ACADEMY OF ANCESTRAL WISDOM

SUPERIOR COURSE IN THEURGY - 7

Conversation About The Cosmos - Part 3

Lesson 281

Ven. Master T. A-O Domingo Días Porta
With Astronomer Francisco Fuenmayor

Our conception is that the Sun is pure energy, it is not electricity, it is not magnetism; it is pure energy.

Luminous —says the astronomer.

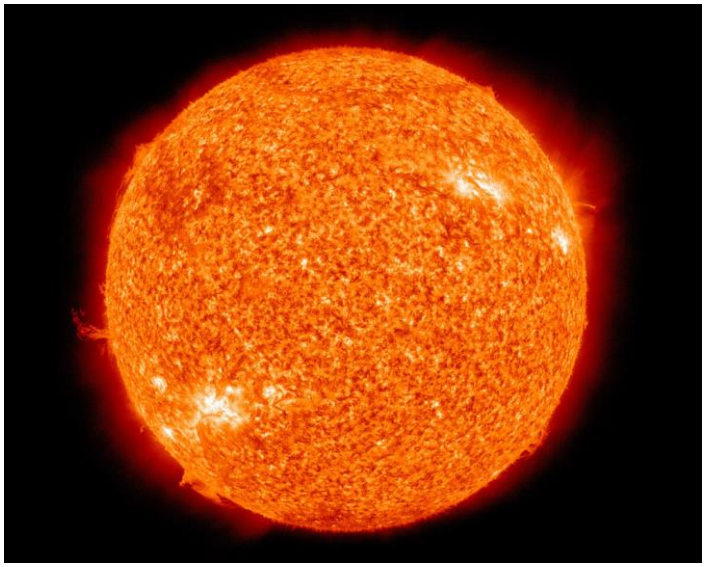
And when it reaches the Earth it is refracted into a rainbow of energies. Then it is refracted into magnetism, into heat, electricity, etc., but when it leaves the Sun it comes out as a pure ray, pure energy. And as you say, when it hits something, then it is "refracted".

It interacts with that something —clarifies the astronomer.

Heat is produced by the friction of the particles —affirms the Master.

Not so much by friction but by what is called excitation and ionization —clarifies the astronomer. When the light, which is a photon in the energy of light that you mention, is "photons", a shower of photons. When a photon hits an atom of helium, for example, it gives energy to that electron and excites it and then its energy increases, its energy increases, that gas goes away... it starts to heat up.

Maestro Domingo: —That's **why it gives it energy**, and the helium heats up by itself, but it's energy that is given, **not heat**.



Astronomer Fuenmayor: No, it's not energy, pure energy that you call it, it's the luminous energy of the sun.

Master: And more than that. I asked our Master, "And the Sun, what's there?" He said, "People live there; there's a city." I asked him, what's the difference with us, then?"

Astronomer: —No, in the Sun there isn't...

"There are no fratricidal fights there." —Maestro Domingo quotes our Master.

Astronomer: —No, in the Sun there can't exist any kind of life; ha, ha, ha, none, because...

Maestro: —We don't know yet.

Astronomer: —No sir, I refute you there.

Teacher: —Most likely, I say, most likely.

Astronomer: It is possible... On the planets, yes, but, for example, on the surface of the sun there is an extreme density of X-ray energy ... that pierces everything.

Yes, but life adapts to the characteristics of each —the Master interrupts.

Astronomer: Life needs peace..., [laughter] and tranquility to develop.

Master: There is peace there too.

Ha, ha, ha, ha, ha —the astronomer laughs.

... Do you think there is a lot of peace on Earth?

Astronomer: No, yes, of course, there were... we have had...

Animals devour each other, humans —the Master comments.

... we have united... Of course, at the beginning... So, after the five hundred million years that it was a volcanic land, pure fire, water took over the Earth, and then the first living cells were formed within it.

We all come from there—the Master comments.

... Yes, from water, and then, some cells learned that by ascending they receive the energy of the sun and by descending they can eat; ascending... descending. And many lived like that, and no one disturbed that rhythm of life, "for millions and millions of years"; and that type of cell still exists. Anemones, for example.

Sister Ma. Guadalupe: You see, and then you just said, Everest, right? The highest, right? It is the highest on the planet, right?

Yes —the astronomer nods—

... That one is frozen.

The atmosphere is colder, the atmosphere.

Frozen, right?

But if you leave the atmosphere...

There are times when one leaves there, one goes out there into space, because like... What I understand is that the Sun emits energy, right? And when it collides with some... yes, some... what is it?

Any particle, any atom, any molecule —answers the astronomer.

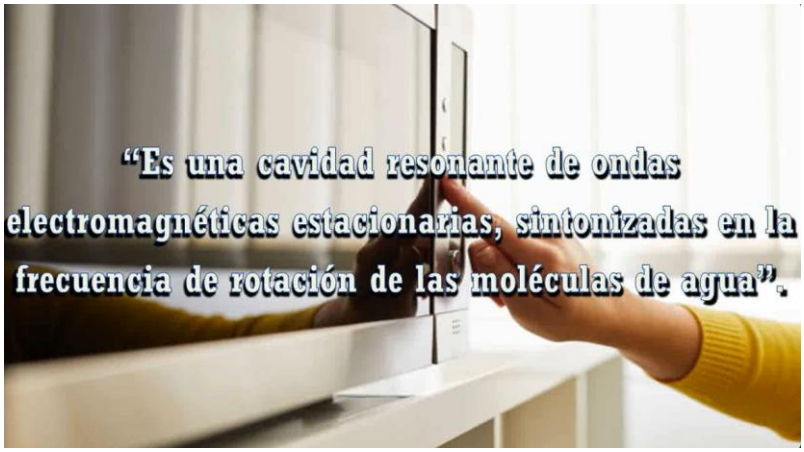
Any particle, it activates, yes, but, if in space..., but outside of that there is..., there are the rays, there are the..., there is the energy, that... There is no luminosity in energy.

