

# THE COSMOS IN THE BIBLE AND SCIENCE

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In this article I present the Biblical description of the Creation of the Cosmos in parallel with the description of contemporary science. The first part deals with the events that started the whole Universe. These are the events that took place during the first day of the Bible and the night that followed it. The first day begins with darkness, which is subsequently dissolved by a bright light that initially shines like in a hot summer noon. In the sequel, this light evolves and eventually disappears through an impressive evening, after about twenty million years. Then comes the first night that ends after about nine billion years, with the emergence of the primitive Earth. The second part of Creation describes how an earth observer would have viewed the formation of the Earth and its waters and the appearance of the living beings and man. The second to the sixth days appear to be merely long periods of time. They do not have a day-night structure like the first day.

The scientific understanding of Creation perceptions I am presenting here is based on the assumption that the forces we see today in Nature were created at the very beginning and have remained unchanged ever since. If we do not make this assumption, we cannot say anything. The few measurements we can make agree with this assumption.

For measuring time, we use the clock of General Relativity and what is known from astrophysical measurements. Before Creation began, time as we know it did not yet exist. Space did not yet exist either, and the Universe was just 'nothing'.<sup>1</sup> From this nothing therefore began the creation of space (the heavens of the Bible) and the emergence of the primitive matter in it.

Before moving on, however, I will mention that until the early twentieth century, the common scientific belief was that the Universe had no beginning. Space was believed to be eternal, as well as matter. It was not until after 1920 that it was discovered that the Universe indeed had a beginning.

Let us start with the Biblical description of the first day.<sup>2</sup>

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

<sup>1</sup> This is equivalent to the  $\mu\eta\ \delta\nu$  in Greek.

<sup>2</sup> 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.

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 (Gen. 1:1–5).

'In the beginning God created the heavens and the earth...' Let us look at time, space, and matter separately. Time, as science perceives it, was created and began to run *in the beginning*. In the creation of the Angels that had happened before, there was of course some kind of time, but not the time we are talking about here. Our Lord Jesus Christ is 'begotten of the Father before all ages'. The Son was begotten, not created, before any kind of time had started running. Only the Holy Trinity, the Father, the Son, and the Holy Spirit have no beginning.<sup>3</sup>

The redistribution of nothing: The heavens of the Bible is the space, and the formless earth is primitive matter. Both emerged at the beginning. Before this beginning, there was neither space nor energy or matter; the universe was simply nothing. At the beginning, the Triune God took the zero energy, this 'nothing' and he separated it into two parts: a positive part, which would become space and matter, and a negative part, which would become gravitational dynamic energy, which would attract the various pieces of matter to each other. Both these parts are of huge magnitude today, but of opposite signs, so that their summation still remains zero.

The entirety of space was originally an extremely small sphere containing all matter of the universe. In fact, it was not yet space. And suddenly, at the beginning (i.e., at time zero), this small sphere started exploding (this is the Big Bang) and its various parts started moving violently away from each other, creating space. At first, this motion was very violent. Then it slowed down... Even today, that original very small sphere, which is now immense, continues to swell and the universe continues to expand. And we can observe and measure this expansion.

This 'redistribution of nothing' is a basic consequence of general relativity, and it is consistent with the Christian belief that the Triune God created the universe from 'nothing', without using any previous 'entity', not even space. The universe is indelibly sealed with the nothing from which it started.

For living beings, however, general relativity cannot help. But the idea that living beings also are indelibly sealed by the nothing from which (by the command of the Triune God) they were created, is plausible. Humankind alone escapes this because of its immortal soul, which prohibits the ultimate return to nothing—even for the body!

<sup>3</sup> Arius could not understand that time had a beginning and that the Holy Trinity existed before any kind of time had started running.

Shortly before the primordial light shines: ‘...the earth was formless and invisible and darkness covered the face of the deep. And the Spirit of God swept over the waters’ (Gen. 1:2).

As space was expanding, the matter inside the Universe was changing rapidly and its matter density was decreasing. Its temperature, which was initially very high, was falling rapidly at the beginning, slowing down later. Numerous particles (like those found in modern accelerators) were being produced then and almost immediately were decaying.

Shortly after the first few minutes though, the situation was temporarily stabilized, and the known matter of the universe consisted only of the light nuclei of hydrogen, helium, and traces of some other light elements, as well as electrons and neutrinos. There were no atoms or molecules at that time, and this may explain why Moses called this matter ‘formless’.

