

1

00:00:00,000 --> 00:00:29,000

The Earth, home to millions of species.

2

00:00:29,000 --> 00:00:43,000

But what might live beyond?

3

00:00:43,000 --> 00:00:51,000

Astronomers have discovered thousands of planets outside our solar system.

4

00:00:51,000 --> 00:00:57,000

They believe there are trillions more.

5

00:00:57,000 --> 00:01:16,000

If life exists on only a fraction of them, then the universe must be alive.

6

00:01:16,000 --> 00:01:22,000

They believe that all living things have the same needs.

7

00:01:22,000 --> 00:01:30,000

To feed.

8

00:01:30,000 --> 00:01:36,000

Reproduce.

9

00:01:36,000 --> 00:01:41,000

And evolve.

10

00:01:41,000 --> 00:01:48,000

By applying the laws of life on Earth to the rest of the universe,

11

00:01:48,000 --> 00:02:01,000

it's possible to imagine what could live on alien worlds.

12

00:02:12,000 --> 00:02:28,000

The Earth, home to millions of species.

13

00:02:28,000 --> 00:02:33,000

Being an astronomer, it's sort of like being a human conversation piece.

14

00:02:33,000 --> 00:02:37,000

There's two questions you always get. The first is what's inside a black hole.

15

00:02:37,000 --> 00:02:46,000

And the second, which is one people are really interested in, is what about life elsewhere in the universe?

16

00:02:46,000 --> 00:02:54,000

And then, you know, almost always we come down to this place.

17

00:03:07,000 --> 00:03:13,000

Area 51 is a secret U.S. Air Force base.

18

00:03:13,000 --> 00:03:24,000

Its existence was only officially recognized in 2013.

19

00:03:24,000 --> 00:03:27,000

So what really goes on back there?

20

00:03:27,000 --> 00:03:30,000

Well, nobody knows.

21

00:03:30,000 --> 00:03:32,000

Of course, some people think they know.

22

00:03:32,000 --> 00:03:39,000

The believers, the conspiracy theorists, they think that that's where all the alien bodies are.

23

00:03:39,000 --> 00:03:43,000

All the dead aliens in the crash spaceships are taken somewhere back there.

24

00:03:43,000 --> 00:03:49,000

And they're held in refrigerators or defructonators or whatever technology you need for an alien body.

25

00:03:49,000 --> 00:03:56,000

And, you know, that's essentially where all the secrets that we're not allowed to know about are being kept.

26

00:04:03,000 --> 00:04:12,000

This is footage supposedly showing an alien body being examined at Area 51.

27

00:04:16,000 --> 00:04:20,000

But the video is a hoax.

28

00:04:20,000 --> 00:04:26,000

Perpetuating the idea that aliens are among us.

29

00:04:33,000 --> 00:04:42,000

The reason why most UFO-ology sounds like a science fiction story is, it is a science fiction story.

30

00:04:42,000 --> 00:05:02,000

But, you know, in spite of the silliness of UFO-ology, I do believe that there is other life in the universe.

31

00:05:02,000 --> 00:05:09,000

And as a scientist, I'm taken to that belief because I really believe that's where the numbers now are leading us.

32

00:05:13,000 --> 00:05:24,000

A couple of years ago, a colleague and I tried to take all the amazing data that we now have.

33

00:05:24,000 --> 00:05:35,000

And we wrote down an equation that allowed us to calculate the total number of planets out there that might have civilizations on them.

34

00:05:35,000 --> 00:05:50,000

Essentially what we found was that there were 10 billion, trillion planets out there in the right place where life and possibly civilizations could form.

35

00:05:51,000 --> 00:06:00,000

Every one of those planets is essentially an experiment.

36

00:06:00,000 --> 00:06:07,000

And for none of them other than ours to turn out with this civilization, that's pushing it quite a bit.

37

00:06:08,000 --> 00:06:23,000

If aliens civilizations are statistically so likely, why haven't astronomers found any sign of them?