Of course, yes —affirms the astronomer.

It is when it rubs, when it collides, that it causes light, it causes heat, it causes...

Yes of course, for example, in the microwave oven, how does a microwave oven work?

No, well I don't know.



Astronomer: —How does it work, **a microwave oven**? I'll define it physically, "you'll be amazed." It is a **resonant cavity of stationary electromagnetic waves, tuned to the rotation frequency of water molecules.** When you, for example... put a small cup of water in, and put in two or three teaspoons of salt, quite a bit of salt, you put them in the microwave oven, close it, and turn it on for thirty seconds. After a few seconds you're going to start to hear [a sizzling] don't be scared, nothing is going to happen, there's not going to be an explosion. The noise you hear (if you want, we can do the experiment), the noise you hear is the friction of the water molecules with the salt crystals, because the energy inside the microwave oven is purely electromagnetic, it's pure energy.

Tuned in, means that the little device that makes noise emits a "microwave" wave that is about centimeters long; it's centimeters, right? It measures centimeters. And precisely, the water molecule can rotate on itself if it receives external radiation of the same frequency at which it rotates. That is the story of the microwave oven. And it rotates at such a speed that the friction (in this instance, yes) releases its energy. The rotating water molecule releases its energy through friction, with all the molecules that make up the food that you want to heat.

The more water the food has, the faster it heats up. The drier it is, the slower it heats up. Because the way the oven works is through the friction that the water molecules, in contact with the rest of the food, transfers heat to them. It transfers heat energy to them, which is friction. It is the same as when you rub your hands together. In this case, it is the water molecule that rotates and touches all the structures of the food.

Master: I have read criticisms about the microwave oven, that it destroys the molecular structure of the food, so the organism cannot digest it properly; and therefore, it is harmful putting food in the microwave oven for a long time. They say that it destroys the molecular structure, the substance is disorganized.

Astronomer: Of course, because compounds that have water as a component, yes, it will be harmful because the water is released, the water, in the water molecules, enter into a crazy friction, all..., all, in the structure of the food and they heat up. But, for example, a cake, a piece of cake, is flour, other components and water.

The water molecules are very small, they serve to heat, maybe they deform the whole thing. In the end, when you open the oven, because it has... In that sense it can modify the structure of the food. And yes, there will be some kinds of food that are not recommended... And, for example, you cannot put anything made of metal inside. Why? Because the electromagnetic wave is an electric current, and when it meets a metal, it forms a short circuit between the emitter that is here, and the metal that is in the middle of the oven. It has happened to me, by accident, and what I see are rays there, like lightning.

So, the radiation from the sun is electromagnetic. Electromagnetic radiation is of many forms, from X-rays to ultraviolet, radio, microwaves, and so on. It is all a very large range and each one has a different behavior [infrareds] they heat up, when you feel your skin getting hot when the sun sets, the water molecules in your skin are floating down there because of the hot fiction on your skin. That is the way the sun's energy transfers heat energy to the skin through microwave waves.

Why can't you look at the sun? Because some components of the sun, in the ultraviolet radiation, ultraviolet and hard ultraviolet, are invisible; they cannot be seen, but they can burn the retina because they penetrate the tissue. Penetrate and attack the atoms that form the molecules of the cornea and can damage the cornea, and the person eventually goes blind.

But not when the Sun is soft —asks Sister Ma. Guadalupe.

Because it has to go through. The light of the sun has to go through a very thick layer of atmosphere when it is on the horizon to reach your eyes. Galileo looked at the Sun for the first time in a telescope, on the horizon, and he could see its spots. But look! In his later years, Galileo was blind. It is true that [at the horizon] is filtered the ultraviolet light, but not all of it, and if you start looking at the Sun like Galileo, counting the spots... Ha, ha, ha, ha! You can go blind!

Master: You have to see it with a special dark filter, right?

Astronomer: —Of course.

Master: Like when there is a solar eclipse, for example.

Astronomer: —Possibly he [Galileo] did it too, putting... With smoke, you smoke the surface of the telescope, and you can look, but it is dangerous.

And then we have the colors, blue, green, etc. For example, chlorophyll, what is the color that interacts with the leaves of plants? What is the color?... with the leaves of plants, for... chlorophyll, red? But that does not heat the leaf or cool it either, but rather it enters the tissue of the leaf, produces a chemical reaction from which the leaf produces sugar with its chemical reaction, chlorophyll.

So..., anyway... Why? Because that radiation is not too hot or too cold, it has a moderate temperature. [...] radiation. It's what you're talking about, pure energy, it's that... There's no way, it's a combination of many kinds of energy. X-rays are extremely penetrating; they can go through your body. It’s what they use to make the plaques.

—X-rays —says Sister Ma. G.

