

Light in Science and Christian Orthodoxy

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Abstract

This talk consists of two parts. In the first we discuss the ordinary light related to the Cosmic Microwave Background radiation and photosynthesis. In the second part the focus is on the Light discussed in the Bible and the acts of Jesus Christ.

Introduction.

The first part of this talk concerns the **ordinary light** we know in science. It is the third oldest thing we have observed in our Universe. It first shone about 380000 years after the Big Bang, creating a day-night structure at the initial stage of our Universe and initiating its first Day. As a case concerning the ordinary light generated in the Sun, I mention photosynthesis.

The second part concerns the uncreated **Light** to which the Bible and the orthodox Christian tradition refer to. This Light lies beyond the scientific ability, since it can only be seen by those to which it is revealed. Nevertheless, there exist people who even today see it. They usually hide themselves though, in order to protect themselves from any superiority feeling. I will only tell you what the Bible and present realities say about it.

First part: The ordinary light we meet in science.

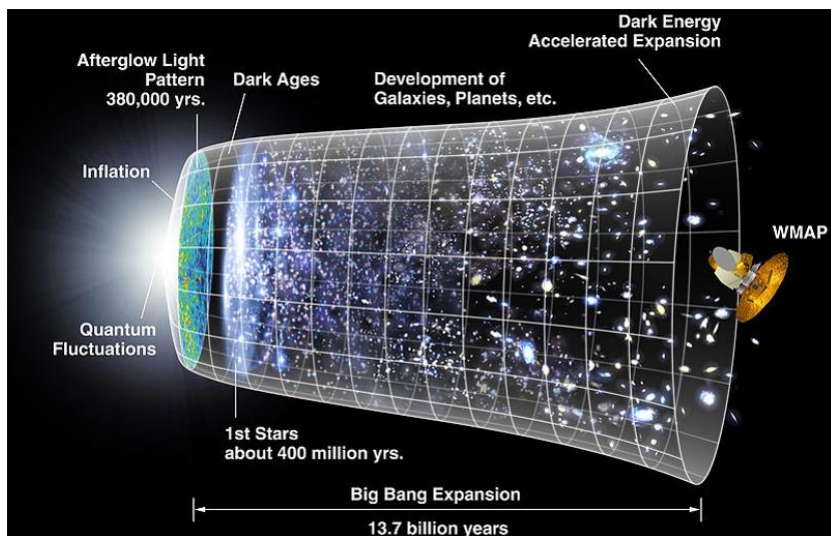


Figure 1: The Big Bang expansion

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The **oldest thing** we have observed in our Universe is space and time. They were both created about 13.8 billion years ago, as the Big Bang was starting generating the space. Initially space was expanding vigorously. Later, till about 5 billion years ago, the expansion started decelerating. Since then, space expansion is accelerating again. A description of it is shown in Fig.1.

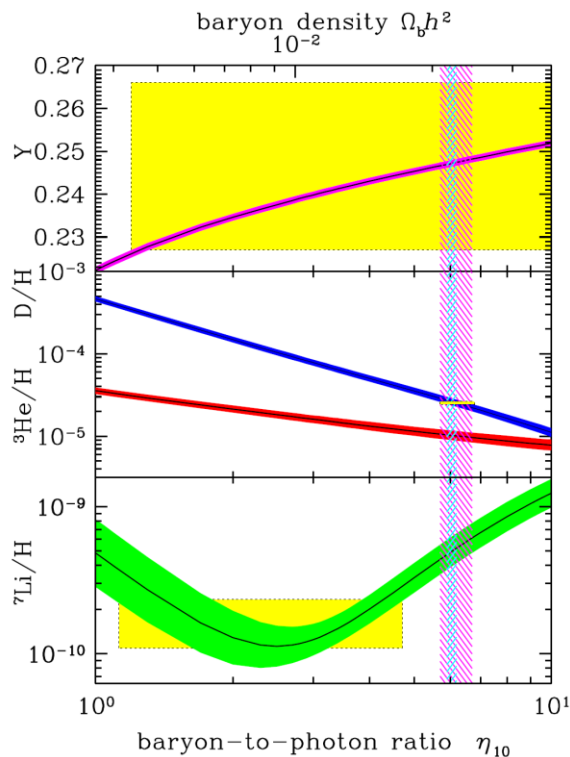


Figure 2: The primordial abundances of D, ^3He , ^4He , and ^7Li nuclei.

