

second edition

Scientific Truths and the Qur'ān



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A.B. al-Mehri



THE QUR'ĀN PROJECT

www.quranproject.org

The Qur'ān Project

PO BOX 13976

Birmingham

B11 9DQ

United Kingdom

info@quranproject.org

www.quranproject.org

Tel: 0800 228 9421

Cover Design: H. Jundi

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

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INTRODUCTION

“And it was not (possible) for this Qur’ān to have been produced by other than God....there is no doubt (it is) from the Lord of the worlds.”

Qur’ān 10:37

From the micro to the macro level, our knowledge of the physical world has grown astronomically in recent times. The nucleic acid double helix, more commonly known as DNA, the existence of sub-atomic particles or the discovery of the expansion of the universe are examples of discoveries which have caused paradigm shifts in our understanding of the universe. We have amended our theories by updating valid ones and by rejecting false ones.

Published literature is a reflection of this reality. Every book represents the knowledge available to a writer at a certain time and place. As a result, books become obsolete after some time due to the information being found to be either false or incomplete, raising the need for them to be revised or re-written. This is the case for the writings of every physicist, scientist or philosopher. No human being has ever written a comprehensive book with absolute perfection and certainty of knowledge. It is also the case that a

writer usually has knowledge of a specific subject or a few related subjects. For example, one can write about history or economics or philosophy or physics etc. But it is not possible for a human being to write simultaneously on a great variety of different subjects with such in-depth and accurate information.

The Qur'ān, God's final revelation, speaks about the origins of the universe, movements of celestial bodies, stages of human embryonic development, behavioural patterns of species, historical and archaeological truths etc. The Qur'ān contains over 6,000 Ayat (verses) with over 70,000 words and yet it is a fact that not a single verse contradicts any established scientific fact.

The miraculous nature of the Qur'ān lies in the knowledge it contains and this is an everlasting, repeatable and a living proof. It is filled with important facts which were revealed at a point in human history when no man could possibly have known them. A miracle is a divine act which defies and transcends universal laws and which God grants to the Prophets in order to convince people of the truth of their message.

These Divine miracles are designed to provide people with the capacity to perceive them as signs of God's power, knowledge and will over all things in the universe. For a miracle to have full impact it should relate to an area of knowledge in which its intended audience are well versed; in this way can a miracle fulfil its purpose.

Multi-dimensional Miracles of the Qur'ān



Linguistic¹ – The genius of its language, elegance, rhythm, rich imagery, fluidity, its weaving of metaphors and concepts, its many varied and previously unheard styles and techniques of prose, as well as a remarkable use of vocabulary, make it a work of eternal perfection. The Arabs of the time of its revelation recognised its non-human origin and accepted its Divinity.

Historic – The Qur'ān makes mention of ancient civilisations and historic events with precise accuracy. As an example, refer to the deliberate usage of the terms “Kings” and “Pharaohs” in the story of Joseph and Moses in the Qur'ān.

¹ For further reading, please refer to “The Miraculous Language of the Qur'ān” by Dr. Bassam Saeh.

Numerical – The numerical harmony of the Qur’ān is undeniable and is just another proof that the Qur’ān is an endless, timeless miracle for every age. With over 70,000 words, the frequency and usage of words is extraordinary. Some examples:

1. The word “man” in its singular form is mentioned a total of 24 times, which is exactly the same number of times the word “woman” is mentioned.
2. “Angels” are mentioned 88 times in the Qur’ān, while “devils” are also mentioned 88 times.
3. “Iblees” (Satan) is mentioned 11 times, and seeking refuge with God is also mentioned 11 times.
4. The phrase “God loves” and its opposite, “God does not love”, both appear exactly 16 times each!
5. The word “belief” is mentioned 25 times, and the word “disbelief” is likewise mentioned 25 times.
6. The words “East” and “West” in their various forms are both mentioned exactly 16 times each.
7. The phrase “Seven Heavens” is mentioned exactly seven times!
8. When we count the number of times the word “say”² appears, it is 332, and when we count the number of times “they say” appears, it, too, is amazingly 332!
9. The Arabic word for “this world” (“Ad-Dunya”) appears in the Qur’ān 115 times, while the word for “the afterlife” (“Al-Akhirah”) also appears 115 times.

² “Qul” – imperative form, i.e. tell them O Prophet.

10. When we count all the mentions of the word “month” in its singular form in the Qur’ān, they add up to exactly 12.
11. We know that the number of days it takes the earth to orbit the sun is 365 (i.e., one solar year). When we count all mentions in the Qur’ān of the word “day” in its singular forms, they shockingly add up to exactly 365!
12. On average, there are 30 days per month—and the number of times the plural forms of the word “day” are mentioned in the Qur’ān is also 30!

Is this all a coincidence?

Biblical fulfilment – There are a number of verses of the Old and New Testament that prophesied the coming of the Prophet Muhammad, such as in Isaiah 42. There are many books written on this topic.

Promise of Allah – The future is an unknown entity for us. Only God knows the future. The Qur’ān predicts the future and makes promises which later become true. For example, it promises the Believers will become rulers on earth (Qur’ān 24:55). Historically, the Muslims rose to become the global super-power of the world, firstly destroying the Persian empire followed by the Roman (Byzantine) empire. Another example is the prediction that within 9 years of the defeat of the Roman empire in approximately 615 C.E., they shall be victorious again. After Greater-Syria was lost to the Persians, Egypt was also annexed, and much of the Roman territory was lost. This lasted till around the year 622 C.E.. The Roman empire was on the verge of complete collapse, and then “came one of the most astonishing reversals in the annals of war.”³

³ Howard-Johnston, James, “*The Armenian History attributed to Sebeos*,” Liverpool University Press (1999), p. xxiv.

In 624 C.E., the Romans had their first victory and began a four year streak of victories culminating in the recapture of much of their lost territory including Jerusalem.

Knowledge of Inner Realities – The Qur’ān addresses the human being with the knowledge of his innermost realities. Upon hearing its words, the reader senses as if he is being addressed personally.

Ruqyah – The recitation of the Qur’ān is a means of healing the sick, whether physically or spiritually. Thousands of people throughout history can testify to the use of the recitation of the Qur’ān in healing their illnesses.

Recitation and Memorisation – It is now a fact that the most popular book of all time is the Qur’ān. No other book has been recited or memorised like the Qur’ān. Today, there are millions of people who throughout the world have memorised the whole Qur’ānic text.

Scientific – The world of science belongs to the category of the ‘created signs of God’ and His Divine Speech belongs to the ‘revealed signs of God’. It is not surprising therefore, that each time there is a breakthrough in unravelling the universe, we increase in certainty that the One who created the universe is the One who revealed the Qur’ān.

Historically, every Prophet was given miracles and these were witnessed by their respective contemporaries. The Prophet Muhammad is unique in the chain of Prophethood, for unlike all previous Prophets, he was sent as God’s final Prophet and Messenger for all mankind. Reason demands, therefore, that he should have a universal miracle that is not bound by time or geographical limitations. Every individual at every stage of human history, no matter where he lived in the world, is hence justified in

saying, “If Muhammad is a Prophet for me today, I would like to behold a miracle today.”

Unlike the tangible miracles [an example being the splitting of the sea] of the previous Prophets, the main miracle of the Prophet Muhammad, although he was given other miracles, was an intellectual miracle. The effectiveness of the tangible miracles would have their greatest impact on eyewitnesses and their full impact would end with the death of these witnesses. If we ask a Jew or Christian to show us the miracles of the Prophet Moses or Jesus – they both would submit that it is not within human power to demonstrate any of those miracles now. The Prophet Moses cannot be asked to split the sea again and the Prophet Jesus cannot be called to raise people from the dead. For us today, these miracles are historical reports. But if a Muslim is asked about the greatest miracle of the Prophet Muhammad, he can readily show the Qur’ān – for the Qur’ān is a miracle which remains in our hands, and can therefore be examined by anybody today.

Non-believers will naturally seek an explanation as to the source of knowledge of the Qur’ān. Atheists would argue that the Qur’ān was the product of intellectual ramblings of the Prophet Muhammad, and the Jews and Christians would say that it was plagiarised from the Old and New Testaments. The fact is that such scientific statements do not belong to the period when the Qur’ān was revealed and no such statements exist in the Old and New Testaments. It is obvious that no one man could possess the diversity of knowledge that is contained in the Qur’ān. One could conceivably be lucky with a few guesses, but the variety, quantity and quality of accurate knowledge in the Qur’ān shows, without doubt, that these are not the words of a mere mortal.

Can the Qur'ān contain scientific errors?

It must be clearly understood that the Qur'ān is not a book of science, philosophy, geology or history - it is a revelation from God for the purpose of guiding Mankind. Nonetheless, if any expert from the various fields of knowledge analysed what the Qur'ān states, they would conclude that the Qur'ān, beyond doubt, is not authored by a man in the 7th century. If what the Qur'ān imparted was unfounded, science would, in time, prove its falsehood. Every scientific theory, from the historic past, that contradicted the Qur'ān has been proven to be false. On the contrary, every established scientific fact has consistently been in complete agreement with the Qur'ān - as true science is also Divine. It is impossible for there to exist a contradiction between an action of God and His word. If it ever seems that the Qur'ān clashes with logic or facts, there are only two possibilities: (1) either what we thought was logical and factual is not really so; or (2) we are not interpreting the Qur'ān correctly. There can never be a contradiction between a scientific fact and the Qur'ān.

There exists a plethora of online literature written by people, many with vested interests, attempting to refute the facts that exist in the Qur'ān. Some of these writings are based on misconceptions, or are academically dishonest and in some cases contain blatant lies. It was for this reason that the corresponding Arabic text was also included for the verses of the Qur'ān quoted. Therefore, everyone is welcome to analyse and study the exact words spoken by God and assess and judge for themselves if the Qur'ān is indeed from Him [The Creator] or is authored by someone who lived over fourteen hundred years ago. There are now a number of authoritative Arabic dictionaries that have been translated into the English language, should you wish to research the words used in the Qur'ān.

Book of Guidance

The primary purpose of the Qur'ān is not to give us technical information about the world, because God has given us senses and intellect for us to gather technical information. The Qur'ān is a message from God addressed to the human and it reveals the meaning and purpose of our existence within the universe. The Qur'ān provides the keys to understanding reality. Without Divine revelation, human beings are like the blind men touching an elephant; we can sense some things but we cannot understand the reality of its existence.

The Qur'ān coheres with reality in such an amazing way that it shows that only the Creator of the Heavens and the Earth could have sent this book. Experiencing the truthfulness of the Qur'ān is like trying out a key. Without the right key, we cannot open a locked door. With the right key (i.e., with the message of the Qur'ān), we open the door (i.e., discover the truth of our existence) and thereby confirm that indeed the key is the right one.

We all have a monumental task of trying to understand who we really are as individuals and what the purpose of our existence is. The journey to ascertain the Truth can only be achieved by those who take their 'lives' seriously. God tells us in the Qur'ān that most people follow mere conjecture and assumptions and not facts. One of the regrets of the people of Hell will be that they did not adequately use their intellects, hence we ask you to look at the contents of this book critically but with an open mind. One should investigate the points being made with the fundamental intention of determining their accuracy and being prepared for the consequences they present. If what God describes of the world we can physically observe to be 100% true – then what He describes of what we cannot physically see, like the approaching judgement

of every human on the Day of Resurrection, the punishments of Hell and the eternal bliss of Paradise, is just as true.

From this we see that the Qur'ān was not intended solely for one people or nation, but came for the benefit and guidance of all; a complete and comprehensive religion, providing knowledge for all the generations. If these teachings were limited to one century or generation, the objective of the Qur'ān would have long since expired. Yet the Qur'ān is constantly regenerating new meaning, providing a continual source of guidance.

A free PDF version of this book is also available online:
www.quranproject.org

A.B. al-Mehri

The Qur'ān Project
Birmingham, U.K

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QUR'ĀNIC INTEGRITY AND SCIENTIFIC ADVANCEMENT

وَمَنْ أَصْدَقُ مِنَ اللَّهِ قِيلًا

“...and who is more truthful than God in His words.”

Qur'ān 4:122

The 'Big Bang Theory' - Historic Preamble

The enormously vast universe has been the object of curiosity since time immemorial. Greek philosophers, including Aristotle, believed that the Universe had always existed and would continue to do so eternally. This was also the mainstream view in scientific circles at the beginning of the 20th century, aptly known as the 'steady state theory'. An eternal state of the universe meant that there was no inherent need for a Creator – for what does not have a beginning does not necessitate a need for a cause. However, advancements in science would shatter this view and fundamentally prove that the Universe had a beginning.

In 1922, physicist Alexander Friedmann, produced computations showing that the structure of the universe was not static and that even a tiny impulse might be sufficient to cause the whole structure to expand or contract according to Einstein's 'Theory of General Relativity'. George Lemaitre was the first to recognise the implications of what Friedmann concluded. Lemaitre formulated that the universe had begun in a cataclysmic explosion of a small, primeval atom. He also proposed that the amount of

cosmic radiation are the leftover remnants of the initial “explosion.”

The theoretical musings of these two scientists did not attract much attention and probably would have gone ignored except for new observational evidence that rocked the scientific world in 1929. That year, American astronomer Edwin Hubble, made one of the most important discoveries in the history of astronomy. He discovered that galaxies were moving away from us at speeds directly relative to their distance from us and from each other. A universe where everything constantly moves away from everything else implied a constantly expanding universe.

Stephen Hawking writes, “The expansion of the universe was one of the most important intellectual discoveries of the 20th century, or of any century.’ Since the universe is constantly expanding, were we to rewind a film [of its history], then necessarily we would find the entire universe was in a joint state, referred to by some as the ‘Primordial Atom’. Many scientists and philosophers resisted the idea of a beginning to the universe because of the many questions that it raised – primarily what or who caused it. However, with Penzias and Wilson’s discovery of microwave radiation emanating from all directions, possessing the same physical characteristics - namely petrified light which came from a huge explosion during the first seconds after the birth of the universe – left little doubt about the fact that the universe had a beginning.

For fourteen hundred years, since the revelation of the Qur’ān, sceptics had trouble understanding the verse, ‘**...the heavens and the earth were a joined entity and We separated them...**’ [21:30]. However, with the assistance of scientific advancements, we can now understand these verses in a new light which help us piece together the cosmological puzzle. The miraculous nature of

the Qur'ān lies in the knowledge it contains. Its verification of scientific facts shows that its message is as applicable to the scientist in his laboratory today as it was to the Bedouin in the desert.

Linguistic Analysis

أَوَلَمْ يَرَ الَّذِينَ كَفَرُوا أَنَّ السَّمَاوَاتِ وَالْأَرْضَ كَانَتَا رَتْقًا فَفَتَقْنَاهُمَا وَجَعَلْنَا
مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ أَفَلَا يُؤْمِنُونَ

“Have those who disbelieved not considered that the heavens and the earth were a [*ratq*] joined entity, and We [*fataqa*] separated them....Then will they not believe?”

Qur'ān 21:30

The word '*ratq*' translated as 'sewn to' means 'mixed in each, blended' in Arabic. It is used to refer to two different substances that make up a whole. The phrase '*fataqa*' is 'unstitched' and implies that something comes into being by tearing apart or destroying the structure of things that are sewn to one another. In the verse, heaven and earth are at first subject to the status of '*ratq*.' They are separated [*fataqa*] with one coming out of the other. Intriguingly, when we think about the first moments of the 'Big Bang' we see that the entire matter of the universe collected at one single point. In other words, everything including 'the heavens and earth' which were not created yet were in an interwoven and inseparable condition. Then, this point exploded violently, causing its matter to disunite.

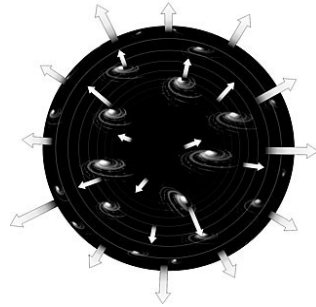
The Expanding Universe

وَالسَّمَاءَ بَنَيْنَاهَا بِأَيْدٍ وَإِنَّا لَمُوسِعُونَ

“And the heaven We constructed with strength, and indeed, We are [its] expander.”

Qur'an 51:47

It was only after the development of the radio telescope in 1937, that the expansion of the universe was observed and established. This discovery is regarded as one of the greatest in the history of astronomy.



During these observations, Hubble established that the stars emit a light that turns redder according to their distance. The wavelengths of receding bodies prolonged in the spectrum of light waves would shift to red, while, if the bodies approached each other, the wavelengths would shorten, shifting to blue. The light that came from galaxies that shifted to red showed that the galaxies were receding. In line with this observation, Hubble discovered a striking law: the speed of galaxies that receded was directly proportional to the distance between galaxies. The farther away a galaxy stood, the more its speed of recession accelerated. The result was tested again and again. In short, galaxies were moving further and further away, all the time.

A universe where everything constantly moves away from everything else implies a constantly expanding universe. The debate now is not whether the universe is expanding but rather at what rate. In 2011, the Nobel Prize in Physics was awarded to three

scientists for the 'discovery of the accelerating expansion of the universe through observations of distant supernovae'.

Early Universe in a state of 'Smoke'

The science of modern cosmology, observational and theoretical, clearly indicates that, at one point in time, the whole universe was nothing but a cloud of 'smoke' [i.e. an opaque highly dense and hot gaseous composition].⁴ This is one of the undisputed principles of standard modern cosmology. Scientists now can observe new stars forming out of the remnants of that 'smoke' [see Figures 1 and 2].



Figure 1: A new star forming out of a cloud of gas and dust (nebula), which is one of the remnants of the 'smoke' that was the origin of the whole universe. (*The Space Atlas, Heather and Henbest, p. 50.*)



Figure 2: The Lagoon nebula is a cloud of gas and dust, about 60 light years in diameter. It is excited by the ultraviolet radiation of the hot stars that have recently formed within its bulk. (*Horizons, Exploring the Universe, Seeds, plate 9, from Association of Universities for Research in Astronomy, Inc.*)

⁴ Weinberg, *The First Three Minutes, a Modern View of the Origin of the Universe*, pp. 94-105.

The illuminating stars we see at night were, just as was the whole universe, in that ‘smoke’ material. God has said in the Qur’ān:

ثُمَّ اسْتَوَىٰ إِلَى السَّمَاءِ وَهِيَ دُخَانٌ

“Then He directed Himself to the heaven while it was smoke...”

Qur’ān 41:11

As the earth and the heavens above (the sun, the moon, stars, planets, galaxies, etc.) have been formed from this same ‘smoke,’ we conclude that the earth and the heavens were one connected entity.

The screenshot shows the Science Magazine website interface. At the top, the 'Science' logo is on the left, and navigation links for 'Home', 'News', 'Journals', 'Topics', and 'Careers' are in the center. On the right, there is a 'Log in | My account' link. Below the navigation bar, the article title 'How the Early Universe Cleared Away the Fog' is displayed in a large font. To the left of the title is a 'SHARE' button with social media icons for Facebook, Twitter, and LinkedIn. Below the title, the author's name 'By Yudhijit Bhattacharjee' and the date 'Nov. 3, 2010, 2:33 PM' are shown. The main text of the article begins with 'About 300,000 years after the big bang, the universe was like a smoke-filled chamber from which light could not escape. By the time the universe was a billion years old, the smoke—actually a gas of light-trapping hydrogen—had cleared almost entirely, allowing stars and galaxies to become visible. But exactly what cut through the haze has been one of the big questions in astrophysics. Now, by analyzing images taken by the Hubble Space Telescope, researchers have come close to confirming their best guess: the smoke was cleared away by a blaze of ultraviolet radiation from the earliest galaxies.' A red box highlights the phrase 'the smoke' in the text. Below this paragraph, a second paragraph starts with 'About 300,000 years after the big bang, the first atoms formed as protons combined with electrons to make hydrogen. Because hydrogen atoms trap light, the young universe entered its "dark ages." Then about a billion years later, some sort of radiation had ionized the hydrogen, turning it into a transparent broth of electrons and ions over a period of several hundred million years; the period is known as the Epoch of Reionization.'

Screenshot taken from the Science Magazine – (one of the world’s top academic journals).

“...By the time the universe was a billion years old, the smoke – actually a gas of light -trapping hydrogen – had almost cleared entirely, allowing stars and galaxies to become visible...”⁵

We know that our world, the sun and the stars did not come about immediately after the primeval explosion. Rather, the universe was in a gaseous state before the formation of the stars. This gaseous state was initially made of hydrogen and helium. Condensation and compression shaped the planets, the earth, the sun and the stars that eventually became the products of the gaseous state. The discovery of these processes was made possible thanks to successive findings, observations and theoretical developments.

The knowledge of all contemporary communities at the time of the Prophet did not suggest that the universe had once been in a gaseous state. The Prophet himself did not claim to be the author of the statements in the Qur'ān as is often mentioned, declaring that he is simply a messenger of God.

تِلْكَ مِنْ أَنْبَاءِ الْغَيْبِ نُوحِيهَا إِلَيْكَ ۖ مَا كُنْتَ تَعْلَمُهَا أَنْتَ وَلَا قَوْمُكَ مِنْ قَبْلِ هَذَا ۗ
فَاصْبِرْ ۗ إِنَّ الْعَاقِبَةَ لِلْمُتَّقِينَ

“That is from the news of the unseen which We reveal to you, [O Muhammad]. You knew it not, neither you nor your people, before this. So be patient; indeed, the [best] outcome is for the righteous.”

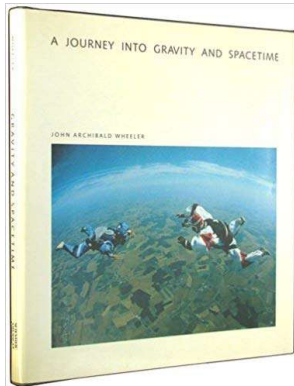
Qur'ān 11:49

⁵ <https://www.sciencemag.org/news/2010/11/how-early-universe-cleared-away-fog>

Spacetime – “Papyrus Scroll”

John A. Wheeler, one of the leading physicists of the 20th century, coined the term ‘Black Hole’ and helped develop the theory of nuclear fission.⁶

He co-authored the classic text ‘Gravitation’ with 2017 Nobel Prize winner Kip S. Thorne and Charles Misner. The book is considered by *Science* magazine as “a pedagogic masterpiece,” and is essential reading for every serious student and researcher in the field of relativity.



'A Journey into Gravity and Spacetime' by John Archibald Wheeler

In another of his books, ‘A Journey into Gravity and Spacetime,’ Wheeler writes,

“Think of spacetime as a great record of all that was, is, and evermore shall be. Spacetime like a great unrolling papyrus scroll with densely sprinkled grains of sand glued to it, loaded throughout its vastness with microscopic events, the collision of particle with particle - or of particle with that bullet of light we call a photon.

⁶ <https://www.nytimes.com/2008/04/14/science/14wheeler.html>

These events are connected by the straight-line tracks of particles and photons as one grain of sand on the scroll is connected to another by the faint strand of a spider's web. We don't need coordinates on the papyrus to be able to pick out and point our finger at an extra-bright ruby-red grain of sand.

We don't have to know how to measure space and time to point to the impact of a meteor on Arizona as an event. Space and time are loaded with events as surely as the scroll is sprinkled with grains of sand.”⁷

On the same page (p. 56), he cites the following Ayat of the Qur'ān.

يَوْمَ نَطْوِي السَّمَاءَ كَطَيِّ السِّجِلِ لِلْكِتَابِ ۚ كَمَا بَدَأْنَا أَوَّلَ خَلْقٍ نُعِيدُهُ ۚ وَعَدَّا عَلَيْنَا ۚ إِنَّا
كُنَّا فَاعِلِينَ


“The Day, We shall roll up the heaven like the rolling up of the scroll for books. As We began the first creation, We will repeat it. [That is] a promise binding upon Us. Indeed, We will do it.”

Qur'ān 21:104

Wheeler was amazed that the Qur'ān had described the rolling of the heavens (or spacetime) like the rolling up of scrolls and included the above picture to accompany the Ayat in his book.

Interestingly, there are three dominant theories held by physicists about the ultimate end of the universe;

⁷ Wheeler, John, A Journey into Gravity and Spacetime, p. 56.



We shall roll up the heavens like the rolling up of the scrolls by a scribe. As We began the first creation, so shall We repeat it.

Koran, Chapter 21, *al-ambiyā'* (103)

Think of spacetime as a great record of all that was, is, and evermore shall be. Spacetime, like a great unrolling papyrus scroll with densely sprinkled grains of sand glued to it, loaded throughout its vastness with microscopic events, the collision of particle with particle—or of particle with that bullet of light we call a photon. These events are connected by the straight-line tracks of particles and photons as one grain of sand on the scroll is connected to another by the faint strand of a spider's web. We don't need coordinates on the papyrus to be able to pick out and point our finger at an extra-bright ruby-red grain of sand. We don't have to know how to measure space and time to point to the impact of a meteor on Arizona as an event. Space and time are loaded with events as surely as the scroll is sprinkled with grains of sand. These events impart to spacetime a definiteness that rises above all coordinates, all frames of reference, all clocks, all measures of time. The right order of ideas is not first frames of reference, then spacetime. The right order is first spacetime, then frames of reference.

How do we measure the spacing between points, between events, between grains of sand? We know from schooldays how to define and measure the separation—or distance—between two grains of sand:

$$(\text{distance})^2 = (\text{east-west separation})^2 + (\text{north-south separation})^2 + (\text{up-down separation})^2$$

Between event and nearby event, there is a separation as definite as that between one grain of sand and another on the papyrus, but of a different quality. Events in the real world are separated in time as well as in space. A separation of this new kind cannot be called distance. Separation in spacetime is called *interval*. The difference in quality between grains of sand and events in spacetime shows most dramatically in this, that the interval for some pairs of events is spacelike, for other pairs timelike, but never both.

How can we tell whether an interval is spacelike or timelike? We look at the east-west separation between the events, the north-south separation, the up-down separation, but also the separation in time. We square all four quantities, then subtract the time squared from the sum of the other three squares. When the difference is positive, it gives directly the square of the interval between the two points and tells us more—that the interval is spacelike:

$$(\text{spacelike interval})^2 = (\text{east-west separation})^2 + (\text{north-south separation})^2 + (\text{up-down separation})^2 - (\text{separation in time})^2$$

Chapter Three

'A Journey into Gravity and Spacetime' by John Archibald Wheeler p. 56

- 1) 'The Big Rip' - where the pull of the universe's expansion gets stronger than the gravity it contains and this tears apart galaxies.
- 2) 'The Big Freeze' - the universe ends due to a big freeze.
- 3) 'The Big Crunch' - the expansion of the universe eventually reverses and the universe collapses, ultimately causing the cosmic scale factor to reach zero, an event potentially followed by a reformation of the universe starting with another Big Bang.

The aforementioned Ayat (21:103) lends support to the third theory, 'The Big Crunch', and is from the very same Surah (chapter) that includes the Ayat of the 'Big Bang' (21:30).

The Orbital Movement of the Sun and the Moon

وَهُوَ الَّذِي خَلَقَ اللَّيْلَ وَالنَّهَارَ وَالشَّمْسَ وَالْقَمَرَ كُلٌّ فِي فَلَكٍ يَسْبَحُونَ

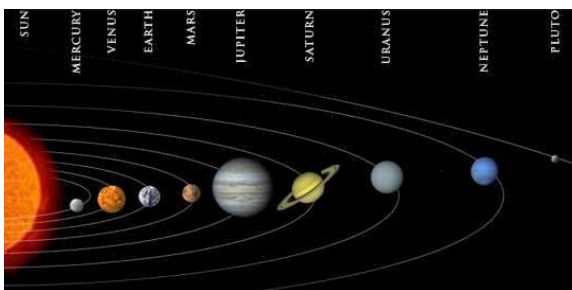
“And it is He who created the night and the day and the sun and the moon; all [heavenly bodies] in an [*falak*] orbit are [*yasbahoon*] swimming.”

Qur'ān 21:33

لَا الشَّمْسُ يَنْبَغِي لَهَا أَنْ تُدْرِكَ الْقَمَرَ وَلَا اللَّيْلُ سَابِقُ النَّهَارِ وَكُلٌّ فِي فَلَكٍ يَسْبَحُونَ

“It is not allowable [i.e., possible] for the sun to reach the moon, nor does the night overtake the day, but each, in an [*falak*] orbit, is [*yasbahoon*] swimming.”

Qur'ān 36:40



The Arabic words used in these verses are *falak* and *yasbahoon* which can be translated as ‘sphere or orbit’ and ‘swimming.’ This concept of the movement of the sun and the moon and the other planets is in perfect harmony with recent discoveries. A

gravitational wave is an invisible (yet incredibly fast) ripple in space and theoretically travels at the speed of light (186,000 miles per second). These waves squeeze and stretch anything in their path as they pass by. In 2015, scientists detected gravitational waves for the very first time using a very sensitive instrument called LIGO (Laser Interferometer Gravitational-Wave Observatory).

NASA explains, “Albert Einstein theorized that when objects move through space they create waves in spacetime around them. These gravitational waves move outward, like ripples from a stone moving across the surface of a pond.”⁸ The word used by God to describe the movement of the planetary bodies is *yasbaboon*, meaning ‘swimming.’

It is inconceivable that an Arab living centuries ago in one of the most primitive parts of the world could have rightly used such a specific term to describe the movements of planets without divine guidance. It should be noted that the discovery of the orbital movement of all celestial bodies was due to the invention of telescopes.

The Spherical Shape of the Earth

يُكَوِّرُ اللَّيْلَ عَلَى النَّهَارِ وَيُكَوِّرُ النَّهَارَ عَلَى اللَّيْلِ

“...He wraps the night over the day and wraps the day over the night...”

Qur'an 39:5

The Arabic word for “wrap” is “*yukowir*” The word is used to depict the act of wrapping a turban around someone’s head. This

⁸ <https://www.jpl.nasa.gov/edu/teach/activity/dropping-in-with-gravitational-waves/>

word was also used in the sense of overlapping of the night and day and vice versa. The reason for the day's turning into night and the night's turning into day is due to the spheroid form of the earth.

God also says, وَالْأَرْضَ بَعْدَ ذَلِكَ دَحَاهَا “And after that He spread the earth.” [Qur'ān 79:30] The Arabic word “*dabw*” means to ‘spread’ or ‘spread out giving something a round shape’, i.e. like that of the ostrich's egg. Many ancient cultures, including the Greek, Indian and Chinese, held the belief that the Earth is flat. The Europeans did not alter their view until the Middle ages.

The Lowest Point on Earth



Figure 3: The Dead Sea is located in a deep valley at the transform boundary between the African and Arabia Plates (shown as a black line on the map). At over 400 metres below sea level, it is the land area with the lowest elevation. Image by the United States Geological Survey.

In the early 7th century, the two most powerful empires at the time were the Roman [eastern - Byzantine] and Persian Empires. Around 614-15 C.E. the two empires went to war in Greater-Syria, with the Romans (Byzantines) suffering a severe defeat at the hands

of the Persians. Damascus and Jerusalem both fell to the Persian Empire. In the following verses from the Qur'ān, God states that although the Romans had been defeated, nine years would not pass except that they will gain victory.

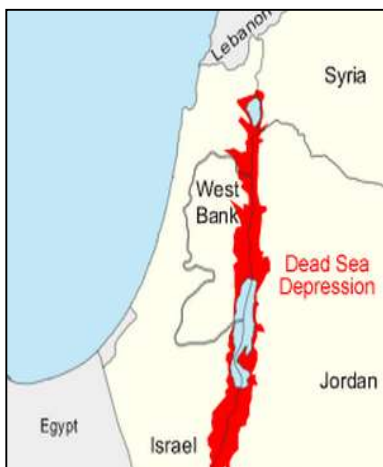
غَلِبَتِ الرُّومُ فِي أَدْنَى الْأَرْضِ وَهُمْ مِنْ بَعْدِ غَلَبِهِمْ سَيَغْلِبُونَ فِي بِضْعِ سِنِينَ

“The Romans have been defeated in [*adna* – nearest, lowest] land. But they, after their defeat, will be victorious. Within a few years [*bida' sineen* – three to nine years]...”

Qur'ān 30: 2-4

Indeed, within nine years following the revelation of these verses, against all the odds, the Roman Empire defeated the Persians and the lost territories were eventually returned to them.

In the verse, God describes the geographical location as ‘*adna al-ardh.*’ The word ‘*adna*’ can be translated as the ‘nearest’ or the ‘lowest’ land. Classic Islamic scholars opted to interpret the word to concord to the first meaning of ‘nearest’. However, recent geological studies have shown that the lowest point on Earth [dry land], is indeed the region where the main battles took place - around the Dead Sea. It is now established that there is no land point on Earth with a lower altitude than the



shoreline of the Dead Sea [which is approximately 418m below sea level].

Is it a mere coincidence that the region described by God as ‘*adna al-ardh*’ – is actually the lowest point on Earth?

The Qur'ān on Mountains

The book entitled ‘Earth’ is a basic reference textbook in many universities around the world. One of its two authors is Professor Emeritus Frank Press. He was the Science Advisor to former US President Jimmy Carter, and for 12 years was the President of the National Academy of Sciences, Washington, DC. His book says that mountains have underlying roots.⁹ These roots are deeply embedded in the ground, thus, mountains have a shape like a peg [see Figures 4, 5 and 6].

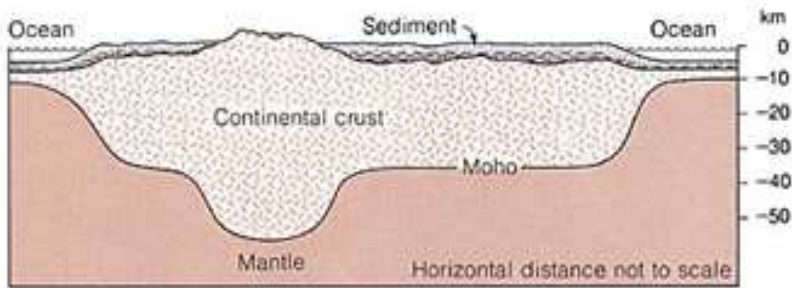


Figure 4: Mountains have deep roots under the surface of the ground.¹⁰

⁹ Press, E.F., *Earth*, p. 435.

¹⁰ *Ibid*, p. 413.

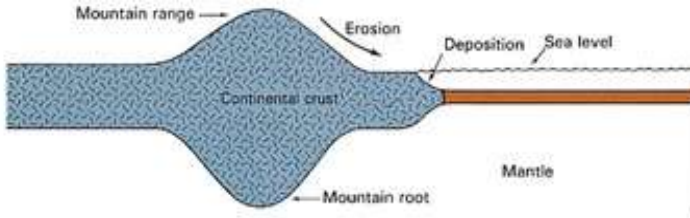


Figure 5: Schematic section. The mountains, like pegs, have deep roots embedded in the ground.¹¹

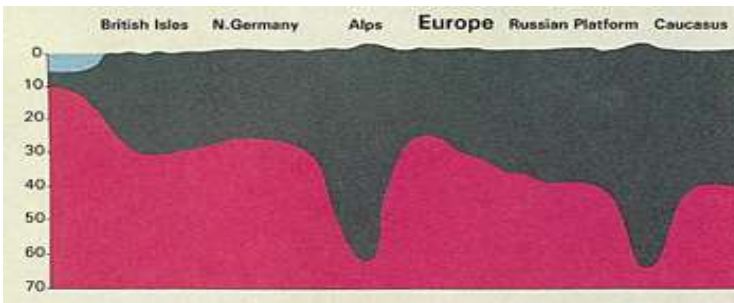


Figure 6: Another illustration shows how the mountains are peg-like in shape, due to their deep roots.¹²

This is how the Qur'ān has described mountains. God has said in the Qur'ān:

أَلَمْ نَجْعَلِ الْأَرْضَ مِهَادًا وَالْجِبَالَ أَوْتَادًا

“Have We not made the earth a resting place? And the mountains as stakes (pegs)?”

Qur'ān 78: 6-7

¹¹ Cailleux, *Anatomy of the Earth*, p. 220.

¹² Tarbuck and Lutgens, *Earth Science*, p. 158.

Modern earth sciences have proven that mountains have deep roots under the surface of the ground [see Figure 6] and that these roots can reach several times their elevations above the surface of the ground.¹³ So the most suitable word to describe mountains on the basis of this information is the word 'peg,' since most of a properly set peg is hidden under the surface of the ground. The history of science tells us that the theory of mountains having deep roots was introduced only in the latter half of the nineteenth century.¹⁴

Mountains also play an important role in stabilising the crust of the earth.¹⁵ They hinder the shaking of the earth. God has said in the Qur'ān:

وَأَلْقَى فِي الْأَرْضِ رَوَاسِيَ أَنْ تَمِيدَ بِكُمْ وَأَنْهَارًا وَسُبُلًا لَّعَلَّكُمْ تَهْتَدُونَ

“And He has cast into the earth firmly set mountains, lest it shift with you, and [made] rivers and roads, that you may be guided.”

Qur'ān 16: 15

Likewise, the modern theory of plate tectonics holds that mountains work as stabilisers for the earth. This knowledge about the role of mountains as stabilisers for the earth has just begun to be understood in the framework of plate tectonics since the late 1960's.¹⁶

Could anyone during the time of the Prophet Muhammad have known of the true shape of mountains? Could anyone imagine that the solid mountain which he sees before him actually extends deep

¹³ Naggar, El-, *The Geological Concept of Mountains in the Qur'ān*, p. 5.

¹⁴ Ibid, p.5.

¹⁵ Ibid p.44-45.

¹⁶ Ibid p.5.

into the earth and has a root, as scientists assert? A large number of books of geology, when discussing mountains, only describe that part which is above the surface of the earth. This is because these books were not written by specialists in geology. However, modern geology has confirmed the truth of the Qur'ānic verses.

The Qur'ān on the Origin of Life in Water

وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ أَفَلَا يُؤْمِنُونَ

“...and We made from water every living thing? Then will they not believe?”

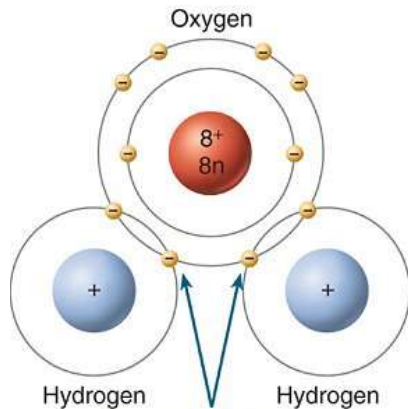
Qur'ān 21:30

The origin of life is now such a basic scientific fact that it is accepted without hesitation. This could lessen one's appreciation for these verses. Yet it must be borne in mind that the Arabian peninsula is a desert land without a single lake or river, these verses describe something unimaginable to those at the time of the Prophet Muhammad.

The verse is categorical and states a universal reality – that the source of all 'life' and everything 'living' is water. Water is the main element of all living organisms. It has been proved that the percentage of water in a human body is 71% in an adult and 93% in an embryo that is a few months old. All vital actions and processes like nutrition, excretion, growth and reproduction cannot be undertaken without water: photosynthesis, the exchange of

solutions between cells due to the capillarity of aquatic solutions as they pass through the cell wall [osmosis] and the building of new cells and tissues that help growth and reproduction. The absence of water equates to the 'death' of every living organism.

Scientists, having studied millions of life forms that live in innumerable ecosystems globally, conclude that for any 'living' organism to exist, water must be present. Even astronomers, investigating the existence of life forms on other planets, seek the presence of water when considering the possibility of life on that planet.



The Qur'ān on Seas and Rivers

Modern Science has discovered that in the places where two different seas meet, there is a barrier between them. This barrier divides the two seas so that each sea has its own temperature, salinity, and density.¹⁷ For example, Mediterranean sea water is warm, saline, and less dense, compared to Atlantic ocean water. When Mediterranean sea water enters the Atlantic over the Gibraltar sill, it moves several hundred kilometres into the Atlantic at a depth of about 1000 meters with its own warm, saline, and less

¹⁷ Davis, *Principles of Oceanography*, pp. 92-93.

dense characteristics. The Mediterranean water stabilises at this depth¹⁸ [see Figure 7].

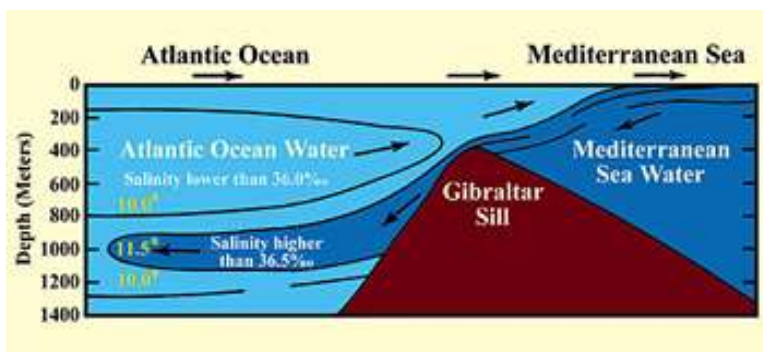


Figure 7: The Mediterranean sea water as it enters the Atlantic over the Gibraltar sill with its own warm, saline, and less dense characteristics, because of the barrier that distinguishes between them. Temperatures are in degrees Celsius (C°). (Marine Geology, Kuenen, p. 43, with a slight enhancement.)

Although there are large waves, strong currents and tides in these seas, they do not mix or transgress this barrier. The Qur'ān mentioned that there is a barrier between two seas that meet and that they do not transgress. God has said:

مَرَجَ الْبَحْرَيْنِ يَلْتَقِيَانِ بَيْنَهُمَا بَرْزَخٌ لَا يَبْغِيَانِ

“He released the two seas, meeting [side by side]; Between them is a barrier [so] neither of them transgresses.”

Qur'ān 55:19-20

¹⁸ Ibid p.93.

However, when the Qur'ān speaks about the divider between fresh and salt-water, it mentions the existence of “a forbidding partition” with the barrier. God has said in the Qur'ān:

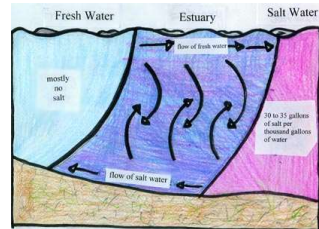
وَهُوَ الَّذِي مَرَجَ الْبَحْرَيْنِ هَذَا عَذْبٌ فُرَاتٌ وَهَذَا مِلْحٌ أُجَاجٌ وَجَعَلَ بَيْنَهُمَا بَرْزَخًا
وَحِجْرًا مَحْجُورًا

“And it is He who has released [simultaneously] the two seas, one fresh and sweet and one salty and bitter, and He placed between them a barrier and prohibiting partition.”

Qur'ān 25:53

One may ask, why did the Qur'ān mention the partition when speaking about the divider between fresh and salt-water, but did not mention it when speaking about the divider between the two seas?

Science has discovered that in estuaries, where fresh (sweet) and salt-water meet, the situation is somewhat different from what is found in places where two seas meet. It has been discovered that what distinguishes fresh water from salt water in estuaries is a “pycnocline zone with a marked density discontinuity separating the two layers.”¹⁹ This partition (zone of separation) has a different salinity from the fresh water and from the salt water [see Figure 8].



¹⁹ Gross, *Oceanography*, p. 242.

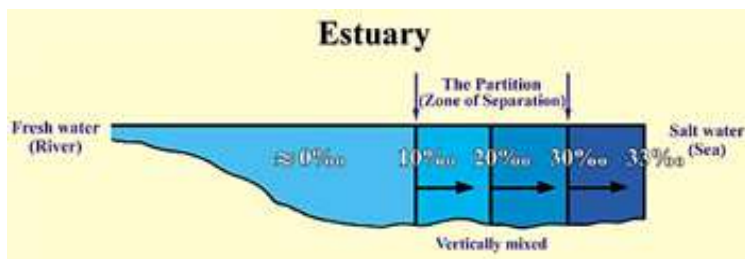


Figure 8: Longitudinal section showing salinity (parts per thousand) in an estuary. We can see here the partition (zone of separation) between the fresh and the salt water.²⁰

This information has been discovered only recently, using advanced equipment to measure temperature, salinity, density, oxygen dissolubility, etc. The human eye cannot see the difference between the two seas that meet, rather the two seas appear to us as one homogeneous sea. Likewise, the human eye cannot see the division of water in estuaries into the three kinds: fresh water, salt water and the partition (zone of separation).

Light and Levels of Darkness in the Oceans

Studies related to marine sciences and sea depths did not practically start before the beginning of the 18th century, when appropriate instruments and techniques were available and when advanced submarines were invented. After many decades of research the following facts were established;

1. The sea divides into two major parts:

²⁰ Thurman, *Introductory Oceanography*, pp. 300-301.

- The surface sea that is penetrated by the solar energy and light.
 - The deep sea where the solar energy and light are non-existent.
2. The deep sea and surface sea differ in temperature, density, pressure, the amount of sunlight and the creatures living in each of them. They are separated by internal waves.
 3. Sea internal waves - internal waves cover the deep sea and serve as a boundary between the deep sea and the surface sea. Surface waves cover the sea surface and serve as a boundary between water and air. Internal waves were discovered in 1900's.²¹ The lengths of internal waves range from tens to hundreds of kilometres. Their height ranges from 10 meters and 100 meters.
 4. The deeper the sea, the darker it becomes. As dark as pitch from the depth of about (200) meters. At this depth there starts the thermocline that separates the warm surface waters from the cold waters of the deep. In it we find the internal waves that cover the cold water in the depth of the sea. In deep seas there are several layers of darkness, and light is non-existent in them. Living organisms and fish that live in them depend on chemical energy to produce light with which to find their way. Some species are blind and use means other than sight to sense their surroundings. Darkness begins at the depth of about 200 meters, and the entire visible light disappears at the depth

²¹ <https://www.nature.com/articles/155669c0>

of about 1000 meters. The structure of these fish is mostly water to withstand the enormous pressure.

God has said in the Qur'ān:

أَوْ كَظُلُمَاتٍ فِي بَحْرٍ جُمِّيٍّ يَغْشَاهُ مَوْجٌ مِّنْ فَوْقِهِ مَوْجٌ مِّنْ فَوْقِهِ سَحَابٌ طُلُومَاتٌ بَعْضُهَا
فَوْقَ بَعْضٍ إِذَا أَخْرَجَ يَدَهُ لَمْ يَكُنْ يَرَاهَا وَمَنْ لَّمْ يَجْعَلِ اللَّهُ لَهُ نُورًا فَمَا لَهُ مِنْ نُّورٍ

“Or [they are] like darkneses within an unfathomable sea which is covered by waves, upon which are waves, over which are clouds - darkneses, some of them upon others. When one puts out his hand [therein], he can hardly see it.”

Qur'ān 24:40

This verse mentions the levels of darkness found in deep seas and oceans one on top of the other. Human beings are not able to dive more than forty meters without the aid of submarines or special equipment. Human beings cannot survive unaided in the deep dark part of the oceans, such as at a depth of 200 meters.

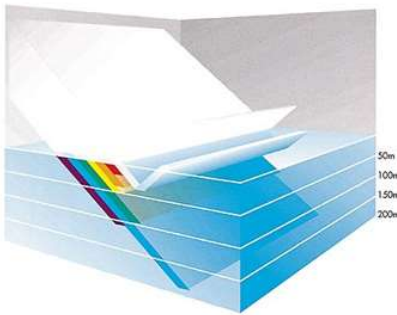


Figure 9: Between 3 and 30 percent of the sunlight is reflected at the sea surface. Then almost all of the seven colours of the light spectrum are absorbed one after another in the first 200 meters, except the blue light. (*Oceans*, Elder and Pernetta, p. 27.)

Scientists have only discovered this darkness by means of special equipment and submarines that have enabled them to dive into the depths of the oceans.

We can also understand from the following sentences in the previous verse, **“...in a deep sea. It is covered by waves, above which are waves, above which are clouds....,”** that the deep waters of seas and oceans are covered by waves, and above these waves are other waves. It is clear that the second set of waves are the surface waves that we see, because the verse mentions that above the second waves there are clouds. But what about the first waves? Scientists have recently discovered that there are internal waves which “occur on density interfaces between layers of different densities.”²² [see figure 10].

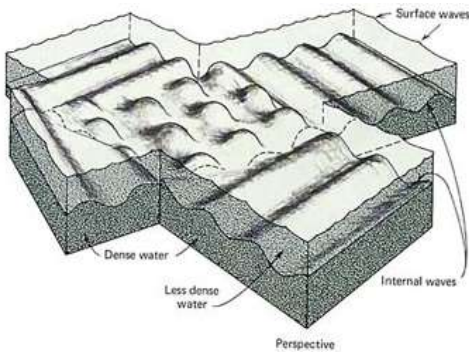


Figure 10: Internal waves at the interface between two layers of water of different densities. One is dense (the lower one), the other one is less dense (the upper one).

The internal waves cover the deep waters of seas and oceans because the deep waters have a higher density than the waters above them. Internal waves act like surface waves. They can also break, just like surface waves. Internal waves cannot be seen by the human eye, but they can be detected by studying temperature or salinity changes at a given location.²³

²² Gross, *Oceanography*, p. 205.

²³ Ibid.

The Qur'ān on Duality in Creation

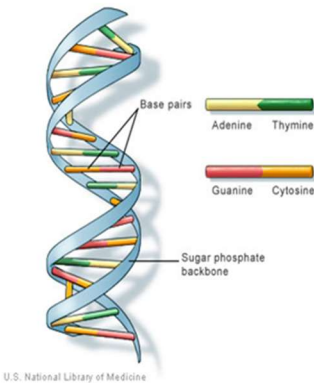
سُبْحَانَ الَّذِي خَلَقَ الْأَزْوَاجَ كُلَّهَا مِمَّا تُنْبِتُ الْأَرْضُ وَمِنْ أَنْفُسِهِمْ وَمِمَّا لَا يَعْلَمُونَ

“Exalted is He who created all pairs - from what the earth grows and from themselves and from that which they do not know.”

Qur'ān 36:36

This Qur'ānic verse outlines the fact that all creatures, whether living beings or solid matter, are created in pairs. It refers to everything that was created. Amazingly, the outstanding truth and generality of this and similar verses came to be gradually realised, and more so recently, during 14 centuries since the Qur'ān was first revealed in a primitive world.

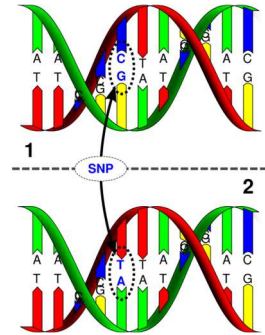
Millions of animal species discovered, classified and investigated only during the last two centuries, were found to be invariably in 'pairs,' male and female. Electron microscopy has clarified that all living creatures, however minute, are in pairs. The smallest microbes, viruses, and bacteria have their counterpart antibodies.



DNA, deoxyribonucleic acid, carries genetic information and is a chemical made up of two long molecules, arranged in a spiral, known as the double-helix structure.

Take for example DNA – it is made up of thousands of different genes, and genes are made up of base pairs. These ‘base pairs’ are made of two paired up nucleotides. In order to form a base pair, we need to pair up specific nucleotides. Each type of nucleotide has a specific shape, so only certain combinations fit.

The sequence, composition, and orientation of these ‘pairs’ of nucleotides control the genetic information carried by the DNA. A chromosome consists of different types of protein bound tightly within a single DNA molecule chain.



The DNA is a large long (up to 1 meter long) amino acid chain. It consists of a ‘pair’ of spiral strands, connected with steps.

Each step consists of a ‘pair’ of chemical components, so-called nucleotides. There are 4 nucleotides. Adenine, Thymine, Guanine and Cytosine represented respectively by the letters A, T, G and C. Due to their shapes only A and T or G and C fit into one another.

Base Pairs [A-T, G-C] (billions of these **matching pairs**) --->
Genes (thousands of these) --> **DNA** --> **Chromosomes** -->
Nucleotides --> **Nucleus** (the ‘brain’ of the cell).²⁴

All life systems including plant, animal and human consist of different types of cells. A cell consists of a nucleus surrounded with cytoplasm which is usually enclosed, within a cell wall. The cell nucleus carries the chromosomes that control all the cell functions. All cells of a particular organism have exactly the same number of chromosomes; the number varies widely between different species.

²⁴ International Human Genome Sequencing Consortium (2004). “Finishing the euchromatic sequence of the human genome”. *Nature* 431 (7011): 931–45

Proteins are formed from various combinations of amino acids. Specifically, 20 types of amino acid are used in different combinations to form more than a million types of protein, present in a human being. Every type of amino acid can exist in either pair of structures (right-handed isomer or left-handed isomer), with opposite polarised light rotation direction. The same applies to the proteins formed thereof.

The wide variety of creatures including living species, solid matter, liquids and gases are marvellous combinations of the same list of building blocks: atoms. These basic units, were long known to consist of a 'pair' of a positively charged nucleus surrounded by negative electrons. The nucleus consists of protons that carry the positive charge, together with neutrons. Even the neutral neutrons have their counterpart, the anti-neutrons. Later advances in nuclear physics has demonstrated that each of these particles is, in effect, a complex structure of much smaller nuclear particles. Over 200 of such elementary particles are now known.

At the atomic level, atoms can, literally, ionise i.e. either lose or gain electrons to form positive cations or negative anions. 'Pairs' of cations/anions combine to produce the wide variety of chemical (inorganic) compounds. This is one of the conclusions made by British physicist Paul Dirac, winner for Nobel Prize for Physics in 1933. His finding, known as 'parity,' revealed the duality known as matter and antimatter.

Another example of duality in creation is plants. Botanists only discovered that there is a gender distinction in plants some 100 years ago. Yet, the fact that plants are created in pairs was revealed in the verses of the Qur'ān 1,400 years ago. It was only after the discovery of microscopes that human beings knew that plants have male organs (stamens) and female organs (ovaries) and that the

wind, together with other factors, carries the pollen from one type to the opposite one so that reproduction can take place.

Every animal species of the wide animal kingdom reproduces sexually. Sexual reproduction results from the combination of a female ovum and a male sperm. The formation of this zygote 'pair' is the starting point in the reproduction cycle. The sperms, in turn are of 'two' kinds, the first carries the hereditary male characteristics, while the other carries the female ones. Flowering plants, of which more than 250,000 have been discovered so far, also reproduce sexually. They have both female (ovaries containing eggs) and male (stamens carrying pollens); either combined in the same flower or in different flowers. In the latter case, fertilization occurs when pollens are transferred by wind or insects to an adjacent flower.

Non-flowering plants, on the other hand, amounting to 150,000 species, reproduce in a double-stage cycle of sexual and asexual reproduction. Yet, the asexual reproduction stage is essentially a process of breaking up the DNA 'pair' of strands into two; followed by each of which re-forming its complementary strand. Thus, a new 'pair' of identical DNA molecules results in the cell, just before it divides into a 'pair' of identical cells. The same applies to the asexual reproduction of bacteria.

Each bacterium consists of a single cell, the smallest biological unit able to function independently. A single bacterium reproduces the same way explained above, i.e. by splitting into a pair of identical cells. As we have seen, cell division occurs through the process of DNA replication, in which the two strands of the DNA molecules are separated; and each strand synthesises a complementary strand to itself. So, 'asexual' reproduction of

bacteria involves the DNA 'pair' of strands splitting and reformation into a new 'pair' of cells.

Chlorophyll – The Green Pigment

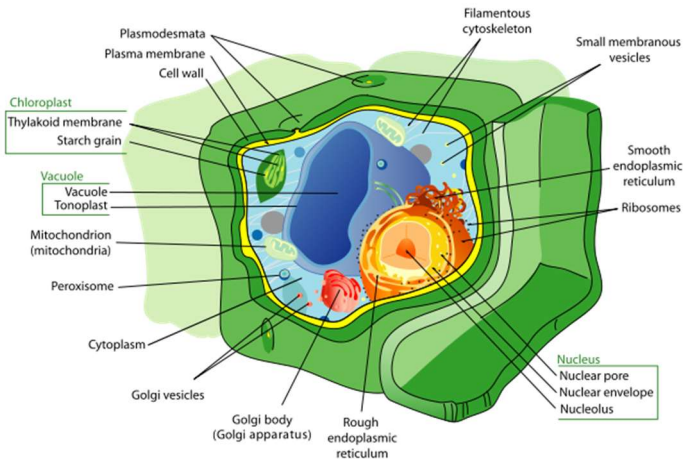


Figure 11: Plant Cell Structure

'Chlorophyll' is the only 'factory' on Earth that produces food: it is the green pigment that converts energy from the sun's energy, carbon dioxide and water to produce food for man and animals and this is referred to as 'chlorophyll a'. 'Chlorophyll b' has a different molecular structure and converts light energy from the sun, followed by a complex chemical reaction that produces sugar and then starch. Therefore, the basis of the formation of seeds and fruits is this green 'factory'.

وَهُوَ الَّذِي أَنْزَلَ مِنَ السَّمَاءِ مَاءً فَأَخْرَجْنَا بِهِ نَبَاتَ كُلِّ شَيْءٍ فَأَخْرَجْنَا مِنْهُ خَضِرًا
تُخْرَجُ مِنْهُ حَبًّا مُتَرَاكِبًا

“And it is He who sends down rain from the sky, and We produce thereby the growth of all things. We produce from it [*khadran*] greenery from which We produce grains arranged in layers....”

Qur'ān 6:99

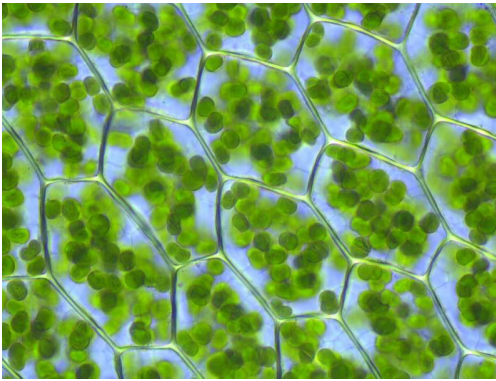


Figure 12: Chloroplasts visible in leaf cells

Scholars of Qur'ānic exegesis said '*khadran*' means something green. Qurtubi, a classic scholar of Qur'ānic commentary, explained the verse, “We brought forth from the plants something green” and Ibn al-Jawzi further explains, “We bring forth from it, that is – from the green thing – clustered grains like wheat and barley [etc].” So from this ‘green substance’ are the fruits and seeds produced.

The Uniqueness of Fingertips

- In 1823 - Jan Purkinje, a Czech physiologist and professor of anatomy at the University of Breslau, published a thesis discussing nine fingerprint patterns.
- In 1858 – William Herschel, alluded to the fact that fingerprints are different from one person to another. This makes the fingerprint an exclusive characteristic of each person.
- Juan Vucetich, an Argentine chief police officer, created the first method of recording the fingerprints of individuals on file, associating these fingerprints to the anthropometric system of Alphonse Bertillon, who had created, in 1879, a system to identify individuals by anthropometric photographs and associated quantitative descriptions.

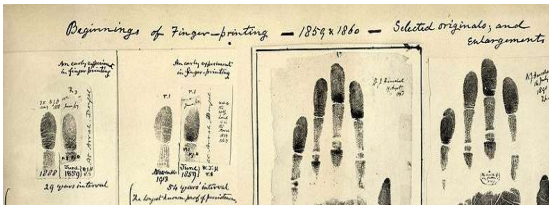


Figure 13: Fingerprints taken by William Herschel in 1859/60

أَيَحْسَبُ الْإِنْسَانُ أَلَّنْ نَجْمَعُ عِظَامَهُ
بَلَىٰ قَادِرِينَ عَلَىٰ أَنْ نَسْوِيَّ بَنَانَهُ

“Does man think that We will not assemble his bones?

Yes. [We are] Able [even] to proportion his fingertips.”

Qur'an 75:3-4

The pagans of Makkah had denied that mankind would be raised on the Day of Resurrection. They wondered, 'How is it possible for God to assemble the bones of the dead?' God said that not only is He capable of assembling the bones of the dead but is also able to perfectly put together the tips of the fingers.



The question is why did God choose to use the body part 'fingertips' as an example of His ability in resurrecting. A human being making the same point may have opted to say 'proportion his face' – for that would apparently seem to be of a greater difficulty and more visible differentiation – fingertips not being something you would traditionally associate with difficulty or uniqueness. God knows the uniqueness He has placed in each human being. The verse stresses that every detail of man shall be brought back to life even to the extent of the information that exists on a fingertip. Only the Creator would have said these words in this way.

The Skin – Sensation of Pain

Shaykh Zindani said, "People used to believe that all the parts of the human body feel pain regardless of where a person is struck, until the advancement of anatomy revealed the truth that not all parts of the body feel pain and that it is only the skin that is the source of pain. For example, if you bring a needle and insert it into the body of a person, the pain stops as soon as it passes through the skin into the flesh. Scientists discovered with the help of a microscope that nerves are centered in the skin and that sensory nerves are of different kinds. Some of them feel touch, some feel pressure, some feel heat and some feel coldness. They realised that

the nerves that give the sensation of heat and coldness are only found in the skin.”

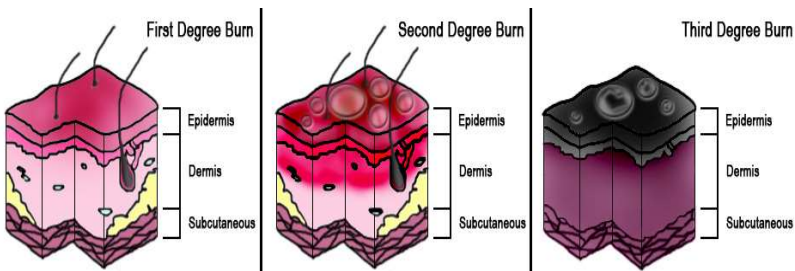
إِنَّ الَّذِينَ كَفَرُوا بِآيَاتِنَا سَوْفَ نُصْلِيهِمْ نَارًا كُلَّمَا نَضِجَتْ
جُلُودُهُمْ بَدَّلْنَاهُمْ جُلُودًا غَيْرَهَا لِيَذُوقُوا الْعَذَابَ

“Indeed, those who disbelieve in Our verses - We will drive them into a fire. Every time their skins are roasted through We will replace them with other skins so they may taste the punishment...”

Qur'ān 4:56

God tells us that He would exchange the disbeliever’s roasted skins for other skins in order to exacerbate the pain they shall suffer in the fire of Hell. He said, “every time their skins are roasted through”, i.e., totally burned with all nerves of sensation and pain. He associated between the sensation of pain and the skin when roasted and burned totally, thus losing its structure and function. When sensation of pain is lost, a new fully composed and functional skin is replaced, where the nerve ending responsible for the painful sensation of heat and burn perform and function to make the disbeliever taste the punishment of being burned with fire over and over again.

Taking skin burns as a distinct cause for the skin sensation of pain, burns can be divided into 3 types:



1. Burns of first degree (sun burns): these affect the epidermis causing swelling and moderate pain. The phenomena of redness, swelling and pain usually disappear within two to three days.
2. Burns of second degree: epidermis and dermis are injured. In such a case, a detachment occurs between epidermis and dermis, causing the collection of secretions between these two layers. The injured person suffers from severe pain, and excessive increase of pain sensation, due to irritation of exposed nerve ending particularly after the outburst of blisters. The skin starts to heal within 14 days as a result of the process of renovation and inversion under the skin.
3. Burns of third degree: the whole skin thickness is burned and perhaps the injury may reach the muscles or the bone. The skin loses elasticity and becomes rough and dry. In this case, the injured person does not feel much pain, as nerve endings have been damaged almost completely due to burning.

For third degree burns, the nerves in the skin are completely destroyed and there will be no longer the feeling of any pain

Frontal Lobe of the Brain

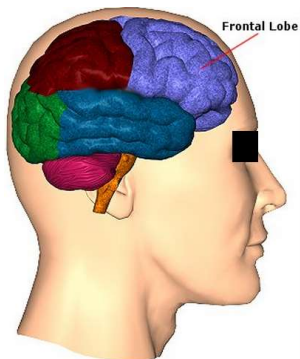
كَلَّا لَئِن لَّمْ يَنْتَهِ لَنَسْفَعًا بِالنَّاصِيَةِ
نَاصِيَةٍ كَاذِبَةٍ خَاطِئَةٍ

“No! If he does not desist, We will surely drag him by the forelock -
A lying, sinning forelock.”

Qur'ān 96:15-16

Shaykh Zindani writes, “The Holy Qur’ān describes the front of the head being lying and sinful. God says, “a lying sinful nasiyah (front of the head).” Since the front of the head does not speak, how can it be described as being lying? It does not commit sins. How is it then said to be sinful?

Professor Muhammad Yusuf Sukkar dispelled my perplexity while he was talking to me about the function of the brain. He said: “The function of the portion of the brain that lies in the front of the human head is to control the human behaviour.” I said: “I have found it.” He said: “what have you found?” I said: “The interpretation of the saying of God, “a lying sinful nasiyah.” He said: “Let me consult my books and references.”



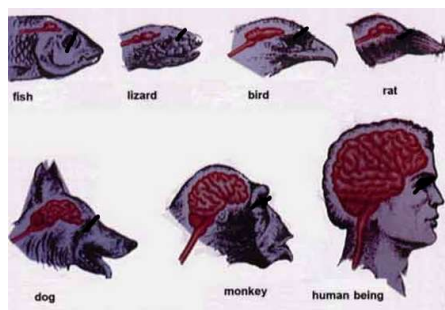
After having done so, he, confirming what he had said, added: “When a person intends to tell a lie, the decision is made in the frontal lobe of the brain, which is the front of the head. If he wants to commit a sin, the decision is made there, too.” Then I discussed the subject with a number of specialized scholars, among whom was Keith L. Moore, who stated that the front of the head is responsible for judging and for directing human behaviour. The working organs of the body (e.g. the limbs) are but tools to carry out the decision made in the front of the head.

The anatomical structure of the upper region of the forehead shows that it consists of one of the bones of the skull, called the fronted bone, which protects one of the lobes of the brain called the frontal lobe, which contains several neural centers in various locations and with various functions.

The prefrontal cortex constitutes the bulk of the frontal lobe of the brain, and its function is involved in the making of one's personality. It is also considered as a superior center among the centers of concentration, thinking and memory. It plays a significant role in the persons emotion and it is somehow concerned with initiative and discrimination.

The cortex is situated directly behind the forehead; it is hidden deep in the front of the head. Thus the prefrontal cortex directs some of the human behaviour that reflects one's personality, with respect to being truthful, lying, right, wrong...etc. It also distinguishes between these virtues and vices and urges one to take the initiative whether with good or evil intent.

In a joint research on the scientific miracle of “*nasīyah*” [frontal lobes] by Keith L. Moore and me, presented in an international conference held in Cairo in 1980, Keith L. Moore did not talk about the function of the frontal lobe of the human brain only, but talked about the function of the ‘*nasīyah*’ in the brains of various animals. Demonstrating pictures of the frontal lobes of a number of animals, he said: “The comparative anatomical study of human and animal brains shows that the *nasīyah* has the same function: It is the center of control and guidance in both man and animals that have brains.”



His saying drew my attention to the saying of God,

مَا مِنْ دَابَّةٍ إِلَّا هُوَ آخِذٌ بِنَاصِيَتِهَا

“...There is no creature but that He holds its forelock...”

Qur'ān 11:56

I also called to mind some of the traditions of the Prophet Muhammad, such as: “O God! I am your servant and the son of your servant and the son of your bondmaid, my *nasiyah* (front of the head) is in Your Hands...” and: “I seek refuge with you from the evil of everything whose *nasiyah* is in Your Grasp.” and: “Horses have goodness embedded in their *nasiyahs*, till the Day of Resurrection.” From the meanings of these texts we can conclude that the *nasiyah* is the center of control and guidance of both human and animal behaviour.

Professor Keith L. Moore says, “The information we now know about the function of the brain, was not mentioned throughout history, nor do we find anything about it in the medical books. Should we survey all the medical literature during the time of the Prophet and several centuries thereafter, we would find no mention of the function of the frontal lobe (*nasiyah*), or an explanation of it or a statement about it except in this Book (Qur'ān).”

The function of the frontal lobe was known for the first time in 1842, when a railway worker in America was hit with a bar that pierced his forehead. That affected his behaviour leaving the other functions of his body intact. Only then doctors came to know the function of the frontal lobe of the brain and its bearing on human behaviour. Doctors, up to then, had thought that this portion of the human brain was a mute region with no function.

Who, then, informed (Prophet) Muhammad that this portion of the brain (nasiyah) is the center of control and guidance in both people and animals and that it is the source of telling lies and committing sins?...Who, then, told (Prophet) Muhammad in particular, of this secret and this fact? It is the Divine Knowledge that no falsehood can approach from before or behind it. It is a witness from God that the Qur'ān is from Him.”

Behavioural Patterns of Species are like Humans

وَمَا مِنْ دَابَّةٍ فِي الْأَرْضِ وَلَا طَائِرٍ يَطِيرُ بِجَنَاحَيْهِ إِلَّا أُمَّمٌ أَمْثَالُكُمْ

“And there is no creature on [or within] the earth or bird that flies with its wings except [that they are] communities like you”

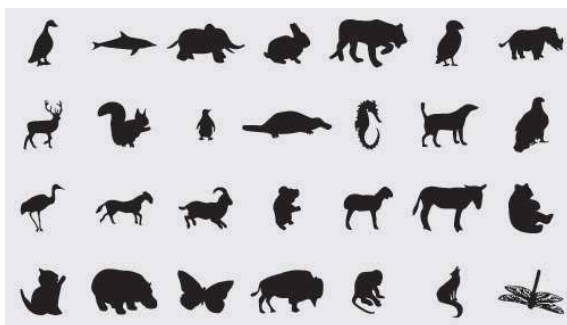
Qur'ān 6:38

Key words – إِلَّا أُمَّمٌ أَمْثَالُكُمْ – ‘communities like you [i.e. humans]’ – Here the Creator informs us that the community structure and behavioural patterns of every single set of species in existence [as God does not exclude any] is similar *مثل* to how we as human beings are – some of us live as married couples, single parents, groups of small family, large tribes, etc.

God has made some animals smart and resourceful and others relaxed and trusting. Some insects store a year's worth of food for themselves, and others rely on the fact that daily provision is guaranteed for them. Some do not know their offspring at all; some look after their own offspring but not others; some never acknowledge their offspring once they become independent.

Some recognise and appreciate kind treatment, whilst for others it does not mean a thing. Some prefer others to themselves, whilst

others, if they gain enough to provide for an entire community of their species, will not let any other come near it. Some animals will not harm unless severely provoked, whilst others will hurt without provocation.



Some bear grudges and never forget if someone hurts them, whilst others do not remember at all. Some never get angry, whilst others get angry quickly and are not easily calmed. Some have very precise knowledge of things which most people know nothing about, and some do not know about anything at all. Some learn quickly and some learn slowly. All this points to the similarities of the behavioural patterns of humans and the various species.

Sufyan ibn Uyaynah, an early Muslim scholar, said, “there is no human being on Earth who does not resemble animals in some way...some run like wolves, some bark like dogs and some flaunt themselves like peacocks. Some people resemble pigs in that if you offer them good food they will not touch it, but if a man gets up from defecating, they will come and roll in it. Hence, you find some people who, if they hear fifty words of wisdom they will not remember anything of that, but if a man does one thing wrong, that will stay in their memory.”

The Qur'ān describes the Creator as –

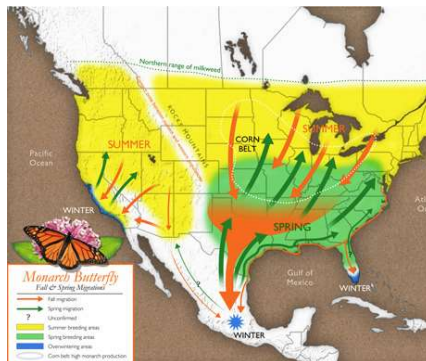
الَّذِي أُعْطِيَ كُلَّ شَيْءٍ خَلْقَهُ ثُمَّ هَدَىٰ

“...He who gave everything its creation and then guided [it].”

Qur'ān 20:50

Note - كُلُّ شَيْءٍ – every single entity – From the stars in the galaxies to every living species, to every different type of cell in an organism to the molecular level of an atom - every single entity has its function and role that is inherent within it - i.e. created and then guided.

Those who study how species behave, will know that in their own ecosystems, every animal from the lion, the snake to the butterfly - each of them has been born with inherent and instinctive patterns of behaviour that drives and guides them in all aspects of their lives from seeking food to seeking a mate.



The monarch butterfly, for example, who is born never meeting its parents - yet knows exactly what to eat, where to fly to, how to attract a mate and fly back to the ancestral home of its great great grandparent in a single season.

Human Embryonic Development – Summary

In order to appreciate the statements of the Qur'ān better, it is imperative we present a summary of the most up to date findings in the science of embryology. The following has been abridged from the works of the leading scientists in the field, namely, 'The Developing Human - Clinically Oriented Embryology' 9th Edition (2013) by Prof. Dr. Keith L. Moore and Dr. Persaud, 'Langman's Medical Embryology' 13th Edition (2015) by Dr. T.W. Sadler and 'Larsen's Human Embryology' 5th Edition (2015) by Dr. Schoenwolf, Dr. Bleyl, Dr. Brauer and Dr. Francis-West. Text books from these scientists form part of the standard curriculum taught in all major universities around the world in the field of medicine and embryology.

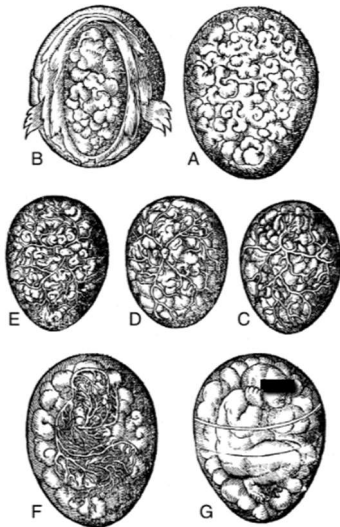
Historic Preamble

The first recorded embryological studies are in the books of Hippocrates of Cos, the famous Greek physician (circa 460–377 BC), who is regarded as the father of medicine. In order to understand how the human embryo develops, he recommended: "Take twenty or more eggs and let them be incubated by two or more hens. Then, each day from the second to that of hatching, remove an egg, break it, and examine it. You will find exactly as I say, for the nature of the bird can be likened to that of man."

Aristotle (circa 384–322 BC), a Greek philosopher and scientist, wrote a treatise on embryology in which he described development of the chick and other embryos. Aristotle promoted the idea that the embryo developed from a formless mass, which he described as a "less fully concocted seed with a nutritive soul and all bodily parts." This embryo, he thought, arose from menstrual blood after activation by male semen.

Claudius Galen (circa 130–201 AD), a Greek physician and medical scientist in Rome, wrote a book, *On the Formation of the Foetus*, in which he described the development and nutrition of fetuses and the structures that we now call the allantois, amnion, and placenta.

The Talmud contains references to the formation of the embryo. The Jewish physician Samuel-el-Yehudi, who lived during the second century AD, described six stages in the formation of the embryo from a “formless, rolled-up thing” to a “child whose months have been completed.” Talmud scholars believed that the bones and tendons, the nails, the marrow in the head, and the white of the eyes, were derived from the father, “who sows the white,” but the skin, flesh, blood and hair were derived from the mother, “who sows the red.” These views were according to the teachings of both Aristotle and Galen.²⁵



Illustrations from Jacob Rueff's *De Conceptu et Generatione Hominis* (1554) showing the fetus developing from a coagulum of blood and semen in the uterus. This theory was based on the teachings of Aristotle, and it survived until the late 18th century. (Needham J: *A History of Embryology*. Cambridge, University Press, 1934)

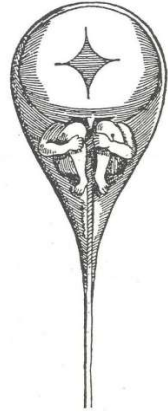
²⁵ Moore, Keith, *The Developing Human*, Introduction, Elsevier Publishers.

Constantinus Africanus of Salerno (circa 1020–1087 AD) wrote a concise treatise entitled *De Humana Natura*. Africanus described the composition and sequential development of the embryo in relation to the planets and each month during pregnancy, a concept unknown in antiquity. Medieval scholars hardly deviated from the theory of Aristotle, which stated that the embryo was derived from menstrual blood and semen. Because of a lack of knowledge, drawings of the fetus in the uterus often showed a fully developed infant frolicking in the womb.²⁶

It has been stated that the embryologic revolution began with the publication of William Harvey's book, *De Generatione Animalium*, in 1651. Harvey (1578–1657) believed that the male seed or sperm, after entering the womb or uterus, metamorphosed into an egg-like substance from which the embryo developed. Harvey was greatly influenced by one of his professors at the University of Padua, Fabricius of Aquapendente, an Italian anatomist and embryologist who was the first to study embryos from different species of animals. Harvey examined chick embryos with simple lenses and made many new observations. He also studied the development of the fallow deer; however, when unable to observe early developmental stages, he concluded that embryos were secreted by the uterus. Girolamo Fabricius (1537–1619) wrote two major embryologic treatises, including one entitled *De Formato Foetu* (The Formed Fetus), which contained many illustrations of embryos and fetuses at different stages of development.

²⁶ Ibid

Early microscopes were simple but they opened an exciting new field of observation. Marcello Malpighi, studying what he believed were unfertilized hen's eggs in 1675, observed early embryos. As a result, he thought the egg contained a miniature chick. A young medical student in Leiden, Johan Ham van Arnheim, and his countryman Anton van Leeuwenhoek, using an improved microscope in 1677, first observed human sperms. However, they misunderstood the sperm's role in fertilization. They thought the sperm contained a miniature preformed human being that enlarged when it was deposited in the female genital tract.



17th century
drawing of a sperm
by Hartsoecker

Caspar Friedrich Wolff refuted both versions of the preformation theory in 1759, after observing that parts of the embryo develop from “globules” (small spherical bodies). He examined unincubated eggs but could not see the embryos described by Malpighi. He proposed the layer concept, whereby division of what we call the zygote produces layers of cells (now called the embryonic disc) from which the embryo develops. His ideas formed the basis of the theory of epigenesis, which states that development results from growth and differentiation of specialized cells. These important discoveries first appeared in Wolff's doctoral dissertation *Theoria Generationis*.

The preformation controversy ended in 1775 when Lazaro Spallanzani showed that both the oocyte and sperm were necessary for initiating the development of a new individual. From his experiments, including artificial insemination in dogs, he concluded that the sperm was the fertilizing agent that initiated the

developmental processes. Heinrich Christian Pander discovered the three germ layers of the embryo, which he named the blastoderm. He reported this discovery in 1817 in his doctoral dissertation.

Karl Ernst von Baer described the oocyte in the ovarian follicle of a dog in 1827, approximately 150 years after the discovery of sperms. He also observed cleaving zygotes in the uterine tube and blastocysts in the uterus. He contributed new knowledge about the origin of tissues and organs from the layers described earlier by Malpighi and Pander. Von Baer formulated two important embryologic concepts: corresponding stages of embryonic development and that general characteristics precede specific ones. His significant and far-reaching contributions resulted in his being regarded as the father of modern embryology.

Latest Embryological Research

Human development begins when a sperm fuses with the ovum to create a unique single cell called the zygote. The zygote contains the genetic information (DNA) needed to become a baby. The zygote travels down the fallopian tube toward the uterus. As it travels the cells of the zygote divide repeatedly to form a hollow ball of cells called a blastocyst. The blastocyst attaches to the endometrium or lining of the uterus on about the 6th day and continues to implant itself in the uterus wall with cells which eventually form the placenta. This process takes more than a week until cell differentiation occurs, developing the embryo and placenta from the blastocyst. The embryo is now attached to the primitive placenta and is hanging via the 'connecting stalk' that will eventually become the umbilical cord. Larsen's Human Embryology (5th Edition 2015) provides the below timings for human development.

Qur'ānic Integrity and Scientific Advancement

Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
1	1-7	0.1-0.2	0	1	Fertilization
				2	First cleavage divisions occur
				3	Blastocyst is free in uterus
				4	Blastocyst hatches and begins implanting
2	8-14	0.1-0.2	0	5	Blastocyst fully implanted
				6	Primary stem villi form;endoderm delaminates;primitive streak develops
3	15-21	0.4-2.5	0	7	Gastrulation commences and notochordal process forms

Qur'ānic Integrity and Scientific Advancement

Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
			0	8	Primitive pit, neural plate, neural groove, neural folds, and neurenteric canal form
			1-3	9	Somites begin to form; primitive heart tube forms; vasculature begins to develop in embryonic disc
4	22-28	1.3-5.4	4-12	10	Neural folds fuse cranial end of embryo undergoes rapid flexion; neuromeres form in presumptive brain vesicles; optic sulci form; otic pits form; heart begins to beat; pulmonary primordium forms; hepatic plate forms; first two pharyngeal arches form; tail bud forms

Qur'ānic Integrity and Scientific Advancement

Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
			13-20	11	Primordial germ cells begin to migrate from wall of yolk sac; cranial neuropore closes; oropharyngeal membrane ruptures; optic vesicles develop; optic pits begin to form
			21-29	12	Caudal neuropore closes; cystic diverticulum and dorsal pancreatic bud form; urorectal septum begins to form; upper limb buds form; pharyngeal arches 3 and 4 form
5	29-35	3.9-12.0	30+	13	Dorsal and ventral columns begin to differentiate in mantle layer of spinal cord and brain stem; septum primum begins to form in heart; spleen forms; ureteric buds form; lower limb buds form; otic vesicles and lens placodes form; motor nuclei of cranial nerves form

Qur'ānic Integrity and Scientific Advancement

Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
				14	Spinal nerves begin to sprout;semilunar valves begin to form in heart; lymphatics and coronary vessels form; greater and lesser stomach curvatures and primary intestinal loop form;metanephric kidneys begin to develop;lens pits invaginate into optic cups;endolymphatic appendages form;secondary brain vesicles begin to form;cerebral hemispheres become visible
				15	Atrioventricular valves and definitive pericardial cavity begin to form; cloacal folds and genital tubercle form;hand plates develop; lens vesicles form; invagination of nasal pits occur and medial and lateral nasal processes form;sensory and parasympathetic cranial nerve ganglia begin to

Qur'ānic Integrity and Scientific Advancement

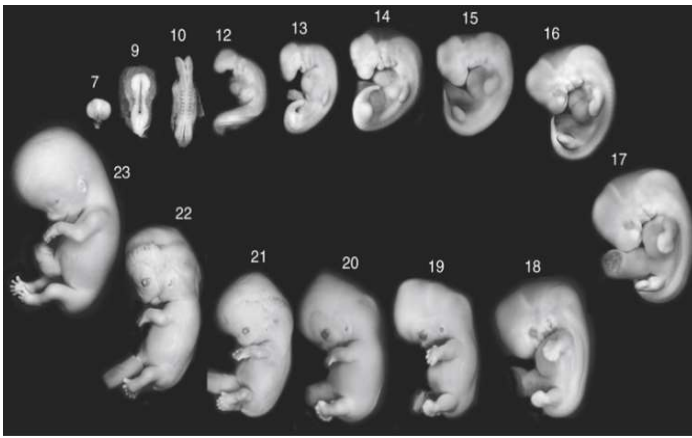
Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
					form; primary olfactory neurons send axons into telencephalon
6	36-42	10.0-21.5	30+	16	Muscular ventricular septum begins to form; gut tube lumen becomes occluded;major calyces of metanephric kidneys begin to form and kidneys begin to ascend; genital ridges form; foot plates develop;pigment forms in retinas;auricular hillocks develop
				17	Bronchopulmonary segment primordia form; septum intermedium of heart is complete; subcardinal vein system forms; minor calyces of metanephric kidneys are forming; finger rays are distinct ;nasolacrimal grooves

Qur'ānic Integrity and Scientific Advancement

Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
					form;cerebellum begins to form;melanocytes enter epidermis;dental laminae for
				18	Skeletal ossification begins;Sertoli cells begin to differentiate in the male gonad;elbows and toe rays form; intermaxillary process and eyelids form;thalami of diencephalon expand; nipples and first hair follicles form
7	43-49	18.0-26.4	30+	19	Septum primum fuses with septum intermedium in heart;urogenital membrane ruptures;trunk elongates and straightens

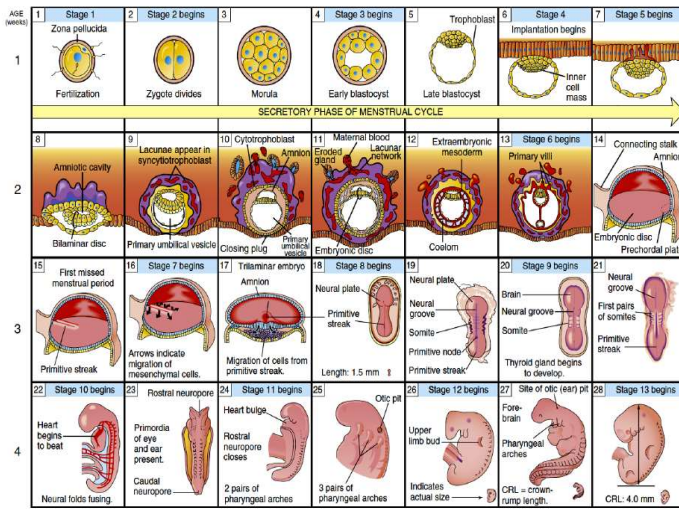
Qur'ānic Integrity and Scientific Advancement

Week	Day	Length (mm)	No. of Somites	Carnegie Stage	Features
				20	Primary intestinal loop completes initial counterclockwise rotation; in males, Müllerian ducts begin to regress and vasa deferentia begin to form; upper limbs bend at elbows
				21	Pericardioperitoneal canals close; hands and feet rotate toward midline
				22	Eyelids and auricles are more developed
8	50-56	23.4-32.2	30+	23	Chorionic cavity is obliterated by the growth of the amniotic sac; definitive superior vena cava and major branches of the aortic arch are established; lumen of gut tube is almost completely recanalized; primary teeth are at cap stage

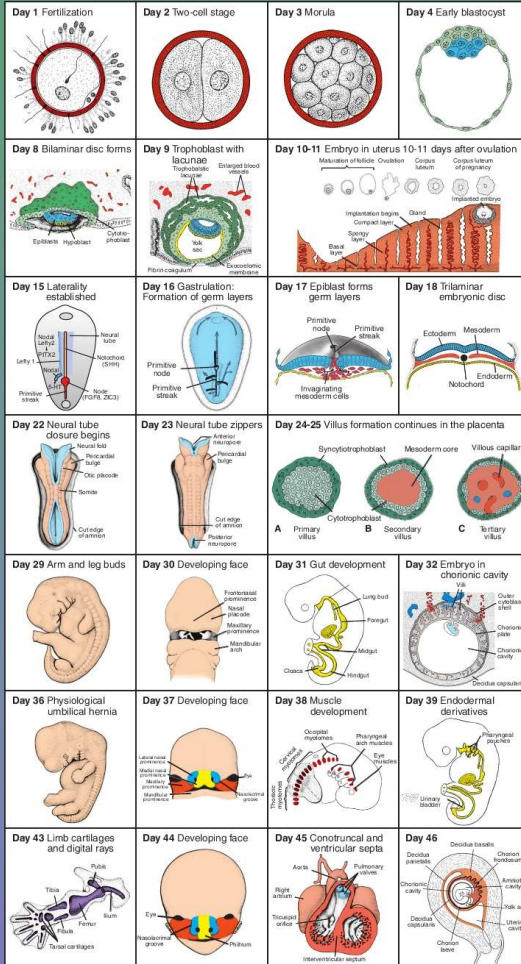


Human embryos (fig. above) is taken from the Kyoto collection at Carnegie stages 7 to 23. The embryo has been dissected from its embryonic membranes at all stages. The Carnegie Embryonic Staging System is used internationally and its use enables comparisons to be made between the findings of one person and those of another.

Moore's Developing Human (9th Edition 2013) timetable of human development up to stage 13.



Embryonic Development in Days



Langman's Medical Embryology (13th Edition 2015)

Embryonic Development in Days

<p>Day 5 Late blastocyst</p>	<p>Day 6-7 Events during first week: Fertilization to implantation</p>	<p>Development Week 1</p>																							
<p>Day 12 Extramembranous mesoderm develops</p>	<p>Day 13 Uteroplacental circulation begins</p>	<p>Day 14 Embryonic disc: dorsal view</p>	<p>Development Week 2</p>																						
<p>Day 19 CNS induction</p>	<p>Day 20 Neurulation: Neural folds elevate</p>	<p>Day 21 Transverse section through somite region</p>	<p>Development Week 3</p>																						
<p>Day 26 Pharyngeal arches present</p>	<p>Day 27</p> <table border="1"> <thead> <tr> <th>Approx. Age (Days)</th> <th>No. of Somites</th> </tr> </thead> <tbody> <tr><td>20</td><td>1-6</td></tr> <tr><td>21</td><td>4-7</td></tr> <tr><td>22</td><td>7-10</td></tr> <tr><td>23</td><td>10-13</td></tr> <tr><td>24</td><td>13-17</td></tr> <tr><td>25</td><td>17-20</td></tr> <tr><td>26</td><td>20-23</td></tr> <tr><td>27</td><td>23-26</td></tr> <tr><td>28</td><td>26-29</td></tr> <tr><td>30</td><td>34-37</td></tr> </tbody> </table>	Approx. Age (Days)	No. of Somites	20	1-6	21	4-7	22	7-10	23	10-13	24	13-17	25	17-20	26	20-23	27	23-26	28	26-29	30	34-37	<p>Day 28 Neurulation complete</p>	<p>Development Week 4</p>
Approx. Age (Days)	No. of Somites																								
20	1-6																								
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25	17-20																								
26	20-23																								
27	23-26																								
28	26-29																								
30	34-37																								
<p>Day 33 Umbilical ring</p>	<p>Day 34 Optic cup and lens placode</p>	<p>Day 35 Branchial arches and diaphragm</p>	<p>Development Week 5</p>																						
<p>Day 40 Auricular hillocks</p>	<p>Day 41 Atrial septum formed</p>	<p>Day 42 Digit formation</p>	<p>Development Week 6</p>																						
<p>Day 47 External genitalia</p>	<p>Day 48 Facial prominences fused</p>	<p>Day 49 Digits present, eyelids forming</p>	<p>Development Week 7</p>																						

In summary, it was not until modern times, with the help of the electron microscope, that scientists learnt more accurate information about human embryonic development. Prior to this, many commentators on embryology were always beset with

mistakes and fallacies. However, it shall be seen that the terminology used to describe human development in the Qur'ān is characterized by accuracy and descriptiveness.

Embryology in the Qur'ān – Correlation Studies with Modern Embryology

Professor Dr. Keith L. Moore is an internationally recognized leader in the teaching of human anatomy and embryology. He has revolutionized the field of medicine for more than 60 years through his innovative research. His investigation in the causes of birth defects led to major advances in how physicians screen for and diagnose several genetic conditions.²⁷ Dr. Moore is a professor emeritus in the Division of Anatomy within the Department of Surgery's Faculty of Medicine, at the University of Toronto, Canada. He has contributed to numerous publications and texts, which include *The Developing Human*, in its 9th Edition, and *Before We are Born*, which is in its 8th Edition.



In 2007 Professor Moore became the first recipient of the Henry Gray/Elsevier Distinguished Educator Award, The American Association of Anatomists' (AAA) highest award for human anatomy education:

“[Professor Keith Moore is] the first recipient of the Henry Gray/Elsevier Distinguished Educator Award, AAA's highest award for human anatomy education. The nominator said

27 Elsevier Authors: Keith L. Moore” <http://elsevierauthors.com/keithmoore/> (accessed 25/01/2013).

“Keith is an individual of nearly legendary status among anatomists around the world...He has had a monumental impact on anatomical education, not only at a national but also at an international level.”

The Chair of the Award Committee who presented the award said “His books were like a breath of fresh air for faculty and students alike. Structures and developmental processes were no longer viewed in isolation from practical application, things to be memorized to exceedingly fine detail, but were presented within a clinical context - that became the famous blue boxes— and taught to a level of detail useful for clinical practice— His contribution to anatomy education around the world has been profound and continuous, and will be an enduring legacy.”

Most recently in 2012, Dr. Moore received the Queen’s Diamond Jubilee Medal – a commemorative medal to honour significant contributions and achievements by Canadians. He was also awarded an Honorary Doctor of Science from The Ohio State University in recognition of his lifetime of achievements in the field of anatomy and on the advancement of medicine.

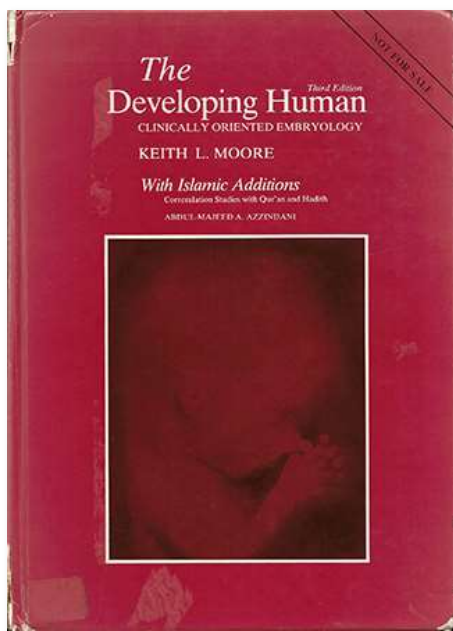


2012: Dr. Keith L. Moore (Professor Emeritus of Surgery) was awarded an Honorary Doctor of Science from The Ohio State University in recognition of his lifetime of achievements in the field of anatomy and on the advancement of medicine.

Correlation Studies with the Qur'ān

In 1983 a special edition of Dr. Moore's popular textbook *The Developing Human* was published. He said, "There is an Islamic edition... it's really an English edition of my book with Islamic additions. My publisher [Saunders] agreed to allow King Abdul-Aziz University to print this special edition but it cannot be sold because they don't want it sold in competition to the regular English edition... You can't purchase it as I understand it in a regular bookstore, but if you need it for your Muslim libraries you can purchase this. That was the arrangement that was made with my publisher."

In the foreword to *The Developing Human with Islamic Additions*, Moore explains that he assisted Sheikh Abdulmajeed Azzindani in the preparation of the text, "It has been a real pleasure for me to assist Sheikh Abdulmajeed Azzindani with the preparation of this Islamic edition of my textbook of embryology. The text is the same as the original, except that numerous references to statements in the Qur'ān and Sunnah about embryology have been added." The publication retains the same ISBN number as the standard print.



In 1980, Dr. Moore was invited to Arabia to lecture on anatomy and embryology. While he was there, Moore was approached by the Embryology Committee of K.A. University for his assistance in interpreting certain verses in the Qur'ān and some sayings in the Hadiths which referred to human reproduction and embryological development. Dr. Moore was amazed at the scientific accuracy of some of the statements which were made in the 7th century AD. He says, "For the past three years, I have worked with the Embryology Committee of King Abdul-Aziz University in Jeddah, Arabia, helping them interpret the many statements in the Qur'ān and Sunnah referring to human reproduction and prenatal development. At first I was astonished by the accuracy of the statements that were recorded in the 7th century AD, before the science of embryology was established." The Embryology Committee presented and published several papers with Moore and others co-authoring a number of papers. In the comparative study, each Qur'ānic verse and text of the Hadith

FOREWORD

It has been a real pleasure for me to assist Sheikh Abdulmajeed Azzindani with the preparation of this Islamic Edition of my textbook of embryology. The text is the same as the original, except that numerous references to statements in the Qur'an and Sunnah about human embryology have been added.

For the past three years, I have worked with the Embryology Committee of King Abdulaziz University in Jeddah, Saudi Arabia, helping them to interpret the many statements in the Qur'an and Sunnah referring to human reproduction and prenatal development. At first I was astonished by the accuracy of the statements that were recorded in the 7th century AD, before the science of embryology was established. Although I was aware of the glorious history of Muslim scientists in the 10th century AD, and of some of their contributions to Medicine, I knew nothing about the religious facts and beliefs contained in the Qur'an and Sunnah.

It is important for Islamic and other students to understand the meaning of these Qur'anic statements about human development, based on current scientific knowledge. The interpretations of the "verses" in the Qur'an and Sunnah, translated by Sheikh Azzindani, are to the best of my knowledge accurate. I wish the Embryology Committee and the textbook every success.

Toronto, Canada
September, 1983

Keith L. Moore

Forward by Keith L. Moore to The
Developing Human with Islamic
Additions.

were thoroughly researched in Qur'ānic Interpretations, the most reliable books of Hadith and more than five Classical Arabic language references for the meanings of the words. The interpretations were then discussed with a number of contemporary Muslims scholars.

Furthermore, interviews and discussions were also held with a number of internationally eminent embryologists, obstetricians and gynaecologists. This was the Committee's means of ascertaining the religious as well as the scientific aspects of the study.

During that time, Dr. Moore himself consulted a number of embryologists for their opinions:

“...I was invited to Saudi Arabia to lecture on embryology at King Abdul-Aziz University in Jeddah, Saudi Arabia... and while I was there, at my suggestion, invited Dr. [T.V.N] Persaud and Dr. [E. Marshall] Johnson to come to Saudi Arabia. And they [the Embryology Committee] asked them the same questions, and I purposefully didn't tell them my interpretations, I wanted them to give their own. So they did and their answers were similar to mine...

Dr. [E. Marshall] Johnson is one of the most outstanding embryologists and teratologists in the United States. We didn't just pick anyone, I picked the best.

And in Canada, Dr. [TVN] Persaud at the University of Manitoba, where I spent twenty years, is also an outstanding embryologist who has three doctors degrees... so I picked the very best.

And then, when I started thinking about other embryologists around the world, we brought in Dr. [Robert] Edwards from Cambridge [world-renowned for his early work on in vitro fertilization]... so we invited him to Saudi Arabia and again he was asked the same questions and they [the Embryology Committee] got essentially the same answers.... [and] one of my colleagues in Kyoto, Japan...he didn't go to Saudi Arabia, [and] he has been consulted and so on.



Sir Robert Geoffrey
Edwards, CBE, FRS

So we have consulted embryologists around the world for their opinions on these statements in the Qur'ān, and it's clear from what Dr. Persaud has said and from all of our work in this area that these statements are correct.”²⁸

The study of the Qur'ān and Hadith has revealed a new system for the classification of the stages of the developing embryo based on easily understood actions and changes in shape. In a relatively few Qur'ānic verses is contained a rather comprehensive description of human development.

No such distinct and complete record of human development, such as classification, terminology, and description existed before the Qur'ān. In most, if not all instances, this description antedates by many centuries the recording of the various stages of human

²⁸ Muslim Students Association, “Embryology in the Qur'ān with Drs. Persaud, Moore and Johnson (1988)”, <http://youtu.be/ZJRRhf5xUI?t=37m32s> (accessed 11/03/2012).

embryonic and fetal development recorded in the traditional scientific literature. Until recently these details were not fully appreciated, since they referred to details in human development which were scientifically unknown in earlier times.

Analysis of the Qur'ānic text

In the Qur'ān, God mentions that human embryonic development passes through a number of distinct stages:

Then We placed him as a sperm-drop [*nutfah*

ثُمَّ جَعَلْنَاهُ نُطْفَةً

in a firm lodging [i.e., womb].

فِي قَرَارٍ مَّكِينٍ

Then We made the sperm-drop into a clinging clot [*alaqah*],

ثُمَّ خَلَقْنَا النُّطْفَةَ عَلَقَةً

and We made the clot [*alaqah*] into a lump [of flesh],

فَخَلَقْنَا الْعَلَقَةَ مُضْغَةً

and We made [from] the lump, bones,

فَخَلَقْنَا الْمُضْغَةَ عِظَامًا

and We covered the bones with flesh;

فَكَسَوْنَا الْعِظَامَ لَحْمًا

then We developed him into another creation.

ثُمَّ أَنشَأْنَاهُ خَلْقًا آخَرَ

So blessed is God, the best of creators.”

فَتَبَارَكَ اللَّهُ أَحْسَنُ
الْخَالِقِينَ

Qur'ān 23:13-14

The stages in the Ayah [verse] can be summarised as follows:

Stage 1: The Nutfah

Stage 2: The 'Alaqah

Stage 3: The Mudghah

Stage 4: Bone Formation [Idham]

Stage 5: Clothing the Bones with Flesh [Lahm]

Stage 1: The Nutfah

The *Nutfah* literally means 'a [single] drop' of fluid whereas *Manii* means 'semen'. God says, **“Had he not been a sperm [nutfah] from semen [manii] emitted?”** [Qur'ān 75:36]

In the Qur'ān and Hadith, Nutfah is used in three different but related contexts:

1. The Male Nutfah [Qur'ān 75:36]
2. The Female Nutfah
3. Nutfah Amshaj – mixed or mingled Male and Female Nutfah [Qur'ān 76:2]

The Male Nutfah

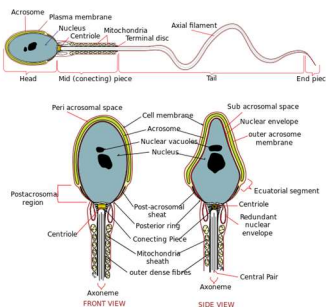


Figure 14: Complete diagram of a human spermatozoa

The word Nutfah was mentioned twelve different times in the Qur'ān and the word Manii was mentioned thrice. In the male context, the Nutfah is a **single particle** from the Manii when it is ejaculated – i.e. a single cell [sperm] from amongst the 200-300 million or so sperm cells.

Furthermore, we learn from a statement of the Prophet Muhammad that not all of the semen is required for impregnation to occur. The Prophet Muhammad was asked about coitus interruptus²⁹ and replied,

مَا مِنْ كُلِّ الْمَاءِ يَكُونُ الْوَلَدُ وَإِذَا أَرَادَ اللَّهُ خَلْقَ شَيْءٍ لَمْ يَمْنَعَهُ شَيْءٌ

“Not from all the fluid is a child produced. When Allah intends to create anything, nothing can prevent Him.”³⁰

This demonstrates that even in the act of coitus interruptus, a small segment of fluid is enough for pregnancy to occur and is not pivotal on the final ejaculation. Before the 16th century, writings on embryonic development did not distinguish the constituent parts of the semen in its role of fertilisation.

“Does man think that he will
be left neglected?”

أَيَحْسَبُ الْإِنْسَانُ أَنْ يُتْرَكَ سُدًى

Had he not been a sperm
[nutfah] from semen [manii]
emitted?

أَلَمْ يَكُ نُطْفَةً مِنْ مَنِيٍّ يُمْنَى

Then he was a clinging clot
[alaqah],

ثُمَّ كَانَ عَلَقَةً

²⁹ Coitus interruptus is a method of birth control in which a man, during sexual intercourse, withdraws at the last moments in an effort to avoid insemination.

³⁰ Saheeh Muslim no. 1438.

and [God] created [his form]
and proportioned [him].

فَخَلَقَ فَسَوَّى

And made of him two mates,
the male and the female.

فَجَعَلَ مِنْهُ الزَّوْجَيْنِ الذَّكَرَ
وَالْأُنثَى

Is not that [Creator] Able to
give life to the dead?"

أَلَيْسَ ذَلِكَ بِقَادِرٍ عَلَىٰ أَنْ يُحْيِيَ
الْمَوْتَى

Qur'an 75:36-40

“And that He creates the two
mates - the male and female

وَأَنَّهُ خَلَقَ الزَّوْجَيْنِ الذَّكَرَ
وَالْأُنثَى

From a sperm-drop [nutfah]
when it is emitted.”

مِنْ نُطْفَةٍ إِذَا تُمْتَى

Qur'an 53:45-46

In these Ayat [verses], there are a lot of facts that require careful consideration. We know the sex of the newborn is determined by the sperm - it is definitively stated that the male and female are fashioned from a sperm-drop from the semen that has been ejaculated. If a sperm carrying an X chromosome fertilises an ovum [which always contains an X chromosome], the offspring will be a girl, while if the fertilising sperm contains a Y chromosome, the offspring will be a boy.

The Qur'ān has stated this fact 1,400 years ago, before anybody knew anything about X and Y chromosomes.

The Female Nutfah

The Female Nutfah [ovum] per se is not mentioned explicitly in the Qur'ān, but is inferred in the term Nutfah Amshaj – i.e. mingled from both male and female [refer to Qur'ān 76:2]. However, it is clearly stated in the Hadith from the Prophet. A Jew came to the Prophet and asked, 'O Muhammad. Tell me from what thing man is created.' The Prophet said, 'O Jew, from both Male and Female Nutfah, man is created.'³¹



This is a very astonishing revelation, as it is only recently that we came to know that both male and female cells [sperm and ovum] join together to form the human zygote – a fact not known before the 19th century.

The Role of Genes

مِنْ أَيِّ شَيْءٍ خَلَقَهُ مِنْ نُّطْفَةٍ خَلَقَهُ فَقَدَرَهُ

'From what substance did He create him? From a sperm-droplet [nutfah] He created him and destined [qadr] for him.'

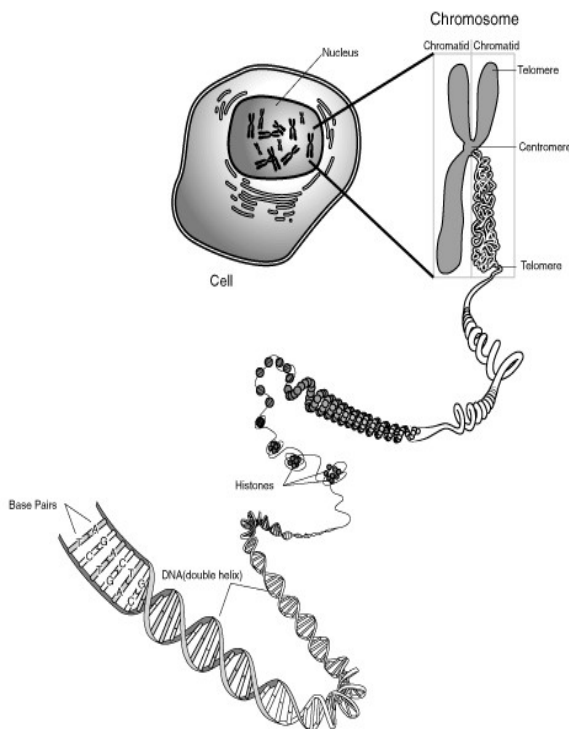
Qur'ān 80:18-19

³¹ Musnad Ahmad. The complete narration has been declared *da'eef* [contains weakness according to the rules of hadeeth verification] by Ahmad Shakir.

In a single zygote, there are 46 chromosomes. They contain genes which determine the type of characteristics the body has, like hair colour, skin type, etc.

Hence, it is within this Nutfah that God has determined and destined all the physical characteristics that an individual has. It is amazing that the description of these realities are so accurately stated by God in the Qur'ān.

The Prophet said, 'God has ordained an angel that accompanies the different stages of development of the Nutfah. The 'Alaqah, the Mudgha and in every stage he asks God, 'O God, what to do next?' If God determines its full development, the angel asks, 'Is it a boy or a girl? Happy or unhappy, his livelihood and his life span. All is written [determined] while he is in the mother's womb.' [Bukhari]



Stage 2: The 'Alaqah Stage

Linguistic Analysis

According to many Arabic dictionaries, the word '*alaqah*' includes the following meanings:

1. Attached and hanging to something,
2. Blood clot,
3. Leech.

1. 'Alaqah as 'attached and hanging'

As we see in Figure 15, the embryo [which is represented by the bilaminar embryonic disc] is attached to the placenta and is hanging or suspended in the chorionic cavity by the connecting stalk. This is in agreement with the meaning of the word 'alaqah as "attached and hanging to something".

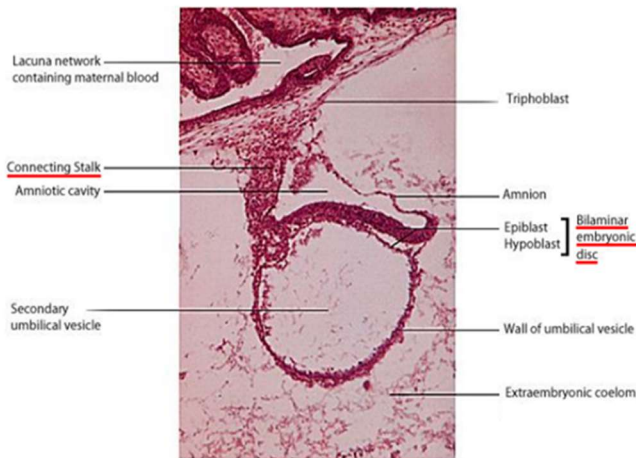


Figure 15: Photomicrographs of longitudinal sections of an implanted embryo at approximately 14 days. High-power view [Ā—95]. The embryo is represented by the bilaminar embryonic disc composed of epiblast and hypoblast. [From Nishimura H [ed]: *Atlas of Human Prenatal Histology*. Tokyo, Igaku-Shoin, 1983]. The embryo is now attached to the primitive placenta and is suspended or hanging via the 'connecting stalk'.³²

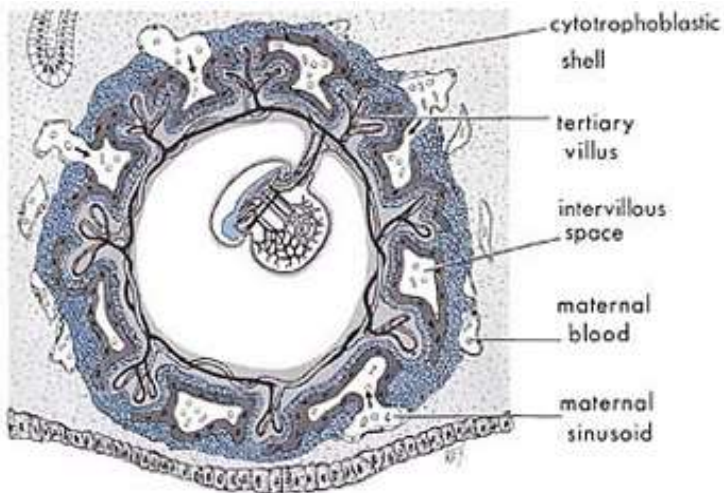


Figure 16: We can see in this diagram the suspension of an embryo during the 'alaqah stage in the womb [uterus] of the mother. Moore and Persaud.

The Developing Human, 5th ed., p. 66.

³² Kareem, E., *Embryology in the Qur'an: The Alaqah Stage*, www.islampapers.com.

2. 'Alaqah as 'blood clot'

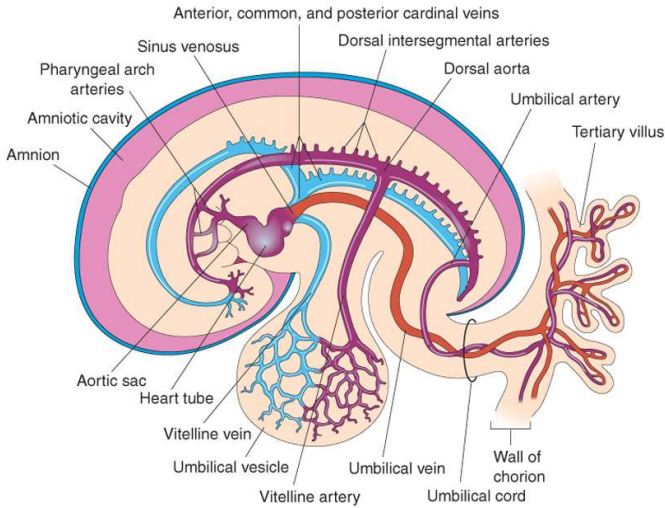


Figure 17: Diagram of the primordial cardiovascular system in an embryo of approximately 21 days, viewed from the left side during the *'alaqah* stage. The external appearance of the embryo and its sacs is similar to that of a blood clot, due to the presence of relatively large amounts of blood in the embryo and the chorion. The umbilical vein carries well-oxygenated blood and nutrients from the chorion sac to the embryo. The umbilical arteries carry poorly oxygenated blood and waste products from the embryo to the chorion. [From Moore and Persaud, 2007].

Figure 17 shows a diagram of the primitive cardiovascular system in an embryo of about 21 days. During this stage we find that the external appearance of the embryo and its sacs is similar to that of a blood clot.

“Implantation begins at about the 6th to 7th day after fertilization. The part of the blastocyst projecting into the uterine cavity remains relatively thin. The

syncytiotrophoblast contains a proteolytic enzyme which causes destruction of the endometrial cells so that the blastocyst sinks deeper and deeper into the uterine mucosa...The final deficiency in the endometrium is sealed off by a **blood or fibrin clot**, overlying the blastocyst. This cover is called the operculum. By about 10 to 12 days after fertilization, the blastocyst is completely encased in the endometrium and thus, implantation is complete.”³³

The blood, though fluid, does not circulate until the end of the third week. On the 21st day, the heart of the embryo connects with the blood vessels in the embryo, the connecting stalk, the chorion and the umbilical vesicle [yolk sac], and the blood starts to circulate and the heart begins to beat. Thus, the embryo takes the appearance of a blood clot even though its blood is fluid.

3. ‘Alaqah as ‘leech’

Scholars, linguists and dictionaries have all mentioned one of the meanings of ‘*alaqah* as a leech³⁴. The fourteenth century dictionary *Lisān al-‘Arab* states that “ ‘*alaqah* refers to a worm living in the water that sucks blood, the plural of which is ‘*alaq*’³⁵ and the dictionary of *al-Qāmūs al-Muhīt* states that ‘*alaq* is “a small creature of water that sucks blood [a leech].”³⁶ The word ‘*alaqah* also occurs

³³ Allan, J., & Kramer, B. *The Fundamentals of Human Embryology*, [2nd ed.], p. 23: Wits University Press – as quoted by Kareem, E., *Embryology in the Qur’an: The Alaqah Stage*.

³⁴ This section is edited from Kareem, E., *Embryology in the Qur’an: The Alaqah Stage*, www.islampapers.com.

³⁵ Ibn Manẓūr, in *Lisān al-‘Arab*, Dār Ṣādir, Beirut, n.d., vol. 10, pp 261-268; as cited in Zindani et al. [1994, p. 68].

³⁶ *Al-Qāmūs al-Muhīt*, vol. 3, p 275 as cited in Zindani et al. [1994, p. 68].

in several languages related to Arabic. In Hebrew there is **עֲלֻקָּב** 'alūqāb [or alukab]³⁷, the generic name for any blood-sucking worm or leech. And in Aramaic and Syriac there are words with apparently similar meanings. In Ad-Damīrī's Arabic zoological lexicon, *Hayāt al-Hayawān* [The Life of the Animals, 1372 C.E.], there is an article on the leech ['*alaq*]³⁸ and in Ibn Wahshīya's *Kitāb al-Sumūm* [The Book on Poisons, c. 950 C.E.] there is the treatment for the one who has swallowed a leech ['*alaq*].³⁹

A popular ninth century Christian polemic against Islam claims that Muslims believe that “God created man from a leech” based on the work of Nicetas of Byzantium. Nicetas, who wrote between 842 and 867 C.E., had a copy of the Qur'ān in Greek translation which he made use of to identify the tenets of Islam. His Greek translation renders both '*alaq* and '*alaqab* as *bdella* [βδέλλα], meaning “leech”.⁴⁰

³⁷ “The leech [עֲלֻקָּב *alūqāb*] has two daughters: Give and Give.” Proverbs 30:15 [ESV]. Hebrew עֲלֻקָּב *alūqāb* meaning a leech. [Blue Letter Bible] Although the Hebrew word is translated leech in most versions of the Bible, there has been much dispute whether this is the proper meaning. Recourse is therefore to the Arabic language - See Kaltner, *The Use of Arabic in Biblical Hebrew Lexicography*: Catholic Biblical Association of America. [1996, pp. 86-87].

³⁸ *Kitāb Hayāt al-hayawān* [The Book of the Lives of the Animals] finished in 1372 C.E. as mentioned in De Somogyi [1950, p. 42].

³⁹ Ibn Wahshīya's *Book on Poisons* c.950 C.E. Known under various titles: *Kitāb al-Shānāq fi al-Sumūm wa'al-tiryāq*, *Kitāb al-Sumūm wa'al-tiryāqāt*, and *al-Sumūm wadaf' madārrhā*. Levey [1966, p. 84].

⁴⁰ “Nicetas accuses the Qur'ān of teaching that man comes from a leech [Confutatio1, lines 90–92]: λέγει, ὅτι ἐκ βδέλλης ὁ ἄνθρωπος γίνεται [he says that man is created from a leech]. The phrase is then picked up by Zigabenos, who finds it absurd...” Simelidis [2011, pp. 900-902] *The Byzantine Understanding of the Qur'ān Term al-Ṣamad and the Greek Translation of the Qur'ān. Speculum*, 86(04), 887-913.

The classic Qur'ānic commentator, Ibn Kathīr [b. 1302 C.E.], mentions the meaning as “elongated like the shape of a leech - فصارت علقة حمراء على شكل العلقة مستطيلة”⁴¹. Finally, *The Qur'ān: an Encyclopedia* has an entry for 'alaq that also mentions the same meanings: “The linguistic definition of 'alaq [singular 'alaqa] is 'leech', 'medicinal leech', '[coagulated] blood', 'blood clot', or 'the early stage of the embryo'.⁴²

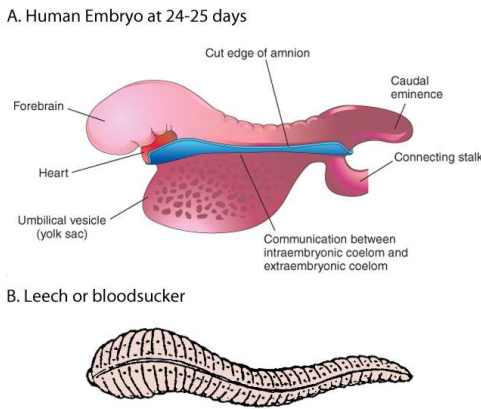


Figure 18: Drawings illustrating the similarities in appearance between a human embryo and a leech [‘alaqah]. **A**, shows a lateral view of an embryo [size 2.5-3.0mm] at days 24 to 25 during folding, showing the large forebrain and the ventral position of the heart [from Moore & Persaud: *The Developing Human* 9th Edition [2013]. **B**, shows a drawing of a leech. Note the leech-like appearance of the human embryo at this stage.

A leech is an apt description of the early human embryo. The embryo clings to the endometrium or lining of the uterus [day 7] just as a leech clings to the skin. The embryo is also surrounded by amniotic fluid just as the leech is surrounded by water. If we consider the literal meaning of “leech”

⁴¹ Ibn Kathīr, *Tafsīr Al-Qur'an Al-'Azīm*, p. 242 (1st ed. Vol. 3). 1980. Beirut, Lebanon: Dār Al-Fikr.

⁴² Sahin, H. “Alaq” p. 27. In O. Leaman [Ed.] [2006], *The Qur'an: An Encyclopedia*. Routledge.

for *'alaqah*, we find that during the third week, the embryo loses its round shape and elongates until it takes the shape of a leech.

Figure 18 above and Figure 19 clearly indicate that the shape of the embryo does in fact resemble a leech. At this stage the cardiovascular system has started to appear and the embryo is now dependent upon the maternal blood for its nutrition like a leech which feeds on the blood of others.⁴³



A. Embryo at 24-25 days



B. Leech or bloodsucker



C. Embryo at 26-30 days

Figure 19: A, shows a lateral view of an embryo [size 2.5-3.0mm] at days 24 to 25 [Modified from Moore & Persaud: *The Developing Human* 8th Edition]. B, *Hirudo medicinalis*, medicinal leech. C, Scanning electron micrograph of an embryo at Week 4, 26 - 30 days [Professor Kathy Sulik, The University of North Carolina]. Note the leech-like appearance of the human embryos at this stage.

⁴³ The umbilical vein carries well-oxygenated blood and nutrients from the chorion sac to the embryo. The arteries carry poorly oxygenated blood and waste products to the chorionic villi for transfer to the mother's blood.

In the BBC television series, *The Human Body: The Incredible Journey from Birth to Death*, Professor Robert Winston⁴⁴ also describes the embryo in a similar way. Prof. Winston demonstrates how the embryo obtains nourishment from the blood of the mother by comparing it with a leech which feeds on the blood of others,

“[The leech] takes whatever it needs to live by sucking the blood of whatever it can latch onto; in this case that’s me! As it sucks my blood, it takes from it all that it needs to live, it literally lives off me and the whole of pregnancy is shaped by a similar kind of parasitic relationship...it does raid her blood for the raw materials it needs to grow. From the word go, both leech and embryo are out for themselves.”⁴⁵



Figure 20: Presenter Professor Robert Winston with a blood sucking leech [*‘alaqah*] attached to his forearm. Professor Winston shows how the embryo obtains nourishment from the blood of the mother, similar to the leech which feeds on the blood of others. [*The Human Body. The Incredible Journey from Birth to Death*, © BBC Worldwide Ltd, 1998].

⁴⁴ Prof. Robert Winston is Professor of Science and Society and Emeritus Professor of Fertility Studies at Imperial College, London.

⁴⁵ Prof Winston in *The Human Body: The Incredible Journey from Birth to Death*, BBC Worldwide [1998].

Similarly, in *Anatomy Demystified*, the early embryo is described as worm-like in appearance which is nourished by the mother's blood supply, "Another membrane becomes the *yolk sac*, which provides nourishment for the early embryo. By 24 days, a *connecting stalk* appears in the middle of the now **worm-like body**."⁴⁶

A segmented body like a leech

The body of the leech is divided into a number of segments which gives rise to a ringed appearance of the body, hence the name "ringed worms."⁴⁷ The human embryo is also segmented just like a leech or worm as Professor Peter Nathanielsz describes in *A Time to be Born: The Life of the Unborn Child*, "By the end of the third week the **embryo has undergone segmentation, rather like an earthworm**, and now consists of zones like stacked circular tires."⁴⁸

These layers curl to form a tube-like structure which Anthony Smith, in *The Human Body*, also likens to a worm, "the early embryo is like a worm, with a gut running from one end to the other, an outer covering also running from end to end and a central layer filling the space between the two."⁴⁹ Ted Zerucha in *Human*

⁴⁶ Layman, D. P., *Anatomy Demystified*, p. 366, [2004] New York: McGraw-Hill Professional; London: McGraw-Hill.

⁴⁷ Garwood, P. R., & Campbell, A. [2007]. "Segmented Worms". The Encyclopedia of Underwater Life. Oxford Reference Online.

⁴⁸ Nathanielsz [1994, p. 22]. Peter W. Nathanielsz is a Professor at the Laboratory for Pregnancy and Newborn Research, Cornell University, Ithaca, USA. "Professor Nathanielsz was amongst the handful of pioneers who assisted at the birth about thirty years ago of the new discipline of fetology and has remained at the forefront of what is now an enormous field. His laboratory has contributed many of the technical advances that now allow the most intimate details of fetal life to be examined with a precision equal to that of a cosmologist's radio telescope."

⁴⁹ Smith, *The Human Body: The Incredible Journey from Birth to Death*, p. 38.

Development also describes the gut of the embryo as a tube, “Running through the body, along the anterior-posterior axis, is the gut. The gut is essentially a tube that runs from the mouth, through the digestive system, to the anus.”⁵⁰ The tube-like depiction of the embryo’s gut is not unlike that of an annelid as described in *The Columbia Encyclopedia*, “The digestive system of annelids consists of an unsegmented gut that runs through the middle of the body from the mouth, located on the underside of the head, to the anus, which is on the pygidium [the posterior terminal region].”⁵¹

Internal structure of a leech

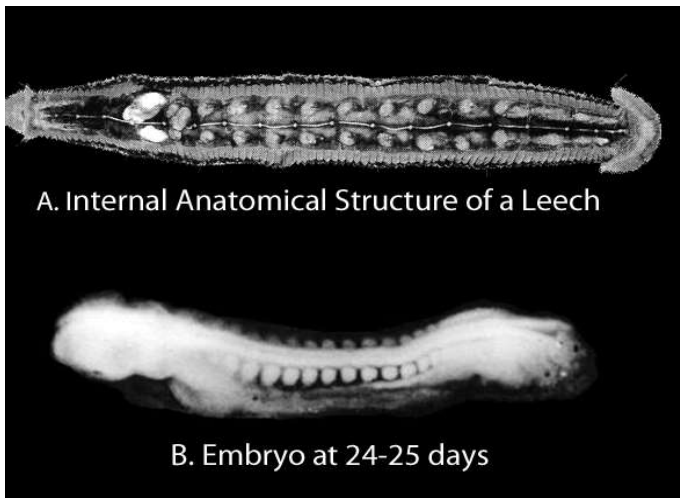


Figure 21: **A**, Ventral dissection showing the internal anatomical structure of a leech. [From J.G. Nicholls and D. Van Essen. *The nervous system of the leech*, 1974, *Scientific American* 230:38-48]. **B**, Dorsal view of a 13-somite embryo

⁵⁰ Zerucha, T., *Human Development*, p. 52.

⁵¹ “Annelida” in *The Columbia Encyclopedia* [2008].

at approximately 24 days, actual size 3.0mm. [From Professor Hideo Nishimura, Kyoto University, Kyoto, Japan]. Note the remarkable similarity in appearance between the human embryo and the internal structure of the leech.

If we examine the anatomy of the leech we find that the appearance of its internal structures is also similar to that of the human embryo:

Figure 21 A shows a ventral view of a dissected medicinal leech. Note how the body is made up of a number of similar segments which resemble the somites in human embryos.

Figure 21 B shows an embryo at 24-25 days. The actual size of the embryo at this stage is just 3.0mm.

Figure 22 A-C showing dorsal views of embryos during the third and fourth weeks.

Figure 22 D shows the internal structure of the leech. Note the remarkable similarity in appearance between the embryos and the anatomy of the leech.

Prevention of blood-clotting

A striking similarity between the leech and the embryo is the way in which enzymes are released to facilitate easy blood-flow and the prevention of the clotting of blood. As the embryo draws nourishment [leech-like] from the mother's blood, the anticoagulant enzyme, Thrombomodulin, [TM] prevents the blood clotting. In the leech, the protein that serves the same function is called Hirudin.

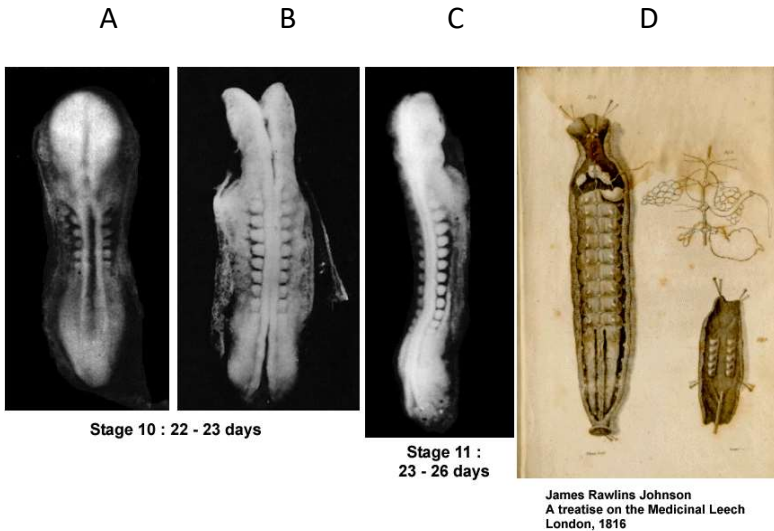


Figure 22: Dorsal views of embryos during the third and fourth weeks. **A**, Dorsal view of a 5-somite embryo, actual size 2.5mm. **B**, Dorsal view of an older eight-somite embryo, actual size 3.0mm. **C**, Dorsal view of a 13-somite embryo at approximately 24 days, actual size 3.0mm [Photographs from Professor Hideo Nishimura, Kyoto University, Kyoto, Japan]. **D**, The anatomical structure of the leech [Illustrated by James Rawlins Johnson, *A Treatise on the Medicinal Leech*, London, 1816. [Rare – In process] UCLA Biomedical Library: History and Special Collections for the Sciences].

Summary of ‘Alaqah stage

The Qur’ānic term *alaqah* is a comprehensive expression for the second stage of embryonic development that descriptively encompasses the primary external and internal features. In this one word, the general shape of the embryo as a leech is described, the internal events such as the formation of blood and closed vessels

are described, and the attachment of the embryo to the placenta is also brought to mind.

The similarity between the embryo and leech is remarkable:

- the external shape of the leech resembles an embryo at 22-25 days [Figure 18 and 19],
- the internal structure of the leech resembles an embryo of 22-26 days [Figure 21 and 22],
- the embryo clings to the lining of the uterus in a similar way to a leech that clings to the skin,
- the embryo obtains nourishment from the blood of the mother [Figure 17], like the leech which feeds on the blood of others [Figure 19],
- the embryo has a segmented body like a worm or leech,
- the early embryo further resembles a leech in that it has a tube-like gut running from one end to the other.

The Qur'ānic term '*alaghāb*' refers to the embryo when it is extremely small. The '*alaghāb*' is just 0.7-3.0mm in length. Due to the small sizes involved, scientists could not have recognised the detailed features of the '*alaghāb*' stage until the second half of the 19th century and the beginning of the 20th.



Prof. Keith L. Moore concludes that it is “remarkable how much the embryo of 23-24 days resembles a leech. As there were no

microscopes or lenses available in the 7th century, doctors would not have known that the human embryo had this leech-like appearance. In the early part of the fourth week, the embryo is just visible to the unaided eye because it is smaller than a kernel of wheat.”⁵²

Stage 3: Mudghah stage



Figure 23: Photograph of the embryo at the end of the *'alaqah* stage [age 24 to 25 days]. Ten pairs of the 13 pairs of somites are easily recognized, but the embryo is still relatively straight and has a leech-like appearance.

The embryo at 24-25 days is finishing the *'alaqah* stage. It changes into the *mudghah* stage at 26-27 days. The transformation from *'alaqah* to *mudghah* is in fact very rapid, and during the last day or two of the *'alaqah* stage, the embryo is beginning to develop some of the characteristics of the *mudghah*, e.g. the somites begin to appear and become a distinct feature of this stage.

One of the meanings of the word *mudghah* is “something that is chewed by teeth.” If one were to take a piece of gum and chew it

⁵² Moore, K. L., *A Scientist's Interpretation of References to Embryology in the Qur'an*.

in his or her mouth and then compare it with an embryo at the *mudghab* stage, we would conclude that the embryo at the *mudghab* stage acquires the appearance of a chewed substance. This is because of the somites at the back of the embryo that “somewhat resemble teeth-marks in a chewed substance.”⁵³ [see Figures 24 and 25].



Figures 24: Photograph of an embryo at the *mudghab* stage [28 days old]. The embryo at this stage acquires the appearance of a chewed substance, because the somites at the back of the embryo somewhat resemble teeth marks in a chewed substance. The actual size of the embryo is 4 mm.⁵⁴



⁵³ Moore and Persaud, *The Developing Human*, 5th ed., p. 8.

⁵⁴ Moore and Persaud, *The Developing Human*, 5th ed., p. 82 – from Professor Hideo Nishimura, Kyoto University, Japan.

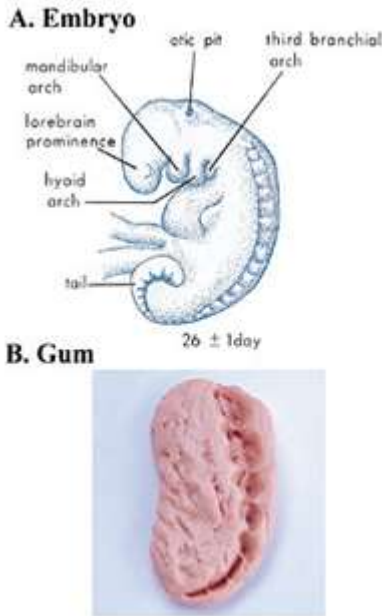


Figure 25: When comparing the appearance of an embryo at the mudghah stage with a piece of gum that has been chewed, we find similarity between the two.

A. Drawing of an embryo at the mudghah stage. We can see here the somites at the back of the embryo that look like teeth marks. [Moore and Persaud, *The Developing Human*, 5th ed., p. 79.]

B. Photograph of a piece of gum that has been chewed.

The appearance of the somites or “imprints” changes continuously, just as the teeth imprint changes on a chewed substance with each act of chewing. The embryo changes its overall shape, but the structures derived from the somites remain. Just as a substance acquires furrows, swellings and a corrugated surface as it is being chewed, so does the appearance of the embryo.

The embryo turns in its position due to the modifications in its centre of gravity with new tissue formation, similar to the turning of a substance with chewing.

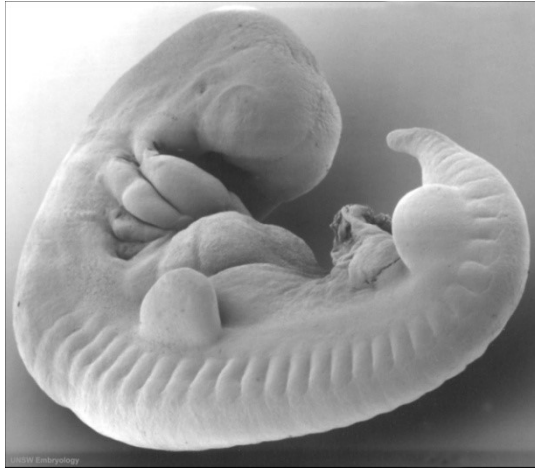


Figure 26: Human embryo day 32 with 35 somites. The embryo is about 7.0 mm in length. Note the indentations that are identified between somites, and with these indentations, the embryo resembles a chewed substance in its external appearance.

In Figure 26, the embryo looks somewhat like a chewed lump. The chewed appearance results from the somites which resemble teeth marks. The somites [cuboidal blocks of mesodermal tissue] represent the beginnings or primordia of the vertebrae. By the 3rd week of human embryonic development, about 38 pairs of somites form. By the 5th week there are 42-44 pairs of somites. Most of the axial skeleton [skull, vertebral column, ribs, and sternum] and skeletal muscles will be derived from these somites.⁵⁵

⁵⁵ This section is an edited version of Kareem, E., *Embryology in the Qur'an: The Mudghab Stage and Some observations on the mudghab (chewed-like) stage of human development*, www.islampapers.com.

As there were no microscopes available in the 7th century C.E., people would not have known that the human embryo had this chewed-like appearance. Professor Marshall Johnson states:

“You have to be really careful on what is the definition of ‘seeing’. I can see a piece of dandruff on this tabletop; I can just barely make it out because this is a nice black surface [but] I can see no detail in it. If I want to see detail in it then I need some sort of visual aid, something to aid my vision, I need a magnifying glass, I need a microscope. So I might be able to see a piece of dandruff, but to see any detail in it as is described in the Qur’ān, I need an instrument that wasn’t developed until the 1700s.”⁵⁶

Stage 4: Bone Formation [Idham]

فَخَلَقْنَا الْمُضْغَةَ عِظَامًا فَكَسَوْنَا الْعِظَامَ لَحْمًا

God continues, “...and We made [from] the lump [mudghah], bones, and We covered the bones with flesh” [23:14]. The mudghah or somite embryo is fashioned into bones which are clothed with flesh.

Hamilton, Boyd and Mossman write that “the somites are the bases from which the greater part of the axial skeleton and musculature develop.”⁵⁷

The timing of this phase has been mentioned in the following statement of the Prophet Muhammad, “When 42 nights [i.e. 6 weeks] have passed from the time of the nutfah [time of

⁵⁶ As quoted in Kareem, E., *Some observations on the mudghah stage of human development*, www.islampapers.com.

⁵⁷ Hamilton, Boyd, Mossman, *Human Embryology*, 4th Edition, as quoted in Albar, M.Ali, *Human Development as revealed in the Holy Qur’an and Hadith*, p. 79.

conception], God sends an angel to it, who shapes it and makes its ears, eyes, skin, muscles and bones...’’⁵⁸

“Before the 42nd day, it is difficult to distinguish the human embryo from the embryos of many animals, but at this time it becomes clearly distinguishable in its appearance.”⁵⁹ The formation of the skeleton gives the embryo its human shape.

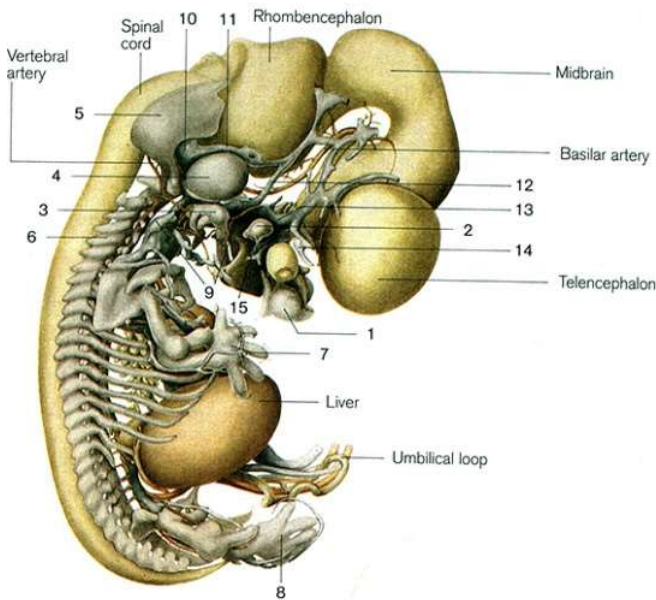


Figure 27: Human embryo at about 50-51 days [Ulrich Drews, *Color Atlas of Embryology*, 1995]

In the 6th week the cartilaginous skeleton begins to form and the embryo acquires a soft skeleton [as we see in Figure 27]:

⁵⁸ Sahih Muslim, *Kitab al-Qadr*.

⁵⁹ G.C. Goeringer, A. A. Zindani, M. A. Ahmed, *Embryology in the Qur'an: Bone and Muscle Development*, www.islampapers.com.

“Formation of bone does not begin uniformly throughout the body. Rather, there is a sequential appearance of bony tissue. However, in the 7th week the spreading development of the skeleton occurs. Bone development in the limbs commences in the limb buds from mesenchymal cells. Primary ossification centres appear in the femur during week 7 and in the sternum [breast bone] and the maxilla [upper jaw] in weeks 8-9.”⁶⁰

Stage 5: Clothing the Bones with Flesh [Lahm]

God says, فَكَسَوْنَا الْعِظَامَ لَحْمًا “...We covered the bones with [lahm] flesh” [23:14]. In the *Fundamentals of Human Embryology*, it is noted that, “Soon after the cartilaginous models of the bones have been established, the myogenic cells, which have now become myoblasts, aggregate to **form muscle masses** on the ventral [front] and dorsal [back or posterior] aspects of the limbs.”⁶¹

Although precursor cells [myoblasts, or primitive muscle cells] are present adjacent to developing bone, “differentiation into skeletal muscle attachments occur **after** the ossification process in the shaft and ends of the bones has begun.”⁶²

⁶⁰ Ibid.

⁶¹ Allan, J., and Kramer, B., *The Fundamentals of Human Embryology*, 2nd Edition, Wits University Press, 2010, p. 148.

⁶² G.C. Goeringer, A. A. Zindani, M. A. Ahmed, *Embryology in the Qur'an: Bone and Muscle Development*, www.islampapers.com.

Conclusion

It is clear from the preceding pages that God, in the Qur'ān, gives a detailed account of the development of the human embryo. Firstly, it accurately describes the main stages of development. Each word describes the characteristic of a specific stage and its morphological and physiological identity. Secondly, it describes the sequence of these events in the same chronological order as discovered by the electron microscope.

Scientist's Acceptance of the Truths in the Qur'ān

Professor Emeritus Keith L. Moore is one of the world's most prominent scientists in the fields of anatomy and embryology and is the author of the book entitled 'The Developing Human', which has been translated into eight languages. Dr. Keith Moore is Professor Emeritus of Anatomy and Cell Biology at the University of Toronto, Toronto, Canada. There, he was Associate Dean of Basic Sciences at the Faculty of Medicine and for 8 years was the Chairman of the Department of Anatomy. In 2007, Professor Moore became the first recipient of the Henry Gray/Elsevier Distinguished Educator Award, The American Association of Anatomists' (AAA) highest award for human anatomy education. Most recently in 2012, Prof. Moore received the Queen's Diamond Jubilee Medal – a commemorative medal to honour significant contributions and achievements by Canadians.

Professor Moore said,

“Because the staging of human embryos is complex, owing to the continuous process of change during development, it is proposed that a new system of classification could be developed using the terms mentioned in the Qur'ān and Sunnah. The proposed system is simple, comprehensive,

and conforms with present embryological knowledge. The intensive studies of the Qur'ān and Hadith [reliably transmitted reports of the Prophet Muhammad] in the last four years have revealed a system for classifying human embryos that is amazing since it was recorded in the 7th Century C.E. Although Aristotle, the founder of the science of embryology, realised that chick embryos developed in stages from his studies of hen's eggs in the fourth century B.C., he did not give any details about these stages. As far as it is known from the history of embryology, little was known about the staging and classification of human embryos until the twentieth century. For this reason, the descriptions of the human embryo in the Qur'ān cannot be based on scientific knowledge in the seventh century. The only reasonable conclusion is: these descriptions were revealed to Muhammad from God. He could not have known such details because he was an illiterate man with absolutely no scientific training.”⁶³

Consequently, Professor Moore was asked the following question: “Does this mean that you believe that the Qur'ān is the word of God?” He replied: “I find no difficulty in accepting this.”⁶⁴

Professor Moore consulted a number of embryologists for their opinions:

“...I was invited to Saudi Arabia to lecture on embryology at King Abdul-Azziz University in Jeddah, Saudi Arabia... and while I was there, at my suggestion, invited Dr. [T.V.N]

⁶³ *This is the Truth* - www.islam-guide.com/truth.htm

⁶⁴ *Ibid*

Persaud and Dr. [E. Marshall] Johnson to come to Saudi Arabia. And they [the Embryology Committee] asked them the same questions, and I purposefully didn't tell them my interpretations, I wanted them to give their own. So they did and their answers were similar to mine...Dr. Johnson is one of the most outstanding embryologists and teratologists in the United States. We didn't just pick anyone, I picked the best. And in Canada, Dr. Persaud at the University of Manitoba, where I spent twenty years, is also an outstanding embryologist who has three doctors degrees... so I picked the very best. And then, when I started thinking about other embryologists around the world, we brought in Dr. [Robert] Edwards from Cambridge [world-renowned for his early work on in vitro fertilization]... so we invited him to Saudi Arabia and again he was asked the same questions and they [the Embryology Committee] got essentially the same answers.... [and] one of my colleagues in Kyoto, Japan...he didn't go to Saudi Arabia, [and] he has been consulted and so on. So we have consulted embryologists around the world for their opinions on these statements in the Qur'ān, and it's clear from what Dr. Persaud has said and from all of our work in this area that these statements [in the Qur'ān] are correct.”⁶⁵

Professor Emeritus T. V. N. Persaud is Professor of Anatomy, Professor of Pediatrics and Child Health and Professor

⁶⁵ Prof. Moore lecture to Muslim Students Association, “*Embryology in the Qur'an with Drs. Persaud, Moore and Johnson [1988].*”
<http://youtu.be/ZJRRhfk5xUI?t=37m32s>

of Obstetrics, Gynecology and Reproductive Sciences at the University of Manitoba, Winnipeg, Manitoba, Canada. There, he was the Chairman of the Department of Anatomy for 16 years. He is well-known in his field. He is the author or editor of 22 textbooks and has published over 181 scientific papers. In 1991, he received the most distinguished award presented in the field of anatomy in Canada, the J.C.B. Grant Award from the Canadian Association of Anatomists. Henry Gray/Elsevier Distinguished Educator Award, American Association of Anatomists, 2010.

When he was asked about the scientific miracles in the Qur'ān, he stated the following:

“The way it was explained to me is that Muhammad was a very ordinary man. He could not read, didn't know [how] to write. In fact, he was an illiterate. And we're talking about twelve [actually about fourteen] hundred years ago. You have someone illiterate making profound pronouncements and statements and that are amazingly accurate about scientific nature. And I personally can't see how this could be a mere chance. There are too many accuracies and like Dr. Moore, I have no difficulty in my mind that this is a divine inspiration or revelation which led him to these statements.”⁶⁶

Professor Persaud has included some Qur'ānic verses and sayings of the Prophet Muhammad in some of his books.

Dr. E. Marshall Johnson is Professor Emeritus of Anatomy and Developmental Biology at Thomas Jefferson University,

⁶⁶ Taken from the video documentary, *'This is Truth.'*

Philadelphia, Pennsylvania, USA. There, for 22 years he was Professor of Anatomy, the Chairman of the Department of Anatomy, and the Director of the Daniel Baugh Institute. He was also the President of the Teratology Society. He has authored more than 200 publications. In 1981, during the Seventh Medical Conference in Dammam, Saudi Arabia, Professor Johnson said in the presentation of his research paper:

“Summary: The Qur’ān describes not only the development of external form, but emphasises also the internal stages, the stages inside the embryo, of its creation and development, emphasising major events recognised by contemporary science.”

“As a scientist, I can only deal with things which I can specifically see. I can understand embryology and developmental biology. I can understand the words that are translated to me from the Qur’ān. As I gave the example before, if I were to transpose myself into that era, knowing what I knew today and describing things, I could not describe the things which were described.

I see no evidence for the fact to refute the concept that this individual, Muhammad, had to be developing this information from some place. So I see nothing here in conflict with the concept that divine intervention was involved in what he was able to write.”⁶⁷

Dr. Yoshihide Kozai is Professor Emeritus at Tokyo University, Hongo, Tokyo, Japan, and was the Director of the

⁶⁷ Taken from the video documentary, *'This is Truth.'*

National Astronomical Observatory, Mitaka, Tokyo, Japan. He said:

“I am very much impressed by finding true astronomical facts in [the] Qur’ān, and for us the modern astronomers have been studying very small pieces of the universe. We’ve concentrated our efforts for understanding of [a] very small part.

Because by using telescopes, we can see only very few parts [of] the sky without thinking [about the] whole universe. So, by reading [the] Qur’ān and by answering the questions, I think I can find my future way for investigation of the universe.”⁶⁸

Professor Tejatat Tejasen is the Chairman of the Department of Anatomy at Chiang Mai University, Chiang Mai, Thailand. Previously, he was the Dean of the Faculty of Medicine at the same university. During the Eighth Saudi Medical Conference in Riyadh, Saudi Arabia, Professor Tejasen stood up and said:

“During the last three years, I became interested in the Qur’ān From my study and what I have learned from this conference, I believe that everything that has been recorded in the Qur’ān fourteen hundred years ago must be the truth, that can be proved by the scientific means.

Since the Prophet Muhammad could neither read nor write, Muhammad must be a messenger who relayed this truth, which was revealed to him as an enlightenment by the one

⁶⁸ Ibid.

who is eligible [as the] creator. This creator must be God. Therefore, I think this is the time to say *La ilaha illa Allah*, there is no diety to worship except God, *Muhammadur rasoolu Allah*, Muhammad is Messenger [Prophet] of Allah [God]. Lastly, I must congratulate for the excellent and highly successful arrangement for this conference I have gained not only from the scientific point of view and religious point of view but also the great chance of meeting many well-known scientists and making many new friends among the participants. The most precious thing of all that I have gained by coming to this place is *La ilaha illa Allah*, *Muhammadur rasoolu Allah*, and to have become a Muslim.”⁶⁹

After all these examples we have seen about the scientific miracles in the Holy Qur'ān, let us ask ourselves these questions:

Could it be just a coincidence that all this recently discovered scientific information from different fields was mentioned in the Qur'ān, which was revealed fourteen centuries ago? Could this Qur'ān have been authored by Muhammad or by any other human being? How could Prophet Muhammad have possibly known all this 1,400 years ago, when scientists have only recently discovered this using advanced equipment and powerful microscopes which did not exist at that time?

The only answer is that the Qur'ān is the word of God Almighty.

⁶⁹ Taken from the video documentary, *'This is Truth.'*

Suggested Reading

- The Qur'ān Project – English translation of the Qur'ān – available free from www.quranproject.org
- Self-Evident Miracles of the Holy Qur'ān by M.U. Kazi, *Abul-Qasim Publishing House*.
- Scientific Wonders on Earth and in Space by Yusuf al-Hajj Ahmad, *Darussalam Publishers*.
- The Unchallengeable Miracles of the Qur'ān by Yusuf al-Hajj Ahmad, *Darussalam Publishers*.
- The Miracles of the Qur'ān by Muhammad ash-Sha'rawi, *Dar al Taqwa*.
- Medical Miracles of the Qur'ān by Dr. Sharif Kaf al-Ghazal, *Islamic Foundation*.
- The Developing Human by Prof. Keith L. Moore, *published by Elsevier Saunders*.
- Belief in Allah by Dr. Umar al-Ashqar, *published by IIPH*.
- Islam Papers – www.islampapers.com
- Human Development as Revealed in the Holy Qur'ān and Hadith by Dr. Mohammed Ali Albar.



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