



1
00:00:08,950 --> 00:00:06,710
and of course it's not just what we say

2
00:00:12,230 --> 00:00:08,960
to kids it's what we show them

3
00:00:15,509 --> 00:00:12,240
the images sent back by nasa's hubble

4
00:00:18,150 --> 00:00:15,519
plays such a huge part in capturing kids

5
00:00:21,029 --> 00:00:18,160
attention in an ever increasingly

6
00:00:22,070 --> 00:00:21,039
crowded world with many many demands on

7
00:00:24,950 --> 00:00:22,080
them

8
00:00:27,109 --> 00:00:24,960
this means we can show kids something of

9
00:00:27,990 --> 00:00:27,119
the cosmic environment that surrounds

10
00:00:33,510 --> 00:00:28,000
them

11
00:00:36,790 --> 00:00:33,520
think about what would it be like to see

12
00:00:39,030 --> 00:00:36,800
a sunset on mars

13
00:00:40,869 --> 00:00:39,040

now manned space flight is a topic which

14

00:00:43,350 --> 00:00:40,879

kids never tire of

15

00:00:45,110 --> 00:00:43,360

and because of nasa they can read about

16

00:00:47,670 --> 00:00:45,120

it they can hear about it watch

17

00:00:50,069 --> 00:00:47,680

documentaries look at photographs and

18

00:00:52,790 --> 00:00:50,079

visit space centers

19

00:00:56,229 --> 00:00:52,800

nasa runs a huge number of educational

20

00:00:59,110 --> 00:00:56,239

programs both in and outside schools

21

00:01:02,389 --> 00:00:59,120

this means that kids space dreams aren't

22

00:01:05,030 --> 00:01:02,399

limited to science fiction

23

00:01:07,270 --> 00:01:05,040

and with exciting new missions planned

24

00:01:09,350 --> 00:01:07,280

back to the moon and onwards to mars it

25

00:01:11,750 --> 00:01:09,360

means that there may be kids now who

26
00:01:14,149 --> 00:01:11,760
will grow up wanting to be astronauts as

27
00:01:17,190 --> 00:01:14,159
excited about it as a whole generation

28
00:01:19,670 --> 00:01:17,200
of astronauts today are the ones

29
00:01:21,429 --> 00:01:19,680
who watched the apollo moon landings in

30
00:01:23,350 --> 00:01:21,439
their pajamas with their parents and

31
00:01:25,429 --> 00:01:23,360
decided they were going to grow up to be

32
00:01:27,749 --> 00:01:25,439
an astronaut and that's certainly an

33
00:01:30,950 --> 00:01:27,759
awful lot more aspirational than wanting

34
00:01:33,910 --> 00:01:30,960
to grow up to appear on reality tv show

35
00:01:35,670 --> 00:01:33,920
or become a pop star

36
00:01:37,270 --> 00:01:35,680
because of nasa

37
00:01:39,590 --> 00:01:37,280
we can also show

38
00:01:42,149 --> 00:01:39,600

kids what our planet what the earth

39

00:01:43,429 --> 00:01:42,159

looks like from space

40

00:01:46,069 --> 00:01:43,439

they can see

41

00:01:48,870 --> 00:01:46,079

what a beautiful planet we live on but

42

00:01:51,590 --> 00:01:48,880

how vulnerable it is how fragile it is

43

00:01:54,469 --> 00:01:51,600

and we can really make it clear to them

44

00:01:56,550 --> 00:01:54,479

that they need to look after it when we

45

00:01:58,149 --> 00:01:56,560

look around us in space we see all sorts

46

00:02:01,270 --> 00:01:58,159

of other fascinating extraordinary

47

00:02:04,230 --> 00:02:01,280

exciting worlds but we don't see another

48

00:02:06,389 --> 00:02:04,240

planet nearby exactly like the earth and

49

00:02:08,150 --> 00:02:06,399

that's a very strong message to kids to

50

00:02:09,910 --> 00:02:08,160

say you live on a beautiful planet

51
00:02:11,350 --> 00:02:09,920
please look after it

52
00:02:13,430 --> 00:02:11,360
so we're not saying that all children

53
