution<sup>6</sup> of matter through the first form.

When the first body, which is the firmament, has in this way been completely actualized, it diffuses its light (*lumen*) from every part of itself to the center of the universe. For since light (*lux*) is the perfection of the first body and naturally multiplies itself from the first body, it is necessarily diffused to the center of the universe. And since this light (*lux*) is a form entirely inseparable from matter in its diffusion from the first body, it extends along with itself the spirituality of the matter of the first body. Thus there proceeds from the first body light (*lumen*), which is a spiritual body, or if you prefer, a bodily spirit. This light (*lumen*) in its passing does not divide the body through which it passes, and thus it passes instantaneously from the body of the first heaven to the center of the universe. Furthermore, its passing is not to be understood in the sense of something numerically one passing instantaneously from that heaven to the center of the universe, for this is perhaps impossible, but its passing takes place through the multiplication of itself and the infinite

<sup>6</sup> The first form is said to 'diminish' matter when instead of rarefying it and extending it to the full it leaves it more dense, as with the inner parts of the sphere. Cf. *De Motu Corporali et Luce* (Baur, p. 92): 'Quando vero congregatur lux in se cum corpulentia materiae, fit condensatio vel diminutio.'

generation of light (*lumen*). This light (*lumen*), expanded and brought together from the first body toward the center of the universe, gathered together the mass existing below the first body; and since the first body could no longer be lessened on account of its being completely actualized and unchangeable, and since, too, there could not be a space that was empty, it was necessary that in the very gathering together of this mass the outermost parts should be drawn out and expanded. Thus the inner parts of the aforesaid mass came to be more dense and the outer parts more rarefied; and so great was the power of this light (*lumen*) gathering together—and in the very act of gathering, separating—that the outermost parts of the mass contained below the first body were drawn out and rarefied to the highest degree. Thus in the outermost parts of the mass in question, the second sphere came into being, completely actualized and susceptible of no further impression. The completeness of actualization and the perfection, of the second sphere consist in this that light (*lumen*) is begotten from the first sphere and that light (*lux*) which is simple in the first sphere is doubled in the second.

Just as the light (*lumen*) begotten from the first body completed the actualization of the second sphere and left a denser mass below<sup>7</sup> the second sphere, so the light (*lumen*) begotten from the second sphere completed the actualization of the third sphere, and through its gathering left below this third sphere a mass of even greater density. This process of simultaneously gathering together and separating continued in this way until the nine heavenly spheres were completely actualized and there was gathered together below<sup>8</sup> the ninth and lowest sphere the dense mass which constitutes the matter of the four elements. But the lowest sphere, the sphere of the moon, which also gives forth light (*lumen*) from itself, by its light (*lumen*) gathered together the mass contained below itself and, by gathering it together, thinned out and expanded its outermost parts. The power of this light (*lumen*), however, was not so great that by drawing together it could expand the outermost parts of this mass to the highest degree. On this account every part of the mass was left imperfect and capable of being gathered together and expanded. The highest part of this mass was expanded, although not to the greatest possible extent. Nevertheless by its expansion it became fire, although remaining still the matter of the elements.<sup>9</sup> This element giving forth light from itself and drawing together the mass contained below it expanded its outermost parts, but not to as great an extent as the fire was expanded, and in this way it produced air. Air, also, in bringing forth from itself, a spiritual

<sup>7</sup> Reading 'infra' with *R F D*.

<sup>8</sup> Reading 'infra' with *F*.

<sup>9</sup> Omitting with *V* 'et sic produxit . . . disgregatione.'

body or a bodily spirit, and drawing together what is contained within itself, and by drawing together, expanding its outer parts, produced water and earth. But because water retained more of the power of drawing together than of the power of expanding, water as well as earth was left with the attribute of weight.

In this way, therefore, the thirteen spheres of this sensible world were brought into being. Nine of them, the heavenly spheres, are not subject to change, increase, generation or corruption because they are completely actualized. The other four spheres have the opposite mode of being, that is, they are subject to change, increase, generation and corruption, because they are not completely actualized. It is clear that every higher body, in virtue of the light (*lumen*) which proceeds from it, is the form (*species*) and perfection of the body that comes after it. And just as unity is potentially every number that comes after it, so the first body, through the multiplication of its light, is every body that comes after it.

Earth is all the higher bodies because all the higher lights come together in it. For this reason earth is called *Pan* by the poets, that is 'the whole,' and it is also given the name *Cybele*, which is almost like *cubile*, from cube (*cubus*) that is, a solid.<sup>10</sup> The reason for this is that earth, that is to say, *Cybele*, the mother of all the gods, is the most compact of all bodies, because, although the higher lights are gathered together in it, nevertheless they do not have their source in the earth through its own operations, but the light (*lumen*) of any sphere whatever can be educed from it into act and operation. Thus every one of the gods will be begotten from it as from a kind of mother. The intermediate bodies have a twofold relationship. Towards lower bodies they have the same relation as the first heaven has to all other things, and they are related to the higher bodies as earth is related to all other things. And thus in a certain sense each thing contains all other things.<sup>11</sup>

The form (*species*) and perfection of all bodies is light, but in the higher bodies it is more spiritual and simple, whereas in the lower bodies it is more corporeal and multiplied. Furthermore, all bodies are not of the same form (*species*) even though they all proceed from light, whether simple or multiplied, just as all numbers are not the same in form (*species*) despite the fact that they are all derived from unity by a greater or lesser multiplication.