The **second oldest** thing we have observed in our Universe are the primordial abundances of the light nuclei D, ^3He , ^4He , and ^7Li , synthesized by the end of the first few minutes. They are in good overall agreement with the primordial abundances inferred from the standard hot Big-Bang cosmology; see² Fig.2.

Before continuing with hot Big Bang though, we turn to the description of the first Day as given in the 1st chapter of Genesis. Its text is³

In the beginning God created the heavens and the earth. And the earth was formless and invisible and darkness covered the face of the deep. And the Spirit of God swept over the waters. And God said, "Let there be light"; and there was light. And God saw that the light was good; and God separated the light from the darkness. And God called the light Day, and the darkness he called Night. And there was evening and there was morning, the first day. (Genesis 1)

² Taken from <http://pdg.lbl.gov/2015/reviews/rpp2014-rev-bbang-nucleosynthesis.pdf>.

³ New Revised Standard Version Bible, copyright 1989, Division of Christian Education of the National Council of the Churches of Christ in the United States of America. The number after the name of any Bible book gives the chapter.

Before comparing with what we know scientifically, we should emphasize that the Bible's description is anthropocentric; i.e. it describes how a human being (if existed at that time) would have seen the Creation events. The word "earth" in the first lines of Genesis describes the primitive matter at the beginning⁴, and "heavens" should be translated as "space". So both, space and the primordial forms of matter were simultaneously created just as the time was starting...

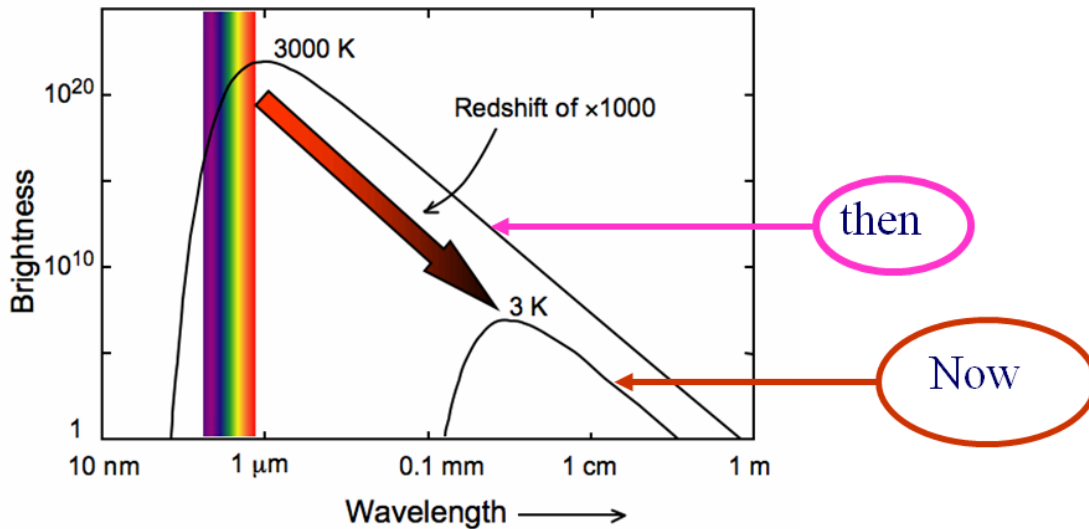


Figure 3: The Brightness versus Wavelength relation of the primordial light at 3000 and 3 °K.