38

00:06:23,000 --> 00:06:28,000

Where is everyone?

39

00:06:28,000 --> 00:06:36,000

Think about it this way. Out there in the Pacific Ocean, there's 187 billion billion gallons of water.

40

00:06:36,000 --> 00:06:49,000

Now, if I take this bucket here and throw it over, and then haul up, see what's in it.

41

00:06:49,000 --> 00:06:56,000

Alrighty, what do we see? Nothing.

42

00:06:56,000 --> 00:07:01,000

Should I take the fact that I don't see any life in my bucket to tell me that there's no life in the Pacific Ocean?

43

00:07:01,000 --> 00:07:03,000

Well, that would be crazy, right?

44

00:07:03,000 --> 00:07:10,000

There's all kinds of life out there. There's sea otters and whales and octopuses and jellyfishes

and god only knows what's out there.

45

00:07:10,000 --> 00:07:14,000

They're just not in this bucket.

46

00:07:14,000 --> 00:07:22,000

That's why this is a perfect metaphor for the search for extraterrestrial intelligence.

47

00:07:22,000 --> 00:07:29,000

Every time we look at an individual star, that's like dropping a bucket in the ocean.

48

00:07:29,000 --> 00:07:40,000

We're going to have to look at a lot of stars, and we're going to have to search through a lot of data until we find the clue that leads us to another civilization.

49

00:07:40,000 --> 00:08:06,000

What sort of alien civilizations might exist in the vastness of space?

50

00:08:06,000 --> 00:08:14,000

Imagine a planet nine billion years old, twice as old as Earth.

51

00:08:14,000 --> 00:08:22,000

Old enough that a truly advanced intelligence could evolve.

52

00:08:22,000 --> 00:08:32,000

This is terror.

53

00:08:32,000 --> 00:08:36,000

It was once a fertile world.

54

00:08:36,000 --> 00:08:40,000

Now it is barren.

55

00:08:40,000 --> 00:08:58,000

But life can still thrive here in artificial zones.

56

00:08:58,000 --> 00:09:17,000

The aliens convert sunlight into glucose energy, which feeds the inhabitants of terror.

57

00:09:17,000 --> 00:09:25,000

Each box contains the brain matter of a super-intelligent being.

58

00:09:25,000 --> 00:09:31,000

In time, they've evolved not to need their bodies.

59

00:09:31,000 --> 00:09:39,000

They exist only as neural tissue.

60

00:09:39,000 --> 00:09:41,000

They never age.

61

00:09:41,000 --> 00:09:43,000

They never die.

62

00:09:43,000 --> 00:09:50,000

They're monitored and maintained by robots.

63

00:09:50,000 --> 00:09:54,000

Each is an individual.

64

00:09:54,000 --> 00:09:58,000

They're created to think as one.

65

00:09:58,000 --> 00:10:03,000

A hive mind.

66

00:10:03,000 --> 00:10:15,000

This is a hyper-advanced civilization.

67

00:10:15,000 --> 00:10:25,000

Humans are the only species to have created any form of civilization.

68

00:10:25,000 --> 00:10:38,000

Why haven't other intelligent creatures done the same thing?

69

00:10:38,000 --> 00:10:52,000

The octopus is as close to an alien intelligence as exists on our planet.

70

00:10:52,000 --> 00:10:57,000

Octopuses belong to a group called cephalopods.

71

00:10:57,000 --> 00:11:05,000

And they have evolved down a completely different pathway.

72

00:11:05,000 --> 00:11:10,000

The octopus has separate nervous systems in each of its arms.

73

00:11:10,000 --> 00:11:14,000

Each arm contains about 40 million neurons.

74

00:11:14,000 --> 00:11:18,000

Each arm can make independent decisions.

75

00:11:18,000 --> 00:11:26,000

The octopus can be said to have essentially nine separate brains.

76

00:11:26,000 --> 00:11:34,000

I kind of want to reach out and touch him.