The aforementioned particles of known matter were moving freely at that time, blocking the propagation of the electromagnetic waves describing light, which existed from the very beginning, forcing the universe to be opaque and thus dark. This situation lasted until the time when the universe was approaching the age of 380,000 years. It is remarkable how Moses, writing at around 1300 BC, manages to describe this by ‘darkness covered the face of the deep’ (Gen. 1:1).

In addition to the known matter, the universe also contained dark matter, which today is about five times more than known matter. Little is known about it. The dark matter does not affect the propagation of light and the aforementioned darkness.

‘...and God said, “Let there be light”; and there was light’. When the universe reached the age of 380,000 years, its temperature dropped to about 3000° K,<sup>4</sup> allowing the nuclei that had already been manufactured to bind electrons, forming neutral atoms. Then, more or less suddenly, the universe became transparent to electromagnetic radiation, known in scientific terminology as ‘black body’ radiation.<sup>5</sup> At the temperature of 3000 K, this radiation was a dazzling white light coming from everywhere. That was the light created by the Lord’s command ‘Let there be light’.

Of course, there were no people at that time. However, the Bible is anthropocentric (i.e., it describes the events that a person would have seen if people had existed then). Using a simple language, we could say that the aforementioned light was like the light during summer at midday, where everything around is hot and radiates.

It is also worth mentioning that the first day had no morning; it started from noon. It is intriguing to point out that the first morning mentioned in the Bible’s description is the one of the second day. Worth mentioning is also the description of

<sup>4</sup> K describes the unit of temperature called Kelvin. Zero Kelvin corresponds to -273° Celsius.

<sup>5</sup> The black body radiation was discovered at the beginning of the twentieth century. Its physical properties solely depend on its temperature.

St Nicodemus of Mount Athos: ‘the light in it did not appear as in a morning, but as in midday, according to Theologians’.<sup>6</sup>

But as time was passing and space was expanding, the wavelengths of that light were also growing, while its brightness was diminishing. Today—13.8 billion years later—it continues coming to us with almost the same intensity from everywhere, but it is no longer visible by human eyes. Its brightness is about 100 billion times smaller than its original value and its wavelengths are some 1100 times higher, while its temperature has dropped to just under 3 K. We can no longer see it with our own eyes, but we can measure it.

This is the same light, as it was when it started on the first day; it contains the same photons as it did then. In 1964, A. Penzias and R. Wilson experimentally identified it and called it Cosmic Microwave Background (CMB). These are remnants of the light born by the Divine command ‘Let there be light!’ Their discovery was instrumental for the acceptance of the Big Bang theory by the scientific community.

Let us go back to the time when this light first shone. As time was passing, the brightness of the light was decreasing, and its color was becoming more and more reddish until 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 deep reddish light. A spectacular evening indeed! ‘And God saw that the light was good.... And there was evening and there was morning, the first day’ (Gen. 1:4–5). Note that a day-night structure is also seen within the Big Bang theory; the Bible and scientific descriptions fit!

During the first night, stars and galaxies and clusters of galaxies were created, or at least started. And finally, at about nine billion years after the beginning, the primitive Earth appeared, signifying and the end of the first night.

We next turn to the second to sixth days of Genesis. The description now focuses on the events that took place on the Earth and cover the period of the last 4.5 billion years. At first glance one could think that these events are insignificant since the size of the Earth is almost nothing. But these events concern the appearance of the human being for whom the whole universe was created. As already said, the corresponding days do not have a day-night structure like the first day. All we can say about them is that they corresponded to long periods of time.

On the second day and the first part of the third day, the separation of waters on the surface of the Earth takes place:

And God said, ‘Let there be a dome in the midst of the waters, and let it separate the waters’. So God made the dome and separated the waters that were under the dome from the waters that were above the dome. And it was

<sup>6</sup> St Nicodemus of Mount Athos, *ΓΥΜΝΑΣΜΑΤΑ ΠΝΕΥΜΑΤΙΚΑ εἰς τὴν Ἀνάστασιν τοῦ Κυρίου*, study ΔΒ’, α’, σ. 273, Ἐκδόση 7η (Βασ. Ρηγόπουλου: Θεσσαλονίκη, 1991): ‘τό γάρ ἐν αὐτῇ γεγονός φῶς οὐχὶ ἀπὸ τοῦ πρωῒ, ἀλλὰ ἀπὸ μεσημβρίας ἤρξατο, κατὰ τοὺς Θεολόγους’.

so. God called the dome Sky. And there was evening and there was morning, the second day. And God said, 'Let the waters under the Sky be gathered together into one place, and let the dry land appear. And it was so. God called the dry land Earth, and the waters that were gathered together he called Seas. And God saw that it was good (Gen 1:6–10).

