AL KITAB
The Renaissance Project

Part 1

The Universe

The Renaissance Project

June 2013

Introduction

It's been 2 years since I started writing this book, and as it draws to completion, I am haunted by a particular page that I cannot seem to write; the introduction to this Part of the Volume. There is too much to be said and not enough time to describe how incredible the Universe really is. From its pulsar stars to its black holes; from its rocky planets to its waterworlds; from its massive galaxies to its lingering asteroids and comets; there are literally billions upon billions upon billions of planets, stars and wonderful objects that inhabit it, all of which are billions of light years apart.

It is simply awe inspiring, and the more I dwell on its complexities, the more I realize that an introduction can never be written for a proper description and understanding of the Universe must be seen, not read or heard.

Let us now journey together and watch the story of our Universe unfold, and as we do so, let us investigate the verses in the Quran and determine whether they are in line with modern scientific findings.

Mohamed Al Qadi

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

{لَخَلْقُ ٱلسَّمَٰوَٰتِ وَٱلْأَرْضِ أَكْبَرُ مِنْ خَلْقِ ٱلنَّاسِ وَلَٰكِنَّ أَكْثَرَ ٱلنَّاسِ لَا يَعْلَمُونَ }

In the name of Allah, the Beneficent, the Especially Merciful

“The creation of Heavens and the Earth is a greater matter than the creation of men; Yet most men do not know"

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Chapter 2

Creation

Mohamed Al Qadi

The Universe

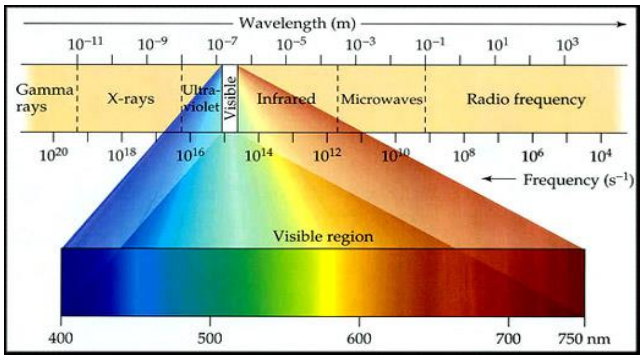
There is nothing more fascinating nor more humbling than staring at the night sky. Its stars can't help but dazzle. Its vast sight is a constant reminder of how small we really are.

For some, watching the night sky provides inspiration. For others, it raises questions. For as long as humans have lived, man cannot help but stare and wonder; where did we come from? Why are we here? What is our purpose? It is perhaps ironic that the answers can indeed be found by staring into the night sky. Edwin Hubble had done just that and consequently shocked the world.

Many people think of the Universe as something that is fixed; that the Universe has always existed in its current size and form. Hubble had shown that this is not true. By observing the light spectrum of different galaxies surrounding us, he detected a phenomenon known as red shift (Figure 2.1).

This phenomenon shows that most of the galaxies and stars are moving away from us. In other words, the Universe is expanding! The concept might be hard to grasp for some. How can the Universe get bigger?

Figure 2.1



Red Shift – The Science

Among the visible spectrum of light, red has the longest wavelength while blue has the shortest. As such, when objects emitting light move away from you, the distance between wave crests increases (the wavelength of this light becomes longer), and thus shifts towards the red end of light spectrum

Many tend to visualize stars and galaxies rushing away from each other into empty space as shown in Figure 2.2. This perception is false. There is no space that stars can expand to as the space doesn't exist yet. Rather, space itself is expanding. The best way to visualize this is by picturing a balloon (Figure 2.3). As one blows air into the balloon, the balloon gets bigger and the points on its surface (such as points a, b, and c) move apart.

Figure 2.2

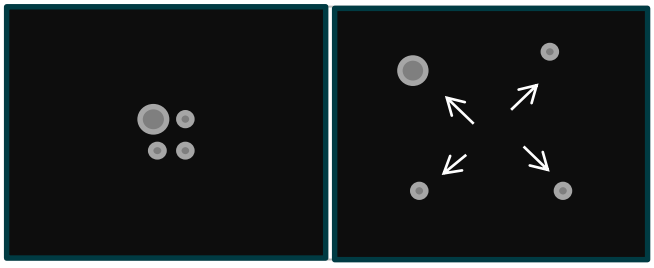
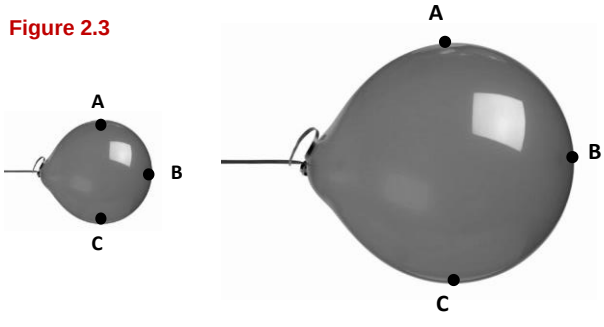


Figure 2.3



In this analogy, the Universe is the balloon. It grows in size and continues to expand. This expansion pushes points a, b and c (galaxies) apart furthering the distance between them.