The plaques... The Sun emits X-rays, and it emits another kind of radiation that is very, very dangerous! and it's the reaction of particles [...]

Neutrinos, they call them —comments Sister Ma. G.

No, it's what forms the northern lights, in the north. There's a magnetic field around the Earth.

Listen carefully, apart from the ozone layer, we have a magnetic field around the Earth, which is what directs these particles, which are sensitive to electric currents, to electromagnetism, and directs these particles to the poles where they can do the least damage. And before reaching the Earth's surface, they interact with the atmosphere, [...] aurora. So, what finally reaches the Earth's surface is very low, except for the large solar storms, when they are very strong, which can interrupt communications. It produces blackouts because it interacts with the electrical networks. There are many kinds of energy that exist in the Universe.

Master: —Yes, pure energy contains them all, and when there is a factor, then, it is refracted and decomposed, we say, electricity or magnetism. So, for us the Sun is pure energy, there is no heat, it is not on fire, it is not a ship burning, it is not atomic explosions; the Sun would have been destroyed in millions of years.

No, because the Sun is... —the astronomer tries to refute.

And if it is a ship on fire, well, no...

Astronomer: The Sun is in perfect dynamic balance, it neither shrinks nor grows. But the enormous amount of energy that comes out of the interior of the Sun is counteracted by the gravitational energy of the mass that forms the Sun. There is a balance between the two: gravitational energy and thermal energy, the electromagnetic energy. So... And when it reaches the surface of the Sun... It is twenty million degrees at the center! When it reaches the surface of the Sun, it is five thousand degrees. In the interior, all that energy that rises manifests itself in very strong movements of matter. It is converted into kinetic energy, energy of movement. And, what finally comes out, is a smaller amount.

Master: —And life adapts to those conditions.

No —the astronomer denies.

Here on Earth, it adapts to other conditions.

Astronomer: —Ah! On Earth yes, but in the Sun...

Master: —On the Sun they will say, no, there can be no life on Earth.

On the surface of the sun —the astronomer tries to refute...

it doesn't have pure energy, it's all...

Ha, ha, ha, ha —the astronomer laughs.

We must not dogmatize, that people, that life on Earth has to be... The whole universe is the same, that [...] Earth...

Astronomer: —No, but, life, the living organism has to be able to absorb energy, process it, excrete mass, excrete part of that energy, etc. If you want life with carbon, nitrogen, oxygen and organic molecules, here on Earth [...] an organic molecule [...] I turn on a blowtorch, that is methane gas, it is an organic molecule. Do you put your hand in a jet of methane from a torch? No, never. How hot is it? It can easily reach fifteen hundred degrees. That's the Sun.

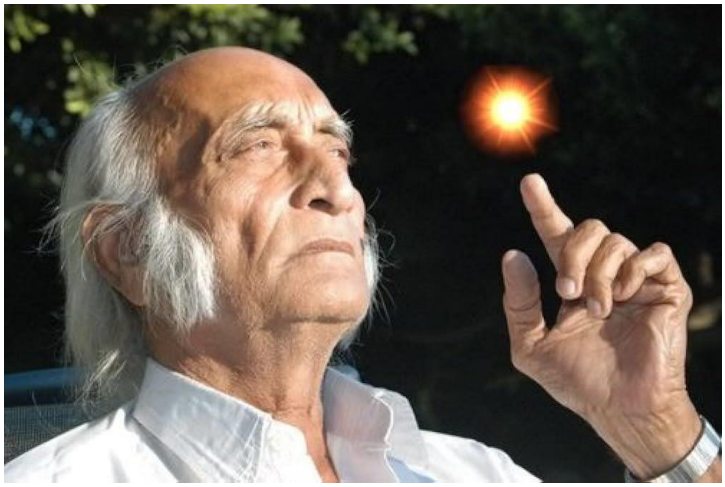
Methane with oxygen, says Sister Ma. G.

Methane with oxygen, of course. Well, no, the Sun doesn't need oxygen to produce its energy.

No, when you turn on the torch, Sister Ma. G. clarifies. You have to combine them.

Yes, but that's a chemical reaction. What happens in the Sun, in the center of a nuclear reaction, doesn't need oxygen, what it needs is a lot of energy, a lot of speed, for the particles to collide a lot against each other to balance the energy. Hydrogen combines with hydrogen and creates a helium atom, more energy, more photons; that's what they know how to do. And we know from laboratory measurements that it won't happen at less than twenty million degrees. What was the scientific, technological proof? The nuclear bombs of Hiroshima. Millions of degrees!

Master: —They dissolved everything, where the bomb fell there was nothing left.



Sister Ma. G.: You know that there is a scientist called Hira Ratán Manek. On one occasion I told you to look for him, with H, Hira Ratán Manek, from India. He is an engineer from India who comes to America. He is there for six months, and they almost have him as... inspecting him. And of course, he shares and wants the people who invite him to know how to feed themselves with sunlight, directly. He... We had him there in Mexico. I told you, right? So, he says that only by contemplating the Sun one hour after it rises over the horizon.

No, the first hour, an hour later no, during the first hour —corrects the Master.

[...] —says the astronomer.

No, no, no, no, we know that the horizon... at the horizon.

Ten minutes! —clarifies the astronomer...

He speaks of an hour, up to an hour, the first hour. The first hour after it rises over the horizon.

What does contemplating it mean? —questions the astronomer.

