



1  
00:00:25,120 --> 00:00:16,080

[Music]

2  
00:00:27,280 --> 00:00:25,130

maximum likelihood methods are more

3  
00:00:30,940 --> 00:00:27,290

familiar from things like parameter

4  
00:00:33,060 --> 00:00:30,950

estimation problems where you have a

5  
00:00:35,860 --> 00:00:33,070

large body of data and you have a

6  
00:00:39,070 --> 00:00:35,870

rigorous mathematical model that

7  
00:00:40,870 --> 00:00:39,080

connects them observations to parameter

8  
00:00:43,030 --> 00:00:40,880

values and you're trying to find the

9  
00:00:47,380 --> 00:00:43,040

best fit to a lot of conflicting

10  
00:00:50,230 --> 00:00:47,390

measurements however you can also use it

11  
00:00:53,350 --> 00:00:50,240

in a more qualitative situation as long

12  
00:01:00,270 --> 00:00:53,360

as you can decide whether one hypothesis

13  
00:01:03,479 --> 00:01:00,280

is more likely than a competitor and the

14

00:01:06,789 --> 00:01:03,489

upshot is that even when you have

15

00:01:10,810 --> 00:01:06,799

multiple components for a hypothesis as

16

00:01:14,559 --> 00:01:10,820

long as at each stage you are choosing

17

00:01:18,209 --> 00:01:14,569

the most likely alternative by the end

18

00:01:20,260 --> 00:01:18,219

of the process you have the most likely

19

00:01:22,660 --> 00:01:20,270

hypothesis among the various

20

00:01:26,080 --> 00:01:22,670

possibilities you can't say anything

21

00:01:30,160 --> 00:01:26,090

about how likely it is in any absolute

22

00:01:33,099 --> 00:01:30,170

sense or whether it's how much it's more

23

00:01:37,499 --> 00:01:33,109

likely than its rivals you can just say

24

00:01:45,219 --> 00:01:42,609

so the the ETI problem I prefer that to

25

00:01:47,410 --> 00:01:45,229

UFOs because of course there are UFOs

26  
00:01:51,519 --> 00:01:47,420  
anybody anything that you can't identify

27  
00:01:53,739 --> 00:01:51,529  
as an unidentified flying object but the

28  
00:01:55,510 --> 00:01:53,749  
hypothesis that interests most people is

29  
00:01:58,980 --> 00:01:55,520  
that some of these unidentified flying

30  
00:02:02,129 --> 00:01:58,990  
objects are be our vehicles operated by

31  
00:02:04,899 --> 00:02:02,139  
extraterrestrial intelligences and as

32  
00:02:08,589 --> 00:02:04,909  
was sort of implied by my build up I'm

33  
00:02:12,610 --> 00:02:08,599  
not trying to estimate the likelihood

34  
00:02:15,369 --> 00:02:12,620  
that the ETI hypothesis is true my

35  
00:02:18,580 --> 00:02:15,379  
discussion here is suppose we stipulate

36  
00:02:19,970 --> 00:02:18,590  
that these are extraterrestrial vehicles

37  
00:02:24,050 --> 00:02:19,980  
what can we

38  
00:02:26,420 --> 00:02:24,060

infer about the ETI from what's been

39

00:02:30,500 --> 00:02:26,430

seen of them what are the most likely

40

00:02:33,680 --> 00:02:30,510

properties a general principle I'll be

41

00:02:35,770 --> 00:02:33,690

using is that the known is more likely

42

00:02:39,589 --> 00:02:35,780

than the speculative if there's

43

00:02:42,500 --> 00:02:39,599

something that we know is real it's more

44

00:02:45,229 --> 00:02:42,510

likely than something that we only know

45

00:02:47,240 --> 00:02:45,239

is possible on the other hand if there's

46

00:02:49,759 --> 00:02:47,250

something that we know is possible

47

00:02:52,699 --> 00:02:49,769

that's more likely than something that

48

00:02:58,309 --> 00:02:52,709

we simply have not yet proven to be

49

00:03:01,449 --> 00:02:58,319

impossible there is however a a caveat

50

00:03:04,119 --> 00:03:01,459

that yeah applying this unthinkingly

51  
00:03:07,309 --> 00:03:04,129  
will always lead to perfectly mundane

52  
00:03:11,809 --> 00:03:07,319  
explanations for everything so it has to

53  
00:03:14,289 --> 00:03:11,819  
be consistent with the evidence now

54  
00:03:16,339 --> 00:03:14,299  
reviewing what the relevant evidence is

55  
00:03:18,259 --> 00:03:16,349  
would require a book

56  
00:03:22,699 --> 00:03:18,269  
fortunately Peter Stewart has written

57  
00:03:24,530 --> 00:03:22,709  
the book so I don't have to but the this

58  
00:03:28,309 --> 00:03:24,540  
current discussion is based on some very

59  
00:03:30,409 --> 00:03:28,319  
general summary observations there is a

60  
00:03:34,009 --> 00:03:30,419  
lot of eyewitness testimony some of it

61  
00:03:37,159 --> 00:03:34,019  
extremely high quality to things that

62  
00:03:39,409 --> 00:03:37,169  
look like aircraft or aerial vehicles

63  
00:03:43,240 --> 00:03:39,419

that aren't aren't identifiable with any

64

00:03:45,920 --> 00:03:43,250

human culture or technology there's

65

00:03:48,800 --> 00:03:45,930

instrument recordings video tapes

66

00:03:51,470 --> 00:03:48,810

similar comments there are somewhat

67

00:03:54,349 --> 00:03:51,480

fewer but some cases of physical

68

00:03:56,420 --> 00:03:54,359

evidence left behind some of this I want

69

00:03:59,629 --> 00:03:56,430

quality witness testimony attests to

70

00:04:02,539 --> 00:03:59,639

seeing occupants who sometimes exit the

71