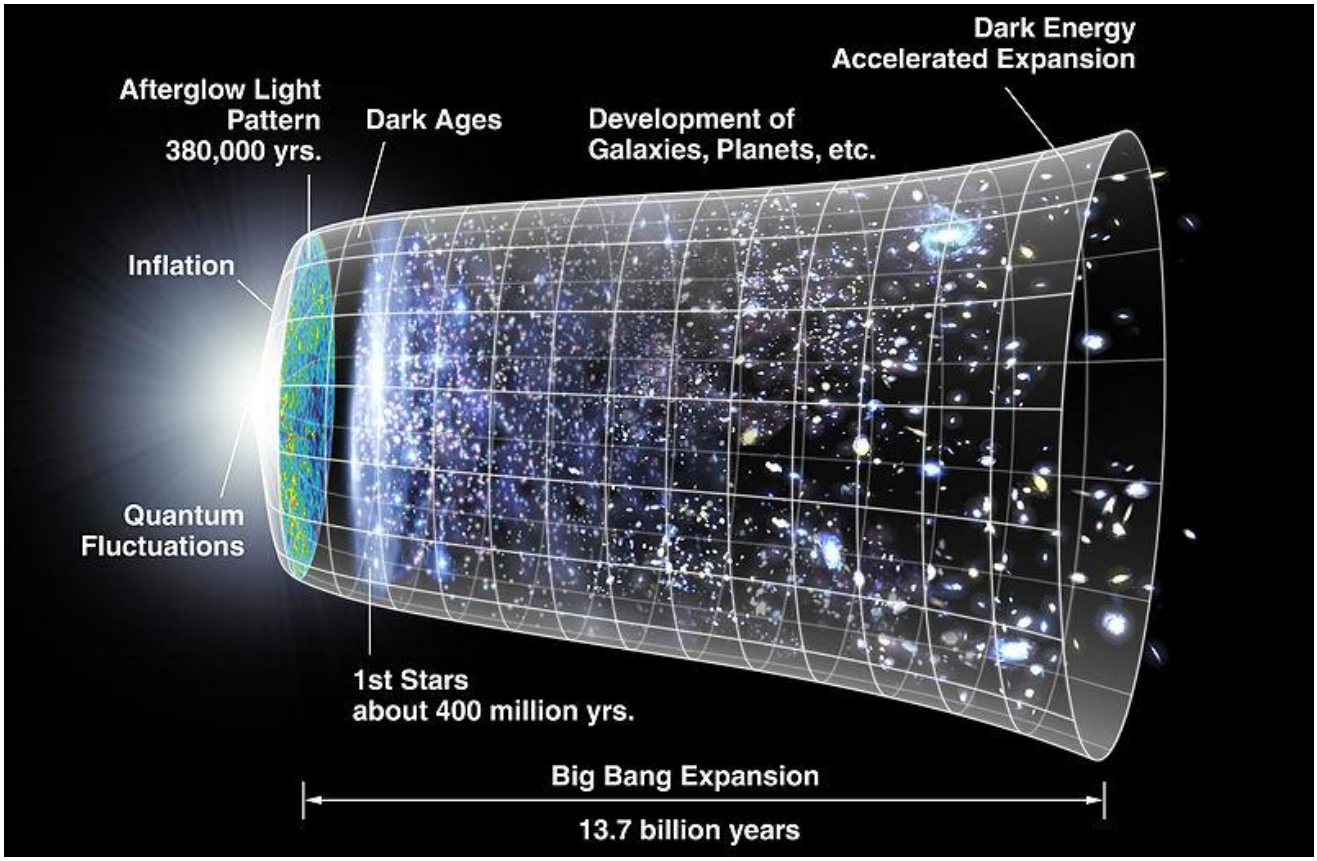
The Big Bang

The importance of this discovery cannot be understated. If the Universe is expanding, there must have been a moment in the past where it was much smaller. In fact, there must have been a moment when all matter you see today and the elementary particles that make them up was condensed into an infinitely small space no larger than a pin prick! The Universe would have been unbelievably hot and infinitely dense. Then, this inconceivably small and hot Universe began to expand rapidly, the energy and matter of which drifting apart. This moment of expansion is termed "The Big Bang" and it is when space, time, and matter came into existence. It is when our Universe was born. It doesn't make sense to speak of time or space before this moment as they did not exist yet. As St. Augustine claimed, time is a property of the Universe that God created and thus time did not exist before the beginning of the Universe.

