



**JAMES
BROWN**

**MATH IS
DISCOVERED,
NOT INVENTED**

1
00:00:03,350 --> 00:00:01,510
thought experiments in physics are

2
00:00:03,909 --> 00:00:03,360
pivotal for the generation of novel

3
00:00:06,070 --> 00:00:03,919
ideas

4
00:00:07,829 --> 00:00:06,080
the dissolution of old ones or simply

5
00:00:09,589 --> 00:00:07,839
for an original take on specific

6
00:00:11,350 --> 00:00:09,599
phenomenons that already exist

7
00:00:13,190 --> 00:00:11,360
given that fundamental physics has been

8
00:00:15,509 --> 00:00:13,200
stalled in the past few decades

9
00:00:16,870 --> 00:00:15,519
primarily due to a lack of data as well

10
00:00:18,550 --> 00:00:16,880
as other factors

11
00:00:19,990 --> 00:00:18,560
and i'm trying to put forth my own

12
00:00:21,109 --> 00:00:20,000
theory of everything and integrate it

13
00:00:23,670 --> 00:00:21,119

with consciousness

14

00:00:25,109 --> 00:00:23,680

i thought how far can i go with thought

15

00:00:27,670 --> 00:00:25,119

experiments

16

00:00:28,550 --> 00:00:27,680

james robert brown is a professor of

17

00:00:32,069 --> 00:00:28,560

philosophy

18

00:00:33,990 --> 00:00:32,079

mathematics and physics

19

00:00:35,270 --> 00:00:34,000

at the university of toronto and he was

20

00:00:37,350 --> 00:00:35,280

generous enough to give me

21

00:00:38,790 --> 00:00:37,360

a few hours of his time he's written

22

00:00:39,510 --> 00:00:38,800

several books which i recommend you

23

00:00:41,030 --> 00:00:39,520

check out

24

00:00:42,790 --> 00:00:41,040

and we spoke yesterday which is what

25

00:00:44,150 --> 00:00:42,800

you'll see first as well as at the end

26

00:00:45,750 --> 00:00:44,160

i'm going to append a sliver of a

27

00:00:46,790 --> 00:00:45,760

conversation that me and him had about

28

00:00:48,950 --> 00:00:46,800

two years ago

29

00:00:51,350 --> 00:00:48,960

but i never posted this is perhaps the

30

00:00:53,910 --> 00:00:51,360

deepest dive you'll see on youtube on

31

00:00:55,510 --> 00:00:53,920

thought experiments as well as platonism

32

00:00:57,270 --> 00:00:55,520

there's even a test to see whether or

33

00:00:59,110 --> 00:00:57,280

not you're a platonist or non-platonist

34

00:01:01,830 --> 00:00:59,120

or newtonian or leibnizian

35

00:01:03,670 --> 00:01:01,840

and they're in the timestamps again in

36

00:01:04,950 --> 00:01:03,680

these podcasts i tend to not shy away

37

00:01:06,390 --> 00:01:04,960

from technical details

38

00:01:07,990 --> 00:01:06,400

for one because i think when you

39

00:01:09,270 --> 00:01:08,000

sacrifice details it's akin to

40

00:01:11,590 --> 00:01:09,280

sacrificing the truth

41

00:01:13,270 --> 00:01:11,600

or at worst giving a false impression as

42

00:01:13,990 --> 00:01:13,280

well as i think that the audience that

43

00:01:16,469 --> 00:01:14,000

is you

44

00:01:17,350 --> 00:01:16,479

are extremely smart and you can keep up

45

00:01:19,190 --> 00:01:17,360

enjoy

46

00:01:24,950 --> 00:01:19,200

it's as if this is my first time alright

47

00:01:28,230 --> 00:01:27,109

hello professor brown how's it going

48

00:01:31,749 --> 00:01:28,240

it's going well

49

00:01:33,030 --> 00:01:31,759

uh and please call me jim okay jim

50

00:01:35,590 --> 00:01:33,040

so jim what are you working on these

51

00:01:37,670 --> 00:01:35,600

days i'm working on

52

00:01:38,870 --> 00:01:37,680

the connection between mathematics and

53

00:01:42,310 --> 00:01:38,880

ethics

54

00:01:43,910 --> 00:01:42,320

there's uh some features of both that

55

00:01:45,990 --> 00:01:43,920

are already well known

56

00:01:47,270 --> 00:01:46,000

for instance our mathematical knowledge

57

00:01:51,429 --> 00:01:47,280

and our ethical knowledge

58

00:01:53,990 --> 00:01:51,439

don't come from sensory experience

59

00:01:55,749 --> 00:01:54,000

like yeah do you mind expounding uh well

60

00:01:59,030 --> 00:01:55,759

by sensory experience i just mean

61

00:02:01,109 --> 00:01:59,040

sight hearing smell taste um

62

00:02:03,429 --> 00:02:01,119

you don't know that uh there are

63

00:02:06,789 --> 00:02:03,439

infinitely many prime numbers because

64

00:02:08,469 --> 00:02:06,799

you've gone out and seen them right

65

00:02:10,389 --> 00:02:08,479

you don't know that root two is an

66

00:02:11,270 --> 00:02:10,399

irrational number because you held up a

67

00:02:13,350 --> 00:02:11,280

ruler

68

00:02:14,869 --> 00:02:13,360

on a diagonal square and got an

69

00:02:17,110 --> 00:02:14,879

irrational number

70

00:02:18,070 --> 00:02:17,120

um our mathematical knowledge is

71

00:02:20,150 --> 00:02:18,080

definitely not

72

00:02:22,229 --> 00:02:20,160

empirical though it might be connected

73

00:02:24,309 --> 00:02:22,239

to the empirical world in

74

00:02:25,270 --> 00:02:24,319

some indirect ways but it's certainly

75

00:02:27,670 --> 00:02:25,280

not like the

76

00:02:29,270 --> 00:02:27,680

natural sciences at all well what does

77

00:02:33,589 --> 00:02:29,280

that have to do with ethics

78

00:02:36,309 --> 00:02:33,599

well ethics is exactly the same so

79

00:02:37,110 --> 00:02:36,319

you could see one person kill another

80

00:02:40,229 --> 00:02:37,120

person

81

00:02:43,670 --> 00:02:40,239

that could be an empirical experience

82

00:02:45,350 --> 00:02:43,680

but to judge it as an immoral act is not

83

00:02:46,869 --> 00:02:45,360

empirical

84

00:02:48,790 --> 00:02:46,879

somebody pulls out a gun and shoots

85

00:02:51,110 --> 00:02:48,800

somebody else and a red light doesn't

86

00:02:54,150 --> 00:02:51,120

flash in the corner of your eye saying

87

00:02:57,750 --> 00:02:54,160

this was wicked this was wicked

88

00:02:59,830 --> 00:02:57,760

okay and how we uh

89

00:03:01,830 --> 00:02:59,840

acquire ethical knowledge and how we

90

00:03:05,670 --> 00:03:01,840

acquire mathematical knowledge are

91

00:03:07,030 --> 00:03:05,680

surprisingly similar in a number of ways

92

00:03:08,710 --> 00:03:07,040

you mentioned before in one of your

93

00:03:10,229 --> 00:03:08,720

talks on youtube about the distinction

94

00:03:12,070 --> 00:03:10,239

between thick and thin concepts

95

00:03:13,830 --> 00:03:12,080

do you mind delineating that for the

96

00:03:16,869 --> 00:03:13,840

audience oh

97

00:03:18,229 --> 00:03:16,879

not at all and this is a really

98

00:03:21,830 --> 00:03:18,239

interesting idea it's

99

00:03:25,430 --> 00:03:21,840

fairly new inside ethics

100

00:03:27,190 --> 00:03:25,440

so the idea of thin concepts are

101
00:03:29,910 --> 00:03:27,200
thin concepts can be anywhere they can

102
00:03:33,270 --> 00:03:29,920
be in the sciences in everyday life

103
00:03:34,309 --> 00:03:33,280
and in ethics so if i say the house is

104
00:03:37,910 --> 00:03:34,319
on fire

105
00:03:41,430 --> 00:03:37,920
i'm using thin concepts if i say

106
00:03:44,630 --> 00:03:41,440
words like mass color taste

107
00:03:47,990 --> 00:03:44,640
those are all sin concepts

108
00:03:51,030 --> 00:03:48,000
but they're from the factual realm

109
00:03:54,390 --> 00:03:51,040
okay and then in the uh ethical

110
00:03:56,550 --> 00:03:54,400
or uh evaluative realm are more thin

111
00:03:57,589 --> 00:03:56,560
concepts but they're just in a different

112
00:04:00,869 --> 00:03:57,599
realm so

113
00:04:04,309 --> 00:04:00,879

good bad beautiful ugly

114

00:04:08,470 --> 00:04:04,319

um uh obligation those

115

00:04:10,630 --> 00:04:08,480

duty those are thin concepts from ethics

116

00:04:12,229 --> 00:04:10,640

okay so the world it seems like is made

117

00:04:13,429 --> 00:04:12,239

up of thin concepts some are in the

118

00:04:15,830 --> 00:04:13,439

factual realm

119

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

some are in the normative evaluative

120

00:04:21,349 --> 00:04:17,919

ethical realm

121

00:04:22,469 --> 00:04:21,359

now then um a few years ago people began

122

00:04:25,270 --> 00:04:22,479

to

123

00:04:27,189 --> 00:04:25,280

focus on a number of words that we use

124

00:04:28,469 --> 00:04:27,199

in daily life and they seem to be really

125

00:04:31,510 --> 00:04:28,479

important in

126
00:04:34,950 --> 00:04:31,520
in how we treat things and how we reason

127
00:04:36,030 --> 00:04:34,960
and these these words are called thick

128
00:04:39,270 --> 00:04:36,040
and that's because they're

129
00:04:42,550 --> 00:04:39,280
simultaneously um

130
00:04:47,990 --> 00:04:42,560
fact type terms and

131
00:04:53,189 --> 00:04:48,000
the evaluative terms okay so if i say

132
00:04:57,830 --> 00:04:56,150
that's actually i'm saying two things

133
00:05:00,390 --> 00:04:57,840
i'm talking about your

134
00:05:03,029 --> 00:05:00,400
health in a factual sense like your

135
00:05:05,350 --> 00:05:03,039
blood pressure is 120 over 80.