Contemplating it is seeing the Sun as I am seeing you, without being like that..., without it causing me heat...

When the Sun rises, it neither dazzles nor warms —comments the Master.

Astronomer: —It is true..., it is a dimmed light. As I was saying, it passes through a very thick layer of atmosphere but, but!..., that does not mean that the... The light is dimmed, the radiation is dimmed, the ultraviolet radiation is dimmed, but simply, it does not mean that the ultraviolet radiation does not enter your sight.

Sister Ma. G.: —Well, he says that we are human batteries and that through the rays that the Sun emits, and at that time... And the idea is to see it with bare feet on the ground, where it is not wet and there is no grass but to see it... He tells us that on a beach is better to see the Sun when it truly rises on the horizon, right?

Yes, I have seen it —the astronomer agrees.

So, we spend ten seconds watching the sunrise on the first day, then the next day it increases to twenty seconds, then thirty seconds, then forty seconds... When you get to fifteen minutes, that's three months; it's ten at a time.

Ah! I couldn't see it in the morning, but in the afternoon, an hour before it sets, you can also look at it, contemplate it, without thinking that... enlighten me, give me... nothing, just seeing it. He says that through the eyes, that is, the photons, as you say, the energy that comes out, at that time, that energy that doesn't harm, that doesn't heat, that are the... It doesn't have ultraviolet rays, it doesn't have infrared rays, all of that, you say, you can check it with a clock that they sell in the United States to be surer. But it doesn't have to be an hour.

How can one clock be different from another clock? —asks the astronomer skeptically.

Master: In that case, the human being awakens, similar to the chlorophyll function of plants, right?

Yes. —answers the astronomer.

One is nourished by the Sun. One can stop eating because one takes the energy directly, because what does one assimilate when eating? You eat a kilo of food a day and you don't gain a kilo of weight a day; you eat a kilo, you lose a kilo.

Of course —says the astronomer.

What do you assimilate? Milligrams of calcium, milligrams of this..., and we can absorb that directly by looking at the Sun.

Yes —says the astronomer.

When the Sun is red, the first hour after rising on the horizon.

Astronomer: —Well, I was applying one of your recipes that I learned here…

Which one? —asks the Master.

… which is to store water in a glass bottle, put it in the sun and drink it later.

He says, from when the Sun rises until it sets. Read it, because it gives you the...

But I don't advise you to look at the Sun directly, unless you can take a photo —says the astronomer.

It's that... Do you know what one looks at? It's the core, it's the soft core when they say it doesn't heat, that it doesn't emit rays…

Be careful, no.

... at that time, over the horizon no...

But, we have done it —comments the Master... and this doctor, the one from India, has been doing this for years, he hardly eats.

He doesn't eat, he doesn't eat —intervenes Sister Ma. G.

He drinks water, a little bit of water. Water yes, but he doesn't eat; and he's been doing this for years.

He's been doing this for many years, and he has traveled the world, he has taught the technique —says the Master.

One should observe him when no one is looking... Ha! —the astronomer comments skeptically. Ha, ha, ha! —the astronomer laughs.

No, he was with us for five days, like five days, right? Five days, which was how long the workshop lasted.

And he ate nothing but air? —asks the astronomer ironically.

No, nothing but water, water.

I'm going to give you his name so you can look him up —the Master tells him.

Sister Ma. G.: Look for him. There are also communities in Brazil where they say even dogs feed on sunlight. So, what happens, instead of ourselves feeding directly on sunlight, we take the food that already has…

Of course —says the astronomer.

… that energy or... right? Because they... they take the energy from the sun and the energy of the earth.

Yes— the astronomer nods condescendingly.

So they make like the ideal food for us, for one to live, but we can do without all that, if one gets used to it. And that is achieved by doing it for up to forty-five minutes. He says that after three months all mental illnesses are cured.

After six months, all physical illnesses are cured; after nine months, all spiritual illnesses are cured and from then on, one's hunger goes away, no..., one no longer feels like eating.

No, traditional Chinese medicine says that fasting is a great medicine— the astronomer comments.

Yes, but fasting from time to time, but living without eating, as he tells us? [Hira Ratan].

No— the astronomer denies.

Ah! Well, we would like you to know it.

What is the Sun Gazing technique called?— asks the Master.

Sun Gazing.

Ah! sun gazing —the Master reaffirms.

Ah! sun gazing, yes —the astronomer repeats.

Sun gazing, with a z. Look it up, but from Hira Ratan Manek. There are people who criticize him, but he is a scientist; he is a scientist that we, when we met him...

Yes, he is not religious, he is not religious, a Swami —the Master comments.

No, he is a scientist.

He is a naval engineer —the Master adds.

Oh, really? —the astronomer exclaims.

He worked in [...] a...

Well, I will look him up—the astronomer says.

How long have we known him? About twenty years or so.

Is he still alive? —the astronomer asks.

I think so. I think so because... Well, he explained all that to us...

Of course, it's not easy to see the Sun rising from the horizon, especially since you live with mountains everywhere, right? But he says, you have to look for that place.

The Sun rises at eight in the morning, at that hour, it is already impossible—the astronomer interrupts.

Aha, but at what time does it rise from the horizon in Mérida? At six, five thirty?

Around six, six fifteen... —the Master comments.

Well, yes, at six, six fifty —the astronomer affirms.

So, we can't see it here anymore.