00:04:05,210 --> 00:04:02,549

vehicles when occupants are reported

72

00:04:07,009 --> 00:04:05,220

they're almost always humanoid they may

73

00:04:10,059 --> 00:04:07,019

or may not be described as wearing what

74

00:04:12,470 --> 00:04:10,069

appears to be environmental protection

75

00:04:15,050 --> 00:04:12,480

supposed vehicles in some sightings

76  
00:04:18,680 --> 00:04:15,060  
undertake maneuvers that are well beyond

77  
00:04:22,000 --> 00:04:18,690  
our technical capability there are some

78  
00:04:25,279 --> 00:04:22,010  
areas of evidence that I am ignoring I

79  
00:04:27,439 --> 00:04:25,289  
am not paying attention to any reports

80  
00:04:29,959 --> 00:04:27,449  
of voluntary boarding of vehicles by

81  
00:04:33,140 --> 00:04:29,969  
humans or of abductions by vehicles

82  
00:04:34,940 --> 00:04:33,150  
although it belatedly occurs to me

83  
00:04:39,770 --> 00:04:34,950  
that it actually wouldn't make much

84  
00:04:41,780 --> 00:04:39,780  
difference to my conclusions one one

85  
00:04:44,090 --> 00:04:41,790  
element that I'm disregarding that would

86  
00:04:47,720 --> 00:04:44,100  
make a difference is reports some of

87  
00:04:49,910 --> 00:04:47,730  
which have been made at the SSE - that

88  
00:04:52,160 --> 00:04:49,920

the ETS are in fact known to an in

89

00:04:53,690 --> 00:04:52,170

regular contact with human governments

90

00:04:55,850 --> 00:04:53,700

and pursuing various kinds of

91

00:04:58,640 --> 00:04:55,860

clandestine cooperation

92

00:05:02,570 --> 00:04:58,650

the reason I'm ignoring that is that

93

00:05:04,310 --> 00:05:02,580

conspiracy theories are not science in

94

00:05:06,560 --> 00:05:04,320

the first place I would say their

95

00:05:09,080 --> 00:05:06,570

intrinsic likelihood as the great

96

00:05:12,290 --> 00:05:09,090

conspiracy is very low it's shared by

97

00:05:15,470 --> 00:05:12,300

mutually hostile regimes over decades

98

00:05:17,890 --> 00:05:15,480

while regimes have changed and yet

99

00:05:20,210 --> 00:05:17,900

despite this apparent worldwide

100

00:05:22,520 --> 00:05:20,220

overwhelming power the conspiracy is

101  
00:05:24,560 --> 00:05:22,530  
somehow failing to silence the brave

102  
00:05:28,910 --> 00:05:24,570  
whistleblowers who are trying to expose

103  
00:05:32,180 --> 00:05:28,920  
it basically believing in the great

104  
00:05:36,050 --> 00:05:32,190  
conspiracy is evidence transcendent any

105  
00:05:38,840 --> 00:05:36,060  
behavior whatsoever is compatible with

106  
00:05:41,060 --> 00:05:38,850  
the notion that it's due to a conspiracy

107  
00:05:43,790 --> 00:05:41,070  
however mysterious it is it's what the

108  
00:05:48,140 --> 00:05:43,800  
conspiracy wants so it can never be

109  
00:05:53,720 --> 00:05:48,150  
refuted it is non falsifiable it has no

110  
00:05:55,700 --> 00:05:53,730  
place in scientific discourse now I and

111  
00:05:58,690 --> 00:05:55,710  
having multiple components of the theory

112  
00:06:01,970 --> 00:05:58,700  
here are the big ones

113  
00:06:02,630 --> 00:06:01,980

do these et eyes have faster than light

114

00:06:04,790 --> 00:06:02,640

travel

115

00:06:06,290 --> 00:06:04,800

do they have reaction with drives did

116

00:06:09,770 --> 00:06:06,300

they have some form of inertia or

117

00:06:12,170 --> 00:06:09,780

gravity control what can we infer about

118

00:06:13,750 --> 00:06:12,180

their biology and where are they coming

119

00:06:22,430 --> 00:06:13,760

from

120

00:06:24,500 --> 00:06:22,440

well FTA FTL travel is a simple one our

121

00:06:26,660 --> 00:06:24,510

current physics absolutely limits

122

00:06:29,780 --> 00:06:26,670

material objects to speeds less than

123

00:06:31,850 --> 00:06:29,790

light there are lots of potential

124

00:06:34,220 --> 00:06:31,860

loopholes in that but none of those

125

00:06:36,260 --> 00:06:34,230

loopholes have been demonstrated to

126

00:06:39,080 --> 00:06:36,270

actually happen in the world that we

127

00:06:42,980 --> 00:06:39,090

live in they are all speculative so

128

00:06:45,200 --> 00:06:42,990

provisional conclusion unless we are

129

00:06:48,140 --> 00:06:45,210

faced with totally incompatible

130

00:06:52,960 --> 00:06:48,150

it is more likely that the ETI do not

131

00:06:58,969 --> 00:06:52,970

have FTL travel reaction --less drops

132

00:07:01,520 --> 00:06:58,979

now in in virtually all cases the things

133

00:07:03,529 --> 00:07:01,530

that are cited fly around and maneuver

134

00:07:05,870 --> 00:07:03,539

they're not showing jet exhaust they're

135

00:07:07,820 --> 00:07:05,880

not showing rocket exhaust they're not

136

00:07:11,390 --> 00:07:07,830

showing any kind of exhaust typically

137

00:07:13,939 --> 00:07:11,400

and when people get a close enough view

138

00:07:16,219 --> 00:07:13,949

to report some details of the object

139

00:07:20,050 --> 00:07:16,229

structure there's nothing that looks

140

00:07:23,980 --> 00:07:20,060

like a rocket venturi or a jet engine

141

00:07:26,870 --> 00:07:23,990

