

SPIRITUALITY IN SCIENCE — THE REVELATION OF RELATIVITY

I begin with a quote from Brian Greene, Professor of Physics and Mathematics at Columbia and Cornell Universities in the United States:

“In moments of loss I’ve taken comfort from the knowledge that all events exist eternally in the expanse of space and time, with the partition into past, present and future being a useful but subjective organization.

The choice, however, of whether to be fully seduced by the face nature reveals directly to our senses, or to also recognize the reality that exists beyond perception, is ours.”

I want to take a tentative step into that reality that exists beyond perception by looking at some relationships between religion and the Theory of Relativity by way of the medium of light.

Light is the most fundamental entity in sciences repertoire and religion associates light with the most fundamental entity in its repertoire, ie God itself which suggests that science and religion may have more in common than is generally acknowledged.

I want to look at what science and particularly the Theory of Relativity has to say in relation to light, and how that might reflect on the way in which we interpret the nature of God. We will see that science corroborates some areas of religion, that relativity makes a statement about eternal life and that there is a mathematical statement by which we can represent God. We will find a relationship between the Trinity and nuclear reactions, and deduce equations which reach back to the Psalms. In some places I draw a long bow but in others I may be much closer to the mark. That is for you to decide.

Apart from the association with light there are other characteristics generally attributed to god, four of which I focus on and which link to the scientific understanding of light. I have attached each of these attributes to a scientist instrumental in the story of light and the development of the theory of relativity.

God is beyond comprehension

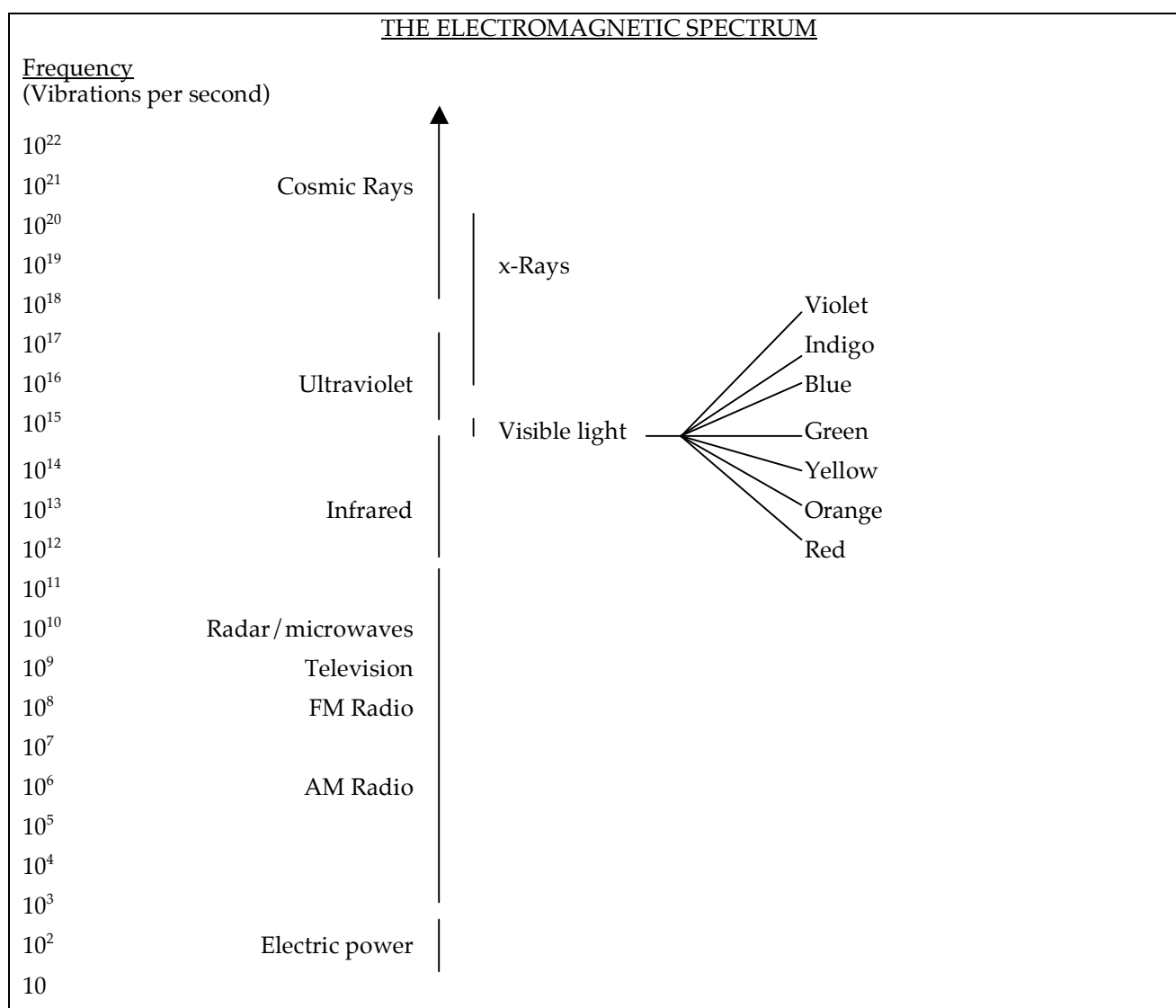
Light was generally considered to travel at infinite speed. Ole Roemer (1676) achieved the first measurement of the speed of light and showed, in contrast to what was generally accepted, that light travelled at a finite speed. The speed of light is quoted as 300 million m/sec in scientific terms. In our everyday terms that is about 1 billion kph.

