

1
00:00:00,490 --> 00:00:08,529
[Music]

2
00:00:16,089 --> 00:00:25,129
[Music]

3
00:00:22,899 --> 00:00:27,289
maximum likelihood methods are more

4
00:00:25,129 --> 00:00:30,949
familiar from things like parameter

5
00:00:27,289 --> 00:00:33,070
estimation problems where you have a

6
00:00:30,949 --> 00:00:35,869
large body of data and you have a

7
00:00:33,070 --> 00:00:39,079
rigorous mathematical model that

8
00:00:35,869 --> 00:00:40,879
connects them observations to parameter

9
00:00:39,079 --> 00:00:43,039
values and you're trying to find the

10
00:00:40,880 --> 00:00:47,390
best fit to a lot of conflicting

11
00:00:43,039 --> 00:00:50,240
measurements however you can also use it

12
00:00:47,390 --> 00:00:53,359
in a more qualitative situation as long

13
00:00:50,240 --> 00:01:00,280
as you can decide whether one hypothesis

14
00:00:53,359 --> 00:01:03,488
is more likely than a competitor and the

15
00:01:00,280 --> 00:01:06,799
upshot is that even when you have

16
00:01:03,488 --> 00:01:10,819
multiple components for a hypothesis as

17
00:01:06,799 --> 00:01:14,569
long as at each stage you are choosing

18
00:01:10,819 --> 00:01:18,218
the most likely alternative by the end

19
00:01:14,569 --> 00:01:20,269
of the process you have the most likely

20
00:01:18,218 --> 00:01:22,669
hypothesis among the various

21
00:01:20,269 --> 00:01:26,090
possibilities you can't say anything

22
00:01:22,670 --> 00:01:30,170
about how likely it is in any absolute

23
00:01:26,090 --> 00:01:33,109
sense or whether it's how much it's more

24
00:01:30,170 --> 00:01:37,478
likely than its rivals you can just say

25
00:01:33,108 --> 00:01:37,478
that this is the most likely inference

26
00:01:37,509 --> 00:01:45,228
so the the ETI problem I prefer that to

27
00:01:42,618 --> 00:01:47,420
UFOs because of course there are UFOs

28
00:01:45,228 --> 00:01:51,528
anybody anything that you can't identify

29

00:01:47,420 --> 00:01:53,748
as an unidentified flying object but the

30
00:01:51,528 --> 00:01:55,519
hypothesis that interests most people is

31
00:01:53,748 --> 00:01:58,989
that some of these unidentified flying

32
00:01:55,519 --> 00:02:02,138
objects are be our vehicles operated by

33
00:01:58,989 --> 00:02:04,908
extraterrestrial intelligences and as

34
00:02:02,138 --> 00:02:08,598
was sort of implied by my build up I'm

35
00:02:04,909 --> 00:02:12,620
not trying to estimate the likelihood

36
00:02:08,598 --> 00:02:15,378
that the ETI hypothesis is true my

37
00:02:12,620 --> 00:02:18,590
discussion here is suppose we stipulate

38
00:02:15,378 --> 00:02:19,979
that these are extraterrestrial vehicles

39
00:02:18,590 --> 00:02:24,060
what can we

40
00:02:19,979 --> 00:02:26,429
infer about the ETI from what's been

41
00:02:24,060 --> 00:02:30,509
seen of them what are the most likely

42
00:02:26,430 --> 00:02:33,689
properties a general principle I'll be

43
00:02:30,509 --> 00:02:35,780

using is that the known is more likely

44

00:02:33,689 --> 00:02:39,598
than the speculative if there's

45

00:02:35,780 --> 00:02:42,509
something that we know is real it's more

46

00:02:39,598 --> 00:02:45,238
likely than something that we only know

47

00:02:42,509 --> 00:02:47,250
is possible on the other hand if there's

48

00:02:45,239 --> 00:02:49,769
something that we know is possible

49

00:02:47,250 --> 00:02:52,709
that's more likely than something that

50

00:02:49,769 --> 00:02:58,319
we simply have not yet proven to be

51

00:02:52,709 --> 00:03:01,459
impossible there is however a a caveat

52

00:02:58,318 --> 00:03:04,128
that yeah applying this unthinkingly

53

00:03:01,459 --> 00:03:07,319
will always lead to perfectly mundane

54

00:03:04,128 --> 00:03:11,818
explanations for everything so it has to

55

00:03:07,318 --> 00:03:14,298
be consistent with the evidence now

56

00:03:11,818 --> 00:03:16,348
reviewing what the relevant evidence is

57

00:03:14,299 --> 00:03:18,269
would require a book

58
00:03:16,348 --> 00:03:22,709
fortunately Peter Stewart has written

59
00:03:18,269 --> 00:03:24,539
the book so I don't have to but the this

60
00:03:22,709 --> 00:03:28,319
current discussion is based on some very

61
00:03:24,539 --> 00:03:30,418
general summary observations there is a

62
00:03:28,318 --> 00:03:34,018
lot of eyewitness testimony some of it

63
00:03:30,419 --> 00:03:37,169
extremely high quality to things that

64
00:03:34,019 --> 00:03:39,419
look like aircraft or aerial vehicles

65
00:03:37,169 --> 00:03:43,250
that aren't aren't identifiable with any

66
00:03:39,419 --> 00:03:45,930
human culture or technology there's

67
00:03:43,250 --> 00:03:48,810
instrument recordings video tapes

68
00:03:45,930 --> 00:03:51,480
similar comments there are somewhat

69
00:03:48,810 --> 00:03:54,359
fewer but some cases of physical

70
00:03:51,479 --> 00:03:56,429
evidence left behind some of this I want

71
00:03:54,359 --> 00:03:59,639
quality witness testimony attests to

72
00:03:56,430 --> 00:04:02,549
seeing occupants who sometimes exit the

73