The third oldest thing observed in our Universe is the light emitted at about 380000 years after Big Bang. This is what is usually referred to as the Cosmic Microwave Background (CMB) radiation. Before this time, the temperature was very high and the matter in the Universe consisted of a plasma of charged freely moving particles. Photons could not move in this environment and the Universe was opaque. At about 380000 years though, the temperature fell to around 3000 °K, thereby allowing the light nuclei already constructed before⁵, to bind the electrons and create neutral atoms.

Then, more or less suddenly, the Universe became transparent and overwhelmed by the primordial light. This is the time described by God's command: **Let there be light.**

The brightness of this light as a function of its wavelength indicated in Fig.3, is determined by the black body radiation theory. The curve at 3000 °K in this figure

⁴ The planet Earth was created billions of years later.

⁵ See the discussion related to Fig.2 above.

describes the light spectrum, as it was when at first shone. Its brightness was then peaking very close to visible region. If humans existed at that time, they would have seen a dazzling white light coming from everywhere, with almost the same brightness from all directions!

As space was expanding, its wavelengths were growing similarly, and today they constitute the CMB radiation. Its present spectrum is approximately described by the 3 °K curve in Fig.3. It is not in the visible region any more, and its brightness is about a factor 10^{12} smaller. It still comes with almost the same intensity from all directions; as it has been doing for about 13.8 billion years.

Penzias and Wilson discovered the remnants of this primordial light in 1964. **They saw the oldest light ever!**

Next I describe the Big Bang results concerning this light, using the Bible's vocabulary. We have already said that this light is coming from everywhere, with almost the same brightness. Using a more common language, I could say that when it first shone, everything around was hot and shining, like e.g. during a July midday here in Crete. The first Day didn't have a morning⁶!

As time was passing by, the brightness of the light was going down, and its color was becoming more and more reddish, till it passed in the infrared, and the first Night began. The Universe was about 20 million years old at that time. The first Day ended in a flood of a deeply reddish light. A spectacular evening indeed!

And there was evening and there was morning, the first day. Note that a Day-night structure is also seen within the Big Bang theory; the Bible and scientific descriptions fit!

During the first Night, most galaxies were started. And finally, at about 9 billion years after the beginning, the primitive Earth appeared.



Figure 4: The Earth

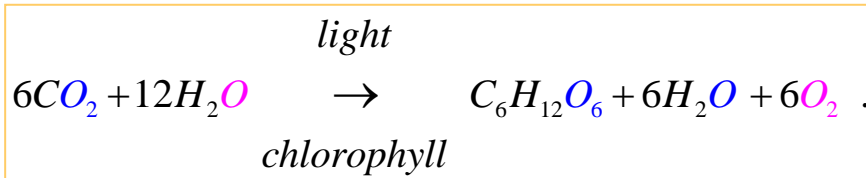
The following five Days in the Bible's account should be considered as long time-intervals. They concern earthy events described, as they would have been seen by an earthy observer. Unlike the first Day, they don't have a day-night structure though.

During these Days the plants and animals were created on the Earth. And finally, the **triune God forms the human being in His image and endows him by His breath of life** (Genesis 2); the

basic human characteristic.

⁶ The Bible also claims that there was no morning in the first Day. It may be worthwhile to also look at St. Nicodemus of the Holy Mountain, ΓΥΜΝΑΣΜΑΤΑ ΠΝΕΥΜΑΤΙΚΑ εἰς τὴν Ἀνάστασιν τοῦ Κυρίου, Μελέτη ΑΒ', α', σ. 273, Εκδοση 7η Βασ. Ρηγόπουλου, Θεσσαλονίκη 1991.

