

Original Research

STUDY OF SCIENTIFIC ASPECTS IN THE QUR'AN

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Abstract

The study of the scientific aspects in the Qur'an, the holy Muslim Book, has taken a great extent lately. Several studies and works have been led and the publication of results of these works has been made especially in Arabic, which has deprived westerners that want information on this subject to have a precise and clear idea. Among the rare suitable studies in a foreign language we quote especially that which has been led by Dr. Maurice Bucaille in his book "The Bible, the Qur'an and Science" (translated in several languages besides English). In the aforementioned book the holy "Biblical and Coranic" accounts confrontation with modern knowledge has been made according to the following rule: "A holy text must agree with data definitively established by modern science". However, Dr. Bucaille has not treated two important problems that are at the heart of current research in contemporary astronomy: namely the future of the solar system, then that of the universe, and the existence of alien life. For reasons of coherence and clarity, we re-examine some passages from: "the Bible, the Qur'an and Science" to complete them if necessary. At the end of the article, we suggest a new approach to the structure of the universe, the chronology of its formation and its evolution on the basis of the Qur'an. Before going through details, we give a short account of the pre-Islamic epoch in order to give an idea about the context of holy revelation.

Keywords

Animal kingdom; Fertilization Agents; Rainfall cycles; Lightning formation; Earth crust; Creation; Water currents; Science of life; Embryo; Fertilization; Fertilized egg; Formation of milk; Animal organism; Aquatic origin; Organisms; Theory of evolution; ASTRONOMY; Generalities; Earth; Planets; Lunar; Solar system; Stars; Moon's fragmentation; Solar system collapse; Universe; Time relativity; Creation; Extra-terrestrial Life; Time; Time Dilation

1. THE CONTEXT OF THE REVELATION

Before the period of revelation, (610-632 AD) all the Arabic peninsula was prey to ignorance and obscurantism. Residents of the desert lived a very humble and primitive life. The following anecdote illustrates this aspect: it is reported that bandits attacked a tribe and took in hostage the girl of the chief. These bandits had asked an accomplice to exchange the girl against a ransom. The latter proposed to the father 100 camels. His companions have, thereafter, reproached him not to have asked for more camels especially that the chief of the tribe was known for his wealth. The extortioner simply replied that he did not know that there existed a number larger than 100.

Another fact which testifies to the ignorance of the inhabitants of the Arabic peninsula is the burial of young girls alive. With the advent of the Islamic era, God had warned people against such practices.

"When the female (infant), buried alive, is questioned: "For what crime she was killed?"" [Sura 81, verses 8-9]

The only specificity of the Arab nomads was that they mastered the Arabic language. Some of them were even able to produce a sentence or a poem verse about a specific subject, and which could be read in opposite directions. God challenged these people to produce a sura similar to the Qur'an. But they could not do it at that time in spite of their erudition. Who can do it nowadays?

"And if ye are in doubt as to what We have revealed from time to time to Our servant, then produce a sura like thereunto; and call your witnesses or helpers (if there are any) besides God, if your (doubts) are true. But if ye cannot -and surely ye cannot- then fear the fire whose fuel is men and stones, which is prepared for those who reject faith." [Sura 2, verses 22-23]

The inhabitants of Mecca, aware of the miraculous eloquence of the Qur'an (see one aspect, in Itifat [1], [8]) were, of course, unable to produce even one verse and they will never be able to do it as it is specified in the previous verse (But if ye cannot-and of a surety ye cannot), in spite of the simplicity and clarity of the language used in the Qur'an as it is illustrated in the following verses where God explains, in the first verse the aim of the diversity of human races (that ye may know each other), in the second verse that the future of human beings when facing the last judgment will mostly depend on their deeds on Earth; the third verse depicts God's might and the fact that He is different from anything one imagines (there is nothing whatever like unto Him).

"O mankind! we created you from a single (pair) of a male and a female, and made you into nations and tribes, that ye may know each other (not that ye may despise each other). Verily the most honoured of you in the sight of God is (he who is) the most righteous of you. And God has full knowledge and is well acquainted (with all things)." [Sura 49 verse 13]

"That man can have nothing but what he strives for; that (the fruit of) his striving will soon come in sight ..." [Sura 53, verses 39-41]

"(He is) creator of the heavens and the earth : He has made for you pairs from among yourselves, and pairs among cattle : by this means does He multiply you : there is nothing whatever like unto Him, and He is the One that hears and sees (all things)." [Sura 42, verse 11]

As for the verses concerning modern science, they can be roughly classified into three categories depending on the degree of difficulty in their interpretation. It is interesting to note here that many classical translators have mistranslated a certain number of verses about scientific notions because they interpreted them subjectively; it would have been more logical if they had offered a literal translation to keep closer to the

holy text. Indeed, a good translation requires a sufficient knowledge of the scientific domain treated in each verse.

Three categories of verses related to scientific notions can be enumerated:

- Verses of a general order.
- Verses related to life sciences.
- Verses related to Astronomy.

2. VERSES OF A GENERAL ORDER

This category is characterized by its accessible interpretation. Translators and exegetes of the Holy Book practically agree on the same translation and interpretation.

2.1. EXISTENCE OF COMMUNITIES AND ORGANIZATION IN THE ANIMAL KINGDOM

In the animal kingdom, the Qur'an refers to three groups of animals which constitute perfect models of a high organization: birds, ants, and bees. The fact that the Qur'an mentions these groups in the animal kingdom testifies to the exceptionally interesting aspect of these animals from a scientific view point.

As an example, we refer the reader to the following verses: that all animal species, including birds, are organized into communities and nations (1st verse), and that each specie or community has its own language for communication (2nd verse).

"There is no animal on the earth, no bird which flies on wings, that (does not belong to) communities like you. We have not neglected anything in the Book (of Decrees). Then to their Lord they will be gathered." [Sura 6, verse 38]

"And Solomon was David's heir. He said: "O ye people! We have been taught the speech of birds, and on us has been bestowed (a little) of all things: this is indeed a manifest grace (from God)". And before Solomon were marshaled his hosts, of jinn's and men and birds, and they were all kept in order and ranks. At length, when they came to a (lowly) valley of ants, one of the ants said: "O ye ants get into your habitations, lest Solomon and his hosts crush you (under foot) without knowing it"." [Sura 27, verses 16-18]

The most typical case of organization which has received most attention in the animal kingdom is certainly that of bees. It is for this reason that God honored bees by giving their name to a sourate (Bees' sourate) where He points to the therapeutic advantages of honey as demonstrated by modern medicine.

"Thy Lord inspired the bee: choose your dwelling in the hills, in the trees and in what (man) built. Eat of all fruit and follow the ways of your Lord in humility. From within their bodies comes a liquor of different colors where is remedy for men" [Sura 16, verses 68- 69]

It is to be noted, here, that researchers, nowadays are investigating what are called multi- agent systems which permit the apprehension of complex problems which are naturally, or logically or physically distributed. Two types of agents are essential: the reactive and the cognitive ones. Reactive agents are simple entities devoid of any kind of intelligence; however, they manage to solve important problems by border effects of their interactions.

The behavior of these agents resembles that of ants and bees. It is for this reason that numerous works of this domain are interested in the life of these insects in the context of the discipline called artificial life. Note also the existence of a combinatory optimization algorithm entitled colonies of bees, which reproduces their life.

The Qur'an mentions spiders only when referring to the tenuousness of their home, the most fragile of all. This is, as the Qur'an puts it, as precarious as that of people who have chosen masters other than God.

"Those who choose masters other than God are like the spider when it takes for itself a dwelling. Verily, the flimsiest dwelling is the dwelling of the spider. If they but knew." [Sura 29, verse 41]

It is interesting to note, here, that the word "home" is associated in Arabic to the word "beit" which also means household. This verse, then, may also mean that the most fragile household is that of the spider. Indeed, some female species of spiders reject their companions after mating and devour them. In the same way, those who have chosen masters other than God will also be rejected by them as it is explained in the following verses:

"And the Day whereon we shall gather them all together, then we shall say to those who did set partners in worship with us: "Stop at your place! You and your partners (whom you had worshipped in the worldly life)." then we shall separate them, and their partners shall say: "It was not us that you used to worship - So sufficient is God as a witness between us and you that we indeed knew nothing of your worship of us"." [Sura 10, verses 28-29]

"When those who were followed disown (declare themselves innocent of) those who followed (them), and they see the torment, then all their relations will be cut off from them" [Sura 2, verse 166]

2.2. FERTILIZATION AGENTS AND RAINFALL CYCLES

The Qur'an specifies that winds are fertilizers of plants (1st verse) and that winds modify the rainfall cycles (2nd and 3rd verses)

"We sent forth the winds that fecundate. We cause the water to descend from the sky, and we provide it to you to drink, and it is not you who are the owners of its stores" [Sura 15, verse 22]

"God is the One Who sends forth the winds which raised up the clouds. He spreads them in the sky as He wills and breaks them into fragments. Then thou seest raindrops issuing from within them. He makes them reach such of His servants as He wills. And they are rejoicing" [Sura 30, verse 48]

"God is the One Who sends forth the winds which raised up the clouds. We drive them to a dead land. Therewith we revive the ground after its death. So will be the resurrection" [Sura 35, verse 9]

2.3. LIGHTNING FORMATION

In the following two verses, there is a clear correlation between the formation of rain-or- hail-laden clouds and that of lightning: the first, a subject of envy because of its benefits and the second a subject of fear- its fall being determined by the Almighty God.

