

# **How studying light helps us to understand the revelation of God in our world**

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## **Introduction**

We will learn interesting aspects of light which can help us to understand God and his world better. But first we want to deal with statements in the Bible about God and the worlds he created. By “the created worlds” I understand the totality of time and space and everything that exists in them. I interpret the first sentence of the Bible as follows: *In the beginning* (of time) *God created the heavens* (the space with the temporal world and the eternal world) *and the earth*.

God is eternal and omnipresent (cf. Ps.90 and Ps.139). Both created worlds, on the other hand, exist in time. Heaven is not timeless either. In Rev.6,11 the martyrs under the altar in heaven were told *that they should rest yet for a little while, until their fellow servants also and their brethren, that should be killed as they were, should be fulfilled*. And in Rev.8,1 we read: *when it opened the seventh seal, there was silence in heaven for about half an hour*.

Our world has a beginning and an end in time. In 2Pet.3,7 & 10 the end of heaven and earth is described. In the following, the biblical term “heaven and earth” is equated with the physical term “universe” <sup>1)</sup>.

The eternal world also began “at the beginning”, but it has no end. (For these two created worlds, see my article: “Thoughts on the biblical account of creation”). We read of the eternal world in Ps.103,19 *The LORD established his throne in heaven*. This created eternal world is invisible to us: *what is visible is temporal; But what is invisible is eternal* (2Cor.4,18).

The creator of these two worlds in time and space is independent of his creation, i.e. God is independent of time and space. Hence it follows from the Bible that there are three worlds, 1) our material, temporal world, 2) the eternal world with the angels which is normally invisible to us (cf. Col. 1:16) and 3) God's world which, like God, is independent of time and space.

## **The world of light**

Can we actually learn about God from light? God has no beginning and no end. In contrast to this light can be observed in our world from its emission to its absorption. However, light also exists in its own world that is independent of time and space. The properties of the world of light follow from the special theory of relativity<sup>2)</sup>. Since light moves at the speed of light, the clock stands still in the world of light and the entire space shrinks to one point:

The world of light is independent of time and space.

So, we learn from Einstein's special theory of relativity that in addition to our world with time and space, there is a world of light that is independent of time and space.

God's world is also independent of time and space. Already 2000 years ago Philo of Alexandria realized through just studying the Bible that time was created by God. He wrote: *God did not create the world at any point in time, but God created time.*

Was light also created by God? There is no direct statement on this in the Bible. On the other hand, we read in Isa.60,19 *the sun will no longer be your light during the day, nor the moon will shine as a lamp, but the Lord will become your eternal light, and your God your shine.* We find corresponding statements in Rev.21,23 and Rev.22,5. I understand these Bible passages to mean that God himself is the source of light in the eternal world. Therefore, I assume that the world of God is identical with the world of light.

### **Different worldviews**

Einstein had a worldview according to which the universe should be eternal and immutable. He wrote: "In the beginning (if there was such a thing as a beginning) God created Newton's laws of motion along with the necessary masses and forces. Einstein knew the first sentence of the Bible, but did not believe the clear statement that the universe has a beginning. He changed the equations of his general theory of relativity so that the solution matched his momentary worldview. When a few years later the expansion of the universe was observed by the astronomer Hubble, Einstein described the change in the equations as his greatest mistake.

Today it is largely common to ignore statements in the Bible on scientific questions. Many people are convinced that the Bible is full of errors, especially on scientific subjects.

In contrast to this attitude, Galileo regarded the Bible as truth as well as nature and wrote to one of his students: "Two truths cannot contradict each other." – With the two truths he meant the two revelations of God, in nature and in the Bible.

In the naturalistic worldview there is only room for our temporal world. For people with this worldview, nothing is conceivable outside of our temporal world. However, may this worldview be too narrow for reality?

Sir Roger Penrose, a well-known mathematician, physicist, physics Nobel Prize winner of the year 2020 and atheist, describes three worlds in contrast to the naturalistic worldview: 1) Our physical world, 2) the mental world i.e. self-consciousness and 3) the platonic world of mathematics (R. Penrose, *The Road to Reality*, ISBN 978-06679454434).

For people with the naturalistic worldview, the worlds 2 and 3 are unthinkable. But the world of light, which is independent of time and space and whose existence has been known for over 100 years, is proof that the naturalistic worldview is too narrow for an understanding of reality.