At six fifty, but it's behind the mountains —the astronomer confirms—.

Aha, so, when it gets here, at eight, we can't see it anymore.

No, of course not —the astronomer replies emphatically.

It has to rise like that [above the horizon], then, yes...

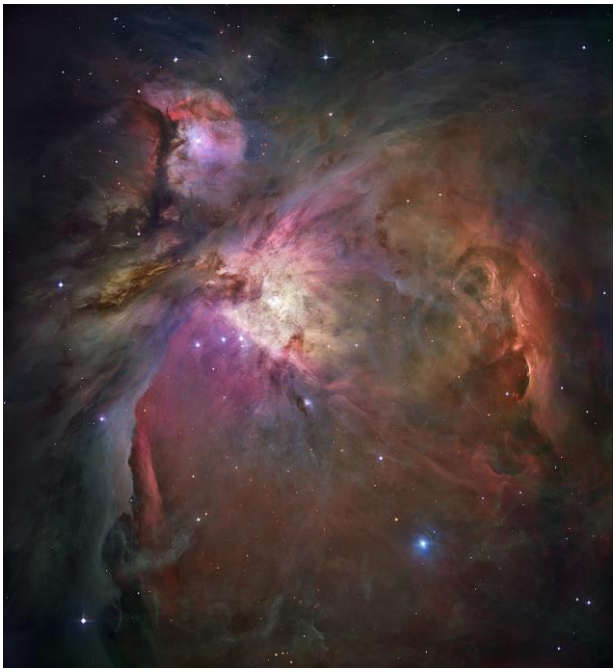
Yes, Margarita, for example, I have taken photos, videos and I have contemplated the sunset, for example —the astronomer comments...

Yes, Margarita.

Even, to be enraptured by the contemplation of the Sun —the astronomer adds...

But remember that the contemplation is "one hour after" [during the course of an hour] of it rising from the horizon, no more, that is, not before, and it is only forty-five minutes that one can reach it. But don't believe us, read it, and you can communicate with it.

Translation from Carl Sagan's voice: "These three bright stars are considered by mortals to be the belt of the well-known constellation of Orion, 'The Huntress'.



From Earth, the central star of Orion's sword appears nebulous as a patch of light. However, it is not a star, it is something completely different, a cloud that covers one of the secret places of nature.

This is a nursery of stars, the place where stars are born. Because of gravity, gas and dust condense until they reach a temperature so high that they make them shine.

These clouds mark the birth of stars, while others witness their death. After stars condense in the hidden interiors of interstellar clouds, what happens to them?

The Pleiades are a loose group of young stars that are only fifty million years old. These young stars are loose in the galaxy still surrounded by pieces of nebula from the gas and dust that form them.

There are clouds hanging like ink blots between the stars, made of very fine dust, organic matter and ice. Some stars are starting to light up inside, nearby ice worlds are evaporating and forming long tails like comets, carried by the stellar winds. They are full of organic molecules. The molds of life are everywhere, they are easily made. In how many worlds have these complex molecules come together to form patterns that we would call life?

Most stars belong to systems of two or three or many suns linked by gravity. Each system is separated from the others by a distance of light years. We are approaching an ordinary yellow dwarf star that is surrounded by a system of nine planets, dozens of moons, thousands of asteroids and billions of comets - the family of our Sun.

Only four light hours from Earth lie the planet Neptune and its giant satellite Triton. They are still shrouded in deep mystery. Although they are on the outskirts of our own Solar System, humans have only just begun our explorations.

Only a century ago we were still unaware of the existence of the planet Pluto; its moon Charon was not discovered until 1978. The rings of Uranus were first detected in 1977. Even so close to Earth, there are new worlds to include in our maps. Saturn is a gigantic world of gas; if it has a solid surface, it must be far below the clouds we see. Saturn's majestic rings are made up of hundreds of millions of billions of ice particles that surround it. We are now only eighty light minutes from Earth, one and a half billion kilometers away.

The largest planet in our solar system is Jupiter, and its dark side is illuminated by fantastic rays of light, as the Voyager spacecraft discovered in 1979. Within Jupiter's orbit lie countless fragments of tiny worlds; asteroids, reefs, and barriers mark the border of the realm of the larger planets.

Now we enter the shallow waters of the Solar System. Here we find worlds with light atmospheres and solid surfaces, Earth-like planets that beg to be explored; this world is Mars. In 1976, after a year of travel, two robot explorers from Earth landed on this foreign shore. On Mars there is a volcano as wide as all of Arizona, and almost three times higher than Everest, it has been called Mount Olympus; it is a world of wonders.

Mars is a planet with ancient valleys and violent sandstorms carried by winds blowing at half the speed of sound. On its surface there is a giant crack five thousand km long, called the 'Valis Marineris', a valley in which the Mariner spacecraft landed when it went to explore Mars from a nearby world.

With this cosmic journey we have begun our exploration of Mars and all the other planets, stars and galaxies. On future trips we will explore them more closely.

For the few light minutes left to us, we will travel to a blue, cloudy world, the third, is the Sun; the end of our long journey will be the world we started from. Our travels allow us to see the Earth in a new way as if we were coming from somewhere else. There are hundreds of millions of galaxies and a billion, billion stars. Why should this modest planet be the only inhabited world? I think it is much more likely that the Cosmos is teeming with life and intelligence, yet until now, every living thing, every intelligent being, every civilization we know of has existed there on Earth. Beneath these clouds the drama of the human species has unfolded; we have finally arrived home.