Up to now I have only discussed the CMB light. Now I briefly turn to the Sun-light and its role in photosynthesis. Through this I want emphasize that in the presence of chlorophyll, the visible light has the impressive ability to enable plants to dissociate suitable collections of carbon dioxide (CO₂) and water molecules, in spite of the strong binding of the later. The whole action is indicated by the relation below



Remember also that it is a chlorophyll property that makes forests green. Apriori, it would had been more economical if chlorophyll were making the forests black. Beauty is always playing an important role in the choice of physical laws!

Second part: The uncreated Light of the other World.

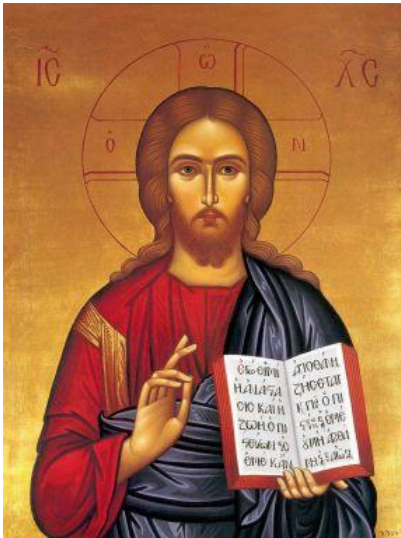


Figure 5: Lord Jesus

In the Christian theology, the value of a human being is immeasurable. Because of the priceless God's breath of life, humans have been endowed with. So, when humanity lost its way, the Son of God had to come to help it, completely ignoring any of its guilt⁷.

In doing this, He disregarded the powerful, the arrogant and the rich. Instead, He turned to the poor and humble and said to them shocking phrases like:

- "I am the **light of the world**" (John 8),
- "The **true light**, which enlightens everyone " (John 1).

And on the same subject,

- John in his first general letter to the Christians says that "**God is light**, and in Him there is no darkness at all" (1John 1);

⁷ And the smallness of his home planet, which some scientists thought relevant.

- and Paul writes to Timothy that “He alone has immortality and **dwells in unapproachable light**” (1Timothy 6);
- while in Psalm 104, it is written that He (the Lord) is “**clothed with honour and majesty, wrapped in light as with a garment**” in (Psalm 104).
- Finally, these aspects of the Light are beautifully summarized in the morning prayer:

“**O Christ, the True Light**, Who **enlightens** and **sanctifies** every man that cometh into the world: Let the **Light of Thy countenance** be signed upon us, that in it we may see the **unapproachable Light**, and guide our steps in the doing of Thy commandments, through the intercessions of Thy most pure Mother, and of all Thy saints.”

The Light we talk about here should not be likened to the light we have discussed in the first part of this article; this was a created light, as everything else of this world.

The Light we talk about here is **uncreated**. It is the **True Light**, which should be identified with the only part of **Jesus Christ’s** Deity, that a human being can in principle see; the essence of Deity is invisible to a human being.

There are many instances in the Bible where **Jesus Christ reveals His Light to people**. Examples are:

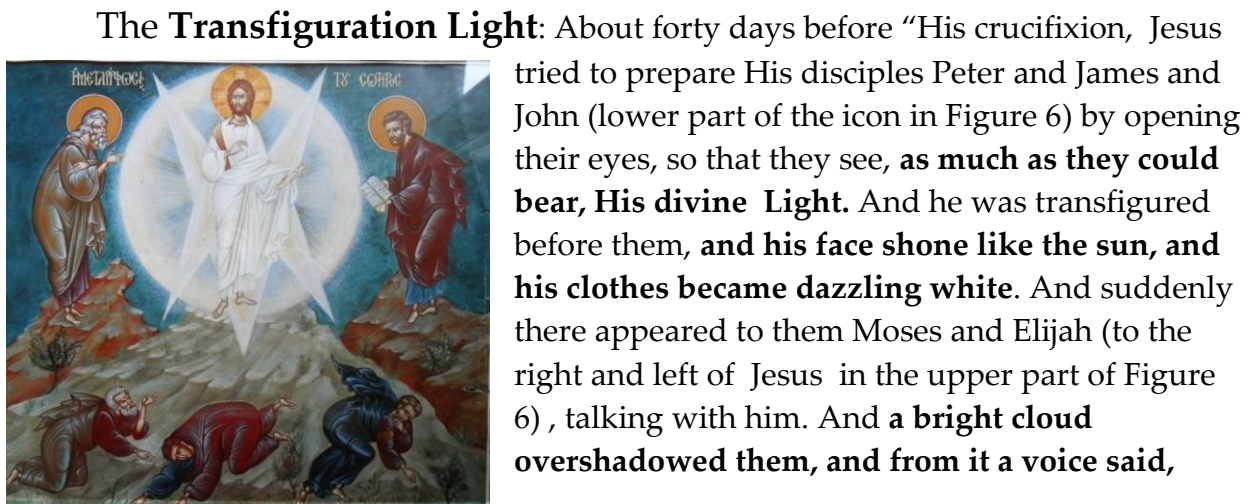


Figure 6: The Jesus Transfiguration.

“**This is my beloved Son; listen to him!** ... They were overcome by fear... And when they looked up, they saw no one except Jesus alone...” (Matthew 17).

For seeing this uncreated Light, their eyes had to be “opened” by Christ. And even then, they could only see as much as they could bear...

Paul on his way to Damascus . Paul in his defense in front of King

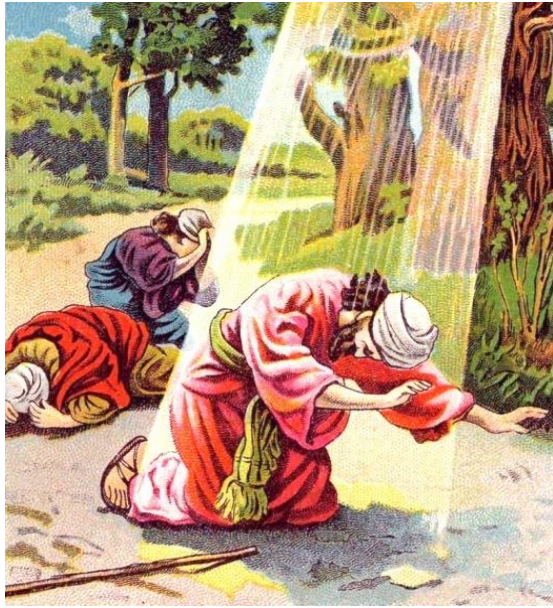


Figure 7: Paul under the Christ's Light on his way to Damascus.

Agrippa, describes the Light that made him a believer: I was travelling, your Excellency, to Damascus with the authority and commission of the chief priests, when at midday along the road, I saw **a light from heaven, brighter than the sun, shining around me and my companions.** When we had all fallen to the ground, I heard a voice saying to me in the Hebrew language, **"Saul, Saul, why are you persecuting me? It hurts you to kick against the goads."** I asked, "Who are you, Lord?" The Lord answered, **"I am Jesus whom you are persecuting"** (Acts 26).

After many years and many such visions, Paul realized that **"Christ Jesus came into the world to save sinners—of whom I am the foremost"** (1Timothy 1).

The reason He reveals His Light to us, is in order to be able to see our sins, so that we become more humble and further try to purify ourselves. This in turn enables us to more clearly see Him. **"Blessed are the poor in spirit, for theirs is the kingdom of heaven"** and **"Blessed are the pure in heart, for they shall see God"** (Matthew 5).



Figure 8: Moses

Light in the Old Testament: As Moses (~1300 bC) was coming down from Mount Sinai carrying the tablets, he did not **know that the skin of his face was shining**, because he had been talking with God. But the Israelites were **seeing it ... and were afraid to come near him** (Exodus 34).