"Hast thou not seen that God makes the clouds move gently, then joins them together, then makes them a heap? And thou seest raindrops issuing from within it. He sends down from the Sky Mountains of hail, He strikes there with whom He wills and He turns it away from whom He wills. The flashing of its lightning almost snatches away the sight."

"(God) is the One Who shows you the lightning, with fear and covetousness. He raised up the heavy clouds. The thunder glorifies His Praise and so do the angels for awe. He sends the thunder-bolts and strikes with them whom He wills while they are disputing about God. He is All Mighty in His Power" [Sura 13, verses 12-13]

2.4. STABILITY OF THE EARTH CRUST

God also explains that mountains are like stakes which fix a tent (1st verse) and that mountains are arranged in such a way as earth equilibrium is maintained (2nd verse) (so that it does not shake with them). In fact, it is known that mountains play an important part in the stabilization of the earth's crust.

"... and the mountains as stakes." [Sura 78, verse 7]

"We have placed in the ground (mountains) standing firm so that it does not shake with them ..." [Sura 21, verse 31]

On the other hand, the following verse refers to mountains as moving like "clouds". Some modern commentators point out, here, that the movement of mountains is a result of Earth's rotation. Others interpret it as a reference to tectonics. It is interesting to note here that the collision of tectonic plates moving by continental drift is a frequent phenomenon in the Mediterranean basin.

"And you will see the mountains and think them firmly fixed, but they shall pass away as the passing away of the clouds. The Work of God, Who perfected all things, verily He is Well-Acquainted with what you do." [Sura 27, verse 88]

2.5. OPTIMIZATION IN THE CREATION

God also explains that He has created everything taking into account precise and optimal proportions. This optimization is most evident in the equilibrium of animal populations due to natural selection.

"Verily, all things have we created in proportion and measure" [Sura 54, verse 49]

This notion of optimization is most evident when the Qur'an mentions creation in the vegetal realm.

"The earth ...we caused to grow therein all kinds of things in due proportion."

A very important aspect of this biodiversity optimization is the fact that for every human being there exists a unique identifier which characterizes it and differentiates it from the other creatures. This unique identifier is the fingerprint. The infidels of Mecca have ironically asked the prophet whether, on the resurrection day, God would be able to gather their bones in order to make them come back to life. The following verse is an answer to that question and specifies that God is capable of giving life to the gathered bones with their proper fingerprints (expressed in the verse below by the phrase "tips of his fingers.")

"Does man (a disbeliever) think that we shall not assemble his bones? Yes, we are Able to put together in perfect order the tips of his fingers." [Sura 75, verses 3-4]

2.6. EXISTENCE OF BARRIERS BETWEEN WATER CURRENTS OF DIFFERENT NATURE

All classical exegetes agree on the existence of a barrier between fresh water and salty water when a river meets the sea (verse 1). But they failed to understand the fact that fresh water currents do not mix with salty water in oceans (verse 2)

"(God) is the One Who has let free the two seas, one is agreeable and sweet, the other salty and bitter. He placed a barrier between them, a partition that it is forbidden to pass." [Sura 25, verse 53]

"He has loosed the two seas. They meet together. Between them there is a barrier which they do not transgress." [Sura 55 verses 19-20]

In fact, this recently discovered phenomenon is explained by the density difference between waters of different salinities. This explains the circulation of currents between the Black Sea and the Mediterranean Sea or in the Northern Atlantic. Salt water flows downwards and fresher water runs surface-ward. For an observer at the surface, a clear limit between the two currents may be seen.

3. VERSES REFERRING TO SCIENCES OF LIFE

This category concerns the verses, the meanings of which have more or less been understood by classical exegetes. However, translators and modern exegetes give corroborating interpretations

3.1. CREATION AND DEVELOPMENT OF THE EMBRYO

In the following paragraph, we are going to enumerate the different steps of the embryogenesis according to modern scientific knowledge. Then, we shall compare with the Qur'an revelations. We focus hereafter on the creation and development of the embryo.

The embryo development represents the phase ranging from fertilization to the 60th day of pregnancy. Knowing that the spermatozoid is 50 to 60 microns long and that the diameter of the ovöcyte ranges from 120 to 150 microns, we can conclude that it is impossible to obtain morphological or physiological data without using advanced technical means (microscope, etc...), which did not exist more than 14 centuries ago.

Fertilization:

The term fertilization refers to the process during which a spermatozoid enters the cytoplasm of the ovöcyte; the mixture leads to the association of the two genomes contained in each nucleus of the sexual cells and the formation of the procreation genome. The Qur'an description of phenomenon is as follows

"Verily, we fashioned man from a small quantity of mingled sperm" [Sura 76, verse 2]

Modification of the fertilized egg:

As soon as the fertilization is over, the egg is directed to the uterine cavity. It splits up into several blastemas through successive mitoses (this is segmentation); then the other phases of embryo development begin (gastrulation, organogenesis, histogenesis...). The different stages of the egg development are explained in the following verse:

"(God) fashioned you in (different) stages." [Sura 71, verse 14]

Towards the 7th day after fertilization, the fertilized egg is at the stage of free blastocyst in the uterine cavity; it takes the right position and sticks to the endometrial epithelium, often at the level of the uterus bottom. This capacity of clinging, characteristic of the blastocyst, continuation of development. The Qur'an refers to this phenomenon:

"... Who fashioned man from something which clings" [Sura 96, verse 2]

After set up, the blastocyst the diameter of which does not exceed 400 microns shows a new morphological aspect comparable to that of "chewed flesh". This fact is referred to in the following verse:

"We fashioned the thing which clings into a chewed lump of flesh and we fashioned the chewed flesh into bones and we clothed the bones with intact flesh ..." [Sura 23, verse 14]

During pregnancy, the embryo develops in an aquatic medium. It is wrapped up in three successive envelopes: the uterine body, the extra-embryo coelom and the water pocket (amniotic cavity).

Now, it is experimentally demonstrated that obscurity is a necessary condition to the fertilization and development of the embryo. This is explained in verse 3 of Sura 39. In this verse the three "veils of darkness" correspond to the three envelopes mentioned above.

"... He creates you in the wombs of your mothers: creation after creation in three veils of darkness..." [Sura 39, verse 6]

If we compare these scientific facts with the Qur'an descriptions, we notice that the Qur'an uses extremely specific terms, which shows a perfect knowledge of the main stages of the embryo development.

3.2. 3.2 FORMATION OF MILK IN THE ANIMAL ORGANISM

Here the Qur'an explains the factors which intervene in the formation of milk : the intestines (of the stomach) and the blood. The meaning of this verse is clear for a specialist. In Maurice Bucaille's book "The Bible, the Qur'an and Science", it is stated that: "the constituents of milk are secreted by the mammary glands. The latter feed on the products of nutrient digestion which are circulated by the blood. Thus, blood plays the role of collector and transporter of materials extracted from nutrients in order to feed the mammary glands producing milk, in the same way as any other organ".

"Verily, in cattle there is a lesson for you. We give you to drink of what is inside their bodies, coming from a conjunction between the contents of the intestine and the blood, a milk pure and pleasant for those who drink it" [Sura 16, verse 66]

3.3. AQUATIC ORIGIN OF LIVING ORGANISMS

Two verses mention the aquatic origin of all living organisms:

"..... and we got every living thing out of the water. Will they then not believe?" [Sura 21, verse 30]

It is to be noted here, that in this verse "every living thing" is not followed by "on Earth". This implies that the living organisms on other habitable planets (cf. §4.2.1.6 existence of extra-terrestrial life) are of aquatic origin and that water is necessary for the formation of life on Earth or elsewhere. The following verse includes the same idea:

"God has created every moving (living) creature from water." [Sura 24, verse 45]

There is, however, between the first and the second verse a minor nuance. The first speaks about the origin of living organisms (We got every living thing), whereas the second verse specifies the main constituent of living organisms which is water (God has created ... from water.)

3.4. POINT OF VIEW ABOUT THE THEORY OF EVOLUTION

We would like to refer, here, to the position of Moslem scholars concerning Darwin's theory, which has fascinated almost all western biologists. Let us point out that this theory speaks mainly of animals in general.

The emergence of "modern" man has not so far been elucidated. Let us examine first of all the following verse from the Qur'an:

"Behold, thy Lord said to the angels: "I will create a vicegerent on earth". They said: "Wilt Thou place therein one who will make Mischief therein and shed blood? Whilst we do celebrate Thy praises and glorify Thy holy (name)?" He said: "I know what ye know not." [Sura 2, verse 29]

In his book "Fiqh as-Sirah" [2], Al-Booti explains this verse by specifying that prior to the creation of our ancestor Adam, God had created several human species. Thus, when God told the angels that He was going to create a curate in order to install him on Earth, the angels were amazed because they had already seen how the behavior of pre-Adam creatures was not honorable at all.