<sup>10</sup> Cf. Aristotle, *De Caelo et Mundo*, III, 8, 307 a 8-9, where this doctrine of the earth as cube is attributed to Plato in the *Timaeus* (55d-e).

<sup>11</sup> This principle Grosseteste could have found in Pseudo-Dionysius, *De Divinis Nominibus*, IV, 7. Dionysius took it over from Proclus, *Elements of Theology*, prop. 103. Cf. the illuminating history of this formula in Greek philosophy, in Dodds, *Proclus, the Elements of Theology*. (Oxford: Clarendon Press, 1933), p. 254.

This discussion may perhaps clarify the meaning of those who say that 'all things are one by the perfection of one light' and also the meaning of those who say that 'things which are many are many through the multiplication of light itself in different degrees.'<sup>12</sup>

But since lower bodies participate in the form of the higher bodies, the lower body because it participates in the same form as the higher body, receives its motion from the same incorporeal moving power by which the higher body is moved. For this reason the incorporeal power of intelligence or soul, which moves the first and highest sphere with a diurnal motion, moves all the lower heavenly spheres with this same diurnal motion. But in proportion as these spheres are lower they receive this motion in a more weakened state, because in proportion as a sphere is lower the purity and strength of the first corporeal light is lessened in it.

But although the elements participate in the form of the first heaven, nevertheless they are not moved by the mover of the first heaven with a diurnal motion. Although they participate in that first light, they are not subject to the first moving power since that light in them is impure, weak, and far removed from the purity which it has in the first body, and also because they possess the denseness of matter which is the principle of resistance and stubbornness. Nevertheless, there are some who think that the sphere of fire rotates with a diurnal motion, and they take the rotating motion of comets to be an indication of this. They say also that this motion extends even to the waters of the sea, in such a way that the tide of the seas proceeds from it. But all sound philosophers say that the earth is free from this motion.

In this same way, too, the spheres that come after the second sphere, which is usually called the eighth when we compute from the earth upward, all share in the motion of this second sphere because they participate in its form. Indeed this motion is proper to each of them in addition to the diurnal motion.

But because the heavenly spheres are completely actualized and are not receptive of rarefaction or condensation, light (*lux*) in them does not incline the parts of matter either away from the center so as to rarefy them, or toward the center to condense them. On this account the heavenly spheres are not receptive of up or down motion but only of circular motion by an intellectual moving power, which by directing its glance upon them in a corporeal way revolves the spheres themselves in a circular corporeal motion. But because the elements are incompletely actualized and subject to rarefaction and condensation, the light (*lumen*) which

is in them inclines them away from the center so as to rarefy them, or toward the center so as to condense them. And on this account they are naturally capable of being moved in an upward or downward motion.

The highest body, which is the simplest of all bodies, contains four constituents, namely form, matter, composition and the composite. Now the form being the simplest holds the position of unity. But matter on account of its twofold potency, namely its susceptibility to impressions and its receptiveness of them, and also on account of its denseness which belongs fundamentally to matter but which is primarily and principally characteristic of a thing which is a duality, is rightly allotted the nature of a duality. But composition has a trinity in itself because there appears in it informed matter and materialized form and that which is distinctive of the composition, which is found in every composite as a third constituent distinct from matter and form. And that which is the composite proper, over and above these three constituents, is classed as a quaternary. There is, therefore, in the first body, in which all other bodies exist virtually, a quaternary and therefore the number of the remaining bodies is basically not more than ten. For the unity of the form, the duality of the matter, the trinity of the composition and the quaternity of the composite when they are added make a total of ten. On this account ten is the number of the bodies of the spheres of the world, because the sphere of the elements, although it is divided into four, is nevertheless one by its participation in earthly corruptible nature.

From these considerations it is clear that ten is the perfect number in the universe, because every perfect whole has something in it corresponding to form and unity, and something corresponding to matter and duality, something corresponding to composition and trinity, and something corresponding to the composite and quaternity. Nor is it possible to add a fifth to these four. For this reason every perfect whole is ten.

On this account it is manifest that only five proportions found in these four numbers, one, two, three, four, are suited to composition and to the harmony that gives stability to every composite. For this reason these five proportions are the only ones that produce harmony in musical melodies, in bodily movements, and in rhythmic measures.

This is the end of the treatise on light of the Bishop of Lincoln.

<sup>12</sup> I have not been able to find the source of these quotations. They have, however, a decidedly neo-Platonic savor. Cf. in particular Pseudo-Dionysius, *De Divinis Nominibus*, IV, 4-6.