136
00:05:07,670 --> 00:05:05,360
all right for instance but i'm saying

137
00:05:10,070 --> 00:05:07,680
more than that when i say you're healthy

138
00:05:11,110 --> 00:05:10,080

i'm saying and it's a good state that

139

00:05:13,189 --> 00:05:11,120

you're in

140

00:05:15,110 --> 00:05:13,199

so there's an evaluative component as

141

00:05:17,749 --> 00:05:15,120

well as a factual component

142

00:05:18,629 --> 00:05:17,759

when i say you're healthy another

143

00:05:22,830 --> 00:05:18,639

example beside

144

00:05:25,909 --> 00:05:22,840

okay yeah i'll give you lots more um

145

00:05:29,510 --> 00:05:25,919

brave courageous

146

00:05:32,629 --> 00:05:29,520

okay courageous uh if i say mary

147

00:05:35,990 --> 00:05:32,639

was courageous that's it that

148

00:05:38,629 --> 00:05:36,000

includes a kind of factual

149

00:05:39,350 --> 00:05:38,639

component especially if we've just seen

150

00:05:41,990 --> 00:05:39,360

mary

151
00:05:43,749 --> 00:05:42,000
run into a burning house and and save

152
00:05:45,830 --> 00:05:43,759
the family's pet dog

153
00:05:47,670 --> 00:05:45,840
okay so she's pulled it out so there's a

154
00:05:50,469 --> 00:05:47,680
straightforward factual

155
00:05:50,870 --> 00:05:50,479
component to that about mary's action

156
00:05:53,189 --> 00:05:50,880
okay

157
00:05:54,870 --> 00:05:53,199
but there's also an evaluative component

158
00:05:57,189 --> 00:05:54,880
like what she did was a good thing

159
00:05:59,029 --> 00:05:57,199
it's good to be brave well done mary

160
00:06:02,390 --> 00:05:59,039
we're really proud of you

161
00:06:05,510 --> 00:06:02,400
so brave is different it's thick

162
00:06:07,270 --> 00:06:05,520
brave is thick now some people say

163
00:06:08,550 --> 00:06:07,280

you don't need thick concepts they're

164

00:06:10,390 --> 00:06:08,560

very convenient

165

00:06:13,670 --> 00:06:10,400

so you don't need them because i could

166

00:06:16,790 --> 00:06:13,680

say this mary ran into the house

167

00:06:20,070 --> 00:06:16,800

she brought out the family dog

168

00:06:23,270 --> 00:06:20,080

and here comes the evaluative

169

00:06:25,510 --> 00:06:23,280

and what she did was good

170

00:06:27,749 --> 00:06:25,520

or i can just sort of summarize it mary

171

00:06:31,110 --> 00:06:27,759

was very brave

172

00:06:31,830 --> 00:06:31,120

and the word brave courageous those sort

173

00:06:35,029 --> 00:06:31,840

of terms

174

00:06:35,830 --> 00:06:35,039

those are thick concepts and we use them

175

00:06:39,350 --> 00:06:35,840

a lot

176

00:06:42,390 --> 00:06:39,360

something

177

00:06:43,270 --> 00:06:42,400

is uh um and once you get that once you

178

00:06:45,590 --> 00:06:43,280

get the feeling

179

00:06:46,710 --> 00:06:45,600

um it's uh you can find them all over

180

00:06:49,430 --> 00:06:46,720

the place why is

181

00:06:50,309 --> 00:06:49,440

the word good not a thick concept uh

182

00:06:52,150 --> 00:06:50,319

because it's it's

183

00:06:54,309 --> 00:06:52,160

it's just thin it just it's just pure

184

00:06:56,469 --> 00:06:54,319

evaluation it doesn't tell you anything

185

00:06:57,990 --> 00:06:56,479

right right right okay uh it doesn't

186

00:06:59,029 --> 00:06:58,000

tell you anything factual that's why

187

00:07:02,150 --> 00:06:59,039

it's thin

188

00:07:03,430 --> 00:07:02,160

evaluative and if i say mary entered the

189

00:07:05,830 --> 00:07:03,440

burning house

190

00:07:07,029 --> 00:07:05,840

that doesn't tell you anything uh

191

00:07:08,950 --> 00:07:07,039

evaluative it just

192

00:07:10,629 --> 00:07:08,960

gives you a factual description of

193

00:07:12,309 --> 00:07:10,639

something that happened

194

00:07:14,830 --> 00:07:12,319

okay but once you get the hang of it you

195

00:07:17,510 --> 00:07:14,840

see all sorts of terms are thick

196

00:07:21,430 --> 00:07:17,520

loyal liar

197

00:07:23,670 --> 00:07:21,440

dastardly uh untrustworthy

198

00:07:25,029 --> 00:07:23,680

see those if i say kirk you're very

199

00:07:27,189 --> 00:07:25,039

untrustworthy

200

00:07:29,350 --> 00:07:27,199

i'm suggesting that you've cheated me on

201
00:07:31,270 --> 00:07:29,360
something or you've lied to other people

202
00:07:34,230 --> 00:07:31,280
or something like that

203
00:07:34,870 --> 00:07:34,240
and it's a bad thing okay so you see how

204
00:07:36,950 --> 00:07:34,880
it's a thick

205
00:07:38,550 --> 00:07:36,960
term right does it always go to good or

206
00:07:40,790 --> 00:07:38,560
bad on that one

207
00:07:42,390 --> 00:07:40,800
line spectrum no if you were if we were

208
00:07:45,510 --> 00:07:42,400
in if we were in the artistic

209
00:07:47,350 --> 00:07:45,520
realm uh it might be rather than good or

210
00:07:49,830 --> 00:07:47,360
bad it might be beautiful ugly

211
00:07:51,909 --> 00:07:49,840
something like that okay but you can see

212
00:07:54,710 --> 00:07:51,919
the evaluative term

213
00:07:55,270 --> 00:07:54,720

uh in the one in what from the one realm

214

00:07:57,589 --> 00:07:55,280

and the

215

00:07:58,550 --> 00:07:57,599

straightforward factual so if i describe

216

00:07:59,990 --> 00:07:58,560

a picture like

217

00:08:02,629 --> 00:08:00,000

well there's a little bit of red here

218

00:08:05,510 --> 00:08:02,639

and there's some blue there

219

00:08:07,029 --> 00:08:05,520

okay that's that's the sort of you just

220

00:08:09,350 --> 00:08:07,039

read the rgb values

221

00:08:11,670 --> 00:08:09,360

that's a thin yeah that's a thin

222

00:08:13,990 --> 00:08:11,680

description of the painting

223

00:08:15,830 --> 00:08:14,000

from a factual point of view and then if

224

00:08:16,790 --> 00:08:15,840

i want to say it's spectacularly

225

00:08:19,670 --> 00:08:16,800

beautiful

226

00:08:21,110 --> 00:08:19,680

or it's charming sorry charming sorry

227

00:08:22,950 --> 00:08:21,120

charming would be um

228

00:08:24,710 --> 00:08:22,960

would be a thick concept it's beautiful

229

00:08:26,550 --> 00:08:24,720

just plain beautiful

230

00:08:28,950 --> 00:08:26,560

okay that would be a thin concept and if

231

00:08:31,589 --> 00:08:28,960

i say it's charming it's evocative

232

00:08:32,949 --> 00:08:31,599

uh and and suggesting a combination of

233

00:08:36,469 --> 00:08:32,959

things that are both

234

00:08:39,110 --> 00:08:36,479

factual and uh evaluated simultaneously

235

00:08:40,630 --> 00:08:39,120

those are the thick ones okay so why am

236

00:08:42,070 --> 00:08:40,640

i interested in that

237

00:08:43,509 --> 00:08:42,080

because that's that's what i just told

238

00:08:44,630 --> 00:08:43,519

you sort of right and how does that

239

00:08:46,389 --> 00:08:44,640

relate to mathematics

240

00:08:48,630 --> 00:08:46,399

exactly okay that's the important

241

00:08:51,750 --> 00:08:48,640

question so i've been thinking about

242

00:08:54,310 --> 00:08:51,760

um by the way thick concepts in ethics

243

00:08:55,110 --> 00:08:54,320

that's commonplace okay and everyone in

244

00:08:56,949 --> 00:08:55,120

ethics

245

00:08:58,949 --> 00:08:56,959

knows about thick thin and then the

246

00:09:01,350 --> 00:08:58,959

standard views about them

247

00:09:03,110 --> 00:09:01,360

okay when when i was thinking about

248

00:09:05,110 --> 00:09:03,120

ethics and math i'm looking for all

249

00:09:05,910 --> 00:09:05,120

kinds of connections between ethics and

250

00:09:09,509 --> 00:09:05,920

math

251
00:09:11,110 --> 00:09:09,519
not just the one about neither of them

252
00:09:13,509 --> 00:09:11,120
are empirical

253
00:09:14,389 --> 00:09:13,519
okay our knowledge isn't empirical in

254
00:09:17,110 --> 00:09:14,399
either case

255
00:09:17,829 --> 00:09:17,120
what are the other connections well one

256
00:09:20,949 --> 00:09:17,839
of them

257
00:09:22,949 --> 00:09:20,959
might be a kind that might be an inside

258
00:09:25,910 --> 00:09:22,959
math and physics

259
00:09:27,829 --> 00:09:25,920
a kind of thick concept so i don't want

260
00:09:30,790 --> 00:09:27,839
to talk about facts and values now

261
00:09:32,630 --> 00:09:30,800
i'm just using this as an analogy so

262
00:09:36,310 --> 00:09:32,640
there can be math

263
00:09:38,630 --> 00:09:36,320

and there can be physics pure math

264

00:09:40,949 --> 00:09:38,640

okay you understand pure math is just

265

00:09:43,269 --> 00:09:40,959

you know nothing but set theory

266

00:09:44,870 --> 00:09:43,279

and pure physics has got nothing

267

00:09:47,750 --> 00:09:44,880

mathematical about it

268

00:09:49,110 --> 00:09:47,760

and the way uh math gets applied is math

269

00:09:51,750 --> 00:09:49,120

provides models

270

00:09:52,389 --> 00:09:51,760

for the physical realm this my what i

271

00:09:54,790 --> 00:09:52,399

just said

272

00:09:56,310 --> 00:09:54,800

is slightly contentious it's probably a

273

00:09:57,509 --> 00:09:56,320

majority opinion

274

00:09:59,430 --> 00:09:57,519

but there are lots of people who would

275

00:10:02,230 --> 00:09:59,440

dispute it let's just stick with the

276

00:10:05,670 --> 00:10:02,240

majority opinion for now

277

00:10:07,030 --> 00:10:05,680

um math provides models of the world and

278

00:10:10,710 --> 00:10:07,040

what a physicist will do

279

00:10:13,829 --> 00:10:10,720

is look at the the range of models

280

00:10:14,310 --> 00:10:13,839

in plato's heaven and say i think this

281

00:10:17,030 --> 00:10:14,320

one

282

00:10:18,550 --> 00:10:17,040

is is structurally very similar to the

283

00:10:21,350 --> 00:10:18,560

physical realm

284

00:10:22,630 --> 00:10:21,360

okay right and we apply math in that

285

00:10:25,829 --> 00:10:22,640

sort of way

286

00:10:28,550 --> 00:10:25,839

now uh that would be thin

287

00:10:29,829 --> 00:10:28,560

pure math is just thin those are nothing

288

00:10:32,470 --> 00:10:29,839

but thin concepts

289

00:10:33,670 --> 00:10:32,480

pure physics without any math in it

290

00:10:37,269 --> 00:10:33,680

nothing but pure

291

00:10:40,630 --> 00:10:37,279

physical concepts could there be a thick

292

00:10:44,310 --> 00:10:40,640

concept that's that that's that somehow

293

00:10:44,949 --> 00:10:44,320

or other involves both not just modeling

294

00:10:47,110 --> 00:10:44,959

modeling

295

00:10:48,310 --> 00:10:47,120

is by itself isn't going to do it a

296

00:10:51,670 --> 00:10:48,320

thick concept would be

297

00:10:53,990 --> 00:10:51,680

a kind of really intimate uh