According to Ibn-Al-Arabi [4], the prophet would have said: "Before your Adam, a hundred thousand Adams had existed" and we are the descendants of the last one.

In other words, several Adams had preceded our ancestor, who is referred to in the Bible and in the Qur'an.

I think that the human species which had preceded our ancestor (Homo Sapiens, ...) did not necessarily have the same physiognomy as ours. The resemblance of human remains (skull, bones, etc.) might have misled Darwin, who therefore believed in a continuous evolution. However, it is to be noted here that the Qur'an has not mentioned these human species. It is only Adam who is cited.

4. VERSES CONCERNING ASTRONOMY

This category concerns the verses about astronomy. These verses require deep knowledge of this field; that is why they have been misunderstood by ancient translators. Most Qur'anic verses about modern science deal with this field. The reason for this emphasis is explained in the Qur'an itself (in the following verse, it is stated that the creation of the universe constitutes a more extraordinary event than the creation of human beings).

"Assuredly the creation of the heavens and the earth is a greater (matter) than the creation of men: Yet most men understand not" [Sura 40, verse 57]

The next verse invites humans to focus first on what exists in the heavens and then on what exists on Earth. Everything in them points to the might of God. It is after this invitation for reflexion that Moslems began to develop Astronomy.

"Say: "Behold all that is in the heavens and the earth ..." [Sura 10, verse 101]

The verses related to Astronomy may be classified into two classes: those related to the solar system and those which deal with the heavens in general.

4.1. VERSES RELATED TO THE SOLAR SYSTEM

4.1.1. GENERALITIES

The Qur'an refers to the solar system as "the nearest heaven"

"We have indeed adorned the lowest heaven with an ornament, the planets." [Sura 37, verse 6]

We know that among the nearest elements of our heaven there are no other permanent elements but the planets and their natural satellites.

4.1.1.1. SPHERICAL SHAPE OF THE EARTH

It is to be noted here that the Earth

*** is a sphere:**

"... *He coils the night upon the day and He coils the day upon the night*" [Sura 39, verse 5]

*** But which is not perfect:**

"*See they not that we reduce the Earth from its outlying borders? ...*" [Sura 13, verse 41]

Both verses above are clear. The same idea stating that the Earth is a sphere and that it rotates

(Suggestion of movement) is found in the following verse:

"*After that (God) spread the Earth out (dahaha : from the verb 'daha')*" [Sura 79, verse 30]

Because they did not understand the meaning of this verse, (since they did not imagine that the Earth was spherical) the ancient exegetes had earlier explained the Arabic verb (dahaha) by (has flattened it). The same explanation has been introduced in the Arab dictionaries. But in these very dictionaries, the origin of this verb is found in the word (Ud-hiya) which means "egg of ostrich". Thus the Earth would look like an ostrich's egg. The same verb is also used to refer to the action of rain on the pebbles which the water current moves.

A logical consequence of the spherical shape of the Earth and of its rotation is that the night does not precede the day as it is explained in the following verse:

"... *The sun must not catch up the moon, nor does the night outstrip the day. Each one is travelling in an orbit with its own motion*" [Sura 36, verse 40]

It is clearly understood, from the expression "nor does the night outstrip the day" that there is a coexistence of the day and the night. In fact, the sun shines over the terrestrial hemisphere facing it whereas darkness covers the other hemisphere. From the preceding verse,

We cannot deduce the rotating movement of the Earth; however, verse 54 in Sura 7 explains this rotation:

- Sura 7, verse 54

"(God) covers the day with the night which is in haste to follow it..."

The rotating movement of the Earth may also be understood from verse 29 in Sura 31, which specifies that there is no order in the succession of the day and the night.

"*Hast thou not seen how God merges the night into the day and merges the day into the night?*" [Sura 31, verse 29]

The following verse refers to the concomitance and gradual appearance of the day and the night.

"Another sign for them is the night from which we withdraw the day..." [Sura 36, verse 37]

Here God establishes a similitude between the gradual appearance of the day and the night and the process of the withdrawal of the skin (representing the night) which covers the flesh (representing the day).

From the following verse, Sura 70, verse 40, it is understood that there is not a unique place for sunrise or sunset. This fact was unknown when the prophet was still alive.

"...Lord of Orient's and Occident's" [Sura 70, verse 40]

4.1.1.2. REFLECTION OF THE LIGHT BY PLANETS

It is also explained, in the verse below, that the sun's nature (qualified as a dazzling lamp) different from the moon's (qualified as "giving light").

"Blessed is the One Who placed the constellations in heaven and placed therein a lamp and a moon giving light" [Sura 25, verse 61]

The distinction, here, between the sun (a star, source of light) and the moon (a heavenly cold body playing the role of light reflector) is evident. This distinction between star /planet/ satellite is still ambiguous for the general public. The notion of light reflection by planets is more specified in the following verse:

"God is the light of the heavens and the earth. The similitude of His light is as if there were a niche and within it a luminary. The luminary is in a glass. The glass is as if it were a planet glittering like a pearl" [Sura 24, verse 35]

4.1.1.3. EXISTENCE OF LUNAR CYCLES

In the following verse, the previously-mentioned ideas are confirmed. Moreover, the lunar cycles are referred to:

"God is the One Who made the sun a shine and the moon a light and for her ordained mansions, so that you might know the number of years and the reckoning (of the time). God created this in truth. He explains the signs in detail for people who know" [Sura 10, verse 5]

4.1.2. EVOLUTION OF THE SOLAR SYSTEM

The Qur'an uses an evaluative term for the sun as well as a destination place. The sun is a star, the age of which is approximately 4.6 billion years. As it is the case for all the stars, the sun goes through evaluative stages. It is presently at the first stage, characterized by the transformation of hydrogen atoms into helium ones. This stage should theoretically still last

4.6 billion years (cf. §4.2.2 Duration of creation) until the transformation of hydrogen into helium is over and then the transformation of helium into carbon and oxygen is also over. Once its energy is used up, the sun will consequently reach a stable state.

"The Sun runs its course towards a proper state (or site) of stability. This is the decree of the Almighty, the Full of Knowledge" [Sura 36, verse 38]

In the following verse, God says that the sun and the moon do not collide because each one of them (sun, moon) moves following a different trajectory "Each one is travelling in an orbit with its own motion".

"... *The sun must not catch up the moon... Each one is traveling in an orbit with its own motion*" [Sura 36, verses 39-40]

The second verse points to the fact that the trajectories of both celestial bodies are governed by laws (physical gravitation laws and kinematic laws).

"*The sun and moon (are subjected) to calculations*" [Sura 55, verse 5]

In fact, these human calculations are but symbolic representations of these fundamental physical subjacent laws.

It is to be noted here that the two previously-mentioned verses have emphasized only the harmony in the movements of the sun and the moon (but not in those of the other planets of the solar system). The explanation of this point resides in the two following facts: on the one hand because the moon and the sun are the most visible and evident celestial bodies, and on the other hand because both these stars will undergo a grandiose astro-physical phenomenon. In fact, at the final stage of the sun's life, the transformation of hydrogen atoms into helium will be over and as a result of that the outer layers of the sun will expand. As we will deduce it later on, this will lead to the swelling of the sun which will destabilize the moon. The latter will be rent (cf. §4.1.3.1-e) and will ultimately fall onto the Earth (cf. §4.1.3.2-e)

4.1.3. FUTURE OF THE SOLAR SYSTEM

Regarding the solar system, the Qur'an has mentioned the apocalypse phenomenon very often. Because they were not much versed in Astronomy, the ancient Moslem exegetes made only general comments (and not explanations) about the verses related to this phenomenon, which is considered as a signal indicating that the day of the last judgment is getting closer.

It is after watching a series of emissions about Astronomy, presented by the fifth French TV channel, that it has been possible to establish a relation between the above-mentioned verses and the end of the solar system. The most known Sura which refers to the beginning of the solar expansion and the phenomena resulting from this expansion is Sura 81, verses 1-6. But it should be noted that many suras have also spoken about these phenomena. Let us examine them hereafter:

"*When the sun becomes like a swelling ball (kuwwirat)*" [Sura 81, verse 1]

Here, the selection of the word "kuwwirat", deriving from the verb "kawwara" (leading to the word "kura(t)", meaning "ball"), is intentional. This verb is used especially to designate the ball-shaped winding (for example of a silk string or a cloth band). It is known that the further the winding the greater the volume of the ball. This means a swelling of the ball. In fact, towards the end of its life, the sun will exactly undergo the same phenomenon. Its volume will increase with time to constitute a red giant. The specialists indicate that the expansion of the sun will result in the coming closer of the surface of the sun and the Earth's orbit. This coming closer of the sun's surface and the Earth's orbit is not explicitly mentioned in the Qur'an (cf. §4.1.3.1-d Sura 75, verse 9) but it is quoted in a "Hadith" (tradition of the prophet Muhammad).