now on the other hand from from physics

142

00:07:32,029 --> 00:07:26,880

the third law of motion has not been

143

00:07:35,029 --> 00:07:32,039

repealed according to known physics you

144

00:07:38,779 --> 00:07:35,039

you can't accelerate without throwing

145

00:07:41,779 --> 00:07:38,789

something the other way so does the lack

146

00:07:43,879 --> 00:07:41,789

of a of an observed exhaust mean that we

147

00:07:46,700 --> 00:07:43,889

have to give that up and the answer is

148

00:07:49,879 --> 00:07:46,710

no a few years ago I presented a paper

149

00:07:53,810 --> 00:07:49,889

on neutrino rocketry it remains the case

150

00:07:57,830 --> 00:07:53,820

that if that it is possible to produce a

151  
00:07:59,810 --> 00:07:57,840  
collimated jet of neutrinos that would

152  
00:08:02,570 --> 00:07:59,820  
exert an unbalanced force on its

153  
00:08:04,730 --> 00:08:02,580  
generator and that is an exhaust that

154  
00:08:06,770 --> 00:08:04,740  
none of our instrumentation would see

155  
00:08:09,710 --> 00:08:06,780  
and of course our eyes wouldn't either

156  
00:08:11,930 --> 00:08:09,720  
so since the there is also other

157  
00:08:14,529 --> 00:08:11,940  
possibilities which I'm not going to go

158  
00:08:17,149 --> 00:08:14,539  
into right now because of limited time

159  
00:08:19,850 --> 00:08:17,159  
but since the evidence does not rule it

160  
00:08:24,620 --> 00:08:19,860  
out it is more likely that ETI vehicles

161  
00:08:26,629 --> 00:08:24,630  
are using reaction drives then there's

162  
00:08:29,240 --> 00:08:26,639  
the question of being able to control

163  
00:08:32,569 --> 00:08:29,250

inertia or have some sort of internal

164

00:08:34,010 --> 00:08:32,579

gravity system to accommodate these some

165

00:08:38,269 --> 00:08:34,020

of these extraordinarily violent

166

00:08:41,779 --> 00:08:38,279

maneuvers and once again I'm coming down

167

00:08:45,220 --> 00:08:41,789

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

168

00:08:48,290 --> 00:08:45,230

exotic physics because there there are

169

00:08:51,170 --> 00:08:48,300

known techniques which are almost at the

170

00:08:53,810 --> 00:08:51,180

level of practical application where you

171

00:08:57,019 --> 00:08:53,820

could get humans to survive tremendous

172

00:08:58,400 --> 00:08:57,029

g-forces basically the idea is fill up

173

00:09:02,119 --> 00:08:58,410

all of your internal

174

00:09:05,059 --> 00:09:02,129

spaces with a liquid of roughly neutral

175

00:09:06,680 --> 00:09:05,069

buoyancy and then to a first

176

00:09:07,970 --> 00:09:06,690

approximation you don't care about

177

00:09:10,340 --> 00:09:07,980

gravity you don't care about

178

00:09:12,499 --> 00:09:10,350

acceleration there will be some limits

179

00:09:16,369 --> 00:09:12,509

because muscle and bone and fat aren't

180

00:09:18,740 --> 00:09:16,379

all exactly the same density and at the

181

00:09:21,889 --> 00:09:18,750

moment the big technological hurdle is

182

00:09:25,730 --> 00:09:21,899

getting a fluid that can oxygenate the

183

00:09:30,460 --> 00:09:25,740

lungs without desiccating them to the

184

00:09:32,869 --> 00:09:30,470

point that that you die of asphyxiation

185

00:09:35,900 --> 00:09:32,879

after the fluid is removed and you try

186

00:09:37,970 --> 00:09:35,910

to get back to breathing air that has

187

00:09:39,920 --> 00:09:37,980

been a very frequent problem with test

188

00:09:41,929 --> 00:09:39,930

animals in this kind of medium and

189

00:09:49,309 --> 00:09:41,939

that's why it hasn't really been tested

190

00:09:52,340 --> 00:09:49,319

in humans yet okay now for biology the

191

00:09:54,369 --> 00:09:52,350

occupants that have been reported most

192

00:09:57,170 --> 00:09:54,379

reports say they're humanoid

193

00:09:59,629 --> 00:09:57,180

they can function in earthly conditions

194

00:10:01,970 --> 00:09:59,639

with and they don't while they may be

195

00:10:03,730 --> 00:10:01,980

wearing protection they don't need so

196

00:10:08,360 --> 00:10:03,740

much protection that the body shape is

197

00:10:10,249 --> 00:10:08,370

unrecognizable now here the evidential

198

00:10:13,040 --> 00:10:10,259

value is limited even if the witness

199

00:10:15,319 --> 00:10:13,050

testimony is totally reliable for one

200

00:10:17,300 --> 00:10:15,329

thing a nonhuman on a non humanoid

201  
00:10:20,269 --> 00:10:17,310  
occupant might not be recognized as an

202  
00:10:22,780 --> 00:10:20,279  
occupant for another thing the humanoids

203  
00:10:25,429 --> 00:10:22,790  
that have been reported and described

204  
00:10:28,160 --> 00:10:25,439  
could perfectly well be telepresence

205  
00:10:32,679 --> 00:10:28,170  
robots or bio engineered life-forms

206  
00:10:36,249 --> 00:10:32,689  
purpose-built for exploration however

207  
00:10:40,220 --> 00:10:36,259  
even granted that that the value of the

208  
00:10:42,530 --> 00:10:40,230  
observations is limited it's not zero so

209  
00:10:44,629 --> 00:10:42,540  
it is at least provisionally more likely