It is also worth noting that because of the immense density and heat of the Universe at that time, light could not escape. In the first ~380,000 years(1) of our Universe's life, the Universe was opaque. It was not until the Universe had sufficiently expanded and cooled down that light was able to escape its dense surrounding causing the Universe to become transparent(2).

As you may imagine, The Big Bang Theory was met with skepticism. The expansion of the Universe alone doesn't provide definitive proof of a Big Bang. Thankfully, there have been a range of other scientific discoveries that have lent strong support to this theory and turned most skeptics into believers.

Figure 2.4- The Story of our Universe



Light, as Einstein had proven, travels at ~300,000 KMs per second. Effectively, we are able to see things as soon as they happen. This however is not true when the object is extremely far away. Most of the stars you view in the night sky are light years away from you. For example, the Pole Star (which indicates where North is for navigation purposes) is 434(3) light years away from Earth. What this means is that it takes 434 years for light from the Pole Star to reach our Planet.

Notes (1): Estimate according to WMAP and COBE satellite observations
(2): The time where the Universe became transparent is called the "era of recombination" where ionized atoms attracted electrons to form neutral atoms

The Big Bang (cont'd)

Thus, when we observe the Pole Star today, we don't see it in its current form. Instead, what we see is what the Pole Star looked like 434 years ago (1570s AD). We do not know what the star currently looks like (we will in 2444 AD if we are still alive). We in effect can only see it in the past. The same concept can be applied to other stars. The furthest galaxy detected to date is ~12 billion light years away from us. By observing it, we can see how the Galaxies looked like ~1.7 billion years after The Big Bang.

This is incredibly helpful because The Big Bang Theory predicts that the first galaxies formed in the early years of the Universe were very small and simple, unlike their modern counterparts. Using modern technology, scientists were able to confirm this thinking, adding further support to The Big Bang Theory.

Another piece of evidence that scientists are keen to point out is the composition of elements in our Universe. From The Big Bang, three elements were predominantly created; Hydrogen, Helium, and a smaller quantity of Lithium with traces of other elements being negligible. As we will explore in Chapter 4, other elements known to us today such as Oxygen and Iron were synthesized inside stars billions of years later. Thus, if The Big Bang did happen, the first stars in our Universe should have an abundance of primary elements and negligible traces of others. Once again, by examining stars that are 12 billion light years away, our data confirms these predictions.

But perhaps the biggest piece of evidence in support of The Big Bang is the Cosmic Microwave Background Radiation (CMBR). As we have seen, the Universe was hot and dense in its early stages. In the 1960s, Robert Dicke, David Wilkinson, and Jim Peebles argued that we should be able to detect the glow of our early Universe, the light of which would be reaching us now. However, because space has expanded rapidly for 13.7 billion years, this light would be extremely red shifted (see page 1). In fact, its wavelengths would have elongated to a point where it no longer conformed to the visible light spectrum; its wavelengths would be long enough to turn it into microwave radiation.

Coincidentally, two American physicists (Penzias and Wilson) were testing a very sensitive microwave detector. To their surprise, they detected extra "noise" coming equally from all direction. The noise was coming form outside the atmosphere. When Penzias and Wilson heard of Dicke and Peebles theory, they immediately made the connection; the noise they were detecting was the CMBR their counterparts had predicted!

The CMBR lends very strong weight to The Big Bang Theory. It is known to many as The Big Bang's smoking gun; just like a gun, we might have missed the "bang" but we can certainly detect whether the gun has been fired by examining its residue. The uniformity of the CMBR across the Universe furthers the point. We might not see The Big Bang, but we can certainly detect its traces.

In conclusion, we know that the Universe is currently expanding and has done so for billions of years. We predict with sufficient confidence that ~13 billion years ago, all matter (the entire Universe we see today) was compacted and compressed together in a space no larger than a pin prick. Then, for reasons unknown, there was a "bang" where space and time were created, expanding the Universe and distancing matter and energy apart. Though we are not able to detect any trace of the first 300,000 years of this event, light would eventually escape, the traces of which (called CMBR) are detected by our microwave sensors to this very day. Before moving on to how stars, our Sun and Earth were formed, let us first investigate the creation of the Universe as narrated by the Holy Quran. Is it compatible with current findings? Does it support any particular theory of origin?