77

00:11:34,000 --> 00:11:38,000

The octopus's brain and the human's brain are quite hard to get apart.

78

00:11:38,000 --> 00:11:44,000

But we're curious to see if he's going to be able to open them.

79

00:12:05,000 --> 00:12:11,000

Octopuses are clearly smart.

80

00:12:11,000 --> 00:12:18,000

But being smart isn't enough to form a civilization.

81

00:12:18,000 --> 00:12:31,000

The key is cooperation.

82

00:12:31,000 --> 00:12:34,000

Sharing ideas.

83

00:12:34,000 --> 00:12:45,000

Passing down knowledge from one generation to the next.

84

00:12:45,000 --> 00:12:48,000

Our culture is constantly improving.

85

00:12:48,000 --> 00:12:56,000

We keep building on each other's inventions.

86

00:12:56,000 --> 00:13:00,000

Alright.

87

00:13:00,000 --> 00:13:03,000

Take this taxi for example.

88

00:13:03,000 --> 00:13:07,000

Wheels were invented more than five and a half thousand years ago.

89

00:13:07,000 --> 00:13:12,000

Iron has been smelted more than four and a half thousand years ago.

90

00:13:12,000 --> 00:13:19,000

Vulcanized rubber has been used for tires since about 180 years.

91

00:13:19,000 --> 00:13:27,000

So all of these inventions were necessary to actually build something as complicated as this car.

92

00:13:27,000 --> 00:13:33,000

An octopus by comparison has to pretty much figure out everything for himself.

93

00:13:33,000 --> 00:13:38,000

There is no improving and building on previous solutions.

94

00:13:38,000 --> 00:13:45,000

And that's pretty limiting even if you have nine brains.

95

00:13:45,000 --> 00:13:56,000

Civilizations are like living organisms with millions of connected parts.

96

00:13:56,000 --> 00:14:03,000

It's this connectivity that allows them to grow.

97

00:14:09,000 --> 00:14:19,000

But the civilization on terror is in peril.

98

00:14:19,000 --> 00:14:28,000

Its star is double the age of our own sun.

99

00:14:28,000 --> 00:14:37,000

And as stars get older they burn bigger and brighter.

100

00:14:37,000 --> 00:14:49,000

Eventually the planet terror will be incinerated.

101

00:14:49,000 --> 00:14:56,000

So an escape plan is underway.

102

00:14:56,000 --> 00:15:03,000

To colonize another planet in the same solar system.

103

00:15:03,000 --> 00:15:13,000

Further from the star than terror.

104

00:15:13,000 --> 00:15:20,000

There's ice on this world but no atmosphere.

105

00:15:20,000 --> 00:15:34,000

It needs to be manufactured.

106

00:15:34,000 --> 00:15:42,000

This is engineering on a planetary scale.

107

00:15:42,000 --> 00:15:53,000

Giant machines melt the ice caps to release vapor and gas.

108

00:15:53,000 --> 00:16:01,000

Generating enough atmosphere to warm the planet.

109

00:16:01,000 --> 00:16:08,000

Such a massive project requires a massive amount of energy.

110

00:16:08,000 --> 00:16:24,000

Delivered directly from the aging star.

111

00:16:24,000 --> 00:16:45,000

The ability to harness energy is the bedrock of civilization itself.

112

00:16:45,000 --> 00:16:49,000

Part of what I do is to try and predict the future.

113

00:16:49,000 --> 00:16:54,000

And you can look back in history and get a lot of ideas from there.

114

00:16:54,000 --> 00:17:00,000

But there are underlying trends that we can use to some extent to see what's to come.

115

00:17:00,000 --> 00:17:04,000

Like life expectancy, wealth, population size.

116

00:17:04,000 --> 00:17:11,000

And one of the most revealing is the amount of energy that civilizations use.

117

00:17:11,000 --> 00:17:20,000

The more energy a civilization can access, the more powerful it becomes.

118

00:17:20,000 --> 00:17:24,000

That's the secret of progress.