### **The world of the human mind**

According to the Bible, the spirit of man is immortal – in contrast to his body. In death, body and spirit are separated: *the dust returns to the earth*

*as it was, and the spirit returns to God who gave it* (Ecclesiastes 12,7). The Bible teaches that “in the beginning” God created a visible, temporal world and an invisible, eternal world. The spirit of man belongs to this eternal world<sup>3)</sup>; he is able to devise experiments through which a photon reveals its wave nature in one case and its particle nature in the other. The human mind can deal with the sequence of natural numbers 1,2,3, etc. This sequence is infinitely long and therefore it has no place in our finite world. On the other hand, we can deal with infinity – our mind is not subject to the limitations of the temporal world. According to Ecclesiastes 3,11, *God also put eternity in people's hearts*.

People, like Galileo, who are convinced that God's word is truth, have a worldview that includes all the reality of the three worlds. A naturalist, on the other hand, has a narrow worldview that cannot even understand the world of light as reality.

### **The three natures of light**

Let us now consider what else we can learn from light. To do this, we first ask what light is. We know that light consists of individual light quanta. Our eyes are so sensitive that after sufficiently long adaptation we can see individual light pulses when looking at an extremely weak light source - i.e. we can perceive individual photons.

In various experiments, a light quantum or photon turns out to be either a wave or a particle during absorption. The well-known physicist J. A. Wheeler gave the following explanation: *“Until it is absorbed, a photon has no true reality - but when it is absorbed, an indivisible bit of information is added to what we know about the world.”*

On the basis of our reflections on the world of light, we can add some words to this statement: *Until it is absorbed, a photon has no true reality in our world, but in the world of light it is an information quantum.* We can therefore regard the photon as the elementary information unit 1 bit that exists in the world of light - i.e. independent of time and space<sup>4)</sup>.

During absorption in our temporal world, the photon shows its nature either as wave or particle, depending on the experimental conditions. Therefore, a light quantum has the following three natures:

- 1) an elementary unit of information (in the world of light),
- 2) a wave (in our world)
- 3) a particle (in our world).

That is why we can see in light an analogy to the Trinity of God.

Particles and waves exist in our world. In contrast, pure information does not belong to our world. The sequence of natural numbers is an example of pure information that has no place in our world because it is infinitely long. But in our finite world there is nothing infinite.

In our world light can appear as particle or wave, but in the world of light it is pure information. In the world of light, the photon is not a combination of information, wave and particle, but it is a quantum of information that is independent of time and space. The particle or wave nature of light is only revealed in time and space.

The eternal, omnipotent and omnipresent God is too great for the created worlds. At the dedication of the temple, Solomon prayed: *Behold, the heavens and the heavens of all heavens cannot contain you* (1Kings 8,27). God is independent of time and space – just like pure information, and according to Joh.1.1 *The Word was God* – i.e. information. The omniscient God is infinite information. The light quantum or photon is only the elementary unit of information, 1 bit. But since God is revealed to us in the Bible as information – namely as infinite information and the light quantum in its own world is also information, the world of light is identical with God's world.

### **The revelations of the triune God in our world**

God reveals himself as one God. The same statement is made in the New Testament (1Tim.2,5): *God is one*.

However, this one God reveals himself in our world either in the Son or in the Holy Spirit. The Son is the image of the invisible God (Col.1:15), and through the guidance of the Holy Spirit, children of God become God's letter to man, (2Cor.3,3) *You are manifestly declared to be the epistle of Christ ministered by us, written not with ink, but with the Spirit of the living God; not in tables of stone, but in fleshly tables of the heart*.

In the Bible, God reveals himself as one person – *The LORD our God is one LORD*

(Deut.6,4). On the other hand, God, the Father, the Son, and the Holy Spirit are revealed as three persons.

The Bible says of a married couple that the two spouses become one flesh – i.e. one person (Gen.2,24; here, too, the numeral “one” is used). The Bible hereby gives an example that the number word “one” can be a compound unit, two persons become one person in marriage, a “two-in-one”. The light now gives us an example of a “trinity”.

While God appeared in our world in the Son of Man, he was and is in God's world the Word – independent of time and space. When the Word became flesh, the Son did not leave the world of God, as the following verses show: Joh.1,14 *the word was made flesh and dwelt among us*.

Joh.1,18 *the only begotten Son who is in the bosom of the Father*.

In God's world there is no time with past, present and future. The only begotten Son is in God's bosom independent of time.

The particle nature of light in our world corresponds to the appearance of God as the Son of man. The Word was made flesh and as a human was bound at one time to one place like a particle of light.

The wave nature of light in our world corresponds to the Holy Spirit, who came into this world as a person at Pentecost. He causes people to become children of God and lives permanently and simultaneously in all children of God. In the time of the OT the Holy Spirit was also effective, but he did not dwell permanently in people.