210  
00:10:46,610 --> 00:10:44,639  
that vehicle occupants are water-based

211  
00:10:50,720 --> 00:10:46,620  
oxygen breathers capable of handling

212  
00:10:52,939 --> 00:10:50,730  
earth gravity and now where do they come

213  
00:10:54,949 --> 00:10:52,949

from the occupants can function in

214

00:10:57,170 --> 00:10:54,959

earth-like environments no such

215

00:10:59,509 --> 00:10:57,180

environments occur naturally in any

216

00:11:02,269 --> 00:10:59,519

other body I mean in this solar system

217

00:11:04,519 --> 00:11:02,279

and that seems to spawn four

218

00:11:07,759 --> 00:11:04,529

possibilities they're comfortable in

219

00:11:10,670 --> 00:11:07,769

widely variable environments or they're

220

00:11:12,350 --> 00:11:10,680

from Earth or they're from artificial

221

00:11:15,850 --> 00:11:12,360

habitats in the solar system

222

00:11:19,639 --> 00:11:15,860

or they're from another solar system

223

00:11:22,759 --> 00:11:19,649

okay could could they be able to handle

224

00:11:24,819 --> 00:11:22,769

any environment well what we know of

225

00:11:27,620 --> 00:11:24,829

biology doesn't seem to agree with that

226

00:11:32,240 --> 00:11:27,630

extremophiles have colonized every

227

00:11:35,150 --> 00:11:32,250

environment that exists on earth but no

228

00:11:38,230 --> 00:11:35,160

extrema file is adapted to all extreme

229

00:11:40,660 --> 00:11:38,240

environments algae can grow on in ice

230

00:11:45,670 --> 00:11:40,670

thermophiles can grow in boiling water

231

00:11:48,259 --> 00:11:45,680

they don't cross over so given an

232

00:11:50,810 --> 00:11:48,269

organism that can survive typical earth

233

00:11:52,819 --> 00:11:50,820

surface conditions it is more likely

234

00:11:56,680 --> 00:11:52,829

that it will be killed by typical

235

00:12:02,480 --> 00:11:56,690

conditions on other solar system bodies

236

00:12:04,400 --> 00:12:02,490

so is ETI really T I mean on the face of

237

00:12:06,410 --> 00:12:04,410

it the most likely explanation for a

238

00:12:07,730 --> 00:12:06,420

human shape human-sized being who

239

00:12:10,280 --> 00:12:07,740

functions well in earth-like conditions

240

00:12:12,139 --> 00:12:10,290

is that it really is a human being from

241

00:12:14,329 --> 00:12:12,149

Earth ah

242

00:12:16,190 --> 00:12:14,339

I consider this incompatible with

243

00:12:20,780 --> 00:12:16,200

evidence but the evidence in this case

244

00:12:23,090 --> 00:12:20,790

is negative we don't know of any human

245

00:12:26,329 --> 00:12:23,100

civilization that has these technical

246

00:12:28,910 --> 00:12:26,339

capabilities and believing that it could

247

00:12:30,380 --> 00:12:28,920

be hidden given how crowded the world is

248

00:12:32,960 --> 00:12:30,390

and how much of it is settled in under

249

00:12:35,750 --> 00:12:32,970

continuous observation requires a return

250

00:12:40,970 --> 00:12:35,760

to the great conspiracy theory see a

251  
00:12:43,900 --> 00:12:40,980  
dozen or so slides back now doesn't the

252  
00:12:47,569 --> 00:12:43,910  
evidence also rule out solar system or

253  
00:12:50,600 --> 00:12:47,579  
origin the thing is unlike Earth the

254  
00:12:52,670 --> 00:12:50,610  
solar system contains vast regions where

255  
00:12:55,579 --> 00:12:52,680  
a high-tech civilization could flourish

256  
00:12:58,790 --> 00:12:55,589  
without being detected by our current

257  
00:13:01,340 --> 00:12:58,800  
technology even in the asteroid belt

258  
00:13:03,829 --> 00:13:01,350  
which is only to astronomical to three

259  
00:13:06,800 --> 00:13:03,839  
astronomical units away an astronomical

260  
00:13:08,870 --> 00:13:06,810  
unit is the radius of Earth's orbit it's

261  
00:13:10,970 --> 00:13:08,880  
estimated that only about two-thirds of

262  
00:13:14,930 --> 00:13:10,980  
asteroids larger than 1 kilometer have

263  
00:13:16,490 --> 00:13:14,940

been detected we've also realized that

264

00:13:19,670 --> 00:13:16,500

there's a lot of stuff out in the Kuiper

265

00:13:22,710 --> 00:13:19,680

belt at about 50 astronomical units

266

00:13:26,500 --> 00:13:22,720

which is much harder to detect

267

00:13:29,050 --> 00:13:26,510

then on the other hand wouldn't

268

00:13:34,030 --> 00:13:29,060

artificial habitats be easier to spot

269

00:13:38,380 --> 00:13:34,040

than rocks and I see that we have some

270

00:13:41,140 --> 00:13:38,390

spacing issues here sorry the answer is

271

00:13:44,770 --> 00:13:41,150

basically that given the constraints

272

00:13:47,470 --> 00:13:44,780

from a that that a space going habitats

273

00:13:49,960 --> 00:13:47,480

suffers there are strong reasons to

274

00:13:52,660 --> 00:13:49,970

think that it would not be putting out a

275

00:13:54,940 --> 00:13:52,670

lot of radiation it would not be

276  
00:13:56,560 --> 00:13:54,950  
particularly more visible than a natural

277  
00:13:59,530 --> 00:13:56,570  
body and it might very well be less

278  
00:14:03,160 --> 00:13:59,540  
visible but I reserved the details for