298

00:10:55,509 --> 00:10:54,000

intertwining of the two and i was sort

299

00:10:57,030 --> 00:10:55,519

of vaguely thinking about this and i

300

00:11:00,310 --> 00:10:57,040

came across um

301
00:11:01,110 --> 00:11:00,320
a wonderful quote in a famous calculus

302
00:11:06,230 --> 00:11:01,120
book

303
00:11:08,710 --> 00:11:06,240
spivak

304
00:11:09,910 --> 00:11:08,720
it's just called calculus uh did you

305
00:11:11,990 --> 00:11:09,920
take physics in

306
00:11:13,110 --> 00:11:12,000
math yeah do you know that you know the

307
00:11:14,790 --> 00:11:13,120
book i'm talking about yeah it's a

308
00:11:18,310 --> 00:11:14,800
famous book it's first year

309
00:11:20,470 --> 00:11:18,320
one five seven one five seven ah okay

310
00:11:21,990 --> 00:11:20,480
but it's a wonderful it's a wonderful

311
00:11:23,670 --> 00:11:22,000
and his second book is also great it's

312
00:11:25,350 --> 00:11:23,680
like a direct book where it's

313
00:11:26,710 --> 00:11:25,360

tiny yeah book is large and then the

314

00:11:28,389 --> 00:11:26,720

second book on manifold

315

00:11:30,230 --> 00:11:28,399

yeah yeah yeah you're right you're

316

00:11:31,430 --> 00:11:30,240

absolutely like two pages long

317

00:11:34,230 --> 00:11:31,440

it takes you a whole semester to get

318

00:11:35,910 --> 00:11:34,240

through that well one page of exposition

319

00:11:39,670 --> 00:11:35,920

followed by ten pages of uh

320

00:11:43,030 --> 00:11:39,680

uh gut wrenching problems that

321

00:11:44,790 --> 00:11:43,040

are so hard to solve okay so anyway uh

322

00:11:47,590 --> 00:11:44,800

there was this wonderful passage

323

00:11:48,470 --> 00:11:47,600

in the calculus book so he's just doing

324

00:11:50,870 --> 00:11:48,480

elementary stuff

325

00:11:51,590 --> 00:11:50,880

he's teaching derivatives first

326

00:11:55,030 --> 00:11:51,600

derivative

327

00:11:57,990 --> 00:11:55,040

this stuff is really important

328

00:11:58,710 --> 00:11:58,000

especially the second derivative y well

329

00:12:01,829 --> 00:11:58,720

think about

330

00:12:06,870 --> 00:12:01,839

newton's newton's law f equals m

331

00:12:10,710 --> 00:12:06,880

a acceleration is the second derivative

332

00:12:12,470 --> 00:12:10,720

okay we got that then he says

333

00:12:13,910 --> 00:12:12,480

next time you're in a car and you go

334

00:12:17,509 --> 00:12:13,920

around a corner

335

00:12:20,550 --> 00:12:17,519

you can feel the second derivative

336

00:12:24,389 --> 00:12:20,560

you think about that no no

337

00:12:26,069 --> 00:12:24,399

i feel the acceleration right

338

00:12:27,670 --> 00:12:26,079

and it's modeled i don't feel the second

339

00:12:29,829 --> 00:12:27,680

you're gonna come on i don't feel a

340

00:12:32,150 --> 00:12:29,839

second derivative don't be ridiculous

341

00:12:33,990 --> 00:12:32,160

nobody can feel a second derivative it

342

00:12:37,350 --> 00:12:34,000

exists in plato's heaven

343

00:12:38,150 --> 00:12:37,360

you can't you can't smell an infinite

344

00:12:41,030 --> 00:12:38,160

series

345

00:12:41,590 --> 00:12:41,040

you can't taste the tangent plane and

346

00:12:43,829 --> 00:12:41,600

you can't

347

00:12:46,150 --> 00:12:43,839

yield the second derivative right that's

348

00:12:47,910 --> 00:12:46,160

what that's what you should say

349

00:12:50,069 --> 00:12:47,920

and i and i but the more i thought about

350

00:12:51,030 --> 00:12:50,079

it i thought i wonder i wonder i wonder

351
00:12:54,790 --> 00:12:51,040
if

352
00:12:59,030 --> 00:12:57,350
well with math in general physicists and

353
00:13:02,790 --> 00:12:59,040
engineers in particular

354
00:13:06,069 --> 00:13:02,800
who maybe have to do problems of motion

355
00:13:06,949 --> 00:13:06,079
where acceleration is important and they

356
00:13:10,550 --> 00:13:06,959
get so

357
00:13:11,110 --> 00:13:10,560
used to treating physical acceleration

358
00:13:13,110 --> 00:13:11,120
think of

359
00:13:14,550 --> 00:13:13,120
the acceleration as an actual physical

360
00:13:16,230 --> 00:13:14,560
process

361
00:13:18,710 --> 00:13:16,240
and attaching it to the second

362
00:13:22,069 --> 00:13:18,720
derivative to calculate

363
00:13:24,629 --> 00:13:22,079

it's become so internalized with them

364

00:13:27,110 --> 00:13:24,639

that acceleration and second derivative

365

00:13:29,829 --> 00:13:27,120

becomes a single concept

366

00:13:32,150 --> 00:13:29,839

it's just a fused concept this would

367

00:13:35,910 --> 00:13:32,160

this would be an example

368

00:13:39,990 --> 00:13:35,920

of a thick concept and i got talking to

369

00:13:42,870 --> 00:13:40,000

some physicist friends uh about this

370

00:13:43,590 --> 00:13:42,880

and they're now they don't exactly

371

00:13:46,069 --> 00:13:43,600

understand

372

00:13:47,110 --> 00:13:46,079

and appreciate what i'm trying to get at

373

00:13:50,389 --> 00:13:47,120

but there's enough of

374

00:13:52,870 --> 00:13:50,399

an understanding that they could sort of

375

00:13:54,470 --> 00:13:52,880

they could sort of agree that that some

376

00:13:56,069 --> 00:13:54,480

parts of math not all

377

00:13:58,310 --> 00:13:56,079

but some parts of math that they use

378

00:14:01,189 --> 00:13:58,320

they've so internalized

379

00:14:02,389 --> 00:14:01,199

that to utter the math or to other under

380

00:14:05,430 --> 00:14:02,399

the

381

00:14:08,470 --> 00:14:05,440

math less physical description

382

00:14:11,910 --> 00:14:08,480

um they're just they're just uh so

383

00:14:14,150 --> 00:14:11,920

intertwined it's become one single thing

384

00:14:15,110 --> 00:14:14,160

what else besides acceleration is there

385

00:14:17,030 --> 00:14:15,120

for math

386

00:14:18,389 --> 00:14:17,040

well this would be hard this because i i

387

00:14:19,910 --> 00:14:18,399

don't want to say it's all the time

388

00:14:22,790 --> 00:14:19,920

because i i wouldn't want to say

389

00:14:25,269 --> 00:14:22,800

that someone in quantum mechanics who

390

00:14:28,069 --> 00:14:25,279

thinks about the state of the system

391

00:14:29,189 --> 00:14:28,079

just flips over to a hilbert space which

392

00:14:31,269 --> 00:14:29,199

is how we represent

393

00:14:33,670 --> 00:14:31,279

states in quantum mechanics and just

394

00:14:36,389 --> 00:14:33,680

think of them interchangeably

395

00:14:38,310 --> 00:14:36,399

it's a possible candidate because we do

396

00:14:40,389 --> 00:14:38,320

use the same notation for both we just

397

00:14:43,189 --> 00:14:40,399

use a simple psi function for

398

00:14:44,069 --> 00:14:43,199

the vector in a hilbert space or for the

399

00:14:47,269 --> 00:14:44,079

state meaning

400

00:14:49,269 --> 00:14:47,279

the physical property of a quantum

401
00:14:49,829 --> 00:14:49,279
mechanical system that's a candidate but

402
00:14:52,949 --> 00:14:49,839
i'm

403
00:14:55,990 --> 00:14:52,959
i'd be reluctant to say that stick maybe

404
00:14:57,189 --> 00:14:56,000
uh an example is a very old example a

405
00:14:59,430 --> 00:14:57,199
good example

406
00:15:01,590 --> 00:14:59,440
and that's real numbers and points on a

407
00:15:08,230 --> 00:15:01,600
line

408
00:15:09,189 --> 00:15:08,240
the unit interval right and we just

409
00:15:11,910 --> 00:15:09,199
attach all the

410
00:15:13,590 --> 00:15:11,920
real numbers between zero and one okay

411
00:15:14,470 --> 00:15:13,600
and we think of a real number and a

412
00:15:18,150 --> 00:15:14,480
point as

413
00:15:19,829 --> 00:15:18,160

the same thing just just back and forth

414

00:15:21,670 --> 00:15:19,839

and once you it's it's well it's the

415

00:15:23,110 --> 00:15:21,680

it's the whole basis of analytic

416

00:15:25,110 --> 00:15:23,120

geometry

417

00:15:26,389 --> 00:15:25,120

ever since ever since descartes said it

418

00:15:29,189 --> 00:15:26,399

was uh

419

00:15:30,470 --> 00:15:29,199

400 years ago when he just said real

420

00:15:36,949 --> 00:15:30,480

numbers and

421

00:15:38,389 --> 00:15:36,959

points in in the plane and so on

422

00:15:39,990 --> 00:15:38,399

we just that they're just completely

423

00:15:41,269 --> 00:15:40,000

interchangeable right

424

00:15:43,110 --> 00:15:41,279

and you're saying that that's a thick

425

00:15:43,829 --> 00:15:43,120

concept because i think i think maybe

426
00:15:47,670 --> 00:15:43,839
word line

427
00:15:50,389 --> 00:15:47,680
implies a space not line let's say point

428
00:15:51,350 --> 00:15:50,399
point and number point and number they

429
00:15:54,629 --> 00:15:51,360
become

430
00:15:58,150 --> 00:15:54,639
um almost a single concept now we can

431
00:15:59,110 --> 00:15:58,160
separate them okay i can ask you to

432
00:16:00,870 --> 00:15:59,120
separate

433
00:16:02,389 --> 00:16:00,880
in your mind and you can do that but

434
00:16:05,990 --> 00:16:02,399
they're so interchangeable

435
00:16:08,470 --> 00:16:06,000
um girdle in a famous

436
00:16:10,389 --> 00:16:08,480
article called what is cantor's

437
00:16:11,990 --> 00:16:10,399
continuum hypothesis

438
00:16:14,629 --> 00:16:12,000

starts out he says the continuum

439

00:16:17,749 --> 00:16:14,639

hypothesis is the question

440

00:16:19,670 --> 00:16:17,759

um how many real numbers are there or

441

00:16:22,150 --> 00:16:19,680

equivalently how many points are there

442

00:16:24,949 --> 00:16:22,160

on a line it just takes them to be

443

00:16:25,910 --> 00:16:24,959

the same issue and that's that's

444

00:16:28,550 --> 00:16:25,920

surprising

445

00:16:29,910 --> 00:16:28,560

for a logician who is you know super

446

00:16:32,870 --> 00:16:29,920

super careful

447

00:16:34,710 --> 00:16:32,880

about um about making distinctions when

448

00:16:36,310 --> 00:16:34,720

he thinks it's appropriate

449

00:16:37,590 --> 00:16:36,320

okay so what's the significance of this

450

00:16:38,710 --> 00:16:37,600

why are you spending your time thinking

451
00:16:40,550 --> 00:16:38,720
about this

452
00:16:41,910 --> 00:16:40,560
the i think it's intrinsically

453
00:16:44,470 --> 00:16:41,920
interesting but

454
00:16:45,990 --> 00:16:44,480
uh for me it can it might actually do

455
00:16:49,350 --> 00:16:46,000
some work

456
00:16:50,069 --> 00:16:49,360
um uh you know you know the continuum

457
00:16:53,829 --> 00:16:50,079
hypothesis

458
00:16:57,590 --> 00:16:53,839
this is the the claim that um

459
00:16:59,829 --> 00:16:57,600
the first uncountable infinity is um