00:03:59,639 --> 00:04:05,219
vehicles when occupants are reported

74
00:04:02,549 --> 00:04:07,019
they're almost always humanoid they may

75
00:04:05,219 --> 00:04:10,068
or may not be described as wearing what

76
00:04:07,019 --> 00:04:12,480
appears to be environmental protection

77
00:04:10,068 --> 00:04:15,060
supposed vehicles in some sightings

78
00:04:12,479 --> 00:04:18,689
undertake maneuvers that are well beyond

79
00:04:15,060 --> 00:04:22,009
our technical capability there are some

80
00:04:18,689 --> 00:04:25,288
areas of evidence that I am ignoring I

81
00:04:22,009 --> 00:04:27,449
am not paying attention to any reports

82
00:04:25,288 --> 00:04:29,968
of voluntary boarding of vehicles by

83
00:04:27,449 --> 00:04:33,150
humans or of abductions by vehicles

84
00:04:29,968 --> 00:04:34,949
although it belatedly occurs to me

85
00:04:33,149 --> 00:04:39,779
that it actually wouldn't make much

86

00:04:34,949 --> 00:04:41,789
difference to my conclusions one one

87
00:04:39,779 --> 00:04:44,099
element that I'm disregarding that would

88
00:04:41,790 --> 00:04:47,730
make a difference is reports some of

89
00:04:44,100 --> 00:04:49,920
which have been made at the SSE - that

90
00:04:47,730 --> 00:04:52,170
the ETS are in fact known to an in

91
00:04:49,920 --> 00:04:53,699
regular contact with human governments

92
00:04:52,170 --> 00:04:55,860
and pursuing various kinds of

93
00:04:53,699 --> 00:04:58,649
clandestine cooperation

94
00:04:55,860 --> 00:05:02,580
the reason I'm ignoring that is that

95
00:04:58,649 --> 00:05:04,319
conspiracy theories are not science in

96
00:05:02,579 --> 00:05:06,569
the first place I would say their

97
00:05:04,319 --> 00:05:09,089
intrinsic likelihood as the great

98
00:05:06,569 --> 00:05:12,300
conspiracy is very low it's shared by

99
00:05:09,089 --> 00:05:15,479
mutually hostile regimes over decades

100
00:05:12,300 --> 00:05:17,900

while regimes have changed and yet

101

00:05:15,480 --> 00:05:20,220
despite this apparent worldwide

102

00:05:17,899 --> 00:05:22,529
overwhelming power the conspiracy is

103

00:05:20,220 --> 00:05:24,570
somehow failing to silence the brave

104

00:05:22,529 --> 00:05:28,919
whistleblowers who are trying to expose

105

00:05:24,569 --> 00:05:32,189
it basically believing in the great

106

00:05:28,920 --> 00:05:36,060
conspiracy is evidence transcendent any

107

00:05:32,189 --> 00:05:38,850
behavior whatsoever is compatible with

108

00:05:36,060 --> 00:05:41,069
the notion that it's due to a conspiracy

109

00:05:38,850 --> 00:05:43,800
however mysterious it is it's what the

110

00:05:41,069 --> 00:05:48,149
conspiracy wants so it can never be

111

00:05:43,800 --> 00:05:53,730
refuted it is non falsifiable it has no

112

00:05:48,149 --> 00:05:55,709
place in scientific discourse now I and

113

00:05:53,730 --> 00:05:58,700
having multiple components of the theory

114

00:05:55,709 --> 00:06:01,979
here are the big ones

115
00:05:58,699 --> 00:06:02,639
do these et eyes have faster than light

116
00:06:01,980 --> 00:06:04,800
travel

117
00:06:02,639 --> 00:06:06,300
do they have reaction with drives did

118
00:06:04,800 --> 00:06:09,780
they have some form of inertia or

119
00:06:06,300 --> 00:06:12,180
gravity control what can we infer about

120
00:06:09,779 --> 00:06:13,759
their biology and where are they coming

121
00:06:12,180 --> 00:06:22,439
from

122
00:06:13,759 --> 00:06:24,509
well FTA FTL travel is a simple one our

123
00:06:22,439 --> 00:06:26,670
current physics absolutely limits

124
00:06:24,509 --> 00:06:29,789
material objects to speeds less than

125
00:06:26,670 --> 00:06:31,860
light there are lots of potential

126
00:06:29,790 --> 00:06:34,230
loopholes in that but none of those

127
00:06:31,860 --> 00:06:36,270
loopholes have been demonstrated to

128
00:06:34,230 --> 00:06:39,090
actually happen in the world that we

129
00:06:36,269 --> 00:06:42,990
live in they are all speculative so

130
00:06:39,089 --> 00:06:45,209
provisional conclusion unless we are

131
00:06:42,990 --> 00:06:48,150
faced with totally incompatible

132
00:06:45,209 --> 00:06:52,969
it is more likely that the ETI do not

133
00:06:48,149 --> 00:06:58,978
have FTL travel reaction --less drops

134
00:06:52,970 --> 00:07:01,530
now in in virtually all cases the things

135
00:06:58,978 --> 00:07:03,538
that are cited fly around and maneuver

136
00:07:01,529 --> 00:07:05,879
they're not showing jet exhaust they're

137
00:07:03,538 --> 00:07:07,829
not showing rocket exhaust they're not

138
00:07:05,879 --> 00:07:11,399
showing any kind of exhaust typically

139
00:07:07,829 --> 00:07:13,948
and when people get a close enough view

140
00:07:11,399 --> 00:07:16,228
to report some details of the object

141
00:07:13,949 --> 00:07:20,060
structure there's nothing that looks

142
00:07:16,228 --> 00:07:23,990
like a rocket venturi or a jet engine

143

00:07:20,060 --> 00:07:26,879
now on the other hand from from physics

144
00:07:23,990 --> 00:07:32,038
the third law of motion has not been