'Welcome to planet Earth, a place of blue skies, oceans of liquid water, cool forests, and soft grasslands; a world that certainly breathes life.'

From a cosmic perspective it is so far unique. It is the only world in which we know for certain that the matter of the Cosmos has come to life and knowledge. There must be many worlds [...] scattered in space but our search begins here, with the accumulated wisdom of men and women of our species acquired at great cost over more than a million years.

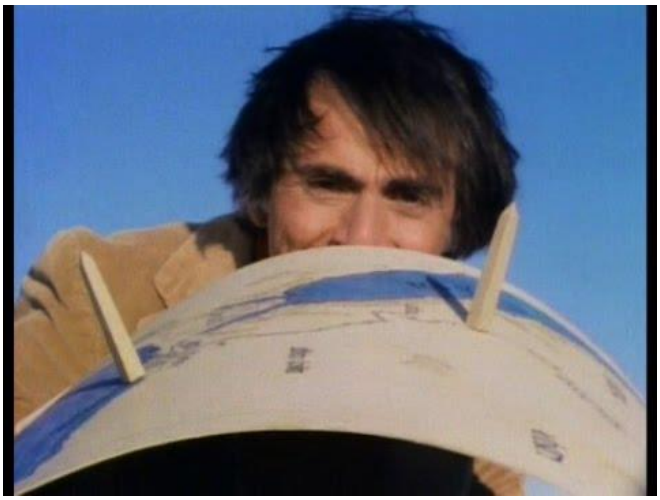
There was a time when our small planet seemed immense, when it was the only world we could explore. Its true size was first calculated in a simple and ingenious way, by a man who lived here in Egypt, in the third century BC.

This tower may have been a communications tower, part of a network extended along the North African coast, which was used to exchange signals. It may also have been used as a lighthouse for ships sailing in the Mediterranean. It is located about fifty kilometers west of what was once one of the largest cities in the world; Alexandria. At that time, there lived in Alexandria a man named Eratosthenes. One of his envious contemporaries called him Beta, the second letter of the Greek alphabet, because he said that Eratosthenes was second in the world in everything.

However, it seems evident that in many fields Eratosthenes was Alpha; he was an astronomer, historian, geographer, philosopher, poet, theatre critic, and mathematician. He was also director of the great library of Alexandria, and one day, while reading a papyrus in the library, he came across a curious legend: to the south, on the border of Sain, something very remarkable could be observed on the longest day of the year. On June 21, the shadows produced by the columns of a temple, or a vertical pole became smaller as noon approached, and as the hours passed, approaching 12, the sun's rays slipped into a deep well that on other days remained in shadow.

At exactly 12 o'clock, the pillars cast no shadow, and the sun shone directly on the water in the well. At that moment, the sun was exactly overhead. It was an observation that no one else would have paid attention to; stakes, shadows, reflections of light in wells, the position of the sun, these were everyday matters, what could they matter? However, Eratosthenes was a scientist, and his study of these everyday matters changed the world, in a way, made the world! Because Eratosthenes had the presence of mind to experiment, to ask himself if here near Alexandria a stake would cast a shadow at noon on June 21. And it turned out that it did.

Some very skeptical people would say that Sain's report was wrong, but it was an accurate observation. Why would anyone lie about a subject like this? Eratosthenes wondered how it was possible that at the same moment a stake in Sain gave no shadow and a stake in Alexandria, which was 800 km to the north, gave a very defined shadow.



Here we have a map of Ancient Egypt. I have placed two obelisks, one here in Alexandria and one in Sain. If at a given moment neither of them gave a shadow, no shadow, it would be perfectly understandable as long as the Earth was flat. If the extension of the shadow of Sain is the same as that of Alexandria, it would also make sense on a flat Earth. But how is this possible? Eratosthenes wondered, if at the same instant there was no shadow in Sain and yet there was one in Alexandria? The only answer was that the surface of the Earth was curved. Not only this, but the greater the curvature, the greater the difference in the size of the shadows.

The Sun is so far away that its rays become parallel when they reach the Earth. Obelisks placed at different angles to the sun's rays will cast shadows of different sizes. Based on the observed difference in shadow size, the distance between Alexandria and Siena would have to be an arc of 7°. Based on this, if you can imagine, these stakes reaching to the center of the Earth would intersect at an angle of about 7°. These 7° are roughly the 50th part of a full 360° circumference of the Earth. Eratosthenes knew the distance between Alexandria and Siena. He knew it was 800 km. Why? Because he hired a man to measure the distance, so that he could do the calculation I'm talking about.