460
00:17:00,949 --> 00:16:59,839
aleph one and it might be and it then

461
00:17:03,189 --> 00:17:00,959
the claim is

462
00:17:04,309 --> 00:17:03,199
that it is um the real numbers the real

463
00:17:07,750 --> 00:17:04,319

numbers have size

464

00:17:09,750 --> 00:17:07,760

out of one the natural numbers

465

00:17:10,870 --> 00:17:09,760

are it's infinitely many but there's

466

00:17:14,230 --> 00:17:10,880

only aleph

467

00:17:18,150 --> 00:17:14,240

zero of them the real numbers are

468

00:17:20,549 --> 00:17:18,160

a bigger infinity and the conjecture

469

00:17:21,669 --> 00:17:20,559

is that um they're the the next biggest

470

00:17:25,750 --> 00:17:21,679

infinity so they'd be

471

00:17:29,510 --> 00:17:25,760

out of one no one's been able to prove

472

00:17:32,710 --> 00:17:29,520

the continuum hypothesis uh or refute it

473

00:17:35,590 --> 00:17:32,720

and in fact uh there are um

474

00:17:37,510 --> 00:17:35,600

there's an independence proof meaning

475

00:17:38,710 --> 00:17:37,520

you can't prove it and you can't refute

476

00:17:41,830 --> 00:17:38,720

it on the basis of

477

00:17:44,150 --> 00:17:41,840

existing axioms of set theory

478

00:17:45,990 --> 00:17:44,160

right and if you think if you think that

479

00:17:48,150 --> 00:17:46,000

the existing axioms of set theory are

480

00:17:49,750 --> 00:17:48,160

adequate for the whole of mathematics

481

00:17:51,510 --> 00:17:49,760

what that really means is the continuum

482

00:17:52,310 --> 00:17:51,520

hypothesis is independent of all of

483

00:17:54,070 --> 00:17:52,320

mathematics

484

00:17:55,430 --> 00:17:54,080

right right now you can know everything

485

00:17:57,190 --> 00:17:55,440

in math you still don't wouldn't know

486

00:17:59,110 --> 00:17:57,200

the continuum hypothesis

487

00:18:00,870 --> 00:17:59,120

so it's you could you could just

488

00:18:03,669 --> 00:18:00,880

arbitrarily make it a

489

00:18:05,590 --> 00:18:03,679

a new axiom that would solve the problem

490

00:18:06,310 --> 00:18:05,600

but it would be very unsatisfying

491

00:18:10,710 --> 00:18:06,320

because

492

00:18:14,710 --> 00:18:10,720

rather than making its negation

493

00:18:18,070 --> 00:18:14,720

the new axiom so we're looking around

494

00:18:19,590 --> 00:18:18,080

for um what you might call independent

495

00:18:22,630 --> 00:18:19,600

evidence

496

00:18:23,990 --> 00:18:22,640

for the continuum hypothesis one way or

497

00:18:27,990 --> 00:18:24,000

the other

498

00:18:30,390 --> 00:18:28,000

what might work well maybe physical

499

00:18:31,430 --> 00:18:30,400

analogies would work you know you just

500

00:18:32,630 --> 00:18:31,440

sort of think about it you're not going

501
00:18:34,950 --> 00:18:32,640
to prove it you're not going to have

502
00:18:36,950 --> 00:18:34,960
any old-fashioned proof but you might

503
00:18:39,909 --> 00:18:36,960
have some other kind of argument

504
00:18:41,430 --> 00:18:39,919
if you are a realist or a mathematical

505
00:18:44,549 --> 00:18:41,440
platonist

506
00:18:49,350 --> 00:18:44,559
you're going to say it is true

507
00:18:52,789 --> 00:18:49,360
or it is false i just don't know which

508
00:18:53,830 --> 00:18:52,799
okay now question how much detail do you

509
00:18:55,510 --> 00:18:53,840
want

510
00:18:57,190 --> 00:18:55,520
oh that's fine let's go in more i know

511
00:18:58,549 --> 00:18:57,200
girdle was a platoonist and he believed

512
00:19:01,270 --> 00:18:58,559
it's either

513
00:19:02,630 --> 00:19:01,280

yeah i think that he proved that it's i

514

00:19:05,510 --> 00:19:02,640

don't recall if it's

515

00:19:07,750 --> 00:19:05,520

both either the negation or the positive

516

00:19:09,669 --> 00:19:07,760

application of the continuity

517

00:19:11,510 --> 00:19:09,679

he showed that it's consistent it's

518

00:19:12,870 --> 00:19:11,520

consistent with the rest of set theory

519

00:19:15,029 --> 00:19:12,880

yeah you can add it and you won't get

520

00:19:16,070 --> 00:19:15,039

into trouble right and it was later

521

00:19:18,470 --> 00:19:16,080

cohen

522

00:19:20,390 --> 00:19:18,480

showed that you can add the negation and

523

00:19:22,390 --> 00:19:20,400

you won't get into trouble

524

00:19:23,669 --> 00:19:22,400

and that and the two results together

525

00:19:25,590 --> 00:19:23,679

give you independence

526

00:19:27,669 --> 00:19:25,600

the audience will keep up get into as

527

00:19:31,029 --> 00:19:27,679

much detail as you like let's go into a

528

00:19:32,789 --> 00:19:31,039

dis proof of the continuum hypothesis

529

00:19:34,549 --> 00:19:32,799

okay you'll have to be hand wavy because

530

00:19:36,310 --> 00:19:34,559

we don't have papers and pens

531

00:19:38,310 --> 00:19:36,320

that's right powerpoint slides and this

532

00:19:40,950 --> 00:19:38,320

is a this is a result um

533

00:19:42,230 --> 00:19:40,960

uh a number of years ago from chris

534

00:19:45,350 --> 00:19:42,240

freiling

535

00:19:48,150 --> 00:19:45,360

uh an american logician and it's in

536

00:19:51,430 --> 00:19:48,160

it's it's wonderfully clever and it's a

537

00:19:54,710 --> 00:19:51,440

refutation of the continuum hypothesis

538

00:19:57,990 --> 00:19:54,720

okay so um as you say

539

00:20:01,590 --> 00:19:58,000

it'll be a bit hand wavy

540

00:20:04,070 --> 00:20:01,600

so for for those with a math education

541

00:20:05,110 --> 00:20:04,080

um they will know what uh oh i'm going

542

00:20:08,310 --> 00:20:05,120

to start out with

543

00:20:11,430 --> 00:20:08,320

what's called zermelo frankel set theory

544

00:20:16,310 --> 00:20:11,440

including the axiom of choice

545

00:20:19,190 --> 00:20:16,320

okay now with the axiom of choice

546

00:20:19,990 --> 00:20:19,200

we can prove what's known as the well

547

00:20:22,470 --> 00:20:20,000

ordering

548

00:20:23,830 --> 00:20:22,480

theorem which means that you take any

549

00:20:27,350 --> 00:20:23,840

set whatsoever

550

00:20:29,110 --> 00:20:27,360

and you can give it a well ordering

551
00:20:31,669 --> 00:20:29,120
and that's to and that means you can

552
00:20:34,149 --> 00:20:31,679
line it up with the ordinal numbers

553
00:20:35,190 --> 00:20:34,159
so one two three four five and then

554
00:20:38,630 --> 00:20:35,200
omega

555
00:20:39,669 --> 00:20:38,640
which is now the first uh infinite

556
00:20:45,270 --> 00:20:39,679
ordinal

557
00:20:47,430 --> 00:20:45,280
all of the countable ordinary done you

558
00:20:50,390 --> 00:20:47,440
get into the uncountable ordinals

559
00:20:50,789 --> 00:20:50,400
this is this is this this will sound

560
00:20:53,830 --> 00:20:50,799
like

561
00:20:56,230 --> 00:20:53,840
um mystical nonsense unless you've

562
00:20:59,350 --> 00:20:56,240
taken a course in set theory and learned

563
00:21:02,470 --> 00:20:59,360

about the hierarchy of infinite sets

564

00:21:05,350 --> 00:21:02,480

so anyway the ordering theorem says

565

00:21:06,230 --> 00:21:05,360

you can put any set including the real

566

00:21:09,669 --> 00:21:06,240

numbers

567

00:21:11,510 --> 00:21:09,679

between 0 and 1 you can line them up

568

00:21:13,750 --> 00:21:11,520

with the this infinite string of

569

00:21:14,630 --> 00:21:13,760

ordinals now they won't go in the same

570

00:21:19,669 --> 00:21:14,640

order

571

00:21:21,190 --> 00:21:19,679

they'll be jumping all over the place

572

00:21:22,630 --> 00:21:21,200

you know like one half might be

573

00:21:23,830 --> 00:21:22,640

associated it's not an intuitive

574

00:21:26,710 --> 00:21:23,840

ordering it's not like we

575

00:21:28,830 --> 00:21:26,720

we have any apprehension of it no uh

576

00:21:31,990 --> 00:21:28,840

here i'm just guarantees it

577

00:21:32,950 --> 00:21:32,000

yeah the the well ordering theorem

578

00:21:35,510 --> 00:21:32,960

guarantees that

579

00:21:36,950 --> 00:21:35,520

that it exists but nobody has any idea

580

00:21:37,830 --> 00:21:36,960

of what a well ordering of the real

581

00:21:40,310 --> 00:21:37,840

numbers would be

582

00:21:41,110 --> 00:21:40,320

no one's found one yet we've got well

583

00:21:44,630 --> 00:21:41,120

orderings

584

00:21:46,230 --> 00:21:44,640

of the rational and they're pretty

585

00:21:49,830 --> 00:21:46,240

straightforward

586

00:21:53,110 --> 00:21:49,840

but not of the real numbers

587

00:21:54,950 --> 00:21:53,120

um so technically the well ordering

588

00:21:57,590 --> 00:21:54,960

theorem says that the subset

589

00:22:00,230 --> 00:21:57,600

that any subset is well ordered it says

590

00:22:03,590 --> 00:22:00,240

that any subset has a first element

591

00:22:04,950 --> 00:22:03,600

right right right uh just to see that

592

00:22:07,350 --> 00:22:04,960

the ordinary ordering

593

00:22:10,789 --> 00:22:07,360

is not a well ordering if i say take all

594

00:22:12,230 --> 00:22:10,799

the real numbers greater than one half

595

00:22:13,830 --> 00:22:12,240

sorry can you repeat that just to say

596

00:22:16,950 --> 00:22:13,840

that what take

597

00:22:18,230 --> 00:22:16,960

the real numbers yep greater than one

598

00:22:20,470 --> 00:22:18,240

half

599

00:22:21,350 --> 00:22:20,480

what's the first element right right

600

00:22:23,110 --> 00:22:21,360

right greater than

601
00:22:25,430 --> 00:22:23,120
not including one half doesn't have yeah

602
00:22:26,230 --> 00:22:25,440
that's right uh it doesn't have a first

603
00:22:28,630 --> 00:22:26,240
element so

604
00:22:30,789 --> 00:22:28,640
that's just not a well ordering but with

605
00:22:33,750 --> 00:22:30,799
some other bizarre ordering i might

606
00:22:34,950 --> 00:22:33,760
take them uh any subset and and it would

607
00:22:38,470 --> 00:22:34,960
have to have a well or

608
00:22:42,149 --> 00:22:38,480
uh there'd have to be a first element

609
00:22:44,549 --> 00:22:42,159
okay so we've we we imagine

610
00:22:45,190 --> 00:22:44,559
that we've got a well ordering of the

611
00:22:47,190 --> 00:22:45,200
real

612
00:22:49,430 --> 00:22:47,200
numbers but just between zero and one

613
00:22:51,909 --> 00:22:49,440

that'll do

614

00:22:52,789 --> 00:22:51,919

okay now comes a little statistical

615

00:22:55,750 --> 00:22:52,799

argument

616

00:22:56,310 --> 00:22:55,760

you and i are gonna throw darts we're

617

00:22:58,789 --> 00:22:56,320

gonna throw

618

00:22:59,350 --> 00:22:58,799

darts at the real line between zero and

619