119

00:17:24,000 --> 00:17:39,000

From the stone age until today.

120

00:17:39,000 --> 00:17:46,000

So unleashing the heat and energy in charcoal allowed us to get temperatures hot enough to smelt metals.

121

00:17:46,000 --> 00:17:52,000

To make tools and weapons.

122

00:17:52,000 --> 00:17:57,000

Later on of course we harnessed fossil fuels like coal, gas.

123

00:17:57,000 --> 00:18:08,000

Allowing the creation of vehicles that could hurtle us across the world at much higher speed than we ever had before.

124

00:18:08,000 --> 00:18:37,000

But the greatest source of energy is of course our star.

125

00:18:37,000 --> 00:18:48,000

The newer power station is the largest solar complex of its kind in the world.

126

00:18:48,000 --> 00:19:01,000

Half a million mirrors at the edge of the Sahara Desert.

127

00:19:01,000 --> 00:19:17,000

The suns over here are heliostats and they track the sun as it moves through the sky and focus all its energy down on that tower.

128

00:19:17,000 --> 00:19:25,000

And that energy goes out into the world and powers modern civilization.

129

00:19:25,000 --> 00:19:33,000

So the power of our transport, our lighting, our agriculture, very relevant for here, air conditioning.

130

00:19:33,000 --> 00:19:50,000

Basically everything that keeps us safe, working and entertained comes from electricity and more and more of that electricity is coming from solar power plants like this.

131

00:19:50,000 --> 00:19:58,000

Humans use only a tiny fraction of all the energy available from the sun.

132

00:19:58,000 --> 00:20:05,000

So 430 quintillion joules of the sun's energy fall on the earth every hour.

133

00:20:05,000 --> 00:20:11,000

For comparison that's very roughly 2000 Hiroshima bombs every second.

134

00:20:11,000 --> 00:20:21,000

How much do we use? Well humanity uses 410 quintillion joules in a year.

135

00:20:21,000 --> 00:20:28,000

So in a year we fail to use all the energy the sun sends us in a single hour.

136

00:20:28,000 --> 00:20:35,000

Imagine if we could capture all that energy and use it to power our civilization.

137

00:20:35,000 --> 00:20:44,000

What miracles could we accomplish? What places could we explore with all that?

138

00:20:44,000 --> 00:21:03,000

According to astrophysicists any truly advanced civilization will be able to harness all its energy directly from the stars.

139

00:21:03,000 --> 00:21:14,000

By this measure the civilization on terra is supremely advanced.

140

00:21:14,000 --> 00:21:25,000

It has built solar panels in space near to its star for maximum effect.

141

00:21:34,000 --> 00:21:52,000

But as the star becomes bigger and brighter it also becomes more volatile.

142

00:21:52,000 --> 00:21:58,000

A solar flare.

143

00:22:03,000 --> 00:22:18,000

Sooner or later this will be the destiny of terror itself.

144

00:22:18,000 --> 00:22:28,000

To be swept away by the power of its sun.

145

00:22:28,000 --> 00:22:39,000

The solution is to colonize the new planet as quickly as possible.

146

00:22:39,000 --> 00:22:51,000

There are no life forms here. All the work is done by machines.

147

00:22:51,000 --> 00:22:59,000

They are able to think for themselves and make their own decisions.

148

00:22:59,000 --> 00:23:11,000

They are artificially intelligent.

149

00:23:11,000 --> 00:23:20,000

If humans are to form colonies in space the groundwork will be done in the same way.

150

00:23:20,000 --> 00:23:26,000

Using robots.

151

00:23:26,000 --> 00:23:34,000

And those robots will be designed by people like Philip Metzger.

152

00:23:34,000 --> 00:23:40,000

He has spent his whole life in and around the space program.

153

00:23:40,000 --> 00:23:49,000

My father used to work in this building. He helped build the Saturn V rockets that were large

enough to take humans to the moon.

