At times, life drama can become overwhelming. Did you forget to fetch your sister from the airport? Failed an exam again? During situations such as these, it may look as if your life is all-consuming and has taken charge of all the iota of the earth's energy. However, definitely, there are billions of other people on earth. Also, for the earth itself, well, that is only the tiniest bit of grit in an ever-growing world. What are you concerned about?

Carl Sagan's abilities lay in making the hard relatable. In several ways, nothing is more huge than Cosmos. Knowing about the world isn't usually about complicated math. It's more like a history lesson as a science lesson. Following on from Sagan's clue, these book chapters take you on a trip through humankind's interest in the work and space from ancient eras through to the ultimate voyages of space exploration during the twentieth century.

Chapter 1 - Earth is really small.

The history of humanity has been restricted to the earth for long. According to us humans, it is everything, basically our world. However, compared to the universe at large, the earth is basically only a speck in a speck of dust. The reason is that the size of the universe, or the Cosmos, is virtually about our understanding.

As a matter of fact, it's really huge that we've needed to form a unique unit of measurement based on the speed of light.

In the world, light is the fastest thing: in only a second it travels 186,000 miles or 300,000 km. So to say is equal to seven times around the earth.

According to that, when scientists mention the Cosmos, they make use light-years – which is the distance light travels in an entire year. In figure, that is nearly 6 trillion miles or 10 trillion km!

If that wasn't incredible enough, think that the Cosmos has had in it about a hundred billion, or 1011, galaxies. And in every galaxy, there are approximately 1011 stars and 1011 planets.

If you calculate it, you'll notice that the human planet is just one of 1022 planets in the Cosmos. Frighteningly unimportant.

The fundamental physical properties of the universe have long been recognized by humans. Scientists were already examining its nature about 2,000 years ago. Also, they estimated that the earth's landmass was not infinite neither was it flat.

During the third century BCE, the director of the popular great Library of Alexandria in Egypt named Eratosthenes, calculated that the earth was a sphere.

One day while Eratosthenes was reading a papyrus scroll, he got to know that in Syene, which is the present-day Aswan, near the Nile, sticks didn't cast any shadow during midday. This meant that in Syene at noon, the sun was directly overhead.

Therefore, Eratosthenes conducted an experiment. He put a stick in the ground in Alexandria and discovered that during midday there was a shadow in the city.

From his observation, he deduced that the earth could not be flat, that the earth had to be curved. If the land was flat, none of the sticks would simultaneously have no shadow, or they would be at the equal angle to the sun and hence would have equal length of the shadow.

Also, he succeeded to use the difference in the lengths of the shadow to correctly estimate the circumference of the earth. However, he had to employ a man to measure the distance between Alexandria and Syene (a walk of nearly 1,000 km) to acquire the last measurement he required for the calculation!

This finding was critical. From this understanding, determined explorers set sail on small boats. The distance they covered, we may never understand. However, the spirit of exploration is still urged on by science to this moment. What are satellites other than ships traveling through space?

Chapter 2 - Both the stars and planets have constantly called to us, making us know about the earth and its position in the universe.

Before the beginning of history, humans have looked at the heavens and attempted to understand those tiny dots that twinkle away in the night sky.

However, they didn’t only gaze at them; also, they understood that they could utilize them.

About 40,000 generations ago, our nomadic ancestors set the dates of yearly meetings with other tribes in other lands by checking the position of the stars.

Also, they made use of the stars to estimate the time of the seasons in order to know when specific fruits would get ripe, and when buffalo and antelope would move.

All these were possible due to the consistent and predictable movement of heavenly bodies.

As a matter of fact, if you track the movement of the planets over time, you'll notice that they’re doing a type of loop-the-loop across the sky.

This observation made Ptolemy, who worked in the Library of Alexandria to postulate a theory during the second century CE. According to Ptolemy, the center of the universe was the earth and the stars as well as planets revolved around it.