"When the apocalypse gets closer, the surface of the sun and the Earth's orbit will get closer" [6].

Many consequences of the sun's expansion and of its movement closer to the Earth's surface are mentioned in the Qur'an. However, the successive events are not referred to in sequence. They can be classified into two categories:

4.1.3.1. CONCERNING THE SKY (HEAVEN)

a) Aspect of the sky

When the sun turns into a red giant, the solar disc will occupy a great part of the heavens. The sudden appearance of this red giant with a remarkable volume will give the illusion of an invasion of the heavens. At this stage, the Qur'an indicates that the sky will look like a rose (the sun representing the heart of the rose) and the rest of the sky will become like red hide (the rose's petals). This is mentioned in the following verse:

"Then, when the heaven is rent asunder, becoming scarlet-rosy like red hide" [Sura 55, verse 37]

The following verse gives more information on the overall aspect of the sky, which besides its scarlet color, will look like a molten metal that is then a metal-red color.

"The Day that the sky will be like molten metal" [Sura 70, verse 8]

Note: It is interesting to note here that if it were possible to simulate this phenomenon of solar expansion on computer, we would perhaps understand why God has chosen to compare the aspect of the heavens with a red rose: Is it for its color only, or for both its color and its shape? Knowing that in the Qur'an there is a wise choice even in the use of the frequency of the alphabet letters [5], what can then be said concerning the choice of words? According to us, it is the second hypothesis (color + shape) which applies.

During its final spasm which will last some thousands of years, the sun will occupy the whole of the celestial dome and will certainly look like one of those agonizing stars which have been very often observed by Hubble spatial telescope (pictures can be seen at hubblesite.org, in particular the "Cat's eye" nebula (Fig 1)). These stars have got rid of their gas envelope, giving birth to superb planetary nebulae.



Fig 1 Cat's eye" nebula (cf. Hubble).

b) Increase of light intensity over the Earth

The following verse says that light intensity will considerably and excessively increase and will cause sight dazzling.

"So, when the sight is dazzled" [Sura 75, verse 7]

It is to be noted, however, that the previous verse, like those relating to the final episode of the sun's life, does not express what will be "observed" or "experienced" by eventual inhabitants of the Earth, because the Earth will have become uninhabitable a long time before this event. Sight dazzling is therefore only a way to explain the increase of light intensity and does not imply that there will still exist human beings to witness this phenomenon. In fact, the Qur'an specifies that the occurrence of this event is not isolated but it is associated with the appearance of other phenomena, such as the boiling of the seas and oceans (cf. §4.1.3.2-b) due to temperature increase. This will lead to the Earth's surface water evaporation, thus eliminating all forms of life.

c) The stars will no longer be visible

The following verses indicate that it will be difficult to see the stars from the Earth, probably because of the light intensity (of the sun) which is very strong, as it has already been mentioned.

"Then when the stars become dim" [Sura 77, verse 8]

"And when the stars, lose their luster" [Sura 81, verse 2]

d) The moon will no longer be visible

The difficulty of observation caused by the increase of the light intensity does not in fact concern only the stars; it applies to the totality of the other celestial bodies. In fact when the Earth is covered by the extreme intensity of the sun's light, it will be impossible to observe even the moon, as it is explained in the following verse:

"And the moon will be eclipsed." [Sura 75, verse 8]

The fact that this verse immediately follows verse 7 of sura 75 mentioned above (cf. §4.1.3.1-b) and speaking about sight dazzle confirms once again that the moon's eclipse is certainly due to the increase in light intensity. This is, in fact, a final and irreversible eclipse.

For a terrestrial observer used to the moon's light, the non-visibility of the moon will give him the illusion of a fusion or "joining" of both celestial bodies (sun and moon). The Qur'an, in Sura 25, verse 61, has attributed a distinctive quality to the sun (it refers to it as a torch) and another one to the moon (it is referred to as a gleam) (cf. §4.1.1.2). After the start of the sun's expansion process, the moon will be totally immersed in the sun's atmosphere. In the celestial dome, only the red giant will be present. The two celestial bodies will be joined as it is specified in the following verse:

"... *And the sun and moon are joined together*" [Sura 75, verse 9]

The enormous increase of the sun's volume will in fact result in its "coming closer" to the moon (joining of the two celestial bodies), therefore closer to the Earth.

Note: This verse is also explained by a "Hadith" (tradition of the prophet Muhammad) [6] (vol. 4, N° 422) which specifies that the sun and the moon will both be bathing in fire. This refers in fact to the immersion of the two celestial bodies in the very high temperature of the sun's atmosphere. The same "Hadith" refers to the increase of the volume of both celestial bodies. As regards the sun, the Qur'an has already dealt with this phenomenon; concerning the moon, this volume increase is due to the moon's expansion as a result of the sun's intense heat.

In the presence of the star's (sun and moon joined) tenuous atmosphere, the moon will be submitted to viscous forces and will gradually lose its energy and also its angular moment. This will result in the destabilization of its orbit (orbital braking) the moon's orbit will shrink little by little resulting in its progressive fall onto the Earth's surface after having been fragmented.

e) The moon's fragmentation

Long before its fall onto the Earth, the effects of the Earth's tide on the moon will ultimately lead to its fragmentation below a certain distance, known as Roche limit. This moon's «Break up» would occur suddenly and brutally once the limit is reached, as it is specified in the following verse:

"*The Hour has drawn near and the moon has been cleft asunder*" [Sura 54, verse 1]

An alternative explanation of this consists in supposing that the moon's fragmentation is a result of its expansion (cf. Note in §4.1.3.1-d above). But if we take into account the verses of §4.1.3.2-e (below) which suggest that the moon's fragments will fall onto the Earth's surface, the thesis of fragmentation resulting from the effect of orbital braking would be more plausible.

The moon's fragmentation will constitute its final stage of disappearance from the solar system. It is evident that the sun will destabilize the moon only after having swallowed up Mercury and Venus, which are closer to it than the moon.

f) Modification of the solar system planets orbits

The Qur'an specifies that there occurs a dispersion in the movement of the solar system planets (modification of orbits), including the Earth (see note at the end of section §4.1.3.2-b).

".....*And when the planets will disperse (intatharat)* " [Sura 82, verse 2]

This is confirmed by the use of the Arabic term "intatharat" which means an organized dispersion, by opposition to the term "tanatharat" which means a random dispersion.

4.1.3.2. CONCERNING THE EARTH

The phenomena which will affect the Earth as a result of the sun's progressive expansion are referred to in many Qur'anic verses. We are going to examine them hereafter.

a) Exodus movement and gathering of wild beasts

Once a certain degree of heating up of the Earth's surface is reached, forest fires will become more and more frequent. Feeling the danger, wild beasts will start general and continuous escapes, which will correspond to great gatherings as it is specified in the following verse.

"...And when the wild beasts are herded together" [Sura 81, verse 5]

b) Boiling and bursting forth of the seas and oceans

The Qur'an indicates that the sun's expansion will result in the warming up of the seas and oceans as it is specified in the verse below:

"And when the seas become as blazing fire" [Sura 81, verse 6]

The warming up of the seas and oceans will result in their boiling up as it is explained in the following verse:

"(I Swear)... By the Canopy Raised High, And by the boiling sea" [Sura 52, verses 5-6]

After the boiling up of the seas and oceans, water expansion will follow as it is said in the verse below:

"... And when the seas are burst forth" [Sura 82, verse 3]

The warming up and expansion of the seas and oceans' waters are certainly indicators of a first stage before their evaporation. According to us, these phenomena will take place at the beginning of the sun's swelling process and in all cases before the destruction of the moon by the sun, because at that moment the Earth's surface would already be totally turned into lava.

Note: It is obvious that the seas and oceans' evaporation will result in a considerable loss of the Earth's mass. But, we should also note that when the sun turns into a red giant and reaches its maximum volume, it would already have lost a part of its mass. According to Newton's law of gravitation a fraction of mass loss (in relation with the initial mass) greater for the sun than for the Earth will result in the orbit of the Earth moving off from the sun's and vice-versa. Because the solar atmosphere will consequently be lost in the intergalactic space, the previous conclusion remains a fortiori valid for any (surviving) planet. Thus, the term "will disperse" (cf. §4.1.3.1-f) should be interpreted as "will move farther away from the sun". The changing of orbit for the surviving planets of the solar system, and especially for the Earth, allows us to suggest that modifications in its revolution and rotation will occur leading to a change of the length of the day, the night and the year.

c) Expansion of the Earth's crust

In the same way, the Earth's overheating will result in its expansion, hence a repulsion and rejection of its content (probably the most volatile elements: atmosphere, water and some trapped elements presently below the crust).