00:23:01,909 --> 00:22:59,360

one

620

00:23:02,710 --> 00:23:01,919

it's a thought experiment can't do it in

621

00:23:04,950 --> 00:23:02,720

reality

622

00:23:06,070 --> 00:23:04,960

but i thought it's better i throw a dart

623

00:23:09,029 --> 00:23:06,080

and i get a number

624

00:23:12,310 --> 00:23:09,039

p somewhere between zero and one you

625

00:23:15,270 --> 00:23:12,320

throw your dart and you get a number q

626
00:23:16,950 --> 00:23:15,280
also on the line between zero and one

627
00:23:20,390 --> 00:23:16,960
now i'm going to make the following

628
00:23:23,590 --> 00:23:20,400
argument um

629
00:23:26,950 --> 00:23:23,600
your uh your

630
00:23:27,270 --> 00:23:26,960
dart hit the number q which is going to

631
00:23:30,950 --> 00:23:27,280
be

632
00:23:31,909 --> 00:23:30,960
later in the well ordering than my dart

633
00:23:34,950 --> 00:23:31,919
p

634
00:23:38,070 --> 00:23:34,960
why because there's only

635
00:23:41,750 --> 00:23:38,080
um a countable infinity at most

636
00:23:45,190 --> 00:23:41,760
of numbers earlier in the well ordering

637
00:23:48,950 --> 00:23:45,200
from p and an uncountable infinity

638
00:23:50,870 --> 00:23:48,960

after and so so that you you might be

639

00:23:51,669 --> 00:23:50,880

earlier than me but the probability is

640

00:23:55,269 --> 00:23:51,679

zero

641

00:23:57,909 --> 00:23:55,279

right right right and you your dart

642

00:23:59,669 --> 00:23:57,919

you you've hit number q and you can say

643

00:24:01,350 --> 00:23:59,679

exactly the same argument

644

00:24:04,470 --> 00:24:01,360

you're going to say the chance that i'm

645

00:24:08,549 --> 00:24:04,480

earlier in the well ordering is zero

646

00:24:12,470 --> 00:24:08,559

and the chance that it's later is is one

647

00:24:16,470 --> 00:24:15,510

because i've i've said you've got to be

648

00:24:17,990 --> 00:24:16,480

later than me right

649

00:24:19,590 --> 00:24:18,000

right right right and you've argued

650

00:24:20,470 --> 00:24:19,600

correctly that i've got to be later than

651
00:24:23,190 --> 00:24:20,480
you

652
00:24:23,590 --> 00:24:23,200
right now i have different points yeah

653
00:24:29,029 --> 00:24:23,600
and

654
00:24:30,950 --> 00:24:29,039
what led to this absurdity the

655
00:24:34,710 --> 00:24:30,960
assumption that there are aleph

656
00:24:36,789 --> 00:24:34,720
one real numbers if there were alice ii

657
00:24:39,669 --> 00:24:36,799
it wouldn't be a problem

658
00:24:40,710 --> 00:24:39,679
why why is that because uh we i might

659
00:24:42,870 --> 00:24:40,720
have landed in

660
00:24:44,549 --> 00:24:42,880
an uncountable there might be an

661
00:24:46,310 --> 00:24:44,559
uncountable number of points earlier

662
00:24:48,310 --> 00:24:46,320
than me

663
00:24:49,590 --> 00:24:48,320

and an uncountable earlier than you so

664

00:24:51,750 --> 00:24:49,600

we couldn't argue

665

00:24:52,710 --> 00:24:51,760

we wouldn't be able to do that the trick

666

00:24:55,269 --> 00:24:52,720

is

667

00:24:56,310 --> 00:24:55,279

when you've got a countable infinity of

668

00:24:57,830 --> 00:24:56,320

numbers

669

00:25:01,190 --> 00:24:57,840

and here comes the result from what's

670

00:25:03,909 --> 00:25:01,200

known as measure theory

671

00:25:04,870 --> 00:25:03,919

the the pro it's it the chance of

672

00:25:07,750 --> 00:25:04,880

landing in there

673

00:25:09,350 --> 00:25:07,760

is zero it's not impossible but it's

674

00:25:11,269 --> 00:25:09,360

zero probability

675

00:25:12,630 --> 00:25:11,279

right and that's interesting for people

676
00:25:12,950 --> 00:25:12,640
to wrap their head around that you can

677
00:25:15,350 --> 00:25:12,960
have

678
00:25:16,070 --> 00:25:15,360
a zero probability but possible that's

679
00:25:17,590 --> 00:25:16,080
right

680
00:25:19,510 --> 00:25:17,600
it's not very well people said that it's

681
00:25:22,870 --> 00:25:19,520
not the same as impossible

682
00:25:25,430 --> 00:25:22,880
okay um if that if

683
00:25:27,350 --> 00:25:25,440
if anyone just to take a slight tangent

684
00:25:31,029 --> 00:25:27,360
anyone who finds that absurd

685
00:25:33,269 --> 00:25:31,039
think of a roulette wheel with uh

686
00:25:35,750 --> 00:25:33,279
every real number between zero and one

687
00:25:38,390 --> 00:25:35,760
on it okay you spin the wheel

688
00:25:40,230 --> 00:25:38,400

and it's going to stop somewhere what's

689

00:25:41,269 --> 00:25:40,240

the what's the chance it's going to land

690

00:25:44,310 --> 00:25:41,279

on say

691

00:25:46,630 --> 00:25:44,320

one half well

692

00:25:48,710 --> 00:25:46,640

there's infinitely many places that

693

00:25:51,350 --> 00:25:48,720

could stop

694

00:25:51,990 --> 00:25:51,360

so the chance is one out of infinity

695

00:25:56,070 --> 00:25:52,000

which is

696

00:25:58,390 --> 00:25:56,080

going to be zero it can happen

697

00:26:00,230 --> 00:25:58,400

but it's going to be zero probability

698

00:26:02,149 --> 00:26:00,240

okay so you and i now have

699

00:26:03,830 --> 00:26:02,159

uh this little we've each got this

700

00:26:07,269 --> 00:26:03,840

little argument

701
00:26:10,470 --> 00:26:07,279
and um um and we each show

702
00:26:14,149 --> 00:26:10,480
that the the other guy is is

703
00:26:15,510 --> 00:26:14,159
uh impossible and this is absurd

704
00:26:17,350 --> 00:26:15,520
and the assumption the background

705
00:26:21,029 --> 00:26:17,360
assumption that led to this

706
00:26:23,909 --> 00:26:21,039
that the continuum hypothesis is true

707
00:26:25,510 --> 00:26:23,919
is in trouble you've got to throw it out

708
00:26:28,549 --> 00:26:25,520
okay

709
00:26:30,710 --> 00:26:28,559
all right now

710
00:26:32,710 --> 00:26:30,720
this is really interesting i mean it's

711
00:26:34,070 --> 00:26:32,720
it could be an argument uh

712
00:26:36,149 --> 00:26:34,080
you know that settles a continuum

713
00:26:38,470 --> 00:26:36,159

hypothesis though it's not a proof in

714

00:26:41,750 --> 00:26:38,480

any ordinary mathematical sense

715

00:26:42,950 --> 00:26:41,760

it's really different mathematicians who

716

00:26:45,029 --> 00:26:42,960

look at this are

717

00:26:48,149 --> 00:26:45,039

oh they're very queasy you know they

718

00:26:49,750 --> 00:26:48,159

don't like this kind of reasoning

719

00:26:51,750 --> 00:26:49,760

they don't mind suggestive reasoning

720

00:26:53,029 --> 00:26:51,760

that's outside of mathematics

721

00:26:55,669 --> 00:26:53,039

they don't want to take it as real

722

00:26:57,510 --> 00:26:55,679

evidence that that you know

723

00:26:59,669 --> 00:26:57,520

that this could be a theorem you know a

724

00:27:02,310 --> 00:26:59,679

real a real genuine

725

00:27:03,430 --> 00:27:02,320

sure to be true result very uneasy about

726

00:27:09,750 --> 00:27:03,440

it

727

00:27:11,990 --> 00:27:09,760

i mean i know how i i can reproduce the

728

00:27:14,630 --> 00:27:12,000

proof i know how it works in that sense

729

00:27:15,909 --> 00:27:14,640

but why the hell does it work you know

730

00:27:17,669 --> 00:27:15,919

it shouldn't work

731

00:27:19,510 --> 00:27:17,679

and then what is its connection to

732

00:27:20,230 --> 00:27:19,520

reality how is it that we can think this

733

00:27:23,029 --> 00:27:20,240

and it's true

734

00:27:24,389 --> 00:27:23,039

is that what you mean by no yeah yeah

735

00:27:27,590 --> 00:27:24,399

yeah that's that's sort of

736

00:27:30,149 --> 00:27:27,600

that's that's behind it all uh for sure

737

00:27:30,870 --> 00:27:30,159

but in particular there are assumptions

738

00:27:33,990 --> 00:27:30,880

made

739

00:27:35,510 --> 00:27:34,000

for this little argument to go and

740

00:27:37,510 --> 00:27:35,520

here that here here are here are some of

741

00:27:39,110 --> 00:27:37,520

the assumptions first of all the real

742

00:27:41,110 --> 00:27:39,120

numbers and the points on the line

743

00:27:44,070 --> 00:27:41,120

correspond

744

00:27:44,710 --> 00:27:44,080

okay so the geometric line between 0 and

745

00:27:48,149 --> 00:27:44,720

1

746

00:27:50,950 --> 00:27:48,159

and the uncountable infinity

747

00:27:51,510 --> 00:27:50,960

uh between zero and one real numbers

748

00:27:55,269 --> 00:27:51,520

they're

749

00:27:57,830 --> 00:27:55,279

yeah okay

750

00:27:59,590 --> 00:27:57,840

um it's an obvious assumption to make

751
00:28:00,470 --> 00:27:59,600
given the long history of analytic

752
00:28:03,510 --> 00:28:00,480
geometry

753
00:28:05,990 --> 00:28:03,520
but i just want to make sure it's there

754
00:28:07,990 --> 00:28:06,000
second thing when you threw a dart and i

755
00:28:11,029 --> 00:28:08,000
threw a dart

756
00:28:13,590 --> 00:28:11,039
each each of us hits a point at random

757
00:28:14,389 --> 00:28:13,600
um the chance of hitting any point along

758
00:28:17,350 --> 00:28:14,399
the line

759
00:28:17,830 --> 00:28:17,360
is is no different than any other point

760
00:28:20,549 --> 00:28:17,840
okay

761
00:28:21,269 --> 00:28:20,559
it's equi-probability for every point

762
00:28:23,190 --> 00:28:21,279
okay

763
00:28:24,870 --> 00:28:23,200

my that's true for my dart also true for

764

00:28:28,149 --> 00:28:24,880

your day

765

00:28:29,750 --> 00:28:28,159

there's a symmetry between our throws

766

00:28:32,230 --> 00:28:29,760

in the sense that it doesn't matter if

767

00:28:34,070 --> 00:28:32,240

you throw first and i throw second

768

00:28:35,909 --> 00:28:34,080

or i throw first and you throw a second

769

00:28:38,630 --> 00:28:35,919

or if we throw simultaneously

770

00:28:39,909 --> 00:28:38,640

it's irrelevant and finally uh

771

00:28:42,149 --> 00:28:39,919

independence

772

00:28:43,510 --> 00:28:42,159

the your result has no effect on my

773

00:28:46,070 --> 00:28:43,520

result

774

00:28:47,430 --> 00:28:46,080

vice versa okay now when you think of

775

00:28:49,590 --> 00:28:47,440

all of those assumptions these are

776

00:28:53,350 --> 00:28:49,600

crucial assumptions

777

00:28:55,830 --> 00:28:53,360

um things like probability

778

00:28:57,029 --> 00:28:55,840

uh can be captured completely inside set

779

00:28:58,549 --> 00:28:57,039

theory

780

00:29:00,470 --> 00:28:58,559

independence can be captured in

781

00:29:03,750 --> 00:29:00,480

completely inside set theory

782

00:29:05,990 --> 00:29:03,760

um the symmetry of the two ethos can be

783

00:29:08,870 --> 00:29:06,000

captured completely inside symmetry

