

LIGHT

In the beginning God created the heavens and the earth. And the earth was void and empty and there was darkness over the face of the deep. And the spirit of God moved over the waters. And God said: *Let there be light*. And light was made.

Genesis I: 1-3

What reality is more critical in our lives than light? It is hardly less important than existence itself. And yet how shall we understand it? Or define it? Its reality is only balanced by its ethereality, its intangibility. Science can hypothesise about light, but its observations are limited to, well... observations. It cannot tell us anything about light's essence. What has metaphysics to say?

Let us note first that science and metaphysics are not mutually incompatible. Each discipline has information and analysis it can provide the other to their mutual advantage and to the benefit of mankind. But science suffers from an intellectual problem caused by its adherence to the erroneous philosophy of materialism. By definition, nothing is *no thing*: it does not exist. But modern science allows that non-being does exist, for by the names 'space', 'vacuum', or 'void', it conceives of non-existence as if it is a reality.

Despite his insistence to the contrary, the materialist scientist is insouciant about causes. The root of his conduct lies in another intellectual defect, one that tends to balance his acceptance of materialism's facile postulates—*subjectivism*. Subjectivism breaches a fundamental rule of Logic. It treats being which exists only in mind, mental being, as real being, and inclines its adherents to move between the one and the other—between the objective and the subjective orders—as if they were interchangeable. Thus the modern scientist thinks nothing of interpolating in the *intellectual* consideration of critical questions, the operations of his imagination. Because he can *imagine* nothing existing, he is prepared to allow that it does exist. That he is admitting the impossible never occurs to him.

Nothing does not exist. It follows that whatever there is between the earth and the sun, between earth and the furthest star, between the atom and its electrons, even if experimentally undetectable, it must be *something*, a material substance.¹

It should be noted that (because of the influence of materialism in the modern world) neither the scientist nor the man in the street understands the term *substance* in its proper sense. He thinks that mass or bulk is essential to its definition: it is not.

¹ A further argument appears in St Thomas's discussion of the senses in Lecture XIV n. 20 of his Commentary on Aristotle's *De Anima*. Every sense, he shows, requires a certain touch. This applies to the sense of sight no less than for the other four senses. In the senses which operate at a distance from their object (chiefly hearing and sight) there must be a medium, a material continuum, between the organ and the object. If we are able to see the light from a star it can be only because there is an uninterrupted material medium between the eye and the star. Therefore it is impossible that this continuum could be breached.

Etymologically, *substance* means “that which stands under [some appearance]”². In Latin the word (*substantia*) is a synonym for *essence*—that of which a thing consists. This says nothing about mass, or experimental detectability. Metaphysics, under Aristotle’s influence, uses the term to signify something cognate to its nominal meaning. *Substance* is something which exists in itself: substance = *be in self*.³

This reality is to be contrasted with the reality of what metaphysics calls *accident*, something which exists only *in something else* (accident = *be in other*). One never sees the colour blue, for instance, except *in something*, whether the sea, the sky, a flower, or a painted surface. One never experiences heat except in some substance, like air, or water. Each of colour and heat is an accident, the species of accident called *quality*.⁴ *Quality* is the accident that qualifies or determines a substance in some manner, as e.g., in its power, shape, colour or temperature.

Both Aristotle and St Thomas teach that light is not a substance, but an accident, a *quality*. Just as we never experience heat save in something hot, neither do we experience light save in something lit. We perceive light in diaphanous things; in earth’s atmosphere and in water; in fluids like turpentine, or alcohol; in glass, diamond, and other precious and semi-precious stones. Since each appears to participate to some extent in light’s nature, it is tempting to insist that light is a quality of each.⁵ A closer consideration of diaphanous substances reveals that they resemble the opaque in that they manifest colour, but much more subtly than the opaque. They may be reduced, then, to the particulated (or rarefied) opaque. Accordingly, though we speak as if light is a quality of the diaphanous, strictly it is not, even of the most etiolated of them. Of what substance, then, is light properly the quality?