00:02:16,150 --> 00:02:13,440
need to grow up and go into space

54
00:02:19,190 --> 00:02:16,160
but we are saying that the work done by

55
00:02:21,270 --> 00:02:19,200
nasa has a profound and lasting impact

56
00:02:24,229 --> 00:02:21,280
on the way that children view their life

57
00:02:26,229 --> 00:02:24,239
on earth their cosmic environment it can

58
00:02:28,309 --> 00:02:26,239
influence the choices they make in the

59
00:02:30,070 --> 00:02:28,319
future and their careers

60
00:02:33,270 --> 00:02:30,080
i'd like to close with a fan letter we

61
00:02:35,270 --> 00:02:33,280
had from ben age six

62
00:02:37,990 --> 00:02:35,280
his mother had told us he wasn't a

63
00:02:40,790 --> 00:02:38,000

confident child but that he loved

64

00:02:42,470 --> 00:02:40,800

reading about space so much that it has

65

00:02:44,949 --> 00:02:42,480

changed his life

66

00:02:48,070 --> 00:02:44,959

he wrote to us to say

67

00:02:50,309 --> 00:02:48,080

now that i know i'm good at space

68

00:02:51,509 --> 00:02:50,319

i've decided to become a scientist when

69

00:03:11,190 --> 00:02:51,519

i grow up

70

00:03:17,910 --> 00:03:15,030

what will we find when we go into space

71

00:03:21,190 --> 00:03:17,920

is there alien life out there or are we

72

00:03:24,070 --> 00:03:21,200

alone in the universe

73

00:03:27,030 --> 00:03:24,080

we believe that life arose spontaneously

74

00:03:29,910 --> 00:03:27,040

on the earth so it must be possible for

75

00:03:32,309 --> 00:03:29,920

life to appear on other suitable planets

76
00:03:33,830 --> 00:03:32,319
of which there seem to be a large number

77
00:03:35,990 --> 00:03:33,840
in the galaxy

78
00:03:37,830 --> 00:03:36,000
but we don't know how life first

79
00:03:39,910 --> 00:03:37,840
appeared

80
00:03:43,190 --> 00:03:39,920
the probability of something as

81
00:03:45,670 --> 00:03:43,200
complicated as a dna molecule being

82
00:03:50,390 --> 00:03:45,680
formed by random collisions of atoms in

83
00:03:52,390 --> 00:03:50,400
a primeval ocean it's incredibly small

84
00:03:54,390 --> 00:03:52,400
however there might have been some

85
00:03:57,670 --> 00:03:54,400
simpler macromolecule

86
00:04:00,390 --> 00:03:57,680
which then built up to dna or some other

87
00:04:01,670 --> 00:04:00,400
macromolecule capable of reproducing

88
00:04:02,789 --> 00:04:01,680

itself

89

00:04:04,949 --> 00:04:02,799

still

90

00:04:07,350 --> 00:04:04,959

even if the probability of life

91

00:04:10,630 --> 00:04:07,360

appearing on a suitable planet is very

92

00:04:13,110 --> 00:04:10,640

small since the universe is infinite

93

00:04:15,830 --> 00:04:13,120

life would have appeared somewhere

94

00:04:17,909 --> 00:04:15,840

if the probability is very low the

95

00:04:21,270 --> 00:04:17,919

distance between two independent

96

00:04:24,310 --> 00:04:21,280

occurrences of life would be very large

97

00:04:27,110 --> 00:04:24,320

however there is a possibility known as

98

00:04:30,150 --> 00:04:27,120

panspermia that life could spread from

99

00:04:33,430 --> 00:04:30,160

planet to planet or from stellar system

100

00:04:35,430 --> 00:04:33,440

to stellar system carried on meteors

101

00:04:38,310 --> 00:04:35,440

we know that earth has been hit by

102

00:04:41,749 --> 00:04:38,320

meteors that came from mars and others

103

00:04:44,150 --> 00:04:41,759

may have come from further afield

104

00:04:46,310 --> 00:04:44,160

we have no evidence that any meteors

105

00:04:48,390 --> 00:04:46,320