145
00:07:26,879 --> 00:07:35,038
repealed according to known physics you

146
00:07:32,038 --> 00:07:38,788
you can't accelerate without throwing

147
00:07:35,038 --> 00:07:41,788
something the other way so does the lack

148
00:07:38,788 --> 00:07:43,889
of a of an observed exhaust mean that we

149
00:07:41,788 --> 00:07:46,709
have to give that up and the answer is

150
00:07:43,889 --> 00:07:49,889
no a few years ago I presented a paper

151
00:07:46,709 --> 00:07:53,819
on neutrino rocketry it remains the case

152
00:07:49,889 --> 00:07:57,840
that if that it is possible to produce a

153
00:07:53,819 --> 00:07:59,819
collimated jet of neutrinos that would

154
00:07:57,839 --> 00:08:02,579
exert an unbalanced force on its

155
00:07:59,819 --> 00:08:04,740
generator and that is an exhaust that

156
00:08:02,579 --> 00:08:06,779
none of our instrumentation would see

157
00:08:04,740 --> 00:08:09,720

and of course our eyes wouldn't either

158

00:08:06,779 --> 00:08:11,939

so since there is also other

159

00:08:09,720 --> 00:08:14,539

possibilities which I'm not going to go

160

00:08:11,939 --> 00:08:17,158

into right now because of limited time

161

00:08:14,538 --> 00:08:19,860

but since the evidence does not rule it

162

00:08:17,158 --> 00:08:24,629

out it is more likely that ETI vehicles

163

00:08:19,860 --> 00:08:26,639

are using reaction drives then there's

164

00:08:24,629 --> 00:08:29,250

the question of being able to control

165

00:08:26,639 --> 00:08:32,579

inertia or have some sort of internal

166

00:08:29,250 --> 00:08:34,019

gravity system to accommodate these some

167

00:08:32,578 --> 00:08:38,278

of these extraordinarily violent

168

00:08:34,019 --> 00:08:41,788

maneuvers and once again I'm coming down

169

00:08:38,278 --> 00:08:45,230

on the side that we don't have to go to

170

00:08:41,788 --> 00:08:48,299

exotic physics because there there are

171

00:08:45,230 --> 00:08:51,180

known techniques which are almost at the

172
00:08:48,299 --> 00:08:53,819
level of practical application where you

173
00:08:51,179 --> 00:08:57,028
could get humans to survive tremendous

174
00:08:53,820 --> 00:08:58,410
g-forces basically the idea is fill up

175
00:08:57,028 --> 00:09:02,129
all of your internal

176
00:08:58,409 --> 00:09:05,068
spaces with a liquid of roughly neutral

177
00:09:02,129 --> 00:09:06,690
buoyancy and then to a first

178
00:09:05,068 --> 00:09:07,979
approximation you don't care about

179
00:09:06,690 --> 00:09:10,350
gravity you don't care about

180
00:09:07,980 --> 00:09:12,509
acceleration there will be some limits

181
00:09:10,350 --> 00:09:16,379
because muscle and bone and fat aren't

182
00:09:12,509 --> 00:09:18,750
all exactly the same density and at the

183
00:09:16,379 --> 00:09:21,899
moment the big technological hurdle is

184
00:09:18,750 --> 00:09:25,740
getting a fluid that can oxygenate the

185
00:09:21,899 --> 00:09:30,470
lungs without desiccating them to the

186
00:09:25,740 --> 00:09:32,879
point that that you die of asphyxiation

187
00:09:30,470 --> 00:09:35,910
after the fluid is removed and you try

188
00:09:32,879 --> 00:09:37,980
to get back to breathing air that has

189
00:09:35,909 --> 00:09:39,929
been a very frequent problem with test

190
00:09:37,980 --> 00:09:41,938
animals in this kind of medium and

191
00:09:39,929 --> 00:09:49,318
that's why it hasn't really been tested

192
00:09:41,938 --> 00:09:52,349
in humans yet okay now for biology the

193
00:09:49,318 --> 00:09:54,378
occupants that have been reported most

194
00:09:52,350 --> 00:09:57,180
reports say they're humanoid

195
00:09:54,379 --> 00:09:59,639
they can function in earthly conditions

196
00:09:57,179 --> 00:10:01,979
with and they don't while they may be

197
00:09:59,639 --> 00:10:03,740
wearing protection they don't need so

198
00:10:01,980 --> 00:10:08,370
much protection that the body shape is

199
00:10:03,740 --> 00:10:10,259
unrecognizable now here the evidential

200

00:10:08,370 --> 00:10:13,049
value is limited even if the witness

201
00:10:10,259 --> 00:10:15,329
testimony is totally reliable for one

202
00:10:13,049 --> 00:10:17,309
thing a nonhuman on a non humanoid

203
00:10:15,328 --> 00:10:20,278
occupant might not be recognized as an

204
00:10:17,309 --> 00:10:22,789
occupant for another thing the humanoids

205
00:10:20,278 --> 00:10:25,438
that have been reported and described

206
00:10:22,789 --> 00:10:28,169
could perfectly well be telepresence

207
00:10:25,438 --> 00:10:32,688
robots or bio engineered life-forms

208
00:10:28,169 --> 00:10:36,259
purpose-built for exploration however

209
00:10:32,688 --> 00:10:40,230
even granted that that the value of the

210
00:10:36,259 --> 00:10:42,539
observations is limited it's not zero so

211
00:10:40,230 --> 00:10:44,639
it is at least provisionally more likely

212
00:10:42,539 --> 00:10:46,620
that vehicle occupants are water-based

213
00:10:44,639 --> 00:10:50,730
oxygen breathers capable of handling

214
00:10:46,620 --> 00:10:52,948