784

00:29:09,750 --> 00:29:08,880

how come the damn argument works because

785

00:29:16,149 --> 00:29:09,760

if i

786

00:29:17,990 --> 00:29:16,159

of my little argument or the symmetry or

787

00:29:19,669 --> 00:29:18,000

the independence i tried to spell it out

788

00:29:23,110 --> 00:29:19,679

in standard mathematics

789

00:29:25,190 --> 00:29:23,120

and could get that result then

790

00:29:26,549 --> 00:29:25,200

then then something would have gone

791

00:29:29,430 --> 00:29:26,559

terribly wrong

792

00:29:30,870 --> 00:29:29,440

i can't get that result from ordinary

793

00:29:34,470 --> 00:29:30,880

mathematics

794

00:29:37,190 --> 00:29:34,480

so the probability in my

795

00:29:37,990 --> 00:29:37,200

argument the independence in the

796

00:29:43,269 --> 00:29:38,000

argument

797

00:29:45,830 --> 00:29:43,279

the probability symmetry and

798

00:29:47,510 --> 00:29:45,840

independence of standard mathematics

799

00:29:50,310 --> 00:29:47,520

something else something weird is going

800

00:29:51,269 --> 00:29:50,320

on it's it must be a related but a

801
00:29:53,510 --> 00:29:51,279
different concept

802
00:29:55,909 --> 00:29:53,520
in each case what do you think is going

803
00:29:58,230 --> 00:29:55,919
on i think it's a thick concept

804
00:29:59,110 --> 00:29:58,240
i think probability as we normally use

805
00:30:02,710 --> 00:29:59,120
it is a thin

806
00:30:06,389 --> 00:30:02,720
concept thin mathematical concept

807
00:30:08,710 --> 00:30:06,399
i think in the dart thought experiment

808
00:30:10,310 --> 00:30:08,720
to refute the continuing hypothesis i

809
00:30:13,350 --> 00:30:10,320
think probability has taken on

810
00:30:16,549 --> 00:30:13,360
a new richness

811
00:30:19,750 --> 00:30:16,559
in the example it's become

812
00:30:21,750 --> 00:30:19,760
physicalized in some sense

813
00:30:23,909 --> 00:30:21,760

and so here's where i'm looking at the

814

00:30:26,070 --> 00:30:23,919

analogy with ethics

815

00:30:27,350 --> 00:30:26,080

instead of a thin concept from

816

00:30:29,510 --> 00:30:27,360

mathematics

817

00:30:31,269 --> 00:30:29,520

or a thin concept from physics i've got

818

00:30:33,909 --> 00:30:31,279

a thick

819

00:30:34,470 --> 00:30:33,919

this is thick probability it's got both

820

00:30:37,510 --> 00:30:34,480

physical

821

00:30:41,190 --> 00:30:37,520

and mathematical aspects to it like

822

00:30:41,590 --> 00:30:41,200

like courageous is both in set theory we

823

00:30:45,029 --> 00:30:41,600

can

824

00:30:47,269 --> 00:30:45,039

formalize probability yep so what's

825

00:30:48,630 --> 00:30:47,279

what's thick about this just the just

826

00:30:50,630 --> 00:30:48,640

throwing the dart but we can

827

00:30:51,990 --> 00:30:50,640

not use the dart and say we pick a point

828

00:30:53,909 --> 00:30:52,000

at random

829

00:30:56,149 --> 00:30:53,919

and there's obviously random variables

830

00:30:58,310 --> 00:30:56,159

and which have nothing to do with darts

831

00:30:59,350 --> 00:30:58,320

so what's what's thick i i don't hear

832

00:31:02,389 --> 00:30:59,360

what's thick

833

00:31:04,950 --> 00:31:02,399

about this i don't know maybe i'm thick

834

00:31:05,669 --> 00:31:04,960

you gotta help no no not at all the the

835

00:31:08,789 --> 00:31:05,679

thickness

836

00:31:11,430 --> 00:31:08,799

the thought experiment is done you're

837

00:31:14,789 --> 00:31:11,440

supposed to imagine yourself throwing a

838

00:31:16,230 --> 00:31:14,799

a dart at an actual line try to

839

00:31:17,990 --> 00:31:16,240

try to make it physical even if you

840

00:31:19,190 --> 00:31:18,000

think it's mathematical it's outside of

841

00:31:21,029 --> 00:31:19,200

set theory

842

00:31:22,710 --> 00:31:21,039

why do you have to imagine that why

843

00:31:24,950 --> 00:31:22,720

can't you just say pick a point

844

00:31:26,870 --> 00:31:24,960

at random instead of throwing a dart is

845

00:31:30,310 --> 00:31:26,880

there a difference

846

00:31:32,470 --> 00:31:30,320

well the dart the dart is is supposed to

847

00:31:33,590 --> 00:31:32,480

be a guarantee that it's genuinely at

848

00:31:36,070 --> 00:31:33,600

random

849

00:31:36,950 --> 00:31:36,080

um if i asked you to pick a real number

850

00:31:40,389 --> 00:31:36,960

between zero

851
00:31:43,750 --> 00:31:40,399
and one at random i'm almost certain you

852
00:31:48,549 --> 00:31:47,110
um i know i know what i'm saying is that

853
00:31:50,310 --> 00:31:48,559
you can formalize

854
00:31:53,190 --> 00:31:50,320
what it means to pick a number from zero

855
00:31:55,669 --> 00:31:53,200
to one randomly

856
00:31:56,789 --> 00:31:55,679
in statistics independent of saying

857
00:31:58,630 --> 00:31:56,799
throw a dart

858
00:32:00,470 --> 00:31:58,640
and you can formalize it with set theory

859
00:32:03,509 --> 00:32:00,480
you know

860
00:32:04,789 --> 00:32:03,519
um yeah yeah yeah that's true that's

861
00:32:07,350 --> 00:32:04,799
certainly true

862
00:32:09,669 --> 00:32:07,360
uh the thing is well here's what here's

863
00:32:12,950 --> 00:32:09,679

what i'm i am faced with

864

00:32:14,710 --> 00:32:12,960

and you're faced with uh if we assume

865

00:32:16,389 --> 00:32:14,720

that the argument works

866

00:32:18,950 --> 00:32:16,399

the frightening argument works as a

867

00:32:21,830 --> 00:32:18,960

refutation we assume it works

868

00:32:23,269 --> 00:32:21,840

and and um and it does seem to make

869

00:32:25,669 --> 00:32:23,279

these crucial assumptions

870

00:32:26,710 --> 00:32:25,679

well it assumes mello frankel said three

871

00:32:29,909 --> 00:32:26,720

with choice

872

00:32:31,509 --> 00:32:29,919

okay and and then it assumes the the

873

00:32:33,269 --> 00:32:31,519

randomness of the dark throw

874

00:32:35,269 --> 00:32:33,279

the the symmetry of the dark throw the

875

00:32:36,789 --> 00:32:35,279

independence of the dark throne

876
00:32:38,870 --> 00:32:36,799
and the correspondence between real

877
00:32:42,310 --> 00:32:38,880
numbers and points on a line

878
00:32:43,190 --> 00:32:42,320
it assumes that if that if all of that

879
00:32:47,190 --> 00:32:43,200
is just

880
00:32:50,630 --> 00:32:47,200
part of mathematics existing mathematics

881
00:32:53,350 --> 00:32:50,640
then we would have derived a refutation

882
00:32:53,669 --> 00:32:53,360
of the continuum hypothesis inside

883
00:32:57,029 --> 00:32:53,679
that's

884
00:32:58,549 --> 00:32:57,039
wouldn't have been independent after all

885
00:33:00,470 --> 00:32:58,559
right since it is independent

886
00:33:02,870 --> 00:33:00,480
demonstrably independent

887
00:33:03,990 --> 00:33:02,880
one of those premises has to be false i

888
00:33:07,110 --> 00:33:04,000

think i think

889

00:33:08,470 --> 00:33:07,120

and so uh if i just say well let's take

890

00:33:10,710 --> 00:33:08,480

the randomness one

891

00:33:12,470 --> 00:33:10,720

i don't know which one is false at least

892

00:33:14,870 --> 00:33:12,480

one of them has got to be false

893

00:33:15,509 --> 00:33:14,880

so the randomness one is fault there

894

00:33:19,350 --> 00:33:15,519

must be

895

00:33:20,950 --> 00:33:19,360

um the randomness that we're assuming in

896

00:33:24,549 --> 00:33:20,960

the thought experiment cannot be

897

00:33:27,909 --> 00:33:24,559

analyzed in normal set theory terms

898

00:33:31,350 --> 00:33:27,919

it's got to have some kind of physical

899

00:33:35,029 --> 00:33:31,360

component that enriches it so that we

900

00:33:39,269 --> 00:33:37,750

so that's where this is where the thick

901
00:33:41,990 --> 00:33:39,279
concepts come i see

902
00:33:42,950 --> 00:33:42,000
so it's it becomes not ordinary

903
00:33:46,549 --> 00:33:42,960
randomness

904
00:33:48,470 --> 00:33:46,559
in in standard math it's becomes a thick

905
00:33:50,870 --> 00:33:48,480
randomness it's got a physical

906
00:33:52,710 --> 00:33:50,880
it's become physicalized in some

907
00:33:53,669 --> 00:33:52,720
important sense now you say physicalized

908
00:33:56,470 --> 00:33:53,679
with a grimace

909
00:33:57,909 --> 00:33:56,480
is that because there is you're a

910
00:34:00,549 --> 00:33:57,919
platonist and you feel like

911
00:34:01,430 --> 00:34:00,559
well if it's not a thinned mathematical

912
00:34:02,789 --> 00:34:01,440
by the way is there

913
00:34:04,830 --> 00:34:02,799

is there a connection between thin and

914

00:34:08,149 --> 00:34:04,840

thick and platinism and

915

00:34:09,829 --> 00:34:08,159

non-platonism i don't know um

916

00:34:11,190 --> 00:34:09,839

most of the people who talk about thick

917

00:34:14,389 --> 00:34:11,200

and thin

918

00:34:17,430 --> 00:34:14,399

uh in ethics what they are

919

00:34:20,550 --> 00:34:17,440

um they often conclude uh that this is

920

00:34:22,230 --> 00:34:20,560

the end of the fact value distinction

921

00:34:24,069 --> 00:34:22,240

so if you think of facts as part of the

922

00:34:26,230 --> 00:34:24,079

physical realm and if you were a

923

00:34:27,990 --> 00:34:26,240

platonist about ethics

924

00:34:30,069 --> 00:34:28,000

and and they're declaring the end of

925

00:34:33,430 --> 00:34:30,079

this dichotomy between

926

00:34:36,230 --> 00:34:33,440

moral reality and physical reality

927

00:34:39,270 --> 00:34:36,240

um then i'm not sure about the status of

928

00:34:41,510 --> 00:34:39,280

moral reality when it's all over

929

00:34:42,710 --> 00:34:41,520

i would like to think it's still there

930

00:34:46,149 --> 00:34:42,720

and these are

931

00:34:50,069 --> 00:34:46,159

a kind of hybrid um human made

932

00:34:51,589 --> 00:34:50,079

concepts in both in ethics and in math

933

00:34:53,990 --> 00:34:51,599

supposed to say that you would like to

934

00:34:56,790 --> 00:34:54,000

believe that morals are a part

935

00:34:57,589 --> 00:34:56,800

of of the platonistic world or a moral

936

00:35:00,310 --> 00:34:57,599

oh definitely

937

00:35:02,230 --> 00:35:00,320

yeah yeah i'm a moral realist yeah for

938

00:35:04,069 --> 00:35:02,240

me there's um

939

00:35:06,470 --> 00:35:04,079

i hate the i hate the distinction

940

00:35:09,109 --> 00:35:06,480

between fact and value

941

00:35:09,589 --> 00:35:09,119

because it makes it sound like values

942

00:35:11,109 --> 00:35:09,599

aren't

943

00:35:13,270 --> 00:35:11,119

themselves facts but they are they're

944

00:35:16,310 --> 00:35:13,280

moral facts uh murder is uh

945