These verses offer no argument supporting the existence of water on the Earth in some stage of its construction. But in Chapter 2 it is stated that the first water that watered the Earth before man was created (and from which the seas were apparently made) did not originate from rain, but came from the depths of the Earth:

In the day that the Lord God made the earth and the heavens, when no plant of the field was yet in the earth and no herb of the field had yet sprung up—for the Lord God had not caused it to rain upon the earth, and there was no one to till the ground; but a stream would rise from the earth, and water the whole face of the ground (Gen. 2:4–6).

Apparently seismic rearrangements were taking place during this period, and mountains and volcanoes were appearing. The primitive atmosphere of the Earth also must have appeared during this period.

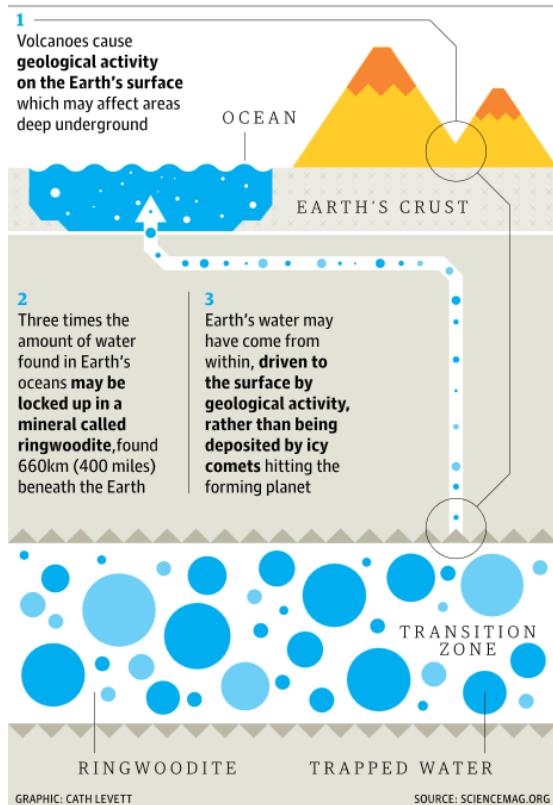
The abundance of water on Earth is striking, especially if one compares it to what is happening on the neighboring planets Mars and Venus. In the Psalms, the waters are even described as the foundations of the Earth: 'to him that stretched out the earth above the waters' (Psalm 135 (136), 6), 'he hath founded it upon the seas, and established it upon the floods (Psalm 23 (24) 2), 'who layeth the beams of his chambers in the waters: who maketh the clouds his chariot: who walketh upon the wings of the wind' (Psalm 103 (104) 3), 'then the channels of waters were seen, and the foundations of the world were discovered' (Psalm 17 (18) 15).

Let us now see what science says about Earth's water. A very small portion of it may have come from icy comets that hit the Earth during its formation about 3.9 billion years ago. Such comets may have originated at the edges of our solar system.

But the bulk of Earth's water appears to have been produced in the Transition Zone inside the Earth at a depth of about 660 km.<sup>7</sup> This is illustrated in the figure below, which depicts a cross-section of the Earth. The top part of this figure illustrates an ocean and some volcanoes at the surface of the Earth, while the bottom shows the Transition Zone at a depth of about 660 km, where a huge amount of water is trapped—probably more than two times more water than in all the oceans put together. This water did not come from rain because rainwater does not go deeper than 100–150 km.