154

00:23:49,000 --> 00:23:55,000

I'm Paul Lerner. This is the launch operation as manager. The launch team wishes you a good luck and godspeed.

155

00:23:55,000 --> 00:24:03,000

Thank you very much. You know it will be a good one.

156

00:24:03,000 --> 00:24:09,000

I'll never forget the Apollo 11 flight.

157

00:24:09,000 --> 00:24:16,000

I was seven years old. I was across the river during the launch watching it.

158

00:24:16,000 --> 00:24:21,000

There were helicopters flying around. People who come from all over the world.

159

00:24:21,000 --> 00:24:26,000

Coming to watch the moon launch. It was electric.

160

00:24:26,000 --> 00:24:31,000

Astronauts reported feels good. 20 seconds in counting.

161

00:24:31,000 --> 00:24:35,000

T minus 15 seconds. Guidance is internal.

162

00:24:35,000 --> 00:24:41,000

12, 11, 10, 9. Ignition sequence start.

163

00:24:41,000 --> 00:24:50,000

6, 5, 4, 3, 2, 1, go.

164

00:24:50,000 --> 00:25:01,000

Lift off. We have a lift off.

165

00:25:01,000 --> 00:25:11,000

As it climbed into the sky you can see that long beautiful flame shimmering across the water.

166

00:25:11,000 --> 00:25:18,000

We got scared Sam. I grew a weak and farmed skirt, Sam.

167

00:25:18,000 --> 00:25:30,000

So I grew up wanting to be a rocket scientist my entire life.

168

00:25:32,000 --> 00:25:39,000

Philip became a NASA scientist.

169

00:25:39,000 --> 00:25:48,000

But rather than sticking at rocket design, he moved into robotics.

170

00:25:48,000 --> 00:25:57,000

If we ever really want to do anything fabulous in space, we need robots.

171

00:26:02,000 --> 00:26:11,000

Razor is designed to work in tough planetary environments.

172

00:26:11,000 --> 00:26:19,000

It can climb over rocks. If it gets stuck, it can get itself unstuck.

173

00:26:19,000 --> 00:26:24,000

If it flips upside down, it can flip itself over.

174

00:26:24,000 --> 00:26:29,000

In any situation it can get itself out of trouble.

175

00:26:29,000 --> 00:26:38,000

The simplest thing that we can mine on a planet is the regolith, the dirt that covers the planetary surface.

176

00:26:38,000 --> 00:26:42,000

You can extract metal from the regolith.

177

00:26:42,000 --> 00:26:48,000

You can also make ceramics that are used for insulating electrical systems.

178

00:26:48,000 --> 00:26:53,000

And you can make rocket fuel.

179

00:26:53,000 --> 00:26:58,000

But mining does take intelligence.

180

00:26:58,000 --> 00:27:01,000

You have to know where to drive, where to cut.

181

00:27:01,000 --> 00:27:04,000

You've got to keep from getting lost, get yourself unstuck.

182

00:27:04,000 --> 00:27:12,000

So it's going to take a clever machine like Razor to be able to start industry in space.

183

00:27:12,000 --> 00:27:17,000

The holy grail of robotics is self-replication.

184

00:27:17,000 --> 00:27:23,000

A machine that can make copies of itself.

185

00:27:23,000 --> 00:27:34,000

This is a spare wheel for Razor, a robot part made by a robot for another robot using space materials.

186

00:27:34,000 --> 00:27:45,000

But this is an early example of how we're evolving the robots toward a fully closed ecology of robots that can self-reproduce in space.

187

00:27:46,000 --> 00:27:52,000

Once you've got self-reproducing robots, everywhere is a place you can go.

188

00:27:52,000 --> 00:27:58,000

I don't think there are any limits.

189

00:27:58,000 --> 00:28:24,000

Without input from any life form, the robots are re-engineering a planet, making it ready for colonization.

190

00:28:28,000 --> 00:28:38,000

Now it's time to abandon terror.

191

00:28:38,000 --> 00:28:44,000

Each of the domes has been designed for this moment.