279  
00:14:07,570 --> 00:14:03,170  
an appendix which I'll get to if I

280  
00:14:09,970 --> 00:14:07,580  
move fast enough so an advanced

281  
00:14:11,950 --> 00:14:09,980  
civilization using space-based resources

282  
00:14:16,090 --> 00:14:11,960  
within the solar system is compatible

283  
00:14:18,520 --> 00:14:16,100  
with the observation then there's the

284  
00:14:22,060 --> 00:14:18,530  
question of solar or extrasolar origin

285  
00:14:24,550 --> 00:14:22,070  
and just as a side note origin here I

286  
00:14:27,130 --> 00:14:24,560  
don't mean where they evolved I mean

287  
00:14:29,080 --> 00:14:27,140  
where they're living now what is the

288  
00:14:32,320 --> 00:14:29,090

spot from which the vehicles start their

289

00:14:34,330 --> 00:14:32,330

missions well the nearest stars are over

290

00:14:36,880 --> 00:14:34,340

a quarter of a million astronomical

291

00:14:40,330 --> 00:14:36,890

units away whereas even a quaver belt

292

00:14:43,540 --> 00:14:40,340

habitat is only 50 astronomical units

293

00:14:46,270 --> 00:14:43,550

away no matter what their technology is

294

00:14:47,950 --> 00:14:46,280

the longer trip is an enormous ly

295

00:14:54,340 --> 00:14:47,960

greater investment of effort and

296

00:14:57,760 --> 00:14:54,350

resources so the the the conclusion

297

00:14:59,800 --> 00:14:57,770

there is that the most likely hypothesis

298

00:15:01,780 --> 00:14:59,810

among those four competitors is that

299

00:15:06,100 --> 00:15:01,790

they live in artificial habitats within

300

00:15:08,830 --> 00:15:06,110

our solar system summing up they do not

301  
00:15:11,740 --> 00:15:08,840  
have FTL travel they live in somewhat

302  
00:15:13,570 --> 00:15:11,750  
earth-like conditions these conditions

303  
00:15:15,220 --> 00:15:13,580  
are artificially maintained in deep

304  
00:15:17,230 --> 00:15:15,230  
space habitats and they use

305  
00:15:19,720 --> 00:15:17,240  
inconspicuous reaction drives for

306  
00:15:21,760 --> 00:15:19,730  
propulsion now was that the five-minute

307  
00:15:24,600 --> 00:15:21,770  
warning I just got then I have time

308  
00:15:28,120 --> 00:15:24,610  
enough to at least go on to appendix 1

309  
00:15:30,310 --> 00:15:28,130  
some additional inferences there

310  
00:15:32,740 --> 00:15:30,320  
naturally their civilization is

311  
00:15:37,090 --> 00:15:32,750  
naturally in conspicuous to our current

312  
00:15:42,190 --> 00:15:39,949  
this may be sufficient to explain their

313  
00:15:44,150 --> 00:15:42,200

non observation or they may be

314

00:15:48,319 --> 00:15:44,160

intentionally stealthy as well that's

315

00:15:50,780 --> 00:15:48,329

appendix 2 okay I see I should have gone

316

00:15:53,540 --> 00:15:50,790

with the PDF form we do know that they

317

00:15:55,400 --> 00:15:53,550

have not chosen to be conspicuous if

318

00:15:58,490 --> 00:15:55,410

they chose to reveal themselves we'd all

319

00:16:01,069 --> 00:15:58,500

know about it instantly so their policy

320

00:16:03,949 --> 00:16:01,079

the policy of the ETI civilization as a

321

00:16:06,500 --> 00:16:03,959

whole therefore it must be either to

322

00:16:08,269 --> 00:16:06,510

avoid making themselves obvious or to

323

00:16:13,910 --> 00:16:08,279

actually make an effort not to be

324

00:16:15,740 --> 00:16:13,920

obvious and yet individual vehicles have

325

00:16:17,600 --> 00:16:15,750

been spotted some times with multiple

326

00:16:20,180 --> 00:16:17,610

instruments and observers on numerous

327

00:16:22,310 --> 00:16:20,190

occasions the controller's of these

328

00:16:24,199 --> 00:16:22,320

vehicles are either deliberately acting

329

00:16:26,690 --> 00:16:24,209

in opposition to their civilizations

330

00:16:29,960 --> 00:16:26,700

policies or they are incompetent at

331

00:16:32,750 --> 00:16:29,970

carrying out those policies ah

332

00:16:35,600 --> 00:16:32,760

and hence the slide titled dissidents or

333

00:16:38,329 --> 00:16:35,610

dots it would seem to follow that ETI

334

00:16:40,509 --> 00:16:38,339

civilization like our own is unable to

335

00:16:43,730 --> 00:16:40,519

instill unanimity of purpose or

336

00:16:47,920 --> 00:16:43,740

uniformity of skill even in individuals

337

00:16:53,269 --> 00:16:51,230

now you may recall from my neutrino

338

00:16:57,110 --> 00:16:53,279

rocketry talk that one of the downsides

339

00:17:00,380 --> 00:16:57,120

of that drive is that any vehicle using

340

00:17:02,720 --> 00:17:00,390

it is a potential Gigaton ball the

341

00:17:05,390 --> 00:17:02,730

implications of having such devices in

342

00:17:10,610 --> 00:17:05,400

the hands of ideological red rebels or

343

00:17:12,890 --> 00:17:10,620

incompetence are not comfortable I think

344

00:17:13,100 --> 00:17:12,900

I've got a couple of minutes yes thank

345

00:17:16,039 --> 00:17:13,110

you

346

00:17:20,990 --> 00:17:16,049

so appendix - why would they be hard to

347

00:17:23,240 --> 00:17:21,000

see okay we can I spot objects in space

348