".... And when the Earth expands. And has cast forth what is within it" [Sura 84, verses 3-4]

Note: The Earth's expansion is not explicitly referred to in the Qur'an; it is in fact mentioned in the prophet's "Hadith" quoted in §4.1.3.1-d.

d) Pulverization of mountains

The fate of mountains, known for their rigidity is explained in the following verse:

"... And the mountains will be like carded wool" [Sura 101, verse 5]

The choice of the expression "carded wool" denotes in fact the change of the mountains- forming rocks' nature; these initially highly compact and tough rocks will ultimately become, because of the heat, viscous and more voluminous (like carded wool). Hence, it is clearly shown that the change in the rocks' state is due to the excessively high temperature prevailing over the Earth after the sun's expansion.

Another fact corroborating what preceded is referred to in another verse indicating that the mountains will melt like "crumbling sand dunes" and will gradually lose height and rigidity:

"...And the mountains will be like crumbling sand dunes" [Sura 73, verse 14]

The comparison with crumbling sand dunes aims to show the progressive loss of height and rigidity of mountains. These two features certainly indicate that the rocks constituting these mountains will be in the process of fusing. This fusion will go on until these mountains are totally flattened as it is indicated in the following verse:

"They ask thee concerning The Mountains: say "My Lord will demolish them and He will leave them as plains Smooth and level" [Sura 20, verses 105-106]

In other words, mountains will be totally disintegrated under the effect of heat. The same reference to "disintegration" is found in the following verse:

"And the mountains turning into crumbles to end up as sparse particles" [Sura 56, verse 6]

Thus, the tough and high mountains will ultimately be frittered away and will look like a mirage as is explained in the following verse:

"And the mountains shall vanish, as if they were a mirage" [Sura 78, verse 20]

From the preceding verses, it can be deduced that the Earth's crust will undergo the same fate, that is, it will fuse.

e) Fall of lunar fragments on the Earth

In another verse, it is said that the Earth (the land's surface) and the mountains will be suddenly and fatally hammered (the Qur'an uses the verb "dakka" to describe what will happen); this verb means to bombard, to hammer.

"And the soil and the mountains are lifted, and then violently hammered at one stroke. On that day, shall the (great) Event come to pass" [Sura 69, verses 13-14]

The lifting cited above is to be related to the expansion of the Earth's crust (cf. §4.1.3.2-c). The hammering of the land's surface and of the mountains, as a result of one stroke, which, according to the Qur'an is fatal, would probably refer to the result of the fall of the biggest (giant) lunar fragment after the moon's disintegration (cf. §4.1.3.1-e) onto the Earth's surface; this event would have the same destructive effect as the explosion of multiple atomic bombs. This will certainly constitute a remarkable and unique event in the Earth's life cycle: "On that day, shall the great Event come to pass".

The Qur'an even specifies the occurrence of this violent shaking. In fact, according to verse

14, Sura 73 (already quoted above), the Earth (the soil) and the mountains will quake only after the mountains have become comparable to crumbling sand dunes, that is after having lost much height. In other words, the occurrence of the "great Event" will follow the crucial phase of mountain disintegration.

"The day when the earth (the soil) and the mountains are shaken up, once the mountains have become like crumbling sand dunes" [Sura 73, verse 14]

It is to be noted that the Qur'an stipulates that after the "great event" (violent shaking of the land's surface), the land surface will undergo successive poundings, which are in fact but the results of the fall of lunar fragment remains.

"Nay! When the earth (the soil) undergoes hammering after hammering" [Sura 89, verse 21]

e-1) The impacts of the lunar fragments fall on the Earth

Another consequence of the Earth's hammering by the enormous lunar meteorites is the formation of "swirling clouds" in the sky as it explained in the following verse:

"The day when the sky is agitated by a swirling cloud" [Sura 52, verse 9]

The swirling clouds in the sky will be in fact accompanied by the formation of a real ashy and dusty screen of clouds the thickness of which would probably reach tens of kilometers and which would cover the whole earth. This covering of the earth by a great mass of smoke ("clouds") is referred to in the following verse:

"And the day when the sky shall be rent asunder with clouds..." [Sura 25, verse 25]

The next verse specifies that the smoke in question is not a common one similar to that known by the prophet's contemporaries. This cloud of smoke will certainly occur after very violent impacts resulting from enormous collisions of great rock bodies (meteorites) falling on the Earth. This cloud of smoke will then be very dense and unique in its kind (a very particular kind of smoke).

"Then wait you for the Day when the sky will bring forth a visible smoke" [Sura 44, verse 10]

e-2) Other impacts of the fall of lunar fragments on the Earth

Except for the reference in the verses mentioned earlier to the very violent quakes, to the swirling smoke over the sky and to the formation of a giant screen of smoke round the Earth, there is no mention of verses in the Qur'an relating explicitly to other impacts of the fall of giant lunar meteorites on the earth (the soil). It is after examining "Hadiths" that we have been able to compile other impacts.

- Slowdown in the speed of the Earth's rotation:

We know that the moon insures the stability of the Earth's movement. The disturbance exerted by the other planets: Venus, Mars, Jupiter and the others, might, in the absence of the moon, enter in resonance with the movement of the Earth's axis of rotation. The Earth would not leave its present orbit, but its movement might become chaotic and totally unpredictable.

It is specified in a "Hadith" that when the apocalypse approaches:

"A day will become like a year, then like a month, then like a week, and finally like a present day." [6]

According to us, the friction and the violent impact of giant lunar meteorites with a diameter of some hundreds of kilometers, added to the forces exerted by the tide of the nearby sun, which once reaching its maximum size, will cause a slowdown in the speed of the Earth's rotation round its axis. This slowing down would result in a longer day. A literal interpretation of the "Hadith" mentioned above means that a day becoming like a year implies a slowdown and a reduction of the initial rotation speed with a ratio of 1/365. This slowdown will gradually continue until the initial rotation speed is re-established.

- Changing of the Earth's rotation direction round its axis:

According to the second "Hadith", that specifies that:

"At the approach of the apocalypse, the sun will rise in the West." [6]

It may be deduced that the huge collisions of lunar fragments with our planet's surface (cf. §4.1.3.2-e sura 89, verse 21), will first end the rotation of our planet round its axis and will ultimately lead to the inversion of the rotation direction. It is obvious that the resumption of rotation in another direction will be progressive, which explains the gradual return to a stability speed as mentioned in the first "Hadith". It is clear that without taking into account the moon, the inversion in the Earth's rotation direction cannot be explained. The sun's expansion has but morphological transformations on the Earth (cf. §4.1.3.2), and a changing (enlargement) of its orbit (cf. §4.1.3.1-f).

Note: As we have just noticed, the Qur'an verses referring to the consequences of the turning of the sun into a red giant on the evolution of the Earth's crust and on the other solar system planets, describe a multitude of facts without respecting these events chronology. For example, when the Qur'an specifies that there will occur an expansion of the Earth's crust (cf. §4.1.3.2-c), and that the mountains will be pulverized (cf. §4.1.3.2-d), it should be understood that these phenomena will take place only after the boiling and evaporation of the seas and oceans (cf. §4.1.3.2-b). They are in fact separated by thousands (or millions) of years.

4.1.4. THE AFTERMATH OF THE SOLAR SYSTEM COLLAPSE

The Qur'an has clearly dissociated the apocalypse which is a phenomenon proper to the solar system and the universe collapse phenomenon (cf. §4.2.4). In fact, the verses that we have just exposed mention only the sun, the moon, the Earth and the bodies which turn around the sun. The Qur'an has clearly specified in Sura 82, verse 2 (cf. §4.1.3.1-f), that the planets of the solar system will disperse. Then only the solar system planets will be affected by the expansion phenomenon of the sun. The Qur'an does not mention the stars which are distant from our solar system. The only references to the stars are found in Sura 77, verse 8 and Sura 81, verse 2 (cf. §4.1.3.1-c) and they specify that during the sun swelling stage, the stars will lose their luster and will become difficult to observe because of the light intensity increase on the Earth.

It is very interesting to note that the Qur'an has specified that after the apocalypse, the Earth will be transformed into another earth. Its general aspect will be different from the present one.

"The Day when the Earth turns out into another Earth and so will be the heavens" [Sura 14, verse 48]

The Earth will undoubtedly undergo great transformations as a result of the sun's expansion and its closer position from the earth's surface. But these transformations concern certainly the earth's crust only. This may be consolidated by the fact that the Qur'an says in Sura 82, verse 2 "...that the planets will disperse" (cf. §4.1.3.1-f). In other words, the Earth and its sisters Mars, Jupiter and the others will move farther from the sun (change of orbit) and will continue to turn round the sun which will progressively use up its energy.

It is also interesting to note that the use of the expression "transformed into another earth" in the previous verse does not give further details, which might shock the prophet's contemporaries, who had already accused him of madness and magic because the Qur'anic revelation ran counter to their beliefs and modes of life.

Open question:

Astrophysical calculations show that when the sun begins to lack hydrogen, it will then start to swell until it becomes a red giant which will swallow up the two closest planets, Mercury and Venus. The sun will consequently be at least a hundred times more shiny than it is now. After completely using up its hydrogen, the sun will begin to consume its helium, which will be transformed into carbon and oxygen. This sudden change will make it contract quickly to a certain extent, then combustion will again be hampered; the sun will resume its expansion, at a greater pace than the first time. Once it has used up its helium, the sun will collapse. It will become a white dwarf, which will shine faintly; then it will die out.