<sup>7</sup> See <http://www.theguardian.com/science/2014/jun/13/earth-may-have-underground-ocean-three-times-that-on-surface>

### Bubbling under The Ringwoodite reservoir



But why such water only appears in the Transition Zone? There is a mineral called ringwoodite,<sup>8</sup> which contains a small amount of water in its crystals (at most 2.6% of its mass). Almost everywhere on Earth, ringwoodite is very unstable and extremely rare. The only exception is in the Transition Zone, where temperature and pressure conditions make it stable, thus allowing for a huge amount of ringwoodite there. Part of this ringwoodite tries to move outside the Transition Zone, but this again makes it unstable, forcing it to leave its water there.

Therefore, in the Transition Zone we have free water, as well as water trapped in the ringwoodite crystals. As already mentioned, the total amount of this water is estimated to be more than twice the amount of water in all of all the oceans put

together. The Transition Zone and the oceans communicate to each other using the same geological processes that cause the motion of the tectonic plates, and this communication plays a crucial role in keeping the amount of water in the oceans stable.

The final conclusion is that the water of the Earth is created mainly within the Transition Zone. This fits fantastically to the biblical phrase that 'a stream would rise from the earth, and water the whole face of the ground' (Gen 2:6).

During the second part of the third day the plants appear—first the simplest ones, then the more complex. Subsequently, the clouds that flooded the Earth's atmosphere vanished and the stars appeared. Then, on the fifth and sixth days, the fish, the birds, and the animals are created—again first the simplest ones, then the more complex. And always by God's command, who checks at every step that the result is indeed 'very good'.

Finally, during the second part of the sixth day, the greatest event of material Creation takes place on Earth. The Triune God, in a kind of a consultation of the three Persons of the Holy Trinity, says: 'Let us make humankind in our image, according to our likeness; and let them have dominion...' (Gen 1:26). 'And the Lord

<sup>8</sup> A kind of brown diamond.

God formed the first man Adam from the dust of the ground, and breathed into his nostrils the breath of life; and the man became a living being' (Gen. 2:7). 'And God saw everything that he had made, and indeed, it was very good. And there was evening and there was morning, the sixth day' (Gen 1:31).

As can be seen throughout the text, Adam was made beautiful (very good, Gen. 1:31) and wise (Gen. 2:18–20). And Eve of course! And they must have retained this beauty and wisdom, even when they had already been driven out of Paradise on earth. This is also evident from the information that soon after their exile the development of civilization on earth began (Gen. 4).

Let us now turn to the paleontological findings. It should be noted from the outset that the definition of the human being in paleontology is not identical to that in the Bible, as paleontology completely ignores what it means for a creature to have the 'breath of life' (Gen. 2:7), which is the main characteristic of the human being. But how can the 'breath of life' be measured scientifically?

Adam's hagiographic description given above prohibits his identification with the ugly (and now already extinct) beings of paleontology, such as the so-called Neanderthal man and others. Necessarily, then, Adam must belong to the kind that paleontologists call the *homo sapiens sapiens*.

The breath of life certainly cannot be analyzed as a scientific notion. Thus, all the beings that paleontology describes as 'men' do not have to be humans. Moreover, Adam must not necessarily be older than the oldest so-called 'man fossils' found. I personally expect that finally, when all questions are answered, science will be consistent with Adam's age in the range of 10,000–15,000 years.

Thus, material creation, at some moment of time accepted its king: the Man, who though perishable, could have lived forever, provided he had kept the first commandment. But man did not keep this commandment. And the Lord knew he would not keep it... and after a few thousand years, the Lord Himself came on our little Earth through the Incarnation.

The Lord Jesus Christ, the Son of God Himself! He came to redeem us from the tragic situation we had fallen into.

And we, who caused all this tragedy with our first and subsequent sins, have not just returned to our initial state. 'But ye we have received the Spirit of adoption, whereby we cry, Abba, Father. The Spirit itself beareth witness... that we are the children of God' (Rom 8:15–16).

#### Note

As already said, in our description the earthy days 2<sup>nd</sup> to 6<sup>th</sup> are simply long periods of time, for which no morning or evening exists. This can be cured if we assume that during these days, the spinning velocity of the Earth around itself, were much slower than its angular velocity around the Sun. That would make these days much longer than the Earth year, which would correspond to the time needed for

a full circulation of the Earth around the Sun. This way, all Genesis days 2<sup>nd</sup> to 6<sup>th</sup> acquire mornings and evenings. And the agreement with the Bible becomes perfect. Of course, in this case, a scientific description of creation of life on Earth becomes much more difficult. But in any case, I believe that it could have never happened without God's command.