00:35:18,310 --> 00:35:16,320

is wrong that's a moral fact setting

946

00:35:19,030 --> 00:35:18,320

kittens on fire for pleasure to watch

947

00:35:21,829 --> 00:35:19,040

them burn

948

00:35:22,230 --> 00:35:21,839

and suffer that's it's a moral fact that

949

00:35:25,270 --> 00:35:22,240

that's

950

00:35:26,790 --> 00:35:25,280

uh wrong how how do we get to

951
00:35:29,030 --> 00:35:26,800
how do we get that moral fact where does

952
00:35:31,829 --> 00:35:29,040
that moral fact come from

953
00:35:33,109 --> 00:35:31,839
okay now this is this is this gets back

954
00:35:35,990 --> 00:35:33,119
to the the problem

955
00:35:37,750 --> 00:35:36,000
a simultaneous problem for both ethics

956
00:35:40,390 --> 00:35:37,760
and for mathematics

957
00:35:42,470 --> 00:35:40,400
so uh most platonists believe not only

958
00:35:43,990 --> 00:35:42,480
in the reality of mathematics

959
00:35:45,990 --> 00:35:44,000
and if you're a platonist about ethics

960
00:35:47,270 --> 00:35:46,000
or a moral realist you believe in

961
00:35:50,790 --> 00:35:47,280
objective moral

962
00:35:51,430 --> 00:35:50,800
facts the the big problem and the thing

963
00:35:52,870 --> 00:35:51,440

that

964

00:35:55,109 --> 00:35:52,880

people who are empiricists and

965

00:35:58,790 --> 00:35:55,119

naturalists complain about is

966

00:36:01,030 --> 00:35:58,800

you have no access to these facts

967

00:36:02,390 --> 00:36:01,040

even if they did exist because you can

968

00:36:05,190 --> 00:36:02,400

see smell

969

00:36:06,630 --> 00:36:05,200

touch and so on but if these live in a

970

00:36:08,390 --> 00:36:06,640

realm completely

971

00:36:10,230 --> 00:36:08,400

separate from us you have no contact

972

00:36:13,430 --> 00:36:10,240

with them you couldn't learn about them

973

00:36:16,710 --> 00:36:13,440

and so on and so on the response from

974

00:36:20,790 --> 00:36:16,720

uh moral realists platonus

975

00:36:24,710 --> 00:36:20,800

um is to appeal to um intuition

976

00:36:29,829 --> 00:36:24,720

an intuition is a cognitive capacity

977

00:36:32,950 --> 00:36:29,839

that we have that will give us

978

00:36:36,069 --> 00:36:32,960

knowledge so to take math

979

00:36:37,910 --> 00:36:36,079

we have everybody has you know scads of

980

00:36:39,990 --> 00:36:37,920

moral intuitions about math

981

00:36:42,150 --> 00:36:40,000

even if you had almost no mathematical

982

00:36:44,069 --> 00:36:42,160

training you have a powerful intuition

983

00:36:46,470 --> 00:36:44,079

that two plus two equals four

984

00:36:48,310 --> 00:36:46,480

and that's a moral intuition sorry no a

985

00:36:50,470 --> 00:36:48,320

mathematical intuition

986

00:36:51,510 --> 00:36:50,480

uh that two plus two equals four and if

987

00:36:53,349 --> 00:36:51,520

i pressed you and i said

988

00:36:55,829 --> 00:36:53,359

oh look i just read in the newspaper

989

00:36:59,349 --> 00:36:55,839

today that

990

00:37:01,589 --> 00:36:59,359

you know in in brazil

991

00:37:02,390 --> 00:37:01,599

some wonderful physicists in brazil have

992

00:37:04,630 --> 00:37:02,400

just

993

00:37:06,390 --> 00:37:04,640

done some fine-tuned measurements and

994

00:37:08,710 --> 00:37:06,400

they have discovered that

995

00:37:11,030 --> 00:37:08,720

two plus two actually equals three point

996

00:37:11,349 --> 00:37:11,040

nine five it doesn't equal four after

997

00:37:15,589 --> 00:37:11,359

all

998

00:37:17,109 --> 00:37:15,599

me germain because there was a recent

999

00:37:18,630 --> 00:37:17,119

controversy about two plus two equals

1000

00:37:23,510 --> 00:37:18,640

five i don't know if you've heard of it

1001
00:37:26,550 --> 00:37:24,870
no no no the other side was being

1002
00:37:29,670 --> 00:37:26,560
serious it was

1003
00:37:31,270 --> 00:37:29,680
it was because they were saying that the

1004
00:37:34,470 --> 00:37:31,280
way that math is set up is

1005
00:37:36,310 --> 00:37:34,480
western and it's not taking into account

1006
00:37:38,310 --> 00:37:36,320
other modes of knowing and there are

1007
00:37:39,510 --> 00:37:38,320
possible worlds where two plus two could

1008
00:37:40,550 --> 00:37:39,520
equal five and in different

1009
00:37:42,069 --> 00:37:40,560
interpretations

1010
00:37:43,670 --> 00:37:42,079
which it's true i mean if you have

1011
00:37:44,950 --> 00:37:43,680
modulo something i'm sure you can make

1012
00:37:46,310 --> 00:37:44,960
two plus two equal five

1013
00:37:48,150 --> 00:37:46,320

or you round oh no you're gonna have

1014

00:37:49,750 --> 00:37:48,160

modular you're absolutely right

1015

00:37:51,750 --> 00:37:49,760

but it doesn't mean may be some

1016

00:37:53,190 --> 00:37:51,760

interpretation and there's probably good

1017

00:37:56,310 --> 00:37:53,200

rules of thumb

1018

00:37:57,430 --> 00:37:56,320

in in some sciences where you you're now

1019

00:37:59,589 --> 00:37:57,440

not talking

1020

00:38:01,270 --> 00:37:59,599

two plus two you're talking about two

1021

00:38:04,950 --> 00:38:01,280

some things and two some things

1022

00:38:07,430 --> 00:38:04,960

so if you're talking about what is it

1023

00:38:08,950 --> 00:38:07,440

water a liter of water mixed with a

1024

00:38:11,030 --> 00:38:08,960

liter of alcohol

1025

00:38:13,670 --> 00:38:11,040

perhaps doesn't give you two liters of

1026

00:38:15,750 --> 00:38:13,680

liquid it gives you something like 1.9

1027

00:38:18,470 --> 00:38:15,760

liters of liquid because of the you know

1028

00:38:20,710 --> 00:38:18,480

the some atomic goings-on

1029

00:38:23,109 --> 00:38:20,720

reduces the the volume of the whole

1030

00:38:27,030 --> 00:38:24,790

you could you might conveniently talk

1031

00:38:28,630 --> 00:38:27,040

that way yeah because you're in the lab

1032

00:38:31,670 --> 00:38:28,640

and it's very constrained

1033

00:38:32,390 --> 00:38:31,680

but no two plus two equals four and more

1034

00:38:33,990 --> 00:38:32,400

generally

1035

00:38:36,790 --> 00:38:34,000

you know a little bit of arithmetic and

1036

00:38:40,230 --> 00:38:36,800

then i can become abstract and i can say

1037

00:38:43,430 --> 00:38:40,240

um any number m and any number

1038

00:38:46,470 --> 00:38:43,440

n if i add them together m

1039

00:38:48,870 --> 00:38:46,480

plus n it's going to equal n plus

1040

00:38:50,150 --> 00:38:48,880

m and everybody they think about that

1041

00:38:50,550 --> 00:38:50,160

for a minute and a half and say yeah

1042

00:38:53,829 --> 00:38:50,560

yeah

1043

00:38:55,270 --> 00:38:53,839

right i see it yes it's true and it has

1044

00:38:57,510 --> 00:38:55,280

to be true

1045

00:38:59,190 --> 00:38:57,520

that's an example of a mathematical

1046

00:39:02,870 --> 00:38:59,200

intuition okay

1047

00:39:05,750 --> 00:39:02,880

okay okay it's not empirical though um

1048

00:39:07,670 --> 00:39:05,760

math and ethics have been the two thorns

1049

00:39:09,990 --> 00:39:07,680

in the side of empiricism

1050

00:39:11,270 --> 00:39:10,000

okay um just for a second because i'm

1051
00:39:11,750 --> 00:39:11,280
trying to wrap my head around this when

1052
00:39:13,589 --> 00:39:11,760
you have n

1053
00:39:16,630 --> 00:39:13,599
plus when you have like a plus b equals

1054
00:39:19,270 --> 00:39:16,640
b plus a just so that it's clear for

1055
00:39:20,470 --> 00:39:19,280
do we not define that with the addition

1056
00:39:22,069 --> 00:39:20,480
being commutative

1057
00:39:24,310 --> 00:39:22,079
like you and then we make a model and

1058
00:39:27,670 --> 00:39:24,320
say that our numbers correspond to it

1059
00:39:29,670 --> 00:39:27,680
we we we do but um uh

1060
00:39:31,589 --> 00:39:29,680
people's elementary experience with

1061
00:39:34,150 --> 00:39:31,599
arithmetic would lead them

1062
00:39:35,910 --> 00:39:34,160
in that very direction okay they've done

1063
00:39:37,750 --> 00:39:35,920

enough adding that they've been making

1064

00:39:40,630 --> 00:39:37,760

change they've been counting pebbles

1065

00:39:42,069 --> 00:39:40,640

who knows what um and after a while they

1066

00:39:43,030 --> 00:39:42,079

come to realize that whether they've

1067

00:39:45,109 --> 00:39:43,040

been told

1068

00:39:46,710 --> 00:39:45,119

that the community okay you're strictly

1069

00:39:47,430 --> 00:39:46,720

speaking about the intuition behind it

1070

00:39:51,270 --> 00:39:47,440

not

1071

00:39:53,589 --> 00:39:51,280

proving it to be true that's right uh

1072

00:39:54,790 --> 00:39:53,599

because to the audience to be true

1073

00:39:57,670 --> 00:39:54,800

that's really interesting

1074

00:39:59,349 --> 00:39:57,680

we actually assume it in in the way that

1075

00:39:59,910 --> 00:39:59,359

we define addition and multiplication

1076

00:40:03,270 --> 00:39:59,920

that they're

1077

00:40:05,430 --> 00:40:03,280

doing arithmetic in any formal sense

1078

00:40:08,230 --> 00:40:05,440

we typically start out with something

1079

00:40:10,550 --> 00:40:08,240

known as the piano axioms

1080

00:40:11,510 --> 00:40:10,560

okay and they tell us how to add how to

1081

00:40:13,109 --> 00:40:11,520

multiply

1082

00:40:14,870 --> 00:40:13,119

and they give us a principle called

1083

00:40:16,790 --> 00:40:14,880

mathematical induction

1084

00:40:17,990 --> 00:40:16,800

and then everything in arithmetic

1085

00:40:19,990 --> 00:40:18,000

follows

1086

00:40:21,589 --> 00:40:20,000

well i need to qualify that almost

1087

00:40:23,670 --> 00:40:21,599

everything in arithmetic follows

1088

00:40:25,430 --> 00:40:23,680

there is a problem about completeness

1089

00:40:27,990 --> 00:40:25,440

but never mind that

1090

00:40:29,510 --> 00:40:28,000

um and everybody's intuition if you've

1091

00:40:32,309 --> 00:40:29,520

been playing with arithmetic

1092

00:40:33,430 --> 00:40:32,319

for a while you'd say yeah this is the

1093

00:40:34,790 --> 00:40:33,440

truth this is how

1094

00:40:36,710 --> 00:40:34,800

addition works this is how

1095

00:40:38,069 --> 00:40:36,720

multiplication works okay let's not get

1096

00:40:39,910 --> 00:40:38,079

hung up on it let's assume

1097

00:40:41,829 --> 00:40:39,920

that okay that's an interesting strong

1098

00:40:43,030 --> 00:40:41,839

intuition those are examples of

1099

00:40:46,150 --> 00:40:43,040

intuitions

1100

00:40:49,510 --> 00:40:46,160

now uh we have the same thing in ethics

1101
00:40:52,309 --> 00:40:49,520
so um um if you saw

1102