carried life but it remains a

106

00:04:51,030 --> 00:04:48,400

possibility

107

00:04:53,270 --> 00:04:51,040

an important feature of life spread by

108

00:04:56,469 --> 00:04:53,280

panspermia is that it would have the

109

00:04:58,230 --> 00:04:56,479

same basis which would be dna

110

00:04:59,670 --> 00:04:58,240

for life in the neighborhood of the

111

00:05:02,150 --> 00:04:59,680

earth

112

00:05:04,469 --> 00:05:02,160

on the other hand an independent

113

00:05:07,990 --> 00:05:04,479

occurrence of life would be extremely

114

00:05:11,270 --> 00:05:08,000

unlikely to be dna-based

115

00:05:13,430 --> 00:05:11,280

so watch out if you meet an alien

116

00:05:16,469 --> 00:05:13,440

you could be infected with a disease

117

00:05:19,110 --> 00:05:16,479

against which you have no resistance

118

00:05:21,909 --> 00:05:19,120

one piece of observational evidence on

119

00:05:25,510 --> 00:05:21,919

the probability of life appearing is

120

00:05:28,070 --> 00:05:25,520

that we have fossils of algae from 3.5

121

00:05:31,430 --> 00:05:28,080

billion years ago

122

00:05:34,469 --> 00:05:31,440

the earth was formed 4.6 billion years

123

00:05:37,670 --> 00:05:34,479

ago and was probably too hot for about

124

00:05:40,469 --> 00:05:37,680

the first half billion years

125

00:05:43,430 --> 00:05:40,479

so life appeared on earth within half a

126
00:05:46,150 --> 00:05:43,440
billion years of it being possible which

127
00:05:49,270 --> 00:05:46,160
is short compared to the 10 billion year

128
00:05:52,070 --> 00:05:49,280
lifetime of an earth-like planet

129
00:05:54,629 --> 00:05:52,080
this would suggest either panspermia or

130
00:05:58,550 --> 00:05:54,639
that the probability of life appearing

131
00:06:01,029 --> 00:05:58,560
independently is reasonably high

132
00:06:03,350 --> 00:06:01,039
if it was very low one would have

133
00:06:04,830 --> 00:06:03,360
expected it to take most of the 10

134
00:06:08,309 --> 00:06:04,840
billion years

135
00:06:11,270 --> 00:06:08,319
available if it is panspermia any life

136
00:06:16,629 --> 00:06:11,280
in the solar system or in nearby stellar

137
00:06:22,230 --> 00:06:19,189
while there may be primitive life in our

138
00:06:25,270 --> 00:06:22,240

region of the galaxy there don't seem to

139

00:06:27,590 --> 00:06:25,280

be any advanced intelligent beings

140

00:06:29,430 --> 00:06:27,600

we don't appear to have been visited by

141

00:06:33,749 --> 00:06:29,440

aliens

142

00:06:35,909 --> 00:06:33,759

i am discounting reports of ufos

143

00:06:39,830 --> 00:06:35,919

would they appear only to cranks and

144

00:06:45,270 --> 00:06:42,469

if there is a government conspiracy to

145

00:06:47,670 --> 00:06:45,280

suppress the reports and keep for itself

146

00:06:48,469 --> 00:06:47,680

the scientific knowledge the aliens

147

00:06:50,629 --> 00:06:48,479

bring

148

00:06:54,070 --> 00:06:50,639

it seems to have been a singularly

149

00:06:56,870 --> 00:06:54,080

ineffective policy so far

150

00:07:00,309 --> 00:06:56,880

furthermore despite an extensive search

151
00:07:03,830 --> 00:07:00,319
by the seti project we haven't heard any

152
00:07:06,070 --> 00:07:03,840
alien television quiz shows

153
00:07:09,270 --> 00:07:06,080
this probably indicates that there are

154
00:07:12,150 --> 00:07:09,280
no alien civilizations at our stage of

155
00:07:17,110 --> 00:07:12,160
development within a radius of a few

156
00:07:22,870 --> 00:07:19,670
