

Text english: Out There

Code: Male Female

00:28

For thousands of years, mankind thought that this was the centre of the Universe.

00:42

But with the emergence of science and the cultural acceptance of its achievements we realised our error, and corrected our picture of the Universe.

1.12

Since then, science has taught us an astonishing amount about our cosmos.

We now know for example, that the Sun is no more the centre of the Universe than we are. It is just an ordinary star, similar to many others, with no particularly outstanding qualities.

1.46

But even before we knew that, people were beginning to question whether we are alone in the Universe, or if there is indeed anyone else out there. It's possible that someone or something is, at this very moment, looking in our direction and asking the very same question.

2.07

Our Sun, the Solar System, and all the stars we see at night are part of the Milky Way — our home galaxy. It consists of several hundred billion stars.

2.19

But even this gigantic star system is not the centre of the Universe.

2.27

The Milky Way is only one of several hundred billion galaxies, each one containing several hundred billion stars of its own

2.38

In its infinite nature, the Universe must have had endless possibilities to create other places like Earth. It is not the question of whether life exists elsewhere, but where we will have to look, and how we will find it — out there.

Part 2 – 8' - Historical (13410 frames @ 30fps)

03.36

The earliest accounts that imagined the existence of life beyond Earth, or interplanetary travel, are almost as old as civilisation itself. Examples of this primitive science fiction have been found all over the world, in every major culture.

03.55

Lucian, *A True Story*, 2nd century AD.

3.58

“Once upon a time I gathered together the poorest people in my kingdom and undertook to plant a colony on the Morning Star, which was empty and uninhabited.”

04.10

It was mankind’s imagination that led to the pursuit of science. In turn, science only served to fuel more imagination.

04.21

The Man in the Moone, Francis Godwin, 1638.

04.25

“Some Hours after the Departure of that Devilish Company, my Gansas began to bestir themselves, still directing their Course toward the Globe or Body of the Moon, making their Way with such incredible Swiftness, that I conceive they advanced little less than fifty Leagues in an Hour.”

04.55

Ever since the dawn of civilisation, the night sky has inspired people to imagine strange other worlds and life forms that could exist out in space, telling enthralling stories and creating breathtaking art in the process.

05.05

Jules Verne, *Autour de la Lune*, 1877.

05.10

"Who says there are no Moon People?" cried Ardan fiercely, with fists clenched and brows contracted.

"I do!" cried Nicholl stoutly; "I deny the existence of anything of the kind, and I denounce every one that maintains any such whim as a visionary, if not a fool!"

(Ardan's reply to this taunt was a desperate fencer, which, however, Barbican managed to stop while on its way towards the Captain's nose.)"

05.27

With the growing acceptance of Darwin's theory of evolution, there came the realisation that extraterrestrial life forms did not necessarily have to share similarities with humans. They could be completely different creatures who have followed their own evolutionary path.

05.43

In the late 19th century, the Italian astronomer Giovanni Schiaparelli observed Mars through a telescope. He, and later the American Percival Lowell, described canals on the planet's surface, which, it was theorised, were built by intelligent beings.

It was at this point in history that astronomy began to be a common topic in fiction.

06.07

For decades after this, Martians became the focus of science fiction literature. In light of current events at the time, another frequent topic in literature was war.

06.27

In the 1920s, people could experience such imaginary worlds in a new and immersive way, in the form of an audio drama on the radio. In a famous example, one of those dramas was so captivating that it led to mass hysteria when people thought the events were actually happening.

06.40

Ladies and gentleman,

An invasion army from the planet Mars is marching towards our capital. A whole division of almost 9000 heavily armed soldiers was annihilated by a single Martian war machine. Some of the survivors reported a kind of flash emerging from the heads of those machines shooting on our brave men. Communication and traffic lines are widely interrupted. Truly, this seems to be a War of the Worlds.

07.16

With the rise of television and comic books, these enchanting and enthralling stories also made their way into mainstream culture.

07.40

Science would soon catch up with these fantastical stories, however, as the advancement of technology meant space probes could explore the Solar System and obtain detailed images of other planets and their moons.

07.59

Revealed by the images obtained during the first ever fly-by of Mars by Mariner 4 in 1965, the Red Planet is not suited to life as we know it. Schiaparelli's canals were mere optical illusions — in reality natural surface features in a dry and cold desert landscape.