It was a theory that remained for centuries. It was only in the year1543 that Nicolaus Copernicus did thoroughly theorize that the earth, and the other planets, revolved around the sun.

Then the sun was considered as the center of the universe.

About 60 years after, the model was refined further. Johannes Kepler a German-born astronomer laid his hands on the extraordinarily thorough information gathered by the late Tycho Brahe, a Danish nobleman, and observational astronomer.

From these datasets, Kepler estimated that the planets’ orbits around the sun were not circular, as has been formerly assumed; however, as a matter of fact, were elliptical. This created the

first laws from his three laws of planetary motion, and these are still used in astrophysics up to this moment.

Also, Kepler had a really fascinating theory. He claimed that a force that he named “magnetism” struck on bodies at a distance. This would clarify the reason planets accelerate when they came nearest to the sun. If it seems kind of familiar, the reason is that Kepler basically predicted Isaac Newton’s theory of universal gravitation by around half a century.

Chapter 3 - Venus is hellish and unwelcoming; however, Mars could be livable.

There is this old saying that goes "Men are from Mars, and women are from Venus.” The saying is from the Roman notion that Venus was the goddess of love, whereas Mars was the god of war. It’s a nice word; however, physics is somewhat a different matter.

There’s no way around it. Venus is essentially our solar system’s form of hell. Because Venus is 60 million km nearer to the sun than the earth, it because extremely hot. Surface temperatures can get to the levels of 900°F or 480°C.

It becomes worse. We can find out what the planet’s atmosphere is made of. Astronomical spectroscopy is utilized to examine the light reflected off Venus. It reveals that the atmosphere is, as a matter of fact, 96% composed of carbon dioxide. And about its surface, the clouds consist of concentrated sulfuric acid. These form the greenhouse effect that assists in making the planet hot.

Venus definitely doesn’t seem like the type of place to go to for a romantic holiday.

On Mars, things are a bit different. Although, Mars would be a good place for honeymoon either; however, at least it’s a little more earth-like. Mars is the planet that is the nearest to earth, and in some ways is kind of similar. On Mars, there are white clouds, dust storms, and polar ice caps. The days on Mars are also 24 hours long.

Those similarities may explain the reason we consider aliens as being “Martians.” The myth of the Martian can be tracked back to Bostonian Percival Lowell, the creator of the Lowell Observatory in Flagstaff Arizona during the year 1894.

Lowell convinced himself that on the surface of Mars, there were signs of water canals. He believed that these probably must have been dug by intelligent beings on the planet.

Although his belief was, definitely, later proven to be untrue, the myth still continued in popular culture.

With that being said, it’s not crazy thought that we humans could live on Mars sometime. Mars is colder than the earth; temperatures are between 0°C to -80°C or 32°F to -112°F. However, that’s not really different from the Antarctic, where humans can and they actually survive.

The main difficulty for humans staying on Mars would be the obtaining of water. On Mars, there are no open bodies, also, there is no water in its atmosphere. Things become more difficult still since the atmospheric pressure is really low, water would boil away really faster than it does on earth.

With that being said, if it possible for us to melt Mars's polar ice caps to fill constructed water canals such as the ones Lowell believed he saw, then perhaps someday we humans might be able to refer to ourselves Martians.

Chapter 4 - There maybe being on other planets; however, it's not likely to get on earth in spacecraft.

Generally speaking, if there are going to be actual Martians sometime, it might just be, humans. However, this doesn’t stop us from asking related questions: is there being on other planets or in other galaxies?

We can’t be sure about this; however, there’s a thing we can be sensibly confident about. Extraterrestrials would certainly look really different from us.

Just consider all the various forms of life on earth. Such as single-cell bacteria, whales, insects, and humans, evolution has formed an abundant cornucopia. It's been a slow and long process occupied with a lot of random mutations and, critically, reliant on earth conditions

This signifies that there's no cause to reason that lifeforms on a different planet would resemble anything like those on earth. Nevertheless, this other planet would have totally different circumstances and a different evolutionary history.