earth gravity and now where do they come

215

00:10:50,730 --> 00:10:54,959

from the occupants can function in

216

00:10:52,948 --> 00:10:57,179

earth-like environments no such

217

00:10:54,958 --> 00:10:59,518

environments occur naturally in any

218

00:10:57,179 --> 00:11:02,278

other body I mean in this solar system

219

00:10:59,519 --> 00:11:04,528

and that seems to spawn four

220

00:11:02,278 --> 00:11:07,769

possibilities they're comfortable in

221

00:11:04,528 --> 00:11:10,679

widely variable environments or they're

222

00:11:07,769 --> 00:11:12,360

from Earth or they're from artificial

223

00:11:10,679 --> 00:11:15,859

habitats in the solar system

224

00:11:12,360 --> 00:11:19,649

or they're from another solar system

225

00:11:15,860 --> 00:11:22,769

okay could could they be able to handle

226

00:11:19,649 --> 00:11:24,828

any environment well what we know of

227

00:11:22,769 --> 00:11:27,629

biology doesn't seem to agree with that

228

00:11:24,828 --> 00:11:32,250

extremophiles have colonized every

229
00:11:27,629 --> 00:11:35,159
environment that exists on earth but no

230
00:11:32,250 --> 00:11:38,240
extrema file is adapted to all extreme

231
00:11:35,159 --> 00:11:40,669
environments algae can grow on in ice

232
00:11:38,240 --> 00:11:45,680
thermophiles can grow in boiling water

233
00:11:40,669 --> 00:11:48,269
they don't cross over so given an

234
00:11:45,679 --> 00:11:50,819
organism that can survive typical earth

235
00:11:48,269 --> 00:11:52,828
surface conditions it is more likely

236
00:11:50,820 --> 00:11:56,690
that it will be killed by typical

237
00:11:52,828 --> 00:12:02,489
conditions on other solar system bodies

238
00:11:56,690 --> 00:12:04,410
so is ETI really T I mean on the face of

239
00:12:02,490 --> 00:12:06,419
it the most likely explanation for a

240
00:12:04,409 --> 00:12:07,740
human shape human-sized being who

241
00:12:06,419 --> 00:12:10,289
functions well in earth-like conditions

242
00:12:07,740 --> 00:12:12,149
is that it really is a human being from

243

00:12:10,289 --> 00:12:14,338

Earth ah

244

00:12:12,149 --> 00:12:16,200

I consider this incompatible with

245

00:12:14,339 --> 00:12:20,790

evidence but the evidence in this case

246

00:12:16,200 --> 00:12:23,100

is negative we don't know of any human

247

00:12:20,789 --> 00:12:26,338

civilization that has these technical

248

00:12:23,100 --> 00:12:28,920

capabilities and believing that it could

249

00:12:26,339 --> 00:12:30,390

be hidden given how crowded the world is

250

00:12:28,919 --> 00:12:32,969

and how much of it is settled in under

251

00:12:30,389 --> 00:12:35,759

continuous observation requires a return

252

00:12:32,970 --> 00:12:40,980

to the great conspiracy theory see a

253

00:12:35,759 --> 00:12:43,909

dozen or so slides back now doesn't the

254

00:12:40,980 --> 00:12:47,579

evidence also rule out solar system or

255

00:12:43,909 --> 00:12:50,610

origin the thing is unlike Earth the

256

00:12:47,578 --> 00:12:52,679

solar system contains vast regions where

257

00:12:50,610 --> 00:12:55,589
a high-tech civilization could flourish

258
00:12:52,679 --> 00:12:58,799
without being detected by our current

259
00:12:55,589 --> 00:13:01,350
technology even in the asteroid belt

260
00:12:58,799 --> 00:13:03,838
which is only to astronomical to three

261
00:13:01,350 --> 00:13:06,810
astronomical units away an astronomical

262
00:13:03,839 --> 00:13:08,880
unit is the radius of Earth's orbit it's

263
00:13:06,809 --> 00:13:10,979
estimated that only about two-thirds of

264
00:13:08,879 --> 00:13:14,939
asteroids larger than 1 kilometer have

265
00:13:10,980 --> 00:13:16,500
been detected we've also realized that

266
00:13:14,940 --> 00:13:19,680
there's a lot of stuff out in the Kuiper

267
00:13:16,500 --> 00:13:22,720
belt at about 50 astronomical units

268
00:13:19,679 --> 00:13:26,509
which is much harder to detect

269
00:13:22,720 --> 00:13:29,060
then on the other hand wouldn't

270
00:13:26,509 --> 00:13:34,039
artificial habitats be easier to spot

271
00:13:29,059 --> 00:13:38,389

than rocks and I see that we have some

272

00:13:34,039 --> 00:13:41,149

spacing issues here sorry the answer is

273

00:13:38,389 --> 00:13:44,779

basically that given the constraints

274

00:13:41,149 --> 00:13:47,480

from a that that a space going habitats

275

00:13:44,779 --> 00:13:49,970

suffers there are strong reasons to

276

00:13:47,480 --> 00:13:52,670

think that it would not be putting out a

277

00:13:49,970 --> 00:13:54,950

lot of radiation it would not be

278

00:13:52,669 --> 00:13:56,569

particularly more visible than a natural

279

00:13:54,950 --> 00:13:59,540

body and it might very well be less

280

00:13:56,570 --> 00:14:03,170

visible but I reserved the details for

281

00:13:59,539 --> 00:14:07,579

an appendix which I'll get to if I

282

00:14:03,169 --> 00:14:09,979

move fast enough so an advanced

283

00:14:07,580 --> 00:14:11,960

civilization using space-based resources