St Thomas distinguishes light into two categories; the light emitted from a source (which he calls *lux*); and reflected, or dissipated, light (which he calls *lumen*). Now, all *lumen* is reduced to *lux*, as every effect is reduced to its cause. Of what substance, then, is *lux* the quality. St Thomas teaches:

“Light is a quality of first altering body, the most perfect and least material of all bodies...”⁶

What is this “first altering body”? Aristotle identified it some 400 years before Christ. He called it “first body”, or *aether*. We have set out in another article on this website a consideration of *aether*’s attributes.⁷ Aristotle says:

² From the Latin verb *substo, substare*, to stand under.

³ Cf. *Metaphysics* Ch. 10, nn. 1017b et seq. *Commentary on the Metaphysics*, Bk. V, Lesson 10.

⁴ The word *quality* is derived from the Latin adjective *qualis, quale* (of what kind).

⁵ In contrast, the opaque surfaces of material things do not appear to participate in light’s nature save in rare instances, luminescent bodies whose luminescence is stimulated by the action of light, or by what science refers to generally as “electromagnetic energy”. Rather, light has the effect of manifesting in them their proper quality, colour. This may be thought a participation in light’s nature but it is so only *secundum quid*, i.e., improperly.

⁶ *In II De Anima* lect. XIV, n. 24.

⁷ *Science and Aristotle’s Aether*, http://www.superflumina.org/ether_science.html, which is a commentary on Christopher A Decaen’s *Aristotle’s Aether and Contemporary Science*, *The Thomist* 68 (2004): 375-429. The present article should be read congruently with that, and with the teachings of

“Clearly there exists something transparent... But transparency does not depend on air or water as such, but on the same quality being found in both, and in the eternal sphere above as well. Light is the act of [the transparent]... [It] is a kind of colour of the transparent in so far as this is actualized by fire or something similar to the heavenly body; which contains indeed something of one and the same nature as fire.”⁸

St Thomas comments —

“[J]ust as the corporeal elements have certain active qualities through which they act, so light is the active quality of the heavenly body through which it acts. It falls within the third species of quality, like heat.”⁹

Light is then, according to these philosophers, a quality not of any earthly substance, but of ‘the heavenly body’, Aristotle’s *aether*.

The thoughtful reader will immediately see that there is a problem. If *aether* is confined to the heavens, how can light, *aether*’s proper quality, be seen in earth’s atmosphere? There appear to be two explanations. Either diaphanous substances (air, water, glass, precious stones, etc.) participate in the quality proper to *aether*, or else *aether* is present in the midst of diaphanous substances; in other words, *aether* is not, as the philosophers thought, confined to the heavens, but is universal.

The First View

Aristotle expresses the first view where, in the passage quoted above, he says:

“Neither air nor water is transparent because it is air or water. Each is transparent because there is contained in it a certain quality which is the same in both and is also found in the eternal upper body.”¹⁰

Commenting on this, and on earlier material where Aristotle deals with colour and the visible, St Thomas says:

“[I]t is evident that neither air nor water nor anything of that sort is actually transparent (*transparens*) unless it is illuminated. Of itself the transparent (*diaphanum*) is in potency to both light and darkness (the latter being a privation of light) as primary matter is in potency both to form, and the privation of form.”¹¹

While Aristotle uses the one Greek word, *diaphanes*, to signify ‘the transparent’, St Thomas introduces a second in the Latin: he distinguishes *transparens*, ‘the transparent’, from *diaphanum*, ‘the diaphanous’.¹² He does so, it would seem, to contrast the heavenly matter, *aether*, with the mundane (air, water, glass, etc.). His distinction of the heavenly matter from the earthly may be seen in this quote from his commentary on the second book of Aristotle’s *De Caelo*:

“The celestial bodies are far from us not only according to quantity of spatial distance, but even more so in that few of their accidents fall under our senses, while it is nevertheless connatural to us that we proceed from accidents, i.e., sensibles, to

Aristotle and St Thomas reproduced in the article, *Light: Aristotle & St Thomas*, also published on this website at http://www.superflumina.org/PDF_files/light_aristotle_st%20thomas.pdf

⁸ *De Anima*, Bk. II, Pt. 7

⁹ In *II De Anima* lect. XIV, n. 22: Unde dicimus, quod sicut corpora elementaria habent qualitates activas, per quas agunt, ita lux est qualitas activa corporis caelestis, per quam agit, et est in tertia specie qualitatis sicut et calor.

¹⁰ *De Anima*, Bk. II, Pt. 7.