192

00:28:44,000 --> 00:28:49,000

To get into orbit.

193

00:28:50,000 --> 00:28:58,000

From here, they will travel to their new home.

194

00:29:12,000 --> 00:29:17,000

The domes have their own life support systems.

195

00:29:17,000 --> 00:29:25,000

But they're helpless against a high energy burst of solar radiation.

196

00:29:48,000 --> 00:29:55,000

Nothing is evolved to survive in the vacuum of space.

197

00:29:59,000 --> 00:30:06,000

This is as true for aliens as it is for humans.

198

00:30:07,000 --> 00:30:16,000

Michael Foll knows all about the dangers of space travel.

199

00:30:16,000 --> 00:30:26,000

In 1997, he was a guest American astronaut on the Russian Mir space station.

200

00:30:27,000 --> 00:30:34,000

During the first collision in space.

201

00:30:34,000 --> 00:30:45,000

There was an attempt by the Russian commander, Vasiliy Yemtis Krumev, to control a cargo ship that weighs 7 tons.

202

00:30:45,000 --> 00:30:50,000

And dock it without the radar, without speed, without distance measurements.

203

00:30:50,000 --> 00:30:57,000

And dock it to our space station.

204

00:31:07,000 --> 00:31:15,000

I felt the station. I didn't felt it. I saw the station move all around me and I heard a thud.

205

00:31:20,000 --> 00:31:24,000

And at that point I thought, this could be it, where I die.

206

00:31:24,000 --> 00:31:28,000

Because I'm looking at all these bolts and I was just waiting for those bolts to part.

207

00:31:28,000 --> 00:31:38,000

And to kind of rip open and just see the vacuum of space.

208

00:31:38,000 --> 00:31:49,000

And then all the fans, all the lights, all the computers failed and went silent.

209

00:31:49,000 --> 00:31:59,000

And now we're in a completely silent station that's getting cold.

210

00:32:09,000 --> 00:32:13,000

And then my ears started to pop.

211

00:32:13,000 --> 00:32:16,000

I knew we were depressurizing.

212

00:32:16,000 --> 00:32:20,000

And basically, air was leaving the space station.

213

00:32:20,000 --> 00:32:26,000

And we only had 23 minutes left to live if we stayed there and we didn't stop the leak.

214

00:32:26,000 --> 00:32:34,000

I started helping Sasha pull these cables out. Huge cables. I thought it would have taken us hours to undo.

215

00:32:34,000 --> 00:32:39,000

We did them in six minutes and we take this cap and we put it in and it sucks in.

216

00:32:39,000 --> 00:32:40,000

And he goes, pssst.

217

00:32:40,000 --> 00:32:47,000

At that point we've stopped the leak.

218

00:32:47,000 --> 00:32:51,000

And it was there in front of the window, looking at the galaxy.

219

00:32:51,000 --> 00:33:01,000

I said, well, I know it's been a really bad day, but this is an amazingly beautiful view.

220

00:33:01,000 --> 00:33:06,000

You're kind of sensing, trying to sense all of the presence in the universe.

221

00:33:14,000 --> 00:33:19,000

In total, Michael Foll went into space on six missions.

222

00:33:19,000 --> 00:33:23,000

Oops, one head going away.

223

00:33:23,000 --> 00:33:33,000

But every second spent off-world increased his dose of radiation.

224

00:33:33,000 --> 00:33:43,000

We're exposed to radiation on Earth. But once you go into orbit, now you're exposed to thousands of times more radiation.

225

00:33:44,000 --> 00:33:48,000

And that radiation now is damaging our DNA much faster.

226

00:33:48,000 --> 00:33:54,000

And the repair mechanisms that we evolved to have are not able to cope with it.

227

00:34:14,000 --> 00:34:23,000

When I came back from my space flights, they found I had like 4% of my white blood cells have DNA mutations.

228

00:34:28,000 --> 00:34:34,000

Most of those mutated cells get killed by other white blood cells in your body.