issuing an insurance policy against

157
00:07:25,110 --> 00:07:22,880
abduction by aliens seems a pretty safe

158
00:07:27,510 --> 00:07:25,120
bet

159
00:07:29,110 --> 00:07:27,520
why haven't we heard from anyone out

160
00:07:31,510 --> 00:07:29,120
there

161
00:07:34,070 --> 00:07:31,520
one who is expressed in this calvin

162
00:07:37,589 --> 00:07:34,080
cartoon

163
00:07:40,070 --> 00:07:37,599

the caption reads sometimes i think that

164

00:07:42,790 --> 00:07:40,080

the surest sign that intelligent life

165

00:07:46,390 --> 00:07:42,800

exists elsewhere in the universe is that

166

00:07:49,029 --> 00:07:46,400

none of it has tried to contact us

167

00:07:52,309 --> 00:07:49,039

more seriously there could be three

168

00:07:54,230 --> 00:07:52,319

possible explanations of why we haven't

169

00:07:55,350 --> 00:07:54,240

heard from aliens

170

00:07:57,510 --> 00:07:55,360

first

171

00:07:59,909 --> 00:07:57,520

it may be that the probability of

172

00:08:02,710 --> 00:07:59,919

primitive life appearing on a suitable

173

00:08:05,830 --> 00:08:02,720

planet is very low

174

00:08:09,189 --> 00:08:05,840

second the probability of primitive life

175

00:08:11,589 --> 00:08:09,199

appearing may be reasonably high but the

176

00:08:15,589 --> 00:08:11,599

probability of that life developing

177

00:08:17,670 --> 00:08:15,599

intelligence like ours may be very low

178

00:08:20,550 --> 00:08:17,680

just because evolution led to

179

00:08:22,469 --> 00:08:20,560

intelligence in our case we shouldn't

180

00:08:24,629 --> 00:08:22,479

assume that intelligence is an

181

00:08:26,550 --> 00:08:24,639

inevitable consequence of darwinian

182

00:08:29,189 --> 00:08:26,560

natural selection

183

00:08:33,589 --> 00:08:29,199

it is not clear that intelligence

184

00:08:36,389 --> 00:08:33,599

confers a long-term survival advantage

185

00:08:38,870 --> 00:08:36,399

bacteria and insects will survive quite

186

00:08:41,430 --> 00:08:38,880

happily even if our so-called

187

00:08:43,509 --> 00:08:41,440

intelligence leads us to destroy

188

00:08:46,710 --> 00:08:43,519

ourselves

189

00:08:50,470 --> 00:08:46,720

this is the third possibility

190

00:08:53,430 --> 00:08:50,480

life appears and in some cases develops

191

00:08:55,750 --> 00:08:53,440

into intelligent beings

192

00:08:58,550 --> 00:08:55,760

but when it reaches the stage of sending

193

00:09:01,350 --> 00:08:58,560

radio signals it will also have the

194

00:09:06,870 --> 00:09:01,360

technology to make nuclear bombs and

195

00:09:12,389 --> 00:09:08,710

it would therefore be in danger of

196

00:09:14,630 --> 00:09:12,399

destroying itself before long

197

00:09:17,829 --> 00:09:14,640

let's hope this is not the reason we

198

00:09:20,389 --> 00:09:17,839

have not heard from anyone

199

00:09:23,190 --> 00:09:20,399

personally i favor the second

200

00:09:25,990 --> 00:09:23,200

possibility that primitive life is

201

00:09:28,550 --> 00:09:26,000

relatively common but that intelligent

202

00:09:30,710 --> 00:09:28,560

life is very rare

203

00:09:36,470 --> 00:09:30,720

some would say it has yet to occur on

204

00:09:40,710 --> 00:09:39,190

can we exist for a long time away from

205

00:09:43,509 --> 00:09:40,720

the earth

206

00:09:46,389 --> 00:09:43,519

our experience with the iss the

207

00:09:48,710 --> 00:09:46,399

international space station shows that

208

00:09:51,430 --> 00:09:48,720

it is possible for human beings to