The great luminosity which will cover the Earth following the sun's expansion will start to decrease progressively with the sun's contraction; this will result in the quasi-darkness of the earth. After the sun's second expansion, its intense light will, once again, cover the Earth. After mentioning the phenomenon of the sun's expansion and its consequences (cf. §4.1.3.1 and §4.1.3.2), the Qur'an announces that an intense light will cover the Earth and this will indicate the beginning of the judgment of human beings on the basis of their actions on Earth. The question is whether the light which will shine intensely all over the Earth has something to do with what is announced in the following verse?

"And the earth will shine with the light of its Lord and the book will be placed; and the Prophets and the witnesses will be brought forward; and it will be judged between them with truth, and they will not be wronged" [Sura 39, verse 69]

No answer to this question can be given.

Note: We have mentioned at the beginning of this section (Sura 14, verse 48) that our planet will not undergo the same fate as the moon. The previous verse (Sura 39, verse 69) constitutes a further proof of this assertion.

4.2. VERSES RELATING TO THE UNIVERSE

4.2.1. GENERALITIES

4.2.1.1. TIME RELATIVITY

The Qur'an explains that time is a relative notion. This notion of relativity can be found in several suras:

"... in a period of time (yaum) whereof the measure is a thousand years of your reckoning" [Sura 22, verse 47]

"... in a period of time (yaum) whereof the measure is fifty thousand years" [Sura 70, verse 4]

We think that these figures should not be understood literally. They should be taken as representing symbolic values (cf. §4.2.1.7).

4.2.1.2. INTRICATION IN THE PROCESS OF CREATION

"Do not the unbelievers see that the heavens and the earth were joined together, then we clove them asunder ..." [Sura 21, verse 30]

"Moreover He turned to heaven when it was smoke and said to it and to the earth: come willingly or unwillingly!. They said: we come in willing obedience" [Sura 41, verse 11]

The following remark can be made about the previous verse: In several places, the Qur'an specifies that the creation phenomenon is a continuous one. The creation of the universe began about 13.8 billion years ago (cf. §4.2.2 Duration of creation), that of the Earth about 4.6 billion years ago. There is, therefore, a phase's intrication of the creation of the heavens and of that of the Earth.

It is well understood, then, that the creation of the Earth did not precede that of the Universe and that by God's will it was similar to that of the Universe. On the other hand, it is known that the Earth was formed from fine particles of a gas cloud and from dusts of celestial bodies according to an agglomeration and gathering process. It is to be noted that this very process is at the origin of the formation of galaxies and consequently of the Universe.

Note: A little time after its formation, the still soft and hot Earth probably underwent an intensive and continuous bombarding by metallic meteorites. The following verse specifies that the presence of iron on the Earth is the result of a "descending" process.

"...And we sent down iron, a source for great might, as well as many benefits for mankind..." [Sura 57, verse 25]

It is to be noted that the verb to "sent down" has been used only for iron (and not for any other metals referred to in the Qur'an such as gold, silver, copper etc...). This suggests that the iron origin is extra-terrestrial.

4.2.1.3. REPETITION OF THE CREATION PROCESS IN THE UNIVERSE

The Qur'an states that the creation phenomenon in the universe is a continuous process.

"It is God who begins (the process of) creation; Then repeats it" [Sura 30, verse 11]

This notion of repetition in the creation process is found in several verses and may be interpreted in two ways: the creation process is a continuous operation in our universe, because the latter is permanently transformed (stars die and others are born, etc...), and whatever is produced in a point in space would also be produced in another point, in the same way. The second interpretation is the cyclical birth of our universe or perhaps the creation of other universes (cf. §4.2.4).

4.2.1.4. THE POSITION OF STARS

"Furthermore I swear by the setting of the stars, - And that is indeed a mighty oath if ye but knew - That is indeed a Qur'an most honorable" [Sura 56, verses 75-76]

This verse reminds us of the Kepler theorem which states that: "the movement of each planet of the solar system is an ellipse where the sun occupies one of its foci". The other stars which are analogous to the sun also follow specific orbits; the eventual planets turning around these stars also behave in the same ways as it is the case for the sun. This verse also includes an allusion to the universal gravitation of Newton which determines the trajectories of all stars and planets.

A study of the Qur'anic text has recently been published by a Syrian engineer; it is entitled "the miracle" [7]. This study is based only on statistical considerations. Thus, the author has examined the symmetry in the use of words and letters, which, in terms of data analysis is called "the oppositions".

He has, in this way, demonstrated an important result (which seems to be applicable to the whole Qur'anic text), namely that for a given verse or sura, the frequency of word or letter use is closely related to the subject which is treated. From the previous verse, he has deduced that the words and letters of the Qur'an occupy well determined places exactly as it is the case for the position of stars in the universe. Indeed, God swears by the position of stars that the Qur'an is God's revelation.

It is clear, here, that during the prophet's epoch, the meaning of this verse could not be understood. It is for this reason that the expression (if ye but knew) was used.

4.2.1.5. SPACE CONQUEST

The Qur'an has explicitly invited Man, not only to conquer space but also to explore the depths of the Earth.

"O assembly of Jinns and Humans, if you can pass beyond the zones of the heavens and the earth, then pass beyond (them)! Not without a power shall ye be able to pass!" [Sura 55, verse 33]

(It is the power of science which is referred to here). Always concerning the same subject

"Even if we opened unto them a gate to heaven and they were to continue ascending there in, they would say: our sight is confused. Nay, we are people bewitched" [Sura 15, verses 14-15]

In the above-mentioned verse, the use of the word "bewitched" simply means to be subjugated by the surprise of discovery following a spatial view of the Earth and its surroundings.

In the following verse, there is also reference to the difficulties of breathing when progressively ascending in the heavens.

"Those whom God (in His plan) willeth to guide, He openeth their breast to Islam. Those whom He willeth to leave straying, He maketh their breast close and constricted, as if they had to climb up to the skies..." [Sura 6, verse 125]

4.2.1.6. EXISTENCE OF EXTRA-TERRESTRIAL LIFE

Many Astronomy researchers assert that the existence of an extra-terrestrial life is highly probable because of the very big number of galaxies in the universe consisting of huge clusters of stars and planets which turn around them. In the following verse, the Qur'an refers not only to the existence of other extra-terrestrial creatures, but also to a possible encounter with the inhabitants of the Earth (probably indirectly by exchanging messages or by means of space travel). At the present state of our technological progress, this verse should be regarded as a prediction.

"And among His Signs is the creation of the heavens and the earth, and the living creatures that He has scattered through them: and He has power to gather them together when He wills" Sura 42, verse 29

The reference to an extra-terrestrial life is also found in the four following verses where the first one indicates that everything in the heaven or on the Earth praises God, whereas the second one specifies that the living creatures of heaven and those on Earth belong to God and that angels obey Him willingly.

The third and fourth verses explain the bewilderment of humans and of the heaven's inhabitants when God decides to end life on Earth.

"Whatever is in the heavens and on earth, let it declare the praises and glory of God: for He is the Exalted in might, the Wise" [Sura 61, verse 1]

"To Him belong all (creatures) in the heavens and on earth: even those who are in His (very) presence are not too proud to serve Him, nor are they (ever) weary (of His service)" [Sura 21, verse 19]

"The trumpet will (just) be sounded, when all that are in the heavens and on earth will swoon, except such as it will please God (to exempt). Then will a second one be sounded, when, behold, they will be standing and looking on!" [Sura 39, verse 68]

"And the day that the trumpet will be sounded, then will be smitten with terror those who are in the heavens, and those who are on earth, except such as God will please (to exempt) : and all shall come to His (presence) as beings conscious of their lowliness" [Sura 27, verse 87]

From what preceded, it is clear that creatures are classified into three different groups:

- Those that are on Earth
- Those that are in heaven (they are creatures who walk as it is mentioned above in Sura 42, verse 29)
- Those that are in His (very) presence (they are angels as it is explained in many suras).

4.2.1.7. EXISTENCE OF PLANETS LIKE THE EARTH

It is important, too, to mention that the Qur'an explicitly refers to the existence of numerous planets like ours in the universe as it is mentioned in the following verse:

"God is the One who created seven heavens and of the earth a similar number. The command descends among them so that you know that God has power over all things and comprehends all things in His knowledge" [Sura 65, verse 12]

The number of heavens and planets is designated by the digit 7. The choice of this digit as a symbol originates from its particular status since it is the smallest prime number after 1, 3 and 5 which are more ordinary ones. All commentators agree that the digit 7 and its multiples designate plurality. This is explained in the Qur'an itself as indicated in the verses below:

"Whether thou ask for their forgiveness, or not, (their sin is unforgivable) : if you ask seventy times for their forgiveness, God will not forgive them : because they have rejected God and His Apostle : and God guideth not those who are perversely rebellious" [Sura 9, verse 80]

"The parable of those who spend their substance in the way of God is that of a grain of corn: it groweth seven ears, and each ear hath a hundred grains. God giveth manifold increase to whom He pleaseth: And God careth for all and He knoweth all things" [Sura 2, verse 261]

4.2.2. DURATION OF CREATION

There remains an important remark to complete this study; it concerns the duration of creation. Indeed, the Qur'an announces, in the following verse, that the universe, including the galaxies matter, was created in six days (yawm) and yet God did not experience any weariness. This seems to be a reply to the Biblical thesis which says that after completing His creation in six days, God took a rest on the seventh day.