229

00:34:34,000 --> 00:34:42,000

But some of them, unfortunately, don't die. They reproduce and mutate and become cancers.

230

00:34:42,000 --> 00:34:46,000

That is a fundamental risk for astronauts.

231

00:34:53,000 --> 00:35:00,000

And if we imagine going out to stars, it could be that out of a hundred ships, only one of them makes it.

232

00:35:12,000 --> 00:35:20,000

Long-distance space travel will always be risky, even for intelligent aliens.

233

00:35:22,000 --> 00:35:26,000

There's no protection against a sudden blast of stellar radiation.

234

00:35:26,000 --> 00:35:33,000

But for those that make it to the end of the journey, this is their reward.

235

00:35:33,000 --> 00:35:37,000

A new terror.

236

00:35:56,000 --> 00:36:04,000

Rather than adapting to a different world, they have created a copy of their old world.

237

00:36:08,000 --> 00:36:12,000

Such are the benefits of an advanced civilization.

238

00:36:12,000 --> 00:36:17,000

But how long will the good times last?

239

00:36:28,000 --> 00:36:36,000

The star keeps growing, bigger and brighter, spitting out more radiation.

240

00:36:42,000 --> 00:36:47,000

Eventually, it will render the new planet as lifeless as terror.

241

00:36:57,000 --> 00:37:04,000

And then they'll need to relocate again, to another planet, further from the star.

242

00:37:13,000 --> 00:37:19,000

This is the advantage of being mobile.

243

00:37:19,000 --> 00:37:28,000

It's possible to transit from world to world, making and remaking home.

244

00:37:28,000 --> 00:37:36,000

Perhaps there's an alien civilization already headed for Earth.

245

00:37:36,000 --> 00:37:44,000

If so, should we hide from them? Or make ourselves known?

246

00:37:46,000 --> 00:37:49,000

Okay, I'll go.

247

00:37:49,000 --> 00:37:54,000

Should we hide from them? Or make ourselves known?

248

00:37:57,000 --> 00:38:02,000

Okay, let me end by saying...

249

00:38:02,000 --> 00:38:10,000

Let me close by telling you why we should begin transmitting and why we should begin right now.

250

00:38:10,000 --> 00:38:26,000

Doug Vakotch wants to open up a dialogue with potential aliens, by sending them radio messages.

251

00:38:26,000 --> 00:38:43,000

But first, he needs to persuade astronomers on Earth that it's a good idea.

252

00:38:43,000 --> 00:38:59,000

This is where it all started. The biggest radio telescope Earth had ever seen.

253

00:39:13,000 --> 00:39:19,000

There's something about being here, the awesomeness, the scale of the place.

254

00:39:27,000 --> 00:39:33,000

This is where, in 1974, we sent humanity's first message into space.

255

00:39:34,000 --> 00:39:45,000

It starts by these pulses that count out the numbers from 1 through 10.

256

00:39:45,000 --> 00:39:56,000

Then after we've shown extraterrestrials how we count, we use those numbers to describe some of the chemical elements essential to life on Earth.

257

00:39:57,000 --> 00:40:07,000

And then after that, what we look like, how many humans there are, how tall we are.

258

00:40:07,000 --> 00:40:12,000

Then after that, a representation of our solar system.

259

00:40:12,000 --> 00:40:18,000

And then it ends with a representation of this telescope itself, where the message came from.

260

00:40:19,000 --> 00:40:31,000

The pulses of the Arasebo message could be arranged into a pictogram to inform intelligent aliens about life on Earth.

261

00:40:38,000 --> 00:40:46,000

But it was a one-time event aimed at a star cluster 25,000 light-years away.

262

00:40:49,000 --> 00:40:59,000

If we'd been sending messages to nearby stars at the same time we sent out the Arasebo message, we could be getting responses today from any of thousands of stars.

263

00:40:59,000 --> 00:41:03,000

But we haven't, and so we're in the dark.