¹¹ In *II De Anima*, lect. XIV, n. 7

¹² Though, in places, he seems to see no difference between the two, as e.g., in Lecture XIV, n. 5: “The diaphanous is the same as the transparent (e.g. air or water)...”

cognising the nature of some thing... But the accidents of the celestial body are of a different notion altogether [*alterius rationem*] and are wholly disproportionate to the accidents of inferior bodies.”¹³

St Thomas, as we have noted above, takes a further step: he distinguishes the light which is produced in a source, such as the sun, or stars, or earthly fire, which he calls *lux*, from the light which is found in diaphanous substances like air or water, which he labels *lumen*. He ascribes *lux* chiefly to the transparent and restricts *lumen* to the diaphanous.¹⁴ These distinctions are a valuable addition to Aristotle’s thinking, and as we will see, they seem to be confirmed by the discoveries of modern science.

The Second View

The second view, (the present author’s thesis), grounded in the assertion of *aether*’s universality is that it is *aether*, and only *aether*, which is the medium of light’s transmission. Its universality is hinted at by American philosopher, Christopher A Decaen in his landmark paper, *Aristotle’s Aether and Contemporary Science*,¹⁵ where he considers modern science’s postulate of a ‘vacuum’ as part of the theory of quantum electrodynamics. The present author contends that even in the diaphanous (air, water, glass, diamond and other stones) where light is dispersed (i.e., *lux* becomes *lumen*) and colour appears, it is *aether* present in the diaphanous media which transmits light and enables us to see. Pursuant to this thesis, light, that most immaterial of material qualities, is proportioned (and proportioned only) to the most immaterial of material substances, *aether*.

The chief objection to the thesis is this: it is impossible for two bodies to be in the same place at the same time. This principle does not, of course, prevent the contiguous. It allows for fish moving through the sea, for silt muddying the waters of a river, for birds flying through the air, and dust penetrating the earth’s atmosphere. Why, then, should it prevent the contiguity with every element of common material being of a substance so subtle that it cannot be detected experimentally?

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It seemed to St Thomas, as it had seemed to Aristotle 1,600 years prior, that ‘the heavenly body’ was comprised not only of the transparent matrix but also of the sun,

¹³ *In II De Caelo*, lect. IV, n. 3. St Thomas uses the expression “the celestial body” in two senses here as is explained hereafter.

¹⁴ *In II De Caelo*, lect. IV, n. 3. An accident of history may have served to precipitate the distinction. St Thomas did not see Aristotle’s original Greek text, but a Latin translation effected by his fellow Dominican, William of Moerbeke. It may have been William exercising the prerogative of the translator who first rendered Aristotle’s one term in the Greek with the two terms used by St Thomas in the Latin. There is evidence of this in those places where St Thomas quotes Aristotle apparently from the Latin text before him, as e.g., at L. XIV, n. 6, “Secundo determinat de lumine, quod est actus eius, ibi, *lumen autem est huius actus et cetera*”; and at L. XIV, n. 7: “Deinde cum dicit *lumen autem*...” I have placed what St Thomas attributes to Aristotle in italics.

¹⁵ *Aristotle’s Aether and Contemporary Science*, *The Thomist* 68 (2004): 365-429.

stars and planets ('the wandering stars') it contained. Thus, in Lecture XIV n. 6 of his Commentary on Aristotle's *De Anima*, he says:

"For at least some celestial bodies are manifestly transparent. We should not be able to see the fixed stars of the eighth sphere unless the lower spheres of the planets were transparent or diaphanous."¹⁶

And, in Lecture XIV n. 7 he says:

"[T]o be enlightened and illuminating is common to fire and the celestial body, just as to be diaphanous is common to air and water and to the celestial body."¹⁷

He uses 'celestial body' (*corpus caelesti*) in two different ways here. The first refers to lucent bodies (*corpora lucentia*) such as sun, stars and planets. The second refers to the heavenly matrix, *aether*, in which they appear. Here he uses the singular in each case. In the earlier passage from the same text cited above (lect. IV, n. 3), he uses the plural for the first and the singular for the second.¹⁸

The reasoning that the heavenly substance was not simply (i.e., unmixedly) transparent seems to be this, that it contained the heavenly lights. But we, blessed with the advantages of modern science, know two things (among innumerable others) that the two philosophers did not know, namely:

- o that 'the heavenly bodies', St Thomas's *corpora lucentia*, are no different in composition from those on earth and, in the case of the sun and stars, they differ from mundane fire only in degree of heat and mass; and,
- o that the distances of the stars (and even of the planets and the sun) from our eyes are inconceivably great.