"We created the heavens, the earth and what is between them in six days (periods), and no weariness touched Us" [Sura 50, verse 38]

The same meaning is found in the following verse which clearly states that there are three groups of things created; they are:

- Those which are found in heavens;
- Those which are found on Earth;
- Those which are found between the heavens and the Earth.

"God is He Who has created the heavens and the earth, and all that is between them in six days (periods)..." [Sura 32, verse 4]

It should be noted; in addition, that the expression "what is between the heavens and the Earth" is also found in at least eight other suras.

However, the word "day" should not be understood as the period included between two successive sun rises, because the "day" was only defined after the creation of the Earth. This remark was made by Maurice Bucaille in his book "The Bible, the Qur'an and Science" [3]. This can also be understood from the verses seen in §4.2.1.1 (Time relativity).

It is evident that if we consider the universe as being what it is, in permanent evolution, the duration of its creation will coincide with its age (cf. §4.2.1.3). I think that it will be possible, then, to explain the creation of the Earth in two days (two periods) as indicated in the following verse:

"Say: Do you disbelieve Him Who created the earth in two periods? Do you ascribe equals to Him. He is the Lord of the Worlds" [Sura 41, verse 9]

4.2.2.1. DURATION OF EARTH'S LIFE

As it is known, the present age of the Earth is approximately equal to 4.6 billion years. A period will then be equal to 2.3 billion years. Always on the basis of the "period creation" notion, it will be possible, I think, to deduce the duration of Earth's life from the following verse:

"He set in the (earth) mountains standing firm. He blessed it. He measured therein its sustenance in four periods, in due proportion..." [Sura 41, verse 10]

From the expression "He measured therein its sustenance in four periods, in due proportion..." we understand that these periods correspond well to the productivity of the Earth and consequently to its life's span, which will be equal, on the basis of what preceded to four periods of 2.3 billion years, that is 9.2 billion years.

Note: the death of the sun may be deduced from the preceding verses and will coincide with that of the Earth. In fact, the duration of the Earth's life is linked to the sun's expansion (cf. §4.1.3 Future of the solar system).

4.2.2.2. AGE OF THE UNIVERSE

From the preceding verses, the ratio between the age of the Earth and that of the universe may be deduced without reference to the notion of "day", which is very relative in the Qur'anic text. We thus have:

$$(\text{Age of Earth})/(\text{age of the universe}) = 2/6 = 1/3.$$

This rule will be very useful for the estimation of the universe's age.

As we said earlier, if we estimate the age of the Earth as being 4.6 billion years, a period will be equal to 2.3 billion years. Hence, the age of the universe would be equal to 13.8 billion years.

It is to be noted that a new method of dating the age of the universe, based on recent observations carried out by H. Richer et al. From the University of British Columbia (Canada) by means of the [Hubble telescope](#) did confirm the approximate figure 13-14 billion years. A more recent estimation suggests an age of 13.7 billion years with an uncertainty margin of 100 million years.

It is interesting to note that the ratio (age of Earth)/(age of the universe) which we have deduced from the Qur'anic verses, was quite accurate at the epoch of the Qur'an revelation. After the passage of x periods from that date the ratio becomes: $(2+x)/(6+x)$. If we compare this ratio to 1/3 (at 10-3 for example), we obtain:

$$[(2+x)/(6+x)] - 1/3 = 10^{-3}$$

Which implies a value of x around 21 million years, which is negligible compared with the present age of the Universe. Thus, at a historical scale, we may consider that the ratio (age of Earth)/(age of the universe) is constant and surely equal to 1/3.

Note : It is pertinent to note here that the verb created used in verse 4, Sura 32 is an attempt to translate the Arabic verb "Khalafa" (accomplished past), which may mean, and especially in the language of the Qur'an, an action which began in the past but which still continues. According to the Qur'anic text, the creation and transformation operation has no end.

Moreover, in the Qur'an, we often encounter descriptions of future phenomena and use of verbs in the accomplished past. This is, in fact, a special style destined to express with certainty the occurrence of cited events. The following verse (referring to an event which has not yet taken place) illustrates this point:

"And behold! God will say (literally «said»): O Jesus son of Mary! Didst thou say unto men, worship me and my mother as gods in derogation of God? He will say: Glory to Thee! Never could I say what I had no right (to say). Had I said such a thing, Thou wouldst indeed have known it. Thou knowest what is in my inner-self, though I know not what is in Thine. For Thou knowest in full all that is hidden" [Sura 5, verse 116]

4.2.3. EVOLUTION OF THE UNIVERSE

4.2.3.1. FORMATION AND EXPANSION OF THE UNIVERSE

In the following verses, the Qur'an says that the universe was created from a gaseous mass with fine particles (first verse) the elements of which were initially soldered to form one unit which will later be divided (second verse). Expansion started after the buildup operation and it continues until now (third verse) (the present is used for the verb expand)

"Moreover He turned to heaven when it was smoke and said to it and to the earth: come willingly or unwillingly! They said: we come in willing obedience" [Sura 41, verse 11]

"Do not the unbelievers see that the heavens and the earth were joined together, then we clove them asunder and we got every living thing out of the water. Will they not then believe?" [Sura 21, verse 30]

"The heaven, we have built it with power, verily we are expanding it" [Sura 51, verse 47]

(The word "heaven" designates all that is exterior to Earth).

It is clear that the Qur'an thesis concerning the creation (first verse) evidently contradicts the classical Big Bang theory according to which the universe would have been first concentrated at a very hot and dense but infinitely small point.

In what follows, we mean by "Big Bang" the instant of beginning of the universe formation according to the Qur'an view point and not according the "primitive atom" theory.

It is to be noted that some modern exegetes have suggested the existence of several universes. They have referred to the following Qur'anic verse:

"Praise be to God, The Cherisher and Sustainer of the worlds (alamin)" [Sura 1, verse 1]

Because in Arabic the word "alamin", plural of "alam" means either world or universe. This meaning of multiple universes was already encountered in §4.2.1.3.

4.2.3.2. GENERAL STRUCTURE OF THE UNIVERSE

In the same way, and taking into account the same considerations of period notion, we can understand from the following verse:

"Then He ordained them seven heavens in two periods, and He assigned to each heaven its mandate by Revelation" [Sura 41, verse 12]

That the global structure of the universe has not changed much after the passage of two periods starting from the beginning of the universe creation (4.6 billion years). This can be clearly understood from the expression "He assigned to each heaven its mandate". Consequently, the major changes in the evolution of the universe occurred before the latter reaching 4.6 billion years. During these 4.6 billion years, the galaxies were certainly more numerous and more active than today and were prey to continuous collisions, agglomerations, etc... This is the crucial period of the history of the universe according to the Qur'anic text. In fact, what we called stabilization of the general structure of the universe is a decrease in the evolution activity of the galaxies and therefore does not constitute a contradiction with the continuous evolution that we mentioned in §4.2.1.3.

Note: It is interesting to note that so far, many astronomers think that the main transformations which affected our universe occurred during the 300 000 years following the big-bang and that later on the general structure of the universe has not changed much [9]. Sura 41, verse 12 does not support this idea.

4.2.4. COLLAPSE OF THE UNIVERSE

It is interesting to note that, so far, the present Astronomy research has not permitted to know with certainty whether our universe is closed or open, since the expansion parameters of the universe are not well determined; however, the most recent data seem to plead for an open universe. The Qur'an specifies that after expansion there will be a collapse, then a re- birth in exactly the same way as at the beginning (therefore a new big-bang).

"The day when we will fold the heaven as letters to the roll! Even as we have produced the first creation, thus so we shall produce a new one: a promise we have undertaken: truly shall we fulfill it" [Sura 21, verse 104]

It should be born in mind, here, that ancient Arabs wrote letters on a papyrus or leather sheet which was then rolled. Thus we can make the following comparison : the universe began as one mass (comparable to a roll of papyrus) ; expansion is comparable to the un-rolling of this papyrus and the collapse of the universe will take place as if it were an open papyrus which would resume its initial shape (a roll) due to its torsion constant. After this "folding" action there will be a repetition of the creation process.

The same meaning of cyclic re-birth is also found in the following verse (cf. §4.2.1.3).