08.52

Three years earlier, Mariner 2 made a fly-by of our other neighbour — Venus.

The images and data sent back to Earth indicated that this planet was also not the right environment for life as we know it.

09.12

Active volcanoes in the planet's past contributed to the thick clouds that make up the atmosphere today, and shaped the surface of the planet. A runaway greenhouse effect raised temperatures to the melting point of lead.

On the surface, the pressure is immense — the Soviet Venera Landers in the 1970s only survived for about an hour before they were crushed.

The image of a life-friendly sister planet to Earth soon vanished.

09.59

So, to keep telling stories, people had to open their minds further and use their imagination to conjure up ever more foreign and distant worlds.

Where will our imagination lead us this time? Will current science fiction soon become science fact?

10.55

In the late 1980s, with the advent of new technologies, scientists began to look for planets beyond our Solar System. In 1988, Canadian astronomers Bruce Campbell, Gordon Walker, and Stephenson Yang found hints of the existence of a planet in the Gamma Cephei star system.

11.19

As the data was at the very limit of instrumental capabilities at the time, the planet's existence was doubted. It was only years later, in 2003, that those doubts were quashed and their planet was confirmed.

11.37

The first planets outside our Solar System were found in 1992.

11.47

Using the Arecibo radio telescope, astronomers Aleksander Wolszczan and Dale Frail found two planets around a pulsar — a remnant of a large star — in the constellation of Virgo.

12.12

Three years later, a Swiss team led by Michel Mayor and Didier Queloz announced the discovery of the first planet around another Sun-like star. With newly developed detection methods, they pioneered the new field of so-called exoplanetary research.

12.36

They observed a star in the constellation of Pegasus and noticed small but periodic changes to its light. Something seemed to be tugging the star, causing it to move slightly.

13.00

The tiny repeated wobbles of the star can be inferred from tiny periodic changes seen in the colour of the light emitted by the star — an effect we were able to observe with our telescopes.

13.24

It turned out that this movement was actually caused by a planet — a foreign world in orbit around another star. The astronomers were able to determine a lot about it, even from the limited data available.

13.50

This planet is a gas giant, similar to Jupiter but about half its mass. Its orbit, however, is very close to its host star, which means the temperature of its atmosphere is over 1000°C, making life as we know it impossible there.

14.15

Since this first discovery, many more exoplanets, as they are known, have been found in our Milky Way.

14:25

For instance, ESO's 3.6-metre telescope at La Silla in Chile further perfected the detection methods and has to date discovered hundreds of planetary systems.

15.15

Some were detected as they passed in front of their star, blocking out some of the star's light and making it appear dimmer for a while.

16.02

Others were detected by their effect on their host star as they caused it to wobble.

16.41

With the world's most powerful observatories — such as ESO's Very Large Telescope (or VLT) in Chile, or the Hubble Space Telescope — some planets have even been seen directly — a feat thought impossible only 20 years earlier.

17.19

The Atacama Large Millimeter/submillimeter Array (ALMA), also in Chile, has allowed us to peer into a fledgling planetary system, which is still forming around a young star.

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Powerful devices in space like the Kepler Space Telescope are able to perform very precise measurements. They took the number of discovered exoplanetary systems to new heights.

18.16

We now know that planets in the Universe seem to be nothing out of the ordinary. Even around our closest stellar neighbour, Proxima Centauri, scientists have found a planet similar in size to Earth.

18.32

Scientists estimate that in our Universe there are at least the same number of planets as there are stars. It seems that, once again, science has caught up with fiction. But these discoveries have only fuelled our imagination — what kinds of different worlds will we find out there?

19.05

Newly built and highly specialised telescopes, such as the satellite CHEOPS, are taking a closer look at previously discovered exoplanetary systems. Such missions will help unlock some of the secrets that surround these very distant worlds. Our curiosity drives us to find out more about these systems: are they Earth-sized rocky planets or gas giants like Jupiter? Is the surface temperature just right for liquid water? Is it even possible that such a world could harbour life, perhaps just like what we see on Earth?

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CHEOPS is a joint project between the European Space Agency ESA and the Swiss Space Office.

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The mission itself is a cooperation between several Swiss universities, in collaboration with other European Science institutions. Operations are directed from the University of Bern, Switzerland.

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Preparations for such a mission take several years.

CHEOPS observes planets which transit their host star and cause the light from it to dim a little. The telescope and the scientific team then attempt to estimate the size of the planet — a tough job with the limited data available.