Many of us have done the 20+hr flight to Europe - try to imagine going there and back in just $1/10^{\text{th}}$ sec - it would be sheer bliss but in reality it is up there with our first god attribute, beyond comprehension.

God is constant/unchanging

James Clerk Maxwell (1873), in what has been described as one of the high points of 19th century science, combined the theories of electricity and magnetism into a single theory which showed that each were different forms of the same type of radiation, which he called electromagnetic radiation. Maxwell was able to calculate the speed of this radiation and when he saw that it equalled the speed of light he realised that light was another form of electromagnetic radiation.

The electromagnetic spectrum ranges from electric power (50hz) through AM and FM radiowaves, through radar and microwaves, infrared(heat from sun), ultraviolet(skin cancer), x-rays, to the highest energy cosmic rays. Visible light which is normally white but can be separated into the 7 colours of the rainbow, occupies only a very small section of the spectrum between infrared and ultraviolet light.



You can see how God is sold short when, as a consequence of our own restricted vision, just that small section of visible light is associated with God rather than the entire spectrum of electromagnetic radiation.

Maxwell's equations were hailed as a great success but they carried a sting in them because, contrary to the expectation of the day, they showed that irrespective of the source, the speed of light did not vary. Like our second god attribute, the speed of light is constant and unchanging.

God is absolute

In 1905 Albert Einstein produced his Theory of Relativity which totally redefined the way in which science understood and used light. Einstein produced several 'prophesies' (scientists use the term predictions) in his theory all of which were ultimately proven correct. One prediction was that the mass (the amount of material in a body, for us it will be like the weight of a body), the mass of a body would increase with the speed of that body such that at the speed of light the body would have infinite mass. Now infinity is the scientific way of saying impossible so it is impossible for a body to travel at the speed of light.

Therefore the speed of light provides a barrier which may not be surpassed. Like our third god attribute the speed of light is absolute.

God is eternal

To explain how the Theory of Relativity points to God being eternal I want first to introduce you to an equation which is a simplified form of the Theory of Relativity as it relates to changes in time.

$$\#1 \quad s^2 + k^2t^2 = c^2$$

This equation brings the 3 dimensions of space and 1 dimension of time together into spacetime.

's' is the speed of a body in the 3 dimensions of space,

't' is its speed in the 1 dimension of time, that is, the speed of its clock,

'c' is the speed of light. The 'c' probably comes from the Latin celeritas for speed or swiftness,

'k' is for a constant, a fixed number and the superscript '2's indicate that the characters, s, k, t, and c are each multiplied by themselves, ie in maths talk they are squared.

(For those of you who are feeling some high school maths returning, yes it is a Pythagoras construction.)

One of the highlights of the Theory of Relativity is often illustrated by the example of an astronaut travelling to another star 50 lightyears away. Even though he travels at 99.9% of the speed of light it will be at least 100 earth years before he returns, however time slows for him to such an extent that only 4years will have elapsed for him when he returns to Earth.

Earlier we heard that the speed of light was constant, so if, in equation #1 we increase the value of 's' then we must decrease the value of 't' in order to maintain 'c' constant. And this is exactly what happens to our astronaut: his speed is increased to close to the speed of light and therefore his clock slows down relative to earth time. [Imagine 4 coins, 2 heads and 2 tails. 1 tail is turned and now we have 3 heads and 1 tail. As the number of heads increases the number of tails must correspondingly decrease] (This scenario has been well proven with aircraft and very accurate atomic clocks, and with reactions between cosmic rays and atoms at the edge of our atmosphere.)

Now I want to extend this example further. What happens if our intrepid astronaut and his ship travel at the speed of light? Then 's' becomes equal to 'c' in equation #1 and the 't' must become zero, time ceases to exist for our astronaut. [In our 4 coin example 3 heads now becomes 4 and we have zero tails]. Earlier we learned that mass became infinitely large at the speed of light so that no physical body such as our astronaut and his rocket could travel at that speed, but something which is without mass, which has zero weight, is not so restricted and that something is energy, electromagnetic radiation, which, as we saw in the diagram of the electromagnetic spectrum, includes light. Consequently a particle or photon of light created at the big bang 13.7 billion of our years ago and travelling all that time at the speed of light, has not aged at all. There is no passage of time at the speed of light !!