This is repeated since then. Even today, **"as we are reflecting the glory of the Lord, we are being transformed into similar images, with an always increasing degree of glory** (2Cor 3). When His Light falls on us, we somehow reflect it and we also shine!

The Light of Christ's Resurrection:



Figure 9: The entrance of the Holy Tomb in Jerusalem.

miracle. It always occurs on the day of Good Saturday, before the Orthodox Easter in Jerusalem, when the orthodox Patriarch goes to Christ's tomb to receive the Holy Light, (see Figure 9). This Light he would then use to light up the Paschal candles of the thousands of the Easter pilgrims...

During the time the Patriarch is inside Christ's tomb, or as he emerges from it with his lit candles, **fire balls** also suddenly appear over the heads of the worshipers inside the great Church, **and streaks of blue and white light** shine. The candles at the hands of the people and the candlesticks hanging from the ceiling, sporadically are lightened by themselves, even at great distances outside the Church.

Before the Patriarch has finished lighting the candles of the pilgrims in front of him, the whole region is flooded by Light, creating chills to the worshipers. The feelings of fear and joy are inexpressible⁸. A description written by an eyewitness, Archimandrite Antonios Sylianakis MD, is given in <http://users.otenet.gr/~styliant/orthodoxia/HolyLight.htm>.

Some people wish to see a miracle in order to believe. Miracles around the Holy Tomb and Golgotha (the place where the Cross with the crucified Christ on it, was standing) are continuous! It needs though something much more precious than plain curiosity, in order to really see it.

We will see Him as He is (1John 3):

We have already said that the **Light** we talk about is not the usual one, and that it is the only part of **Jesus Christ** deity, that a human being can in principle be allowed to see. For the prerequisites for it, we have already mentioned His sayings: "**blessed are the pure in heart, for they shall see God**" (Matthew 5), and that "**those who have my commandments and keep them, are the ones who love me; and those who love me, will be loved by my Father, and I will love them and reveal myself to them**" (John 14).

Do I love Him? Am I ready to deny myself for Him? If the answer is "Yes", then St. John the evangelist exclaims:

"We are God's children now; but it has not yet been revealed what we will become. What we do know is that when it is revealed, we will be like Him, for

⁸ But it has nothing to do with what in the Pentecost denomination is claimed.

we will see Him as He is” (1John 3). We will see Him, through His Light, of course!

I next turn to passages from three persons who have lived under His Light and explain what “seeing Him as He is” means.

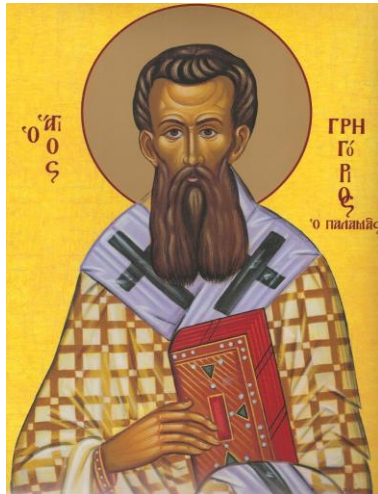


Figure 10: St. Gregory Palamas

St. Gregory Palamas (Born in Constantinople in 1296. Later he became Archbishop of Thessaloniki where he died in the fall of 1359.)

He asserts us that: **Vision of God, is not simply symbolic, nor sensory or created, but it is a true deification.**

Through deification a man is deemed worthy of seeing God. Deification is not an abstract state, but the union of a human being with God.

This is the aim where Christ wishes to lead us! Towards this was also St. Gregory’s continuous prayer: **Holy Virgin enlighten my darkness.**



Figure 11: St. Symeon, the new theologian

St. Symeon, the New Theologian (See Figure 11. A monk and poet. He was born in 949 in Galatia and died in 1022.).