"It is God who begins (the process of) creation; Then repeats it." [Sura 30, verse 11]

The idea of cycle, which implies returning to the beginning, may be understood from the expression "Even as we have produced the first creation". This expression may also mean the repetition of the creation of other universes "...thus so we shall produce a new one: a promise we have undertaken..." But even if infinity of other universes exists, ours is unique: it is the one we inhabit and we will never know others. If this interpretation of the creation of other universes proves to be accurate, then a multitude of universes, similar to soap balls in systolic movement (contraction and expansion) with no contact between them, would exist.

Note: The Qur'an states that the beginning of the universe collapse will start on the resurrection day. In §4.1.4 (cf. open question) we spoke about the existence of a possible relation between the beginning of resurrection and the second expansion of the sun, which will thus lead to the complete end of the solar system. If our suggested interpretation proves accurate, then the beginning of the universe collapse (big crunches) will coincide at the latest with the end of the solar system which will take place 4.6 billion years from now, that is 18.4 billion years after the big bang, as implied in the following verse:

"They made not a just estimate of God such as due to Him. And on the day of Resurrection the whole of the Earth will be under His will and the heavens will be rolled up... Glorified be He, and high be He above all that they associate as partners with Him!" [Sura 39, verse 67]

Here is another point of view concerning verse 104, Sura 21, which we have already quoted: "The most recent analyses show that the universe is condemned to a continuous expansion.

The mass of universe is not sufficient. Moreover, it is now advanced that the cosmological constant imagined by Einstein is not nil. There would exist, therefore, a force of repulsion at a great scale associated to the "void energy". This energy would originate from tiny void quantic fluctuations, where matter and anti-matter separate before being annihilated in most cases. However, in this process, slightly more important fluctuations might be maintained and grow. But, immediately, the dimensions of this object detach themselves from the space-time dimensions of our own universe. This would give rise to the beginning of a new universe. An infinite number of universes might thus be born permanently, but without possibility of communication with ours (detached universes).

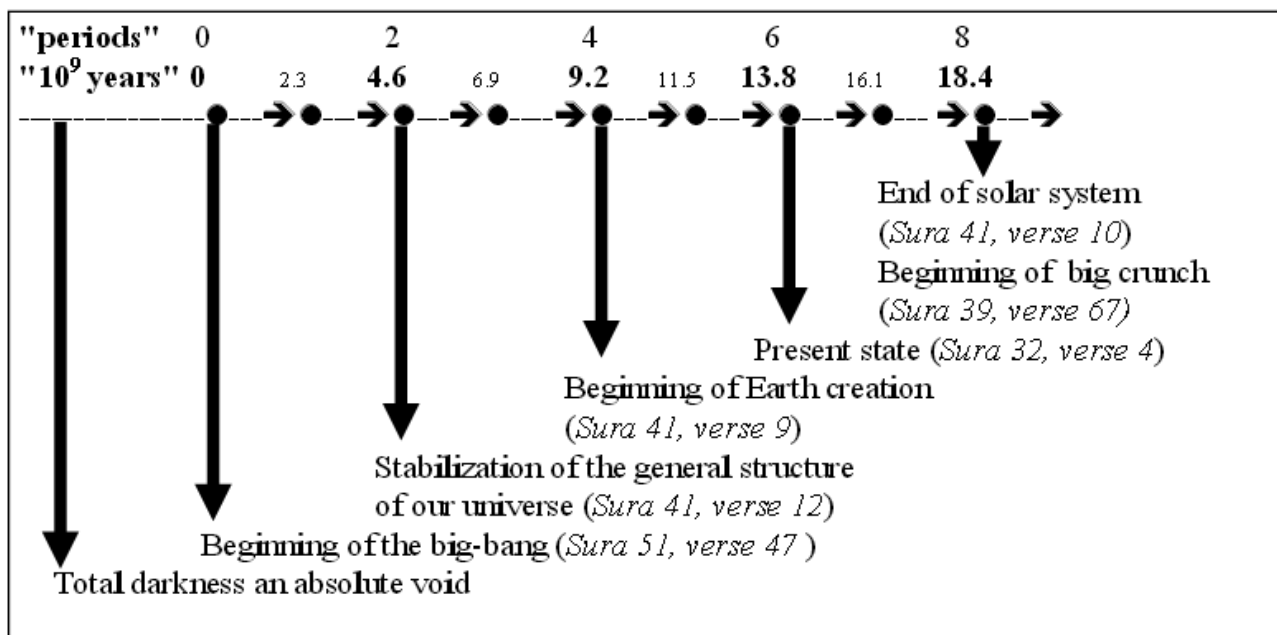
Though the concept is different, it may well be interpreted according to the Sura. In fact, the ropes theory, which predicts these void fluctuations, indicates that these objects are subtended by our usual space-time dimensions in addition to the new dimensions, which are those that will separate if a new universe "diverges" and develops. But the ordinary dimensions span a quasi-infinite space and so have no measurable curve (plane or very low-curve geometry). However, the new dimensions originating from the previous ones have quantic dimensions and are consequently curved over radii approximately the size of an atom. In this way, the image of "roll" and rolling reflect well enough this concept, as origin of the creation of a new universe. It is to be noted that this is the best theory at present, but like everything in cosmology, the idea still remains a speculation. It must be proven by observations. The verse, after all, does not really suggest the idea of a collapse. Simply, what has been done to create our universe would be continuously and infinitely repeated everywhere in our own universe".

We should mention, here, that according to a recent study presented by P. Steinhardt (Princeton University) and N. Turok (Cambridge University), the universe would experience an endless succession of "big-bangs" and "big crunches", separated by expansion and contraction periods. It is curious to note that the authors developed in their theory the representation of the universe by two parallel sheets of paper (cf. Sura 21, verse 104) which meet and bounce. (cf. sciencedaily.com)

Thus, according to the verses concerning the creation and the evolution of the universe, the following chronology may be established:

- Beginning of the creation of the universe 13.8 billion years ago (the big-bang)
- Beginning of the universe expansion which still continues according to Sura 51, verse 47.
- Stabilization of the general structure of the universe after the passage of two periods (that is 4.6 billion years) (cf. §4.2.3.2 Sura 41, verse 12).
- Beginning of the creation of the Earth after the passage of two more periods, that is 9.2 billion years after the start of expansion.
- The duration of the Earth's life is 9.2 billion years. Its end is linked to that of the solar system (according to Sura 81, verse 1 and Sura 41, verse 10) which would occur towards 18.4 billion years after the big-bang.

The above figures may be summed up in the following scheme (the unit is billions of years):



4.2.5. THE POST-COLLAPSE PHASE OF THE UNIVERSE

Let us reexamine the verse of §4.1.4

"The Day when the Earth turns out into another Earth and so will be the heavens" [Sura 14, verse 48]

It is clearly understood, from this verse, that after the collapse of the universe, the latter will be transformed in the same way as the Earth. Hence, after the re-birth of the universe, its evolution will not be the same as that we know today.

It is also interesting to note that the expression "and so will be the heavens" in the previous verse reconfirms the collapse of the universe (cf. §4.2.4 Sura 21, verse 104) which will have an end in the same way as the solar system, but with a different chronology.

5. CONCLUSION

As a conclusion to this paper, one wonders whether the Qur'an was written by a human being who had lived through a period of obscurantism (cf. §2) or whether it is really a divine revelation. If the Qur'an was a pure invention of a highly intelligent person, why would this person take the risk to put forward scientific theses which would prove false afterwards?

What we can say is that the study of the Qur'an verses related to scientific notions has not, so far, revealed any discordance with our present knowledge, contrary to the ideas which prevailed 14 centuries ago. But it should be noted that such questions which cross the mind of any human being had already been asked in the Qur'an which gives an answer in the following two verses :

"We will show them our signs in the universe, and in their own selves (souls), until it becomes manifest to them that this (the Qur'an) is the truth. Is it not sufficient in regard to your Lord that He is a Witness over all things?" [Sura 41, verse 53]

"Do they not then consider the Qur'an carefully? Had it been from other than God, they would surely have found therein many a contradiction" [Sura 4, verse 82]

Our study is far from being exhaustive. Our aim was especially to show that the Qur'an includes verses related specially to science, which no objective reader can deny. We can quote here the points dealing with Astronomy, e.g. the apocalypse scenario and the final fate of the Earth and the moon (cf. §4.1.3). We refer the reader, especially, to the universe expansion parameters and to the difficulty of space travel outside the solar system and in corollary the great difficulty to detect traces of life in the distant space. It is interesting to note that one of the interesting aspects of this study is the fact that there exists a difference between the Qur'an theses and some present scientific knowledge concerning points which have not definitely been settled. I am referring here to the stabilization of the general structure of the universe 4.6 billion years after the big-bang and the beginning of its collapse (big crunches) at the end of the solar system.

+ + + + + + + + + +

«Verily! In the creation of the heavens and the earth, and in the alternation of night and day, there are indeed signs for men of understanding. Those who remember (celebrate) The praises of God standing, sitting, and lying down on their sides, and think deeply about the creation of the heavens and the earth, (saying) : Our Lord! You have not created (all) this without purpose, glory to You! » (Qur'an 3 : 190-191)

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