However, that doesn't signify that we can't attempt to predict what this other being might resemble. What of Jupiter? Well, Jupiter is a huge gas planet with a lot of hydrogen and helium in its atmosphere.

If there were lifeforms present, they might occur as huge gas balloons, maybe even kilometers across. They'd most likely move by expelling gusts of gas, and maybe make their own food via a process that is similar to plant photosynthesis here on earth.

With that being said, if we're going to interact with extraterrestrials, it's not likely that the way we will contact will be direct. They would most likely contact us first via radio waves. The reason is that radio is a cheap, fast and easy means to communicate across huge distances.

Any advanced extraterrestrial civilization will understand that even civilization as "simple" as our own would most likely have figured out the fundamentals of radio and would try to use it to get transmissions from space. Therefore, that's most likely what they would attempt to send to us.

However, what type of message would they send across? Maybe a sequence of prime numbers might work fine. The reason is that the perfect message should specify clearly and briefly that it is intentional and being sent by an intelligent lifeform.

Also, what of us humans? Can we have physical contact with life on other planets? Theoretically, it's possible; however, politics makes it impossible. Project Orion was established in 1958. The notion was to form an interstellar aircraft that would be propelled by huge quantities of energy. This energy would be created by little atomic explosions outside the aircraft.

However, it wasn't to be. The Soviet Union and the United States signed a treaty that prohibited "the detonation of nuclear weapons in space" during the year 1963. Also, just like that, the chance of an Orion-type starship getting to the stars became futile.

Chapter 5 - Modern science isn't really modern: the ancient Ionians were the first to reach there; however, their effort was repressed for centuries.

For the majority of the people, modern science contains some kind of connection with the Enlightenment or with the likes of Copernicus and da Vinci, who were themselves outcomes of the sixteenth-century Renaissance.

However, as a matter of fact, modern science has a lot of deeper origins. The Ionians of Greece were its ancestors.

Ionia was an area in the eastern Mediterranean: what we now consider as the eastern Greek islands and the western coast of Turkey. In olden times, it stood at the crossroads of civilization. Ionia wasn't just a center of trade; however, the area was also ruled by Egyptians, Babylonians and other huge civilizations.

All of these civilizations had their own gods, who were believed to rule the area.

This made the Ionians a bit confused. Who should they worship then, is it the Greek god Zeus or the Babylonian Marduk? The decision they made was surprising. They chose that principles of physics and laws of nature were the ones that ruled the world.

The Ionians began conducting experiments and therefore ushered in a scientific revolution. Perhaps well-known, Democritus developed the theory of the atom is about 430 BCE. It's a Greek term that signifies "uncuttable." He claimed that when you divide an apple, your knife is really going through the empty spaces between atoms. Subsequently, he concluded that all objects could be viewed as having atoms and empty spaces.

But, Unfortunately, experimental Ionian methods and learning were suppressed for several centuries. The Greek Pythagoras can be blamed for this.

Pythagoras, as well as his disciples, assumed that the universe, is divine and perfect, followed by fixed geometrical laws. All they required was pure thought and nothing more. Experimentation didn't have any place in this academic attitudes.

Critically, Plato and Aristotle, who were the greatest philosophers of the typical world among them, were deeply swayed by Pythagoras' concepts.

During the fifth to fourth centuries BCE, they began to make the claim that experimenting was similar to manual work in the fields. Hence, It was work appropriate for slaves. Pure intellectual work has to, conversely, be theoretical.

When Christianity became prevalent, it also took the Pythagorean concept of a perfect divine universe. Subsequently, scientific attempts that might have produced new doctrine-threatening findings were suppressed.

This suppression had a huge influence on them. The scientific process of observation and experimentation was only revived during the sixteenth century.

Chapter 6 - Light has an exceptional spot in our world.