284

00:14:09,980 --> 00:14:16,100

within the solar system is compatible

285

00:14:11,960 --> 00:14:18,530

with the observation then there's the

286
00:14:16,100 --> 00:14:22,070
question of solar or extrasolar origin

287
00:14:18,529 --> 00:14:24,559
and just as a side note origin here I

288
00:14:22,070 --> 00:14:27,140
don't mean where they evolved I mean

289
00:14:24,559 --> 00:14:29,089
where they're living now what is the

290
00:14:27,139 --> 00:14:32,330
spot from which the vehicles start their

291
00:14:29,090 --> 00:14:34,340
missions well the nearest stars are over

292
00:14:32,330 --> 00:14:36,889
a quarter of a million astronomical

293
00:14:34,340 --> 00:14:40,340
units away whereas even a quaver belt

294
00:14:36,889 --> 00:14:43,549
habitat is only 50 astronomical units

295
00:14:40,340 --> 00:14:46,280
away no matter what their technology is

296
00:14:43,549 --> 00:14:47,959
the longer trip is an enormous ly

297
00:14:46,279 --> 00:14:54,350
greater investment of effort and

298
00:14:47,960 --> 00:14:57,769
resources so the the the conclusion

299
00:14:54,350 --> 00:14:59,810
there is that the most likely hypothesis

300
00:14:57,769 --> 00:15:01,789
among those four competitors is that

301
00:14:59,809 --> 00:15:06,109
they live in artificial habitats within

302
00:15:01,789 --> 00:15:08,839
our solar system summing up they do not

303
00:15:06,110 --> 00:15:11,750
have FTL travel they live in somewhat

304
00:15:08,840 --> 00:15:13,580
earth-like conditions these conditions

305
00:15:11,750 --> 00:15:15,230
are artificially maintained in deep

306
00:15:13,580 --> 00:15:17,240
space habitats and they use

307
00:15:15,230 --> 00:15:19,730
inconspicuous reaction drives for

308
00:15:17,240 --> 00:15:21,769
propulsion now was that the five-minute

309
00:15:19,730 --> 00:15:24,610
warning I just got then I have time

310
00:15:21,769 --> 00:15:28,129
enough to at least go on to appendix 1

311
00:15:24,610 --> 00:15:30,320
some additional inferences there

312
00:15:28,129 --> 00:15:32,750
naturally their civilization is

313
00:15:30,320 --> 00:15:35,500
naturally in conspicuous to our current

314

00:15:32,750 --> 00:15:35,500
technology

315
00:15:37,100 --> 00:15:42,200
this may be sufficient to explain their

316
00:15:39,958 --> 00:15:44,159
non observation or they may be

317
00:15:42,200 --> 00:15:48,329
intentionally stealthy as well that's

318
00:15:44,159 --> 00:15:50,789
appendix 2 okay I see I should have gone

319
00:15:48,328 --> 00:15:53,549
with the PDF form we do know that they

320
00:15:50,789 --> 00:15:55,409
have not chosen to be conspicuous if

321
00:15:53,549 --> 00:15:58,500
they chose to reveal themselves we'd all

322
00:15:55,409 --> 00:16:01,078
know about it instantly so their policy

323
00:15:58,500 --> 00:16:03,958
the policy of the ETI civilization as a

324
00:16:01,078 --> 00:16:06,509
whole therefore it must be either to

325
00:16:03,958 --> 00:16:08,278
avoid making themselves obvious or to

326
00:16:06,509 --> 00:16:13,919
actually make an effort not to be

327
00:16:08,278 --> 00:16:15,750
obvious and yet individual vehicles have

328
00:16:13,919 --> 00:16:17,610

been spotted some times with multiple

329

00:16:15,750 --> 00:16:20,190

instruments and observers on numerous

330

00:16:17,610 --> 00:16:22,320

occasions the controller's of these

331

00:16:20,190 --> 00:16:24,209

vehicles are either deliberately acting

332

00:16:22,320 --> 00:16:26,700

in opposition to their civilizations

333

00:16:24,208 --> 00:16:29,969

policies or they are incompetent at

334

00:16:26,700 --> 00:16:32,759

carrying out those policies ah

335

00:16:29,970 --> 00:16:35,610

and hence the slide titled dissidents or

336

00:16:32,759 --> 00:16:38,338

dots it would seem to follow that ETI

337

00:16:35,610 --> 00:16:40,519

civilization like our own is unable to

338

00:16:38,339 --> 00:16:43,740

instill unanimity of purpose or

339

00:16:40,519 --> 00:16:47,870

uniformity of skill even in individuals

340

00:16:43,740 --> 00:16:47,870

who have access to significant resources

341

00:16:47,929 --> 00:16:53,278

now you may recall from my neutrino

342

00:16:51,240 --> 00:16:57,120

rocketry talk that one of the downsides

343
00:16:53,278 --> 00:17:00,389
of that drive is that any vehicle using

344
00:16:57,120 --> 00:17:02,730
it is a potential Gigaton ball the

345
00:17:00,389 --> 00:17:05,400
implications of having such devices in

346
00:17:02,730 --> 00:17:10,620
the hands of ideological red rebels or

347
00:17:05,400 --> 00:17:12,900
incompetence are not comfortable I think

348
00:17:10,619 --> 00:17:13,109
I've got a couple of minutes yes thank

349
00:17:12,900 --> 00:17:16,048
you

350
00:17:13,109 --> 00:17:21,000
so appendix - why would they be hard to

351
00:17:16,048 --> 00:17:23,250
see okay we can I spot objects in space

352
00:17:21,000 --> 00:17:24,869
just generally from their emissions or

353
00:17:23,250 --> 00:17:27,150
from the reflection of emissions of

354
00:17:24,869 --> 00:17:28,438