One of his principal teachings was that humans could and should experience *theoria*; i.e. direct experience of God. Two beautiful passages from him are:

The first: **When men Search for God with their bodily eyes, they can find him nowhere, for he is invisible. But for those who ponder in the Spirit, he is present everywhere. He is in all, yet beyond all. Salvation is near those who fear him, but far away from sinful men.**

And the second one: **He Himself is discovered within me, resplendent inside my wretched heart, enlightening me from all sides with His immortal splendor, shining on all of my members with His rays. He embraces me entirely, the unworthy one, and I am filled with His love and beauty. I am sated with**

pleasure and Divine tenderness. I share in the Light. I participate also in the glory. My face shines like that of my beloved and all my members become bearers of Light.



Figure 12: Elder Sophrony

Finally I turn to **Elder Sophrony of Mount Athos and Essex** who is contemporary to us (See Figure 12. Born in Moscow in 1896 and died in the Monastery of St John the Baptist, Tolleshunt Knights, Essex UK in 1993).

Fr. Sophrony had started seeing the uncreated Light, even at the time he was an infant in the arms of his Mother. Later on this knowledge deepened of course, and he discusses it extensively in his writings.

In his book entitled *“We Shall See Him as He Is”*, p172, he describes his experience as:

“This Light penetrates us with the power of God. We become without beginning — not through our origin, but by the gift of Grace: life without beginning is communicated to us. And there is no limit to the outpouring of the Father’s love: man becomes identical to God — the same by content, not by primordial Self–Being. God will eternally be GOD for the human being.”

He reminds us also that the appearance of the uncreated Light is a very sensitive event. He recalls that at his early Light-experiences, during his prayers, he didn't even dare to look at it, since any superiority feeling in him, would force it to disappear!

Finally, I also include some thoughts of him concerning the awareness we acquire in prayer of the divine Presence of our Lord, Jesus Christ. There is nothing greater than to have this personal relationship with our Creator.

In Christ and the coming of the Holy Spirit, God gave us the full and final revelation of Himself. His Being now for us is the First Reality, incomparably more evident than all the transient phenomena of this world. We sense His divine presence both within us and without: in the supreme majesty of the universe, in the human face, in the lightning flash of thought. He opens our eyes that we may behold and delight in the beauty of His creation. He fills our souls with love towards all mankind. His indescribably gentle touch pierces our heart. And in the hours when His imperishable Light illumines our heart, we know that we shall not die. We know this with a knowledge that we used to prove in the ordinary way, but which for us requires no

proof, since the Spirit Himself bears witness within us. (Archimandrite Sophrony in His Life is Mine, p22-23).

To develop this relationship with God takes time and effort. In the Scriptures we can observe how slowly He has revealed His full nature to His disciples. At the very end of His time on earth He told them, *"The Holy spirit...shall teach you all things to your remembrance, whosoever I have said unto you."* (John 14:36) *"When the Spirit of truth, comes, He will guide you into all truth"* (John 16:13). They prepared themselves for this, with several years of His teaching and many days of prayer and fasting. It is in a life of prayer that we receive inspiration from Him sending on us His unlimited love. The relationship we can develop with Him is one that cannot be put into words.

For us, Christians, Jesus Christ is the measure of all things, divine and human. "In Him dwelleth the fulness of the Godhead" (Col 2:9) and of mankind. He is our most perfect ideal. In Him we find the answer to all our problems, which without Him would be insoluble. He is in truth the mystical axis of the universe. If Christ were not the Son of God, then Salvation through the adoption of man by God the Father, would be totally incomprehensible. With Christ man steps forward into divine eternity (Archimandrite Sophrony: His Life is Mine, p 31).

Conclusions: The closer a human being approaches the Light, the more he realizes his impotency to achieve his salvation without Christ's grace. Our deification only comes as a gift from Him!

I finish with a sentence from Revelation: And I saw the new Jerusalem, coming down from heaven... and *"there will be no more night; they shall need no light of lamp or sun, for the Lord God will be their light, and they will reign forever and ever"* (Revelation 22).