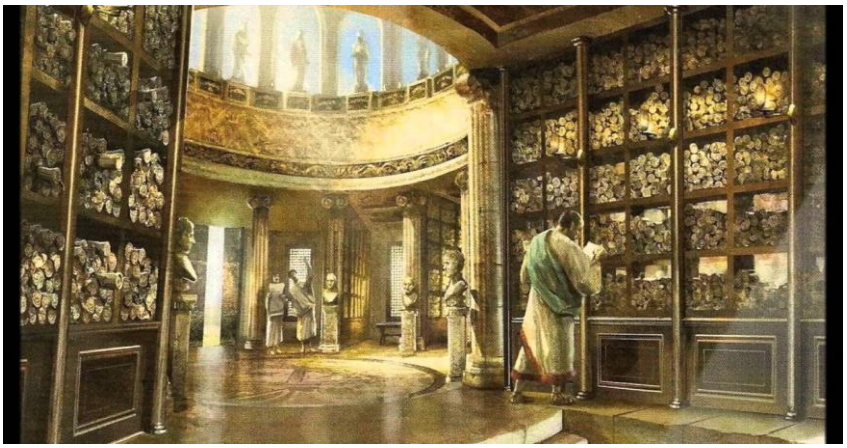
Now, 800 km x 50 = 40,000 km and that must be the circumference of the Earth; that's the distance you have to travel to go around the Earth; and that's the correct answer. Eratosthenes had no tools other than sticks, eyes, fee,t and a head, and a great desire to experiment. With these tools he correctly deduced the circumference of the Earth with enormous precision and a minimum percentage of error. His calculation was quite good considering that he did it 2,200 years ago!

Then as now, the Mediterranean was teeming with merchant ships, fishing vessels and naval fleets, but voyages into the unknown were also made. Four hundred years before Eratosthenes, Africa was being circumnavigated by a Phoenician fleet under the command of the Egyptian Pharaoh Necho. They probably set sail from the Red Sea in ships as fragile and open as these, heading for the east coast of Africa. Then they continued north along the Atlantic and back via the Mediterranean. This epic journey lasted three years, the same time it took Voyager to go from Earth to Saturn. After Eratosthenes, perhaps some attempted to circumnavigate the Earth, but none succeeded until the times of Magellan and Elcano.

How many adventure stories must have been told for sailors and navigators, the practical men of the world, to risk their lives for the theories of a scientist from ancient Alexandria. Today Alexandria shows few traces of its former glory, of the days when Eratosthenes strolled its wide avenues. Over the centuries, waves of conquerors converted its palaces and temples into castles and churches, which later became minarets and mosques. The city was chosen by Alexander the Great as the capital of the empire, one winter evening in 333 BC. A century later it had become the largest city in the world, each successive civilization having left its mark.

What remains now of the marble city of Alexander's dream? Alexandria is still a thriving market, a crossroads for the people of the Near East. Once it was radiant with self-assurance, secure in its power! Yet how can a bygone era be recalled through a few broken statues and scattered fragments of ancient manuscripts? In Alexandria there was a vast library and research institute where the greatest minds of the ancient world worked.

All that has survived from that legendary library is this damp, forgotten basement, which is in the library's annex, the Serapeum, which was once a temple and then rededicated to science. These few moldy shelves that probably stored books are the only physical remains. Nevertheless, this place was once the brain and glory of the greatest city on planet Earth. If I could go back in time, this is the place I would visit: the Library of Alexandria at its peak, two thousand years ago.



Here, the intellectual adventure that has led us into space really began. All the science of the ancient world was confined within these marble walls. In the main hall there must have been a mural of Alexander with his scepter, his whip, and the ceremonial cloak of the pharaohs of ancient Egypt. This library was the citadel of human knowledge, the beacon of our journey to the stars. It was the world's first real research institute. And what did they study? They studied everything, the entire Cosmos. Cosmos is a Greek word meaning 'order of the Universe', in some ways it is the opposite of Chaos; it implies a deep interconnection between all things, the complex and subtle way in which the Universe is made.

Genius flourished here. Besides Eratosthenes there was the astronomer Hipparchus, who made a map of the constellations and measured the brightness of the stars. And there was Euclid, who brilliantly systematized geometry and told his king, who was struggling with a difficult math problem, that there was no royal road to geometry. There was Dionysius of Thrace, the man who defined the parts of speech: nouns, verbs, and so on. In some ways he did what Euclid did with geometry; there was Herophilus, a physiologist who identified the brain rather than the heart as the seat of Intelligence.

We have Archimedes, the great genius of mechanics until the time of Leonardo da Vinci, and the astronomer Ptolemy who compiled much of what is today the false science of astrology. His theory that the Earth was the center of the Universe was in force for fifteen hundred years, thus proving to us that intellectual brilliance is compatible with being absolutely wrong.

Among these great men there was a great woman, her name was Hypatia, a mathematician and astronomer. She was the last light of the library, and her martyrdom is linked to the destruction of this place, seven centuries after it was founded.

Look carefully at this place. The kings of Egypt who succeeded Alexander considered the advances of science, literature and medicine as the treasures of the empire. For centuries, they generously supported research and scholarship, a civilized attitude shared by few heads of state then as now. At the exit of this main hall there were ten large research laboratories, there were fountains and columns, botanical gardens, and even a zoo with animals from India and the Sahara. There was an anatomy laboratory and an astronomical observatory.

But the treasure of the library consecrated to the God Serapis and built in the city of Alexandria was its collection of books. The organizers of the library searched for books from all cultures and languages of the world, they sent emissaries abroad to buy entire libraries. The commercial ships that docked in the port of Alexandria were searched by the police who were not looking for contraband but books. The scrolls of parchment were borrowed to be copied and then returned to their owners. These scrolls were placed in large piles and were called books from the ships.

Although it is difficult to make an exact calculation, it seems that the library had about a million scrolls at its peak.