What follows? First, 'the heavenly bodies' are not part of the heavenly substance at all, but are located in that substance like the rest of common material being. Second, it is impossible that the lights of 'the heavenly bodies' could be conveyed to our eyes if the substance through and by which they are transmitted to us shared in the nature of even the most refined of diaphanous substances, air. For even at its most refined, the diaphanous will eventually obscure the light that passes through it. The closest star to us is *alpha centauri*, 4.37 light years away¹⁹. In other words, it takes the light emitted by this star and travelling at 299,792.458 kilometres per second 4.37 years to reach our eyes. It is, then, somewhat more than 41 million, million kilometres away. If that material substance was even the most rarified of common material substances, the light would never arrive. *Aether* must, then, as Christopher A Decaen has argued, be transparent by essence.

¹⁶ *In II De Caelo*, lect. XIV, n. 6. Manifestum est enim aliqua caelestia corpora esse diaphana. Non enim possemus videre stellas fixas, quae sunt in octava sphaera, nisi inferiores sphaerae planetarum essent transparentes, vel diaphanae.

¹⁷ *In II De Caelo*, lect. XIV, n. 7. Esse enim lucens actu et illuminativum, commune est igni et corpori caelesti, sicut esse diaphanum est commune aeri et aquae, et corpori caelesti.

¹⁸ *Corpora autem caelestia* non ita sunt longe a nobis tanto... Hanc autem elongationem dicit multo maiorem esse quam localem: quia si consideremus localem distantiam, aliqua proportio est distantiae qua distat a nobis *corpus caeleste*, ad distantiam qua distat a nobis aliquod inferiorum corporum, puta lapis aut lignum, et utraque distantia est unius generis; sed accidentia *caelestium corporum* sunt alterius rationis, et omnino improportionata accidentibus inferiorum corporum. [emphases added]

¹⁹ Actually, a combination of three stars which appear to the naked eye to be one star.

Diaphanous substances are not *per se* transparent. Indeed, they seem to be a mixture of the transparent and the opaque. The air in earth's atmosphere when lit by the sun always displays colour; now blue, now gray, now pink or red, depending on the atmospheric conditions obtaining, the colour of the sea (itself determined by the presence or absence of cloud cover) and the admixture of moisture, dust or other matter. In other words, diaphanous substances are transparent only in a qualified sense. *Aether*, on the other hand, is transparent by essence. It is not lit by the light it carries.²⁰ Indeed, light is invisible until it strikes a *corporis terminatum*, i.e., the surface of an extended common material body, whether opaque or diaphanous. This characteristic invisibility of light was noted by the Doctor of the Catholic Church, St John of the Cross [1542-1591], in his mystical treatise *The Ascent of Mount Carmel*. It is implicit in the teachings of Aristotle and St Thomas but, so far as the writer is aware, was never expressed by either of them.

Here is a synopsis of the teachings of the two philosophers and of the discoveries of modern science with the author's interpretation of their significance.

- Light is not a *substance*; i.e., it is not, as one scientific hypothesis has it, a body.
- Light is an accident, a *quality*, not of any substance at all, but of *aether*, and only of *aether*.
- Light in a source is properly termed *lux*.
- In *aether* (the transparent) light is invisible.
- Light becomes visible only when it strikes a *corporis terminatum*, the surface of some element of common material being, whether opaque or diaphanous, or its proper organ of reception, the eye.
- Light in the diaphanous is properly termed *lumen*.
- Light is to the diaphanous what colour is to common material being.²¹
- Light is an active quality (in particular, for living things), as *aether*, its proper substance, is an active substance.²²
- Light (i.e., white light) contains all colour virtually.
- Light activates colour in the *corporis terminatum* via the instrumentality of the diaphanous which acts as a virtual prism.²³

Is Light In Fact Invisible?

There is a further possibility flowing from the interchange between metaphysics and science, namely, that like all the other forms of what science calls

²⁰ Further consideration will show that *aether* is not affected in any way by the other species of electromagnetic energy it carries. Nor, indeed, are any of these elements of energy detectable in it. They are detectable only, after transmission from their source, in a recipient.