00:40:53,190 --> 00:40:52,319
somebody if you saw some teenage kids

1103
00:40:56,230 --> 00:40:53,200
catch a kitten

1104
00:40:57,910 --> 00:40:56,240
pour gasoline on it set it on fire you

1105
00:40:59,030 --> 00:40:57,920
would be aghast you would be morally

1106
00:41:02,069 --> 00:40:59,040
outraged

1107
00:41:05,190 --> 00:41:02,079
um you have a very strong moral

1108
00:41:08,069 --> 00:41:05,200
intuition that that was an evil thing to

1109
00:41:11,190 --> 00:41:08,079
do but those kids don't

1110
00:41:12,790 --> 00:41:11,200
uh they might they might and they're

1111
00:41:15,109 --> 00:41:12,800
just uh overwhelmed by

1112
00:41:16,630 --> 00:41:15,119
peer pressure and gang behavior and

1113
00:41:18,309 --> 00:41:16,640

stuff like that

1114

00:41:19,910 --> 00:41:18,319

and then you're right they might not

1115

00:41:21,510 --> 00:41:19,920

even yeah unless i imagine they might

1116

00:41:24,550 --> 00:41:21,520

now let's take the edge case the which

1117

00:41:27,109 --> 00:41:24,560

the edge cases just to investigate this

1118

00:41:28,390 --> 00:41:27,119

so what if they genuinely don't have

1119

00:41:29,910 --> 00:41:28,400

anything wrong with that like genghis

1120

00:41:31,910 --> 00:41:29,920

khan for example said

1121

00:41:33,910 --> 00:41:31,920

the best of life would be conquering his

1122

00:41:35,030 --> 00:41:33,920

enemies and enslaving their women and

1123

00:41:37,430 --> 00:41:35,040

now we look at that

1124

00:41:39,030 --> 00:41:37,440

and say that that's ridiculous but let's

1125

00:41:40,950 --> 00:41:39,040

believe him that that actually

1126
00:41:42,309 --> 00:41:40,960
invoked pleasure in him and he thought

1127
00:41:45,750 --> 00:41:42,319
that was morally

1128
00:41:48,390 --> 00:41:45,760
correct okay okay i don't know

1129
00:41:49,750 --> 00:41:48,400
i don't know enough about him to know

1130
00:41:51,430 --> 00:41:49,760
exactly what's going on

1131
00:41:53,270 --> 00:41:51,440
so i'll give you the short answer and

1132
00:41:55,109 --> 00:41:53,280
that is we've made a hell of a lot of

1133
00:41:57,990 --> 00:41:55,119
moral progress

1134
00:41:58,630 --> 00:41:58,000
since since that announcement right how

1135
00:42:01,990 --> 00:41:58,640
do we

1136
00:42:03,670 --> 00:42:02,000
made moral progress without already

1137
00:42:05,349 --> 00:42:03,680
assuming what we're trying to prove

1138
00:42:07,270 --> 00:42:05,359

that's a very difficult that's an

1139

00:42:10,790 --> 00:42:07,280

extremely difficult question

1140

00:42:13,910 --> 00:42:10,800

um i don't want to say well

1141

00:42:17,030 --> 00:42:13,920

my views have won over the long run

1142

00:42:18,230 --> 00:42:17,040

um though they have like my view is we

1143

00:42:20,150 --> 00:42:18,240

shouldn't have slavery

1144

00:42:22,230 --> 00:42:20,160

and almost everybody agrees with that

1145

00:42:24,630 --> 00:42:22,240

now my view is that women

1146

00:42:26,150 --> 00:42:24,640

should be treated equally with men and

1147

00:42:28,150 --> 00:42:26,160

most people agree with that now that

1148

00:42:32,309 --> 00:42:28,160

they wouldn't have a century ago

1149

00:42:32,630 --> 00:42:32,319

my view is that um um gays and lesbians

1150

00:42:42,150 --> 00:42:32,640

and

1151
00:42:44,550 --> 00:42:42,160
uh at least a strong majority of

1152
00:42:45,750 --> 00:42:44,560
canadians if not a strong majority of

1153
00:42:49,510 --> 00:42:45,760
the world population

1154
00:42:51,790 --> 00:42:49,520
agree with that so um

1155
00:42:53,910 --> 00:42:51,800
i i don't have a hard and fast

1156
00:42:56,390 --> 00:42:53,920
non-circular argument

1157
00:42:58,550 --> 00:42:56,400
i can say that as people think about

1158
00:43:01,190 --> 00:42:58,560
these things over time

1159
00:43:02,230 --> 00:43:01,200
they tend to change their views in the

1160
00:43:05,589 --> 00:43:02,240
direction

1161
00:43:06,230 --> 00:43:05,599
that that we have come not many people

1162
00:43:08,950 --> 00:43:06,240
were

1163
00:43:10,950 --> 00:43:08,960

against slavery for years and years and

1164

00:43:13,109 --> 00:43:10,960

then had an epiphany and said

1165

00:43:14,630 --> 00:43:13,119

i made a terrible mistake i think we

1166

00:43:15,910 --> 00:43:14,640

should have slaves i think that would be

1167

00:43:17,990 --> 00:43:15,920

a great idea

1168

00:43:19,589 --> 00:43:18,000

okay people don't go in that direction

1169

00:43:20,870 --> 00:43:19,599

let me let me press for a bit i actually

1170

00:43:22,790 --> 00:43:20,880

agree with you but here's what i'm

1171

00:43:25,750 --> 00:43:22,800

thinking here's what pops into my head

1172

00:43:26,309 --> 00:43:25,760

so social consensus what is required and

1173

00:43:27,750 --> 00:43:26,319

what if

1174

00:43:29,670 --> 00:43:27,760

10 years from now you know there's some

1175

00:43:31,990 --> 00:43:29,680

evidence that people who are on the

1176

00:43:34,069 --> 00:43:32,000

lower end of the iq spectrum have more

1177

00:43:36,230 --> 00:43:34,079

children let's just imagine that many

1178

00:43:37,510 --> 00:43:36,240

people and we can even demean them and

1179

00:43:39,109 --> 00:43:37,520

say conservatives

1180

00:43:40,950 --> 00:43:39,119

like let's say we're let's imagine that

1181

00:43:41,510 --> 00:43:40,960

we're supporters that's we're aggressive

1182

00:43:42,790 --> 00:43:41,520

liberals

1183

00:43:45,430 --> 00:43:42,800

i'm not even i'm not saying we are but

1184

00:43:47,109 --> 00:43:45,440

let's see okay these foolish reactionary

1185

00:43:49,190 --> 00:43:47,119

conservatives are the ones that populate

1186

00:43:51,109 --> 00:43:49,200

the earth and then they like its slavery

1187

00:43:52,390 --> 00:43:51,119

later and the majority of the earth like

1188

00:43:53,670 --> 00:43:52,400

slavery except those who are enslaved

1189

00:43:57,670 --> 00:43:53,680

but they're a minority

1190

00:44:00,870 --> 00:43:57,680

does that make that correct no

1191

00:44:03,510 --> 00:44:00,880

okay no no no no so what's the reason

1192

00:44:05,190 --> 00:44:03,520

okay so there's two questions um is

1193

00:44:06,309 --> 00:44:05,200

there such a thing as objective right or

1194

00:44:08,710 --> 00:44:06,319

wrong

1195

00:44:09,670 --> 00:44:08,720

yes i mean correct is there is there is

1196

00:44:12,870 --> 00:44:09,680

there an objective

1197

00:44:16,150 --> 00:44:12,880

shape of the earth yes

1198

00:44:17,990 --> 00:44:16,160

i think it's round it's spherical

1199

00:44:19,430 --> 00:44:18,000

and i think we've got a ton of evidence

1200

00:44:21,430 --> 00:44:19,440

that this is so

1201
00:44:22,630 --> 00:44:21,440
but if for some reason in the future

1202
00:44:26,150 --> 00:44:22,640
people said no

1203
00:44:29,910 --> 00:44:26,160
we're pretty sure it's flat um

1204
00:44:32,390 --> 00:44:29,920
and then i would say well i pity that

1205
00:44:35,190 --> 00:44:32,400
future civilization they've got it wrong

1206
00:44:35,589 --> 00:44:35,200
they've made a terrible mistake that's

1207
00:44:39,910 --> 00:44:35,599
fact

1208
00:44:41,670 --> 00:44:39,920
people actually said well i

1209
00:44:43,030 --> 00:44:41,680
we think we think slavery is a pretty

1210
00:44:46,069 --> 00:44:43,040
good idea

1211
00:44:48,390 --> 00:44:46,079
um i'd say no you're i would say they've

1212
00:44:50,870 --> 00:44:48,400
made a terrible terrible mistake

1213
00:44:52,790 --> 00:44:50,880

but um i acknowledge the possibility

1214

00:44:54,470 --> 00:44:52,800

that it could happen

1215

00:44:56,950 --> 00:44:54,480

germany was a very germany is a very

1216

00:44:59,589 --> 00:44:56,960

progressive country uh in the

1217

00:45:00,470 --> 00:44:59,599

you know uh 19th and very early 20th

1218

00:45:03,910 --> 00:45:00,480

century

1219

00:45:05,670 --> 00:45:03,920

and then by the time you know horrible

1220

00:45:09,270 --> 00:45:05,680

calamities in

1221

00:45:11,030 --> 00:45:09,280

in the in the 30s hitler comes to power

1222

00:45:14,069 --> 00:45:11,040

and a majority of germans are willing to

1223

00:45:15,910 --> 00:45:14,079

go along with some pretty horrific views

1224

00:45:17,430 --> 00:45:15,920

uh-huh yeah they're just wrong they're

1225

00:45:20,150 --> 00:45:17,440

just wrong

1226

00:45:20,470 --> 00:45:20,160

okay we can talk about that another time

1227

00:45:21,829 --> 00:45:20,480

but

1228

00:45:23,510 --> 00:45:21,839

basically my argument was this well

1229

00:45:24,710 --> 00:45:23,520

first of all i want to make it clear to

1230

00:45:26,309 --> 00:45:24,720

the people who are watching that i don't

1231

00:45:28,470 --> 00:45:26,319

think low iq people are conservative

1232

00:45:29,829 --> 00:45:28,480

i was just straw manny for the sake of

1233

00:45:31,990 --> 00:45:29,839

argument okay

1234

00:45:33,270 --> 00:45:32,000

second i thought that what you were

1235

00:45:36,710 --> 00:45:33,280

suggesting was given

1236

00:45:38,950 --> 00:45:36,720

that we have a line toward

1237

00:45:40,309 --> 00:45:38,960

something that over time people believe

1238

00:45:42,069 --> 00:45:40,319

in a certain value

1239

00:45:43,510 --> 00:45:42,079

that's evidence that the value is

1240

00:45:44,150 --> 00:45:43,520

objectively correct and then i was

1241

00:45:45,910 --> 00:45:44,160

saying well

1242

00:45:47,430 --> 00:45:45,920

what if that reverses or we go into

1243

00:45:48,390 --> 00:45:47,440

another direction and then you're saying

1244

00:45:51,510 --> 00:45:48,400

no that's wrong

1245

00:45:53,910 --> 00:45:51,520

but how does that not jive with saying

1246

00:45:55,349 --> 00:45:53,920

that there's societal movement towards a

1247

00:45:57,270 --> 00:45:55,359

certain direction and that

1248

00:45:58,950 --> 00:45:57,280

corresponds to being objectively correct

1249

00:46:01,829 --> 00:45:58,960

morally no no it's

1250

00:46:03,349 --> 00:46:01,839

this is this is a very good question and

1251

00:46:05,510 --> 00:46:03,359

it's very hard to answer

1252

00:46:07,349 --> 00:46:05,520

i don't have a terrific answer i only

1253

00:46:10,710 --> 00:46:07,359

have a weak answer

1254

00:46:12,309 --> 00:46:10,720

and my weak answer is that um it's like

1255

00:46:18,309 --> 00:46:12,319

science

1256

00:46:19,990 --> 00:46:18,319

it's possible that what we believe today

1257

00:46:21,589 --> 00:46:20,000

about let's say quantum mechanics and

1258

00:46:23,750 --> 00:46:21,599