And the papyrus reed that grows in Egypt is the origin of our word paper, and every one of the millions of volumes that once existed in this library were handwritten on papyrus scrolls. What has become of all these books? The same civilization that created them disintegrated them. The library was destroyed, only a small part of the works was saved and of the rest we have only sad, loose fragments left to torment us. For example, we know that there once existed a book here written by the astronomer Aristarchus of Samos, which defended the theory that the Earth was just another planet that revolved around the Sun and that the stars were enormously far away. His theory was correct, but we had to wait almost two thousand years for it to be rediscovered.

Astronomy was abundant in the library of Alexandria; Hipparchus, Ptolemy... And here we have Aristarchus, here is his book, how I wish I could read this book, know how Aristarchus did his calculations. But it has disappeared forever and if we multiply our sense of the loss of this work of Aristarchus by a hundred thousand, we can begin to appreciate the greatness of the achievement of classical civilization and the tragedy of its destruction. We have certainly made great strides in the field of science relative to what was known in ancient times, but there are irreparable gaps in our historical knowledge.

Imagine how many mysteries of the past could be solved with a reader's card for this library. We know, for example, that there was a three-volume history of the world, now lost, written by a Babylonian priest named Berosus. The first volume covering the period from the creation of the world to the Great Flood, a period which he said lasted 432,000 years, or about a hundred times longer than the chronology of the Old Testament. How many wonders must have been in Berosus' books. The reason they were taken back two thousand years to the library of Alexandria is because it was there that knowledge of the world began to be collected in a serious and systematic way.

This is the Earth that Eratosthenes knew, a small spherical world floating in the immensity of space and time. We were finally beginning to understand our true relationship to the Cosmos. The scientists of antiquity took the first steps in that direction before their civilization collapsed. After the age of superstition and ignorance, there was a general rediscovery of the works these sages had done here, which gave rise to the Renaissance, which was naturally a powerful influence on our culture. When Europe was finally ready to wake up from its long sleep in the 15th century, it turned to some of the instruments, books, and concepts that had existed here more than a thousand years before.

Around 1600, the long-forgotten ideas of Aristarchus were rediscovered. Johannes Kepler built elaborate models to understand the movement and arrangement of the planets, the movement of the clock in the heavens. And at night he dreamed of travelling to the moon. His main tools were the mathematics of the library of Alexandria and a faithful respect for the facts, however disturbing they were. His story and that of the scientists who followed him are also part of our journey.

Seventy years later, the sun-centered universe of Aristarchus and Copernicus was widely accepted in Renaissance Europe. The idea that the planets were governed by the laws of nature was born, and scientific interest turned to the motion of the stars. Accurate timekeeping allowed great voyages of exploration to be made by sailing ships that circled the Earth. This was a time when individual inquiry was once again valued. And 250 years later, the Earth had been fully explored, and new adventurers now turned their attention to the planets and stars. Galaxies were recognized as vast clusters of stars, islands of universes millions of light years away.

Around 1920, astronomers began measuring the speed of distant galaxies. They discovered that galaxies were moving away from each other. To everyone's amazement, the entire Universe was expanding. Humans had begun to probe the true depths of time and space. After centuries of research, scientists have revealed that the Universe has been around for about 15 billion years, which was the big moment of the gigantic explosion that gave birth to the Cosmos. The cosmic calendar summarizes the history of the Universe in one year. If the Universe began on January 1, the Milky Way did not form until May. In June, July and August other planetary systems should appear, but our Sun and Earth would not appear until mid-September; life would be born shortly after.

Everything we humans have done happened in that bright spot at the bottom right of the cosmic calendar. The gigantic explosion is at the top left, in the first second of January 1. Our present time is 15 billion years later at the last second of December 31st. Each month is 1.25 billion years old, and each day is 40 million years old, each second is about 500 years of our history – the blink of an eye in the panorama of cosmic time. On this scale, the cosmic calendar is the size of a football field, and the entire history of humanity would occupy an area the size of my hand.

We are just beginning to reconstruct the long and winding path that began with the primeval fireball and led to the condensation of matter, gas, dust, stars, galaxies and, at least in our little corner of the universe, planets and life, intelligence, and men and women researchers. Our appearance has been so recent that the events of our history occupy only the last minute of December 31st. However, some crucial events for the human species began much earlier – a few minutes earlier. So, we change our scale from months to minutes.

Here below, the first human beings made their debut at about 10:30 on the evening of December 31st, and with the passing of each cosmic minute, each minute of 30,000 years, we begin the arduous journey toward understanding where we live and who we are. It is 11:46, only fourteen minutes ago, human beings have mastered fire. At 11:59:20, it is the evening of the last day of the cosmic year, the 11th hour, the 59th minute, and the 20th second. The exploitation of plants and animals begins: the application of human talent to make tools. It is 11:59:35, agricultural communities migrate to the big cities. The appearance of human beings in the cosmic calendar is so recent that our history occupies only the last seconds of the last minute of December 31st.

In the vast ocean of time that this calendar represents, all our memories are confined to this small square. Every person we have any reference of who lived somewhere in this square. All those kings and battles, migrations and inventions, wars and loves, everything contained in the history books happened here in the last ten seconds of the cosmic calendar.

We humans have just awakened to this vast ocean of space and time from which we have emerged. We are the legacy of 15 billion years of cosmic evolution; we have no choice. We can enhance life and discover the universe that created us, or we can waste our 15 billion years of heritage in senseless self-destruction. What happens in the first second of the next cosmic year will depend on what we do with our intelligence and our knowledge of the Cosmos.