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The CHEOPS telescope is being tested thoroughly. Once launched into space, it will encounter a harsh and extreme environment where repairs will no longer be possible. Every screw and cable has to be firmly installed and scrutinised. Nothing must come loose during the bumpy launch at the tip of the rocket — an event which could prove fatal for the whole mission.

21.30

The control room for CHEOPS is at the University of Geneva, a world-leading institution for exoplanet research. From here, all the scientific work is coordinated and the telescope controlled.

21.45

Worldwide, many efforts are underway to answer one particular question: are life-friendly planets like our Earth common in the Universe?

22.00

Perhaps this question could even be answered by taking a closer look at our own Solar System. Some moons of Jupiter and Saturn are covered by an immense sheet of ice. Beneath, scientists suspect there are vast oceans of water, which could possibly support life.

22.20

NASA's Galileo probe took a closer look at Jupiter's moon, Europa. Deep cracks in the moon's ice sheet were observed, from which scientists later detected jets of emerging water.

22.33

There are ambitious plans to send a submarine to Europa to explore its subsurface ocean. Once again, something that would not long ago have been confined to science fiction is now becoming a reality.

22.50

Titan, the largest moon of the ring-planet Saturn, has an atmosphere and surface oceans consisting of fluid methane, a common organic gas here on Earth.

23.00

The ingredients for life are there — is it possible that we could witness its discovery on another world?

The American-European joint probe, Cassini, successfully deployed a small lander, called Huygens, which delivered more data about this interesting world, and even took images from the moon's surface.

23.27

As we continue to learn more about our own Solar System, we are beginning to realise the diversity of different worlds and life-forms that could exist in our cosmos.

23.45

On Mars, traces of water have finally been confirmed and we now know that vast oceans once covered the Red Planet. Many probes are keeping a keen eye on its surface, attempting to decipher more of its secrets. Even though Schiaparelli's canals were nothing more than hopeful imagination, our planetary neighbour is still the source of many exciting stories and scientific discoveries. At any rate, as it is the next target for manned missions, we will soon have human "Martians" walking on its surface.

24.28

It is possible that, in its past, the Red Planet was very similar to Earth.

24.37

Is it perhaps true that life in the Universe is the norm — and not the exception?

25.03

Our Universe is immensely large. We are only just beginning to discover its true diversity. There is still much to learn and many secrets to uncover.

25.28

Sometime in the future, it is likely that we will discover other worlds out there that are suitable for life as we know it.

25.43

Given our current technological limitations, paying a visit to those places is, for now, only possible in our imagination. But who can say, perhaps science fiction will once again become fact?

26.10

Up to now, we have only explored a very small fraction of the cosmos — the equivalent of our local neighbourhood.

What we have found just in this small corner of the galaxy has surpassed even the wildest expectations of scientists. How many of our galaxy's hundreds of billions of stars have planets? How many of those are habitable? How many could sustain life? Is it the same in the hundreds of billions of other galaxies in the Universe?

26.58

A new generation of telescopes, like CHEOPS and the European Space Agency's GAIA, the James Webb Space Telescope of NASA, ESA and CSA, or ESO's European Extremely Large Telescope in Chile, will help us find answers to these questions. In the near future, we will be able to detect and analyse the atmospheres of distant planets. This will be a big step forward in assessing whether these worlds could support life as we know it.

27.34

Our home planet, Earth, might not be at the centre of the Universe and doesn't reside in a special galaxy. Nor does it orbit a special star. As it turns out, it is only one among a proliferation of planets existing in each and every galaxy.

28.01

But for now, this is the only place in the incomprehensible vastness of the Universe where we do know that life can be sustained.

Trailer

35:10

For thousands of years, mankind thought that this was the centre of the Universe.

35:22

Thanks to our curiosity, imagination and urge to explore, we now know that planets like our Earth are nothing special in the cosmos. The Sun is just one ordinary star among hundreds of billions in our galaxy, the Milky Way.

35.51

With the world's most powerful telescopes, we are able to explore more and more of the Universe.

36.20

What we have found so far has surpassed even the wildest expectations of scientists as well as authors of science fiction. Most stars have planets — it turns out they are more common than we thought.

A huge diversity of different worlds is out there, just waiting to be discovered.

36:45

But, despite all these discoveries, one question remains unanswered: is there life out there?