So if God is light or travels with light then according to the Theory of Relativity God will exist in the absence of time, life for God will be eternal, infinite, never-ending. And religion has believed and upheld this for centuries.

What are the implications for us

If at death the spirit separates from the body, and in its simplest form it is pure energy, ie light or some other part of the electromagnetic spectrum, then the strictures of relativity theory will apply and as such the spirit will exist in the absence of time, it will experience eternal life. This is not a hope but a statement of fact. It is here that religion and relativity diverge because relativity does not say we, as spirit, will necessarily share eternal life with God, just that we will exist in the same dimension.

We may live in the same country but not necessarily in the same city.

If we recap our four God attributes we find that:

Religion says

God is beyond comprehension

God is constant/unchanging

relativity says

the speed of light, 'c', is a very large number, almost beyond comprehension

the speed of light, 'c', does not vary

God is absolute	the speed of light, 'c', may not be surpassed by any physical object, it is an absolute barrier
God is eternal	At the speed of light, 'c', time ceases to exist, it is the equivalent of eternal life.

A new representation of God

The ancients saw God and light as being intimately related. We have found a relationship between attributes of God and the speed of light which encompasses not just visible light but the whole of the electromagnetic spectrum of energy. This is a more comprehensive relationship and may justify changing the representation of God as light to one of God as the speed of light. Light can be turned on and off at the flick of a switch but the speed of light is unchanging so this representation effectively removes God from our control.

Remember the symbol for the speed of light, 'c' for celeritas; might it also be 'c' for Creator?

However I want to use not c but c^2 as our representation of the Creator and I have two reasons for doing this. In many of the Theory of Relativity equations,

as in equation #1 $s^2 + k^2t^2 = c^2$

the speed of light appears not as 'c' but as c^2 , that is the speed of light multiplied by itself. Remember our first God-attribute, God is beyond comprehension where we found 'c' is almost beyond comprehension then c^2 certainly is beyond comprehension. It is 1 billion multiplied by 1 billion, that is 1 followed by 18 zeroes.

Secondly the universe is believed to be more like a 2-dimensional sheet than a 3-dimensional sphere and the two dimensionality of c^2 fits better with this. (Milky Way about 100,000 light-years across and less than 7,000 light-years thick)

So we have a symbol c^2 for the Creator. Is this a lucky coincidence, a one-off occurrence or can we deduce other relationships between science and religion which link c^2 and the Creator and might provide further justification for our representation of the Creator by c^2 ?

Consider the Trinity, a fundamental part of our belief. Does it have a basis in science?

We are told (John 7.39) that the disciples were not to know the Holy Spirit until after Jesus ascended to God at the Ascension (Acts 1.8-9) and then in Acts 2.1-4 we read:

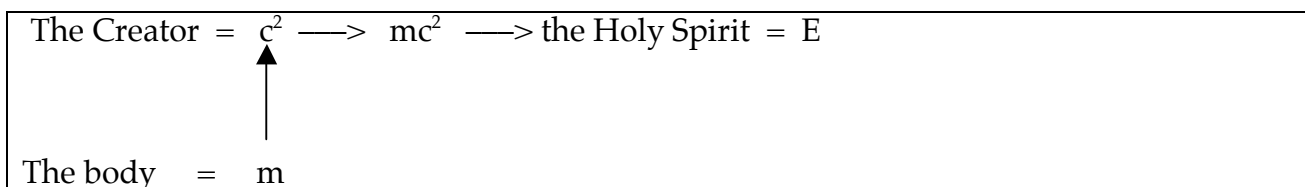
'When the day of Pentecost had come, they were all together in one place.

And suddenly a sound came from heaven like the rush of a mighty wind,

And they were all filled with the Holy Spirit and began to speak in other tongues, as the Spirit gave them utterance.'

Jesus was restricted by the physical body which gave him human form, and it was necessary for him to ascend to God before the energy of the Holy Spirit could come upon the disciples.

So it is necessary for the body of the Risen Christ represented by mass 'm' to ascend to and join with the Creator represented by c^2 giving mc^2 which enables the transition to the Holy Spirit.



If the Holy Spirit is pure energy and we represent it by 'E' then we can represent the Trinity by the equation

$$mc^2 = E$$

Or to put it in its more recognisable form, probably the world's most famous equation

#2

$$E = mc^2$$

This equation, which comes from Einstein's Theory of Relativity, is fundamental to the evolution of the Universe. It describes the inter-conversion of mass and energy and is the equation that has governed nuclear reactions ever since the Big Bang. It governs nuclear reactions in the Sun through which the Creator gives life to the earth, and in nuclear weapons through which humans are able to bring death and destruction to the earth.