When light appears as a particle in our world, its wave nature cannot appear at the same time. While the Word was made flesh in our world, the Holy Spirit could not be as a person in our world. This is indicated in Joh.7,33 *the Holy Spirit was not yet there because Jesus was not yet glorified.*

Only after the glorification of Jesus Christ, i.e. after the ascension, could the Holy Spirit dwell personally and permanently in the children of God.

The decisive, spiritual prerequisite for the personal coming of the Holy Spirit was the completion of the redemption work in the atoning death of Jesus Christ. But even after the completion of the atonement for the sin of the world, the Holy Spirit did not come to earth immediately in person. The personal coming of the Holy Spirit happened when the day of Pentecost was fulfilled (Act.2,1).

The Lord promised his disciples a Comforter, the Holy Spirit, (Joh.14,16) *I will pray the Father, and he shall give you another Comforter, that he may abide with you forever.* In this context our Lord Jesus said, (Joh.14,23) *If a man loves me, he will keep my words: and my Father will love him, and we will come unto him, and make our abode with him.*

Thus, through the reception of the Holy Spirit, God – the Father, the Son and the Holy Spirit comes into the heart of the believer and makes it his dwelling. This fact can only be understood from the perspective of God and his divine world.

The Holy Spirit cannot be located – just as a wave cannot be located. God's spirit dwells in all God's children all over the world: *For by one Spirit were we all baptized into one body, whether we be Jews or Gentiles, whether we be bond or free; and have been all made to drink into one Spirit* (1Cor.12,13). God's revelation through the Holy Spirit in this world is the basis of the unity of all children of God since Pentecost.

Are we a legible letter (2Cor.3,3) – sent from Christ to those around us?

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1) In the biblical term "heaven and earth" the earth is mentioned separately from the celestial bodies sun, moon and stars. On the other hand, the term "universe" includes the earth as a planet in one of very many solar systems in the Milky Way, and the Milky Way is one of many galaxies in the universe.

The biblical description of heaven and earth is based on the view of an observer on the surface of the earth. The modern worldview, on the other hand, describes the universe as it would appear from a fictitious observation point in space. The biblical description is neither wrong nor outdated. We still talk today about sunrise and are at the same time convinced of the heliocentric worldview.

2) These results of the special theory of relativity were first tested and confirmed experimentally on muons. These particles are created by the high-energy cosmic radiation at a height of about 10 km. Their half-life is so short that – without considering the theory of relativity – they would largely disintegrate after 1 km. However, a high percentage of them reach the surface of the earth because, due to their high speed, their own clock runs much slower than clocks in our world. Time dilatation has also been demonstrated in clocks (J. Hafele, Keating, R.: Around the world atomic clocks: observed relativistic time gains. In: Science. 177, No. 4044, July 14, 1972, pp. 168-170).

The Lorentz transformations provide the physical basis for this and for the “eigenworld” of light:

1.) The time dilatation:  $\Delta t = \Delta t_r / (1 - v^2/c^2)^{1/2}$ . The time interval  $\Delta t_r$  at rest becomes  $\Delta t$  at the speed  $v$ . If the speed  $v$  approaches the speed of light  $c$ , the time interval increases and becomes infinitely long at  $v = c$

– i.e. time stands still for the photon.

2.) The length contraction:  $\Delta r = \Delta r_r (1 - v^2/c^2)^{1/2}$ . The length  $\Delta r_r$  at rest is shortened at the speed  $v$  and shrinks to zero at  $v = c$  – i.e. the space becomes a mathematical point in the world of the photon. Therefore, the photon is independent of time and space.

3) For more detailed thoughts on the world of the human mind, see: Ising, Hartmut (2017): Information, Time and the Human Mind. figshare. Dataset. <https://doi.org/10.6084/m9.figshare.3123175.v6>

4) The energy  $E$  of the light quantum or photon is equal to Planck's quantum of action  $h$  multiplied by the frequency of the light:  $E = h\nu$ . Since a photon transmits 1 bit of information into our world during absorption, this process can also be interpreted in terms of information theory.

In a thought experiment I have shown that the time span  $\Delta t$  for the transmission of this information from the world of light to the light detector in our world is equal to the period  $\lambda/c$  of light. This results in the following information-theoretical interpretation:

The elementary flow of information (1 bit) /  $\Delta t$  is equal to the energy of the photon:  $E = h (1 \text{ bit}) c/\lambda$ . (See Ising, Hartmut (2018): Information and energy. figshare. Dataset. <https://doi.org/10.6084/m9.figshare.2115400.v7>)