other sources I'm going to assume that

355
00:17:27,150 --> 00:17:32,548
there's nothing involved that's big

356
00:17:28,439 --> 00:17:34,200
enough to use gravitational lensing most

357
00:17:32,548 --> 00:17:36,000
asteroid observation is done with

358
00:17:34,200 --> 00:17:39,120
visible light which asteroids reflect

359
00:17:36,000 --> 00:17:41,099
but do not admit IR telescopes can also

360
00:17:39,119 --> 00:17:44,009
track things by their thermal emissions

361
00:17:41,099 --> 00:17:47,500
now artificial bodies will also reflect

362
00:17:44,009 --> 00:17:51,049
and will also emit thermal radiation

363
00:17:47,500 --> 00:17:52,579
however if it's an artificial habitat

364
00:17:51,049 --> 00:17:55,009
for something that likes to live around

365
00:17:52,579 --> 00:17:57,740
liquid water if it's located in the

366
00:17:55,009 --> 00:17:59,720
asteroid belt or farther out it has to

367
00:17:57,740 --> 00:18:02,779
be maintaining an internal temperature

368
00:17:59,720 --> 00:18:04,940
that's a lot higher than the blackbody

369
00:18:02,779 --> 00:18:07,730
at equilibrium temperature from sunlight

370
00:18:04,940 --> 00:18:10,100
at their location so that means it's

371

00:18:07,730 --> 00:18:12,440
designers will want to trap radiation

372
00:18:10,099 --> 00:18:16,519
and they'll want to radiate as little

373
00:18:12,440 --> 00:18:18,590
waste heat as they possibly can so the

374
00:18:16,519 --> 00:18:20,539
side facing the Sun is going to have as

375
00:18:18,589 --> 00:18:22,759
lower reflectivity as possible because

376
00:18:20,539 --> 00:18:24,950
they want to catch whatever they can and

377
00:18:22,759 --> 00:18:27,230
when they're radiating waste heat

378
00:18:24,950 --> 00:18:30,410
they'll want to use the most efficient

379
00:18:27,230 --> 00:18:33,620
heat sink available which is the 2.7

380
00:18:30,410 --> 00:18:35,960
Kelvin background of the open sky away

381
00:18:33,619 --> 00:18:42,889
from the Sun which also happens to be

382
00:18:35,960 --> 00:18:45,940
the side away from us regarding

383
00:18:42,890 --> 00:18:48,020
propulsion from in atmosphere

384
00:18:45,940 --> 00:18:50,029
observations we think that they're

385
00:18:48,019 --> 00:18:52,700

probably using drives that don't show a

386

00:18:50,029 --> 00:18:53,990
visible exhaust even if there's

387

00:18:52,700 --> 00:18:57,590
something different between in

388

00:18:53,990 --> 00:18:59,539
atmosphere and deep space propulsion the

389

00:18:57,589 --> 00:19:02,569
kinds of rockets we're accustomed to are

390

00:18:59,539 --> 00:19:05,329
very inefficient I mean the glare and

391

00:19:02,569 --> 00:19:09,799
the shine doesn't add anything to the

392

00:19:05,329 --> 00:19:11,569
thrust so an optimal reaction Drive is

393

00:19:09,799 --> 00:19:14,659
going to be tightly collimated it's

394

00:19:11,569 --> 00:19:17,929
going to be in extremely internally cold

395

00:19:14,660 --> 00:19:19,690
if we're not going to see it unless it

396

00:19:17,930 --> 00:19:23,120
hits something

397

00:19:19,690 --> 00:19:27,049
similarly talking we're using broadcast

398

00:19:23,119 --> 00:19:29,209
radio all the time we're also all living

399

00:19:27,049 --> 00:19:30,859
on the same planet the farther you have

400
00:19:29,210 --> 00:19:33,710
to send a message the more inefficient

401
00:19:30,859 --> 00:19:35,629
it is to broadcast whatever technology

402
00:19:33,710 --> 00:19:37,579
they use for signaling they're almost

403
00:19:35,630 --> 00:19:39,470
certainly using tight beams that will

404
00:19:37,579 --> 00:19:43,779
only see if we happen to be in the beam

405
00:19:39,470 --> 00:19:46,059
path now that's just the natural

406
00:19:43,779 --> 00:19:48,289
considerations for a space-based

407
00:19:46,059 --> 00:19:50,450
civilization what if they're actually

408
00:19:48,289 --> 00:19:53,299
hiding that would imply that they're

409
00:19:50,450 --> 00:19:55,910
even more careful about their signaling

410
00:19:53,299 --> 00:19:57,919
and drive beam paths and they're going

411
00:19:55,910 --> 00:19:59,840
to make an effort to make sure that

412
00:19:57,920 --> 00:20:00,769
nothing points than anything where

413
00:19:59,839 --> 00:20:04,429
somebody might see

414
00:20:00,769 --> 00:20:06,889
you now why would they be hiding just

415
00:20:04,430 --> 00:20:08,750
going through this very quickly it may

416
00:20:06,890 --> 00:20:10,370
be that they don't want to damage us it

417
00:20:08,750 --> 00:20:12,319
may be that they think we're dangerous

418
00:20:10,369 --> 00:20:13,879
we can rule out the possibility that

419
00:20:12,319 --> 00:20:15,740
they're hostile if they wanted to get

420
00:20:13,880 --> 00:20:19,870
rid of us they they could immediately

421
00:20:15,740 --> 00:20:19,870
and thank you I'll now take questions

422
00:20:20,000 --> 00:20:27,430
[Applause]

423
00:20:28,569 --> 00:20:33,539
into UI did anybody miss the moderators

424
00:20:31,700 --> 00:20:36,598
privilege yes

425
00:20:33,539 --> 00:20:36,598
[Music]