From the things we can see with our eyes and with telescopes, it's obvious that the universe is an amazing and mysterious place. Comets, cosmic dust, exploding stars, and the abundance of planetary colors are marvelous in their own right. However, also more incredible is that there's far more about the Cosmos that we can explain however we can't see.

The typical example is the speed of light. What's remarkable is not just its speed; however, also the fact that this speed is a continuous and nothing can surpass it.

During the early twentieth century, Albert Einstein figured out these characteristics of light through a series of what he named Gedankenexperimente, the German term for “thought experiments.”

This is an illustration. Assuming you’re in a car, about to go over a railroad crossing. A train that is at a right angle to you in on the tracks and is going for the same crossing as you. As you get close the crossing, you got to know that you will get there at precisely the same time as the train. Therefore, you slow down right in time to prevent the crash.

Imagine in its place that your friend is on the other part of the railroad crossing from you’re your friend is further down the road you’re on and is seeing you drive straight at him.

For the thought experiment: suppose you and the train were traveling close to the speed of light?

Your friend will notice you all thanks to the light reflected off your car. Assuming the speed of light was changeable, the light would get to you at the speed of light + the speed of the car. The light reflected off the train – which is not traveling in your direction – would merely arrive at the speed of light. Meaning, your friend would watch you get to the crossing before the train. How can you and your friend go through the same occurrence differently?

Einstein understood counterintuitive events like these could just be prevented if the following rules were abided by. First of all, light travels at the same speed all the time, regardless of who’s watching it. Secondly, there is absolutely nothing that can travel faster than the speed of light.

Chapter 7 - Our civilization is carried through space with Voyagers 1 and 2.

Since Eratosthenes found out that the earth was curved, explorers and travelers have been motivated by science to travel to find new realms.

There is nothing that represents our knowledge of finding better than the voyages of the unmanned spacecraft who travel through our solar system and out into space.

September of 1977, NASA launched Voyagers 1 into space and Voyagers 2 was launched into space August of 1977. The two spacecraft were intelligently made: they had millions of parts compiled redundantly. That entails that if a part fails, another part can take its role.

For example, each Voyagers consists of three different types of computers, and each computer itself is replicated.

Their sources of power are made to last long. It's just like having "a small nuclear power plant" on board. Energy is formed by the breakdown "of a pellet of plutonium."

Also, both of the crafts are supplying us with a lot of data, as well as images that are sent back to earth via radio. During the year 1979, Linda Morabito from the Voyager team was able to make use of some of these images to find an active volcano on Io, the deepest moon of Jupiter.

The Voyager crafts don't only send signals to us; they also, carry data about the best parts of humanity. The scientists agreed on this really thoroughly.

They knew that if extraterrestrial life-forms interrupt signals from the earth, they would definitely become really confused. They would most likely pick up the signals from radio and television broadcasts. Their image of the earth would be a combination of car advertisements and detergents, mixed with bursts of official messages sent during periods of disaster and war. How would they see us?

Now, there's absolutely nothing to be done about those signals: they've been sent already.

But, the Voyager team chose to attach to each craft an image that is gold-plated copper with a stylus and cartridge. There were even guidelines on how to play the records on the aluminum record sleeves. The discs had recordings on what NASA believed was exceptional and fascinating about the earth. They added data about the cerebral cortex and limbic systems in our brains, and greetings in 60 human languages. There was one hour of music from the entire cultures around the world and sounds from nature and contemporary technologies.

It’s a really wide selection of material. Maybe the extraterrestrials who see it will like our accomplishments. Or perhaps they basically won’t know. We can say that we made an effort at least.

Cosmos by Carl Sagan Book Review

The Cosmos is a huge object nearly above understanding; however, we are aware that is occupied with remarkable and wonderful things. Over several centuries and thanks mainly to scientific research, we have understood that our earth is only a spot in the huge Cosmos. We now understand our place; however, astrophysics let us explore it gradually.

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