264

00:41:06,000 --> 00:41:11,000

The biggest reason we haven't sent more messages is because we're afraid.

265

00:41:12,000 --> 00:41:18,000

Because the blockbuster science fiction films show aliens coming to Earth and annihilating us.

266

00:41:20,000 --> 00:41:23,000

And so that's what we think would really happen.

267

00:41:27,000 --> 00:41:38,000

I think the most prominent challenge is the concern that some people have that transmitting intentional messages will lead to an alien invasion.

268

00:41:38,000 --> 00:41:45,000

And I think the easiest response to that is our planners have been giving off evidence of life for two billion years.

269

00:41:45,000 --> 00:41:52,000

So if there are any really paranoid aliens out there who want to annihilate any competition, they've had a long time to come here, and I haven't seen them.

270

00:41:56,000 --> 00:42:04,000

Rather than sending an occasional message into space, Doug's plan is to transmit thousands of them.

271

00:42:05,000 --> 00:42:09,000

When the Arasebo telescope is on downtime.

272

00:42:12,000 --> 00:42:18,000

With radio astronomy you can do it any time of the day. But I like to do it at night.

273

00:42:21,000 --> 00:42:27,000

Caffeine is essential for astronomers. A lot of late nights in the observations and we have to stay sharp.

274

00:42:35,000 --> 00:42:41,000

Once a month Arasebo does a survey of recently discovered asteroids.

275

00:42:43,000 --> 00:42:50,000

Quite often there's a gap, maybe an hour where the transmitter is transmitting off into space at no particular place.

276

00:42:50,000 --> 00:43:08,000

What I'm proposing is that Arasebo should use those gaps in the schedule to target nearby stars with a message in case there are any extra tracers in orbit around that star.

277

00:43:09,000 --> 00:43:15,000

Each month we could be targeting about 50 stars that may support intelligent life. For me it's a no-brainer. I think we should be doing that.

278

00:43:26,000 --> 00:43:31,000

I think of this in terms of what's sometimes called joining the galactic club.

279

00:43:32,000 --> 00:43:40,000

What I find so strange about that analogy is that no one ever talks about paying our dues or even submitting an application.

280

00:43:40,000 --> 00:43:47,000

That's what messaging extra tracerill intelligence does. It may just be our way of making first contact.

281

00:43:47,000 --> 00:43:49,000

Thank you.

282

00:44:00,000 --> 00:44:11,000

When we reach out to other stars, when we send them our messages, in the best case scenario we get a reply back in 10 or 20 years.

283

00:44:12,000 --> 00:44:16,000

But realistically it could take thousands of years.

284

00:44:20,000 --> 00:44:30,000

So this is something that we're doing not for ourselves but for our children, for our grandchildren and even for the aliens.

285

00:44:30,000 --> 00:44:42,000

Eight, seven, six, five, four, three, two, one.

286

00:44:52,000 --> 00:44:58,000

In 2018 the latest planet hunting telescope went into orbit.

287

00:45:01,000 --> 00:45:14,000

It is finding evidence of new worlds across the night sky.

288

00:45:15,000 --> 00:45:30,000

Astronomers think it's only a matter of time before some alien life forms are discovered.

289

00:45:35,000 --> 00:45:39,000

Among them perhaps, intelligent beings.

290

00:45:45,000 --> 00:45:48,000

One day we will know for sure.

291

00:45:52,000 --> 00:45:58,000

Until then we can only guess at who or what is out there.

292

00:46:14,000 --> 00:46:19,000

The next day we will know who or what is out there.

293

00:46:19,000 --> 00:46:24,000

The next day we will know who or what is out there.

294

00:46:24,000 --> 00:46:29,000

The next day we will know who or what is out there.

295

00:46:29,000 --> 00:46:34,000

The next day we will know who or what is out there.

296

00:46:34,000 --> 00:46:39,000

The next day we will know who or what is out there.

297

00:46:44,000 --> 00:46:47,000

you

298

00:47:14,000 --> 00:47:17,000

you