426
00:20:40,950 --> 00:20:49,350
thank you very much I made two comments

427
00:20:46,769 --> 00:20:51,329
one is I think one it's helpful to

428

00:20:49,349 --> 00:20:53,089
distinguish I'll hold the mic close

429
00:20:51,329 --> 00:20:54,990
there okay it's helping distinguish

430
00:20:53,089 --> 00:20:57,899
ordinary physics from extraordinary

431
00:20:54,990 --> 00:21:00,170
physics and if you consider

432
00:20:57,900 --> 00:21:02,820
extraordinary physics and of course

433
00:21:00,170 --> 00:21:05,670
considerations about time of travel and

434
00:21:02,819 --> 00:21:08,309
resources have become irrelevant in this

435
00:21:05,670 --> 00:21:10,410
context mitre also bear in mind reports

436
00:21:08,309 --> 00:21:14,609
of objects appearing out of nowhere and

437
00:21:10,410 --> 00:21:18,870
then vanishing suggesting that we live

438
00:21:14,609 --> 00:21:20,099
in a very complex space-time okay all

439
00:21:18,869 --> 00:21:23,939
right

440
00:21:20,099 --> 00:21:27,629
once you consider extraordinary physics

441
00:21:23,940 --> 00:21:31,470
possibly involving other space-time

442
00:21:27,630 --> 00:21:38,420

manifolds the other point I want to make

443

00:21:31,470 --> 00:21:42,870
is that analysis of of databases

444

00:21:38,420 --> 00:21:46,289
show a strong relationship to local

445

00:21:42,869 --> 00:21:54,329
sidereal time and that points towards

446

00:21:46,289 --> 00:21:56,159
origin outside the solar system my

447

00:21:54,329 --> 00:21:58,429
response to that sorry I forgot for a

448

00:21:56,160 --> 00:22:01,170
moment that I didn't need that mic is

449

00:21:58,430 --> 00:22:04,560
that with regard to extraordinary

450

00:22:01,170 --> 00:22:07,380
physics of course it is very easy to

451

00:22:04,559 --> 00:22:09,269
explain things by invoking extraordinary

452

00:22:07,380 --> 00:22:13,260
physics in terms of a likelihood

453

00:22:09,269 --> 00:22:16,099
analysis I felt compelled to stick with

454

00:22:13,259 --> 00:22:19,349
the principle that known physics is

455

00:22:16,099 --> 00:22:21,619
intrinsically more likely than

456

00:22:19,349 --> 00:22:23,789
extraordinary physics unless

457
00:22:21,619 --> 00:22:27,329
observations are completely incompatible

458
00:22:23,789 --> 00:22:30,930
with known physics regarding satiereal

459
00:22:27,329 --> 00:22:37,649
time correlations I will simply note

460
00:22:30,930 --> 00:22:40,130
that a a a a paper belt habitat is going

461
00:22:37,650 --> 00:22:44,100
to have a longer orbit than Pluto's

462
00:22:40,130 --> 00:22:47,160
which means more than two to three

463
00:22:44,099 --> 00:22:49,409
centuries which means that a single

464
00:22:47,160 --> 00:22:51,810
origin point somewhere out in the Kuiper

465
00:22:49,410 --> 00:22:53,850
belt would only have moved across a

466
00:22:51,809 --> 00:22:58,379
small patch of sky in the

467
00:22:53,849 --> 00:23:01,109
we've been making observations thank you

468
00:22:58,380 --> 00:23:04,340
for your stunning use of logic that was

469
00:23:01,109 --> 00:23:08,399
really interesting regarding the the

470
00:23:04,339 --> 00:23:10,558
propulsion force probably you're

471
00:23:08,400 --> 00:23:13,110
familiar with all the ways lifters that

472
00:23:10,558 --> 00:23:16,829
are on the Internet we have one in the

473
00:23:13,109 --> 00:23:20,009
lab you just attached to wires to

474
00:23:16,829 --> 00:23:22,288
conductors on a lightweight frame to

475
00:23:20,009 --> 00:23:24,629
10,000 volts and it lifts like a genie

476
00:23:22,288 --> 00:23:27,869
and ours lifts up about a meter or so

477