00:17:24,860 --> 00:17:23,250

just generally from their emissions or

349

00:17:27,140 --> 00:17:24,870

from the reflection of emissions of

350

00:17:28,429 --> 00:17:27,150

other sources I'm going to assume that

351

00:17:32,539 --> 00:17:28,439

there's nothing involved that's big

352

00:17:34,190 --> 00:17:32,549

enough to use gravitational lensing most

353

00:17:35,990 --> 00:17:34,200

asteroid observation is done with

354

00:17:39,110 --> 00:17:36,000

visible light which asteroids reflect

355

00:17:41,090 --> 00:17:39,120

but do not admit IR telescopes can also

356

00:17:44,000 --> 00:17:41,100

track things by their thermal emissions

357

00:17:47,490 --> 00:17:44,010

now artificial bodies will also reflect

358

00:17:51,040 --> 00:17:47,500

and will also emit thermal radiation

359

00:17:52,570 --> 00:17:51,050

however if it's an artificial habitat

360

00:17:55,000 --> 00:17:52,580

for something that likes to live around

361

00:17:57,730 --> 00:17:55,010

liquid water if it's located in the

362

00:17:59,710 --> 00:17:57,740

asteroid belt or farther out it has to

363

00:18:02,770 --> 00:17:59,720

be maintaining an internal temperature

364

00:18:04,930 --> 00:18:02,780

that's a lot higher than the blackbody

365

00:18:07,720 --> 00:18:04,940

at equilibrium temperature from sunlight

366

00:18:10,090 --> 00:18:07,730

at their location so that means it's

367

00:18:12,430 --> 00:18:10,100

designers will want to trap radiation

368

00:18:16,510 --> 00:18:12,440

and they'll want to radiate as little

369

00:18:18,580 --> 00:18:16,520

waste heat as they possibly can so the

370

00:18:20,530 --> 00:18:18,590

side facing the Sun is going to have as

371

00:18:22,750 --> 00:18:20,540

lower reflectivity as possible because

372

00:18:24,940 --> 00:18:22,760

they want to catch whatever they can and

373

00:18:27,220 --> 00:18:24,950

when they're radiating waste heat

374

00:18:30,400 --> 00:18:27,230

they'll want to use the most efficient

375

00:18:33,610 --> 00:18:30,410

heat sink available which is the 2.7

376

00:18:35,950 --> 00:18:33,620

Kelvin background of the open sky away

377

00:18:42,880 --> 00:18:35,960

from the Sun which also happens to be

378

00:18:45,930 --> 00:18:42,890

the side away from us regarding

379

00:18:48,010 --> 00:18:45,940

propulsion from in atmosphere

380

00:18:50,020 --> 00:18:48,020

observations we think that they're

381

00:18:52,690 --> 00:18:50,030

probably using drives that don't show a

382

00:18:53,980 --> 00:18:52,700

visible exhaust even if there's

383

00:18:57,580 --> 00:18:53,990

something different between in

384

00:18:59,530 --> 00:18:57,590

atmosphere and deep space propulsion the

385

00:19:02,560 --> 00:18:59,540

kinds of rockets we're accustomed to are

386

00:19:05,320 --> 00:19:02,570

very inefficient I mean the glare and

387

00:19:09,790 --> 00:19:05,330

the shine doesn't add anything to the

388

00:19:11,560 --> 00:19:09,800

thrust so an optimal reaction Drive is

389

00:19:14,650 --> 00:19:11,570

going to be tightly collimated it's

390

00:19:17,920 --> 00:19:14,660

going to be in extremely internally cold

391

00:19:19,680 --> 00:19:17,930

if we're not going to see it unless it

392

00:19:23,110 --> 00:19:19,690

hits something

393

00:19:27,040 --> 00:19:23,120

similarly talking we're using broadcast

394

00:19:29,200 --> 00:19:27,050

radio all the time we're also all living

395

00:19:30,850 --> 00:19:29,210

on the same planet the farther you have

396

00:19:33,700 --> 00:19:30,860

to send a message the more inefficient

397

00:19:35,620 --> 00:19:33,710

it is to broadcast whatever technology

398

00:19:37,570 --> 00:19:35,630

they use for signaling they're almost

399

00:19:39,460 --> 00:19:37,580

certainly using tight beams that will

400

00:19:43,770 --> 00:19:39,470

only see if we happen to be in the beam

401  
00:19:46,050 --> 00:19:43,780  
path now that's just the natural

402  
00:19:48,280 --> 00:19:46,060  
considerations for a space-based

403  
00:19:50,440 --> 00:19:48,290  
civilization what if they're actually

404  
00:19:53,290 --> 00:19:50,450  
hiding that would imply that they're

405  
00:19:55,900 --> 00:19:53,300  
even more careful about their signaling

406  
00:19:57,910 --> 00:19:55,910  
and drive beam paths and they're going

407  
00:19:59,830 --> 00:19:57,920  
to make an effort to make sure that

408  
00:20:00,760 --> 00:19:59,840  
nothing points than anything where

409  
00:20:04,420 --> 00:20:00,770  
somebody might see

410  
00:20:06,880 --> 00:20:04,430  
you now why would they be hiding just

411  
00:20:08,740 --> 00:20:06,890  
going through this very quickly it may

412  
00:20:10,360 --> 00:20:08,750  
be that they don't want to damage us it

413  
00:20:12,310 --> 00:20:10,370

may be that they think we're dangerous

414

00:20:13,870 --> 00:20:12,320

we can rule out the possibility that

415

00:20:15,730 --> 00:20:13,880

they're hostile if they wanted to get

416

00:20:19,990 --> 00:20:15,740

rid of us they they could immediately

417

00:20:20,000 --> 00:20:28,560

[Applause]