²¹ Here I modify the teaching of St Thomas that contrasts light *in the transparent* with colour in common material being by insisting more radically on his distinction between *the transparent* and *the diaphanous*. Light (i.e., as *lux*) is invisible in *aether*, the transparent; it is visible, as *lumen*, in the diaphanous (air or water). It is to its presence *in the diaphanous*, I argue, that St Thomas was referring.

²² For a consideration of the activity of the heavenly substance, see *Science and Aristotle's Aether*, at http://www.superflumina.org/ether_science.html

²³ Underwater photography under artificial light at depths in the ocean which prevent the penetration of atmospheric light shows that other diaphanous materials (e.g., sea water) provide this function in the same way as air.

“electromagnetic energy” transmitted in *aether*, light is invisible *per se*. If this be the case, what we call ‘light’ (*lux*) is simply primary colour, white, in varying degrees of splendour excited in a source by this invisible active quality. It is dissipated (as *lumen*) in the diaphanous which acts as a virtual prism eliciting the colour present in every bodily surface (*corporis terminatum*). When *lux* strikes a *corporis terminatum* in the absence of the diaphanous it is reflected only in primary colour (white) though the surface’s proper colours affect the reflection by diminishing its purity so that the object lit appears, as we would say, in black and white. This phenomenon is manifest in photographs of the moon’s surface and of the exterior of artificial ‘space stations’²⁴.

St Thomas considered this ancillary issue in his Commentary on the *De Anima*:

“[S]ome have simply identified light with the manifestation of colour. But this appears clearly to be false in the case of things that shine by night while their colour is hidden.”²⁵

But this objection will not stand if white is understood as primary colour, that is, the matrix in which all other colours are virtually contained. Before the time of Newton it was thought that a prism produced colour from white light. By using prisms against each other Newton demonstrated that all colours emanate from, and are virtually contained in, white light. In this he demonstrated experimentally the truth enunciated by St Thomas 450 years before, that—

“light (*lux*) is, in a certain manner, the very substance of colour...”²⁶

Should this assertion be demonstrated in the fulness of time to be true, so close is the identification between light and its proper effects there could be little difficulty in continuing to ascribe to these effects the name ‘light’.

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Confirmation in Divine Revelation?

The words quoted in the anagraph at the head of this paper are the very first words in the Book of *Genesis*, Almighty God’s revelation to mankind. The accepted interpretation of the passage is that by ‘the heavens’ is meant the great and lesser lights of the heavens, and by ‘the earth’ the planet on which we live. A critic might object on the basis that the interpretation places the light producing heavenly bodies *before* the creation of light, though the answer may be that the heavenly bodies were created before their Author enabled them to produce light—and certainly they are prior, ontologically, to the light they produce.

But there may be another interpretation consistent with the arguments advanced here. By the expression ‘the heavens’, the Divine Author may refer to the matrix, the great sea, in which the whole of His material creation was to be established—*aether*;

²⁴ But not their interiors which are filled with an artificial atmosphere, a diaphanous medium.

²⁵ *In II De Anima* Bk II, lecture XIV, n. 21 § 419. Quidam vero dixerunt quod lumen non est nisi evidentia coloris. Sed hoc aperte apparet esse falsum in his quae lucent de nocte, et tamen eorum color occultatur.

²⁶ *In II De Anima*, Lecture XIV, n. 28

and by 'the earth', to the whole of common material being with which He peopled it, including the sun, the stars and the planets. The order indicated in the text is significant: first He created 'the heavens', then 'the earth'. If *aether* is as crucial to the existence of common material being as has been advanced in this and in the previous paper on this website, it is prior to all of common material being and, ontologically, must have been created first.²⁷

The writer hopes this paper will serve to stimulate discussion on the topics by metaphysicians and scientists alike.

Michael Baker

29th September 2009 — *Sts Michael, Gabriel and Raphael, Archangels*

²⁷ Note that this does not mean that the two were not created together in time. On the distinction between the ontological and the temporal orders, see the author's paper *St Augustine & St Thomas on Creation* at http://www.superflumina.org/PDF_files/creation_sts_augustine_thomas.pdf