00:23:24,630 --> 00:23:31,020
but I've seen some of them lifting up 5

478
00:23:27,869 --> 00:23:33,239
or 10 meters is this a possibility it's

479
00:23:31,019 --> 00:23:36,089
very simple you just need a high voltage

480
00:23:33,240 --> 00:23:38,940
source and I suppose if these are

481
00:23:36,089 --> 00:23:40,829
developed further than what what the

482
00:23:38,940 --> 00:23:44,000
hobbyists have been able to do you could

483
00:23:40,829 --> 00:23:46,519
get substantial lift out of that

484
00:23:44,000 --> 00:23:49,859
possible electromagnetic drive

485

00:23:46,519 --> 00:23:51,690
mechanisms that interact with the

486
00:23:49,859 --> 00:23:56,279
atmosphere or the Earth's magnetic

487
00:23:51,690 --> 00:23:59,940
fields are among the possibilities that

488
00:23:56,279 --> 00:24:02,990
I glossed over for lack of time so yes

489
00:23:59,940 --> 00:24:02,990
that's certainly plausible

490
00:24:10,720 --> 00:24:18,319
hi York known physics to you and all of

491
00:24:15,829 --> 00:24:20,629
us I think now includes the ability to

492
00:24:18,319 --> 00:24:23,178
shift subtly the probabilities of events

493
00:24:20,630 --> 00:24:30,490
is it possible that they got here and

494
00:24:23,179 --> 00:24:33,530
travelled by an improbable ax T Drive I

495
00:24:30,490 --> 00:24:36,190
am afraid I have to class that with

496
00:24:33,529 --> 00:24:40,668
extraordinary physics mostly because

497
00:24:36,190 --> 00:24:43,759
experiments in parapsychology show that

498
00:24:40,669 --> 00:24:46,759
there is some sort of disconnect between

499
00:24:43,759 --> 00:24:49,250

the probabilities of relatively

500

00:24:46,759 --> 00:24:52,750
infrequent events like bits being

501

00:24:49,250 --> 00:24:57,579
processed and the probabilities for

502

00:24:52,750 --> 00:25:01,308
elementary interactions I pair showed a

503

00:24:57,579 --> 00:25:04,428
1 in 10,000 probability shift from RNG s

504

00:25:01,308 --> 00:25:07,700
if I can do a 1 in 10,000 probability

505

00:25:04,429 --> 00:25:09,320
shift in molecules I can slam that door

506

00:25:07,700 --> 00:25:16,700
and hold it shut against the battering

507

00:25:09,319 --> 00:25:19,099
ram we don't see that in the lab york

508

00:25:16,700 --> 00:25:21,169
regarding conspiracy theories I think

509

00:25:19,099 --> 00:25:23,058
Richard Nixon said that you're not

510

00:25:21,169 --> 00:25:26,690
paranoid if they really are out to get

511

00:25:23,058 --> 00:25:30,859
you the converse of that is that you

512

00:25:26,690 --> 00:25:32,870
even if they are out to get you paranoia

513

00:25:30,859 --> 00:25:36,199
is still unhealthy and dysfunctional

514
00:25:32,869 --> 00:25:38,000
thinking but more seriously if the

515
00:25:36,200 --> 00:25:40,400
extraterrestrials are hiding their

516
00:25:38,000 --> 00:25:41,859
presence isn't that a kind of conspiracy

517
00:25:40,400 --> 00:25:45,019
theory ah

518
00:25:41,859 --> 00:25:47,990
no because I'm not postulating that

519
00:25:45,019 --> 00:25:49,970
there's a human conspiracy that has

520
00:25:47,990 --> 00:25:51,859
somehow managed to infiltrate every

521
00:25:49,970 --> 00:25:56,089
major government on earth while still

522
00:25:51,859 --> 00:25:57,798
hiding itself if they're hiding there

523
00:25:56,089 --> 00:26:02,959
they're way out there where they're hard

524
00:25:57,798 --> 00:26:03,769
to see ok thank you very much York good

525
00:26:02,960 --> 00:26:07,819
presentation

526
00:26:03,769 --> 00:26:11,328
[Applause]

527
00:26:07,819 --> 00:26:11,328
[Music]

528

00:26:11,470 --> 00:26:13,529

you

529

00:26:23,210 --> 00:26:25,269

you