418

00:20:33,530 --> 00:20:31,690

into UI did anybody miss the moderators

419

00:20:40,940 --> 00:20:33,540

privilege yes

420

00:20:49,340 --> 00:20:46,760

thank you very much I made two comments

421

00:20:51,320 --> 00:20:49,350

one is I think one it's helpful to

422

00:20:53,080 --> 00:20:51,330

distinguish I'll hold the mic close

423

00:20:54,980 --> 00:20:53,090

there okay it's helping distinguish

424

00:20:57,890 --> 00:20:54,990

ordinary physics from extraordinary

425

00:21:00,160 --> 00:20:57,900

physics and if you consider

426

00:21:02,810 --> 00:21:00,170

extraordinary physics and of course

427

00:21:05,660 --> 00:21:02,820

considerations about time of travel and

428

00:21:08,300 --> 00:21:05,670

resources have become irrelevant in this

429

00:21:10,400 --> 00:21:08,310

context mitre also bear in mind reports

430

00:21:14,600 --> 00:21:10,410

of objects appearing out of nowhere and

431

00:21:18,860 --> 00:21:14,610

then vanishing suggesting that we live

432

00:21:20,090 --> 00:21:18,870

in a very complex space-time okay all

433

00:21:23,930 --> 00:21:20,100

right

434

00:21:27,620 --> 00:21:23,940

once you consider extraordinary physics

435

00:21:31,460 --> 00:21:27,630

possibly involving other space-time

436

00:21:38,410 --> 00:21:31,470

manifolds the other point I want to make

437

00:21:42,860 --> 00:21:38,420

is that analysis of of databases

438

00:21:46,280 --> 00:21:42,870

show a strong relationship to local

439

00:21:54,320 --> 00:21:46,290

sidereal time and that points towards

440

00:21:56,150 --> 00:21:54,330

origin outside the solar system my

441

00:21:58,420 --> 00:21:56,160

response to that sorry I forgot for a

442

00:22:01,160 --> 00:21:58,430

moment that I didn't need that mic is

443

00:22:04,550 --> 00:22:01,170

that with regard to extraordinary

444

00:22:07,370 --> 00:22:04,560

physics of course it is very easy to

445

00:22:09,260 --> 00:22:07,380

explain things by invoking extraordinary

446

00:22:13,250 --> 00:22:09,270

physics in terms of a likelihood

447

00:22:16,090 --> 00:22:13,260

analysis I felt compelled to stick with

448

00:22:19,340 --> 00:22:16,100

the principle that known physics is

449

00:22:21,610 --> 00:22:19,350

intrinsically more likely than

450

00:22:23,780 --> 00:22:21,620

extraordinary physics unless

451  
00:22:27,320 --> 00:22:23,790  
observations are completely incompatible

452  
00:22:30,920 --> 00:22:27,330  
with known physics regarding satireal

453  
00:22:37,640 --> 00:22:30,930  
time correlations I will simply note

454  
00:22:40,120 --> 00:22:37,650  
that a a a a paper belt habitat is going

455  
00:22:44,090 --> 00:22:40,130  
to have a longer orbit than Pluto's

456  
00:22:47,150 --> 00:22:44,100  
which means more than two to three

457  
00:22:49,400 --> 00:22:47,160  
centuries which means that a single

458  
00:22:51,800 --> 00:22:49,410  
origin point somewhere out in the Kuiper

459  
00:22:53,840 --> 00:22:51,810  
belt would only have moved across a

460  
00:22:58,370 --> 00:22:53,850  
small patch of sky in the

461  
00:23:01,100 --> 00:22:58,380  
we've been making observations thank you

462  
00:23:04,330 --> 00:23:01,110  
for your stunning use of logic that was

463  
00:23:08,390 --> 00:23:04,340

really interesting regarding the the

464

00:23:10,549 --> 00:23:08,400

propulsion force probably you're

465

00:23:13,100 --> 00:23:10,559

familiar with all the ways lifters that

466

00:23:16,820 --> 00:23:13,110

are on the Internet we have one in the

467

00:23:20,000 --> 00:23:16,830

lab you just attached to wires to

468

00:23:22,279 --> 00:23:20,010

conductors on a lightweight frame to

469

00:23:24,620 --> 00:23:22,289