Here we have a coming together of science and religion through the Theory of Relativity and the Creator represented by this factor c^2 .

A relationship to the Psalms

But that is not all. We have seen how this equation speaks to us about the Trinity:

If E and m refer to the spirit and the body of each one of us then this equation also speaks to us about the nature of our relationship with God.

One of the delights of mathematics is the manipulation of equations to produce a simpler and more meaningful solution. The rule is simple, whatever action is performed on the left side must be repeated on the right side.

We begin with equation #2

$$E = mc^2$$

To isolate c^2 I divide both sides by m.

As a result we get

$$\frac{E}{m} = \frac{mc^2}{m}$$

on the right side $\frac{m}{m} = 1$ and the m's disappear

Which gives equation #3
$$\frac{E}{m} = c^2$$

Which makes the pure and simple statement that when the spirit is above or superior to the body then we are at one with God, c^2 .

Equation #3 can also be written
$$\frac{E}{m} = \frac{c^2}{1}$$

And if we invert both sides

we get equation #4
$$\frac{m}{E} = \frac{1}{c^2}$$

Here I need to mention reciprocals. The reciprocal of a number is one divided by that number and the larger the number the smaller is the reciprocal.

For example 10 is less than 100, but in the reciprocals $1/10$ is more than $1/100$.

We are representing God by c^2 , an extremely large number. The reciprocal, $\frac{1}{c^2}$, will be so small as to represent the virtual absence of God.

So we can read equation #4
$$\frac{m}{E} = \frac{1}{c^2}$$

as saying that when the body is above or superior to the spirit we are far removed from God, we are in hell, or Sheol as the ancients described it.

But there is hope for us: For while $1/c^2$ is an extremely small number you will notice that it still contains the element of the Creator, c^2 , within it.

Equations #3 & #4 reflect in mathematical form what has been acknowledged in word form for thousands of years for in Psalm 139 verses 7-8 we read

[7] Whither shall I go from thy Spirit?

Or whither shall I flee from thy presence?

[8] If I ascend to heaven, thou art there!

If I make my bed in Sheol, thou art there!

Look at equation #3
$$\frac{E}{m} = c^2$$

when the spirit is above or superior to the body then we are at one with God, we are in heaven.

And equation #4
$$\frac{m}{E} = \frac{1}{c^2}$$

when the body is above or superior to the spirit we are far removed from God, we are in Sheol. Yet we are not abandoned for the Creator, c^2 is there also.

We like to simplify difficult concepts by constructing images which are closer to everyday life and more meaningful to us. Michelangelo's fresco of 'The Creation' in the Sistine Chapel is probably the ultimate example. The representation of the Creator as c^2 the square of the speed of light, unlike Michelangelo's image of the Creator, has no physical form and gives us nothing to hang an image on other than a very large number in empty space.

I wonder what images you might construct to illustrate this representation of the Creator as c^2 , the square of the speed of light. Here are three that occur to me.

c^2 gives me an image of a carpet square or a blanket enfolding the whole of creation, which metamorphoses in Jesus' words in Mt23.37.

"O Jerusalem, Jerusalem, killing the prophets and stoning those who are sent to you! How often would I have gathered your children together as a hen gathers her brood under her wings, and you would not!

So c^2 becomes an image of the Creator gathering all creation under her wings.

Or consider the Celtic prayer:

May your path rise up before you

May the wind blow gently at your back

May the sun shine warmly on your face

May the rain fall softly on your fields

And may Almighty God hold you safe in the palm of his hand until we meet again.

Maybe c^2 becomes for you the palm of the Creators hand?

According to Sufism, the mystical branch of Islam, the best symbol for God is empty space, nothing. This story comes from their tradition.

The courtiers decided to give a banquet in honour of the great king. All filed into the banquet chamber with the prime minister organising them into their seats until there was just one seat remaining. Then in walked a rather unkempt sufi. He walked over to the last remaining seat and sat down. The prime minister was rather taken aback at this and approached the sufi and asked if he sat there as one of the courtiers.

"I am more than they" was the reply. "Are you by chance the new prime minister?" asked the prime minister wondering if the king had replaced him secretly.

"I am more than he" was the reply. "Are you by chance the king in disguise?" asked the prime minister.

"I am more than he" was the reply. Now the prime minister was starting to sweat a little.

"Are you by chance the prophet?" asked the prime minister.

"I am more than he" was the reply. Now the prime minister was really sweating "Only God can be more than the prophet. Are you God?" asked the prime minister.

"I am more than God" was the reply. "But" said the prime minister "nothing can be more than God"

And the unkempt sufi replied "I am nothing, _ _ _I am no thing"

Text of a presentation given by Dr B. C. Elmes to the Spirituality Café outreach of St Georges Anglican Church, Malvern on 23rd September, 2008.