Creation & The Quran

أَأَنْتُمْ أَشَدُّ خَلْقًا أَمِ السَّمَاءُ بَنَاهَا (79, 26)

As previously noted, translation is a tricky process. Predictably, the translated version of the Quran doesn't resemble the original. The beauty of the writing, its expressiveness and attention to detail, and more often than not, its meaning is lost. I would encourage Arabic readers to pay attention to the Arabic extracts only. For the Non-Arab speaking audience, I will try to communicate the meaning of these verses to the best of my ability

Figure 2.5

"سَنُرِيهِمْ آيَاتِنَا فِي الْآفَاقِ وَفِي أَنْفُسِهِمْ حَتَّىٰ يَتَبَيَّنَ لَهُمْ أَنَّهُ الْحَقُّ ۗ أَوَلَمْ يَكْفِ بِرَبِّكَ أَنَّهُ عَلَىٰ كُلِّ شَيْءٍ شَهِيدٌ" (41,53)

We shall show them our signs in the far reaches of the Universe and in their own selves, until it becomes clear to them that it is the truth (*the Quran*). Does it not suffice your Lord that He is a witness of everything?

Despite modern literature's attempt to depict religion and science as incompatible elements, in the verse above, God encourages us to look deep into ourselves and into the far reaches of the Universe, because in each of these entities, the scientific secrets we unlock will provide definitive proof of His existence and the authenticity of his Book (Quran). Let's investigate if this is indeed true.

As mentioned previously, humanity always viewed the Universe as static and unchanging. In 1929, Hubble proved that it was expanding, with recent estimates showing that it has done so for 13 billion years. What is so fascinating is that the Quran made this bold statement 1400 years ago.

"وَالسَّمَاءَ بَنَيْنَاهَا بِأَيْدٍ وَإِنَّا لَمُوسِعُونَ" (51,47)

"And the Heavens, we have built them mightily and We shall surely expand them"

It is very difficult to imagine anyone in the 6th century, let alone an illiterate Bedouin living in the desert far from the civilized empires of that time making such a bold prediction. It is even more impressive that the Quran subsequently describes The Big Bang in incredible fashion

"أَوَلَمْ يَرَ الَّذِينَ كَفَرُوا أَنَّ السَّمَاوَاتِ وَالْأَرْضَ كَانَتَا رَتْقًا فَفَتَقْنَاهُمَا ۖ وَجَعَلْنَا مِنَ الْمَاءِ كُلَّ شَيْءٍ حَيٍّ ۖ أَفَلَا يُؤْمِنُونَ" (21,30)

Have the unbelievers not seen that Heavens and the Earth were one piece, then we separated them? And of water we produced every living thing? Will they not believe then?

Here, the Quran makes two scientific statements unbeknown to anyone living during that time. Not only does it detail the singularity point and the subsequent expansion of The Big Bang in incredible form, it also mentions that water is the source of all life.

Creation & The Quran Cont'd

أَأَنْتُمْ أَشَدُّ خَلْقًا أَمِ السَّمَاءُ بَنَاهَا (79, 26)

It is also worth noting the audience this verse is addressed to; the unbelievers. But the unbelievers here are not the ignorant idol worshipers of Mecca. How would they see or know that all matter was adjoined into one? Or that they were subsequently ripped apart? Or that water is the source of life? God is addressing a different audience in this verse. He is addressing the unbelievers of this age. He is addressing the scientists and readers that have grown to understand the Universe better than anyone else. It is as if God is saying "how can you not believe that this book is not the true word of God after reading this verse? How can you explain that a book written 14 centuries ago is painting an incredibly accurate picture of the Universe's creation"; a picture most educated people still struggle to understand today. The language and tone cannot be coincidental. There is also further proof that this verse is indeed describing The Big Bang.

If you were to read the Quran, you will notice that Allah describes his relation with the "earth and heavens" (Universe) in 3 main ways; مالك (its king, or its owner), خالق (its creator), and فاطر (fater) from the verb (fatar) فطر . If God is indeed the creator of the Universe, then he must own it as well and thus the first two descriptions make sense. The third description however seems out of place though it is mentioned frequently throughout the Quranic text. The word "fatar" is a verb meaning to cleft asunder. It is only when you understand The Big Bang Theory and the singular origins of the universe does this description make sense.

In this chapter, I have argued that Science and the Quran provide the same narrative of the beginning of our Universe. However, this is not the case when it comes to the fate of it. This is because science currently does not claim to know if or how the Universe will end. There are various theories and possibilities that we may never be able to prove. What is interesting is the Quran makes a prediction of its own, which is aligned with one particular scientific theory on the Universe's fate; the Big Crunch. Investigating this will provide further proof of the Quran's knowledge of the Big Bang.

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Photo and Figure Sources

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Editors

I would like to thank all the individuals that helped contribute to the production of this Chapter. Special thanks to Dr. Laila Al Abidi for her insight and rigorous review