10,000 volts and it lifts like a genie

470

00:23:27,860 --> 00:23:24,630

and ours lifts up about a meter or so

471

00:23:31,010 --> 00:23:27,870

but I've seen some of them lifting up 5

472

00:23:33,230 --> 00:23:31,020

or 10 meters is this a possibility it's

473

00:23:36,080 --> 00:23:33,240

very simple you just need a high voltage

474

00:23:38,930 --> 00:23:36,090

source and I suppose if these are

475

00:23:40,820 --> 00:23:38,940

developed further than what what the

476  
00:23:43,990 --> 00:23:40,830  
hobbyists have been able to do you could

477  
00:23:46,510 --> 00:23:44,000  
get substantial lift out of that

478  
00:23:49,850 --> 00:23:46,520  
possible electromagnetic drive

479  
00:23:51,680 --> 00:23:49,860  
mechanisms that interact with the

480  
00:23:56,270 --> 00:23:51,690  
atmosphere or the Earth's magnetic

481  
00:23:59,930 --> 00:23:56,280  
fields are among the possibilities that

482  
00:24:10,710 --> 00:23:59,940  
I glossed over for lack of time so yes

483  
00:24:18,310 --> 00:24:15,820  
hi York known physics to you and all of

484  
00:24:20,620 --> 00:24:18,320  
us I think now includes the ability to

485  
00:24:23,169 --> 00:24:20,630  
shift subtly the probabilities of events

486  
00:24:30,480 --> 00:24:23,179  
is it possible that they got here and

487  
00:24:33,520 --> 00:24:30,490  
travelled by an improbable ax T Drive I

488  
00:24:36,180 --> 00:24:33,530

am afraid I have to class that with

489

00:24:40,659 --> 00:24:36,190

extraordinary physics mostly because

490

00:24:43,750 --> 00:24:40,669

experiments in parapsychology show that

491

00:24:46,750 --> 00:24:43,760

there is some sort of disconnect between

492

00:24:49,240 --> 00:24:46,760

the probabilities of relatively

493

00:24:52,740 --> 00:24:49,250

infrequent events like bits being

494

00:24:57,570 --> 00:24:52,750

processed and the probabilities for

495

00:25:01,299 --> 00:24:57,580

elementary interactions I pair showed a

496

00:25:04,419 --> 00:25:01,309

1 in 10,000 probability shift from RNG s

497

00:25:07,690 --> 00:25:04,429

if I can do a 1 in 10,000 probability

498

00:25:09,310 --> 00:25:07,700

shift in molecules I can slam that door

499

00:25:16,690 --> 00:25:09,320

and hold it shut against the battering

500

00:25:19,090 --> 00:25:16,700

ram we don't see that in the lab york

501  
00:25:21,159 --> 00:25:19,100  
regarding conspiracy theories I think

502  
00:25:23,049 --> 00:25:21,169  
Richard Nixon said that you're not

503  
00:25:26,680 --> 00:25:23,059  
paranoid if they really are out to get

504  
00:25:30,850 --> 00:25:26,690  
you the converse of that is that you

505  
00:25:32,860 --> 00:25:30,860  
even if they are out to get you paranoia

506  
00:25:36,190 --> 00:25:32,870  
is still unhealthy and dysfunctional

507  
00:25:37,990 --> 00:25:36,200  
thinking but more seriously if the

508  
00:25:40,390 --> 00:25:38,000  
extraterrestrials are hiding their

509  
00:25:41,850 --> 00:25:40,400  
presence isn't that a kind of conspiracy

510  
00:25:45,010 --> 00:25:41,860  
theory ah

511  
00:25:47,980 --> 00:25:45,020  
no because I'm not postulating that

512  
00:25:49,960 --> 00:25:47,990  
there's a human conspiracy that has

513  
00:25:51,850 --> 00:25:49,970

somehow managed to infiltrate every

514

00:25:56,080 --> 00:25:51,860

major government on earth while still

515

00:25:57,789 --> 00:25:56,090

hiding itself if they're hiding there

516

00:26:02,950 --> 00:25:57,799

they're way out there where they're hard

517

00:26:03,760 --> 00:26:02,960

to see ok thank you very much York good

518

00:26:07,810 --> 00:26:03,770

presentation

519

00:26:11,460 --> 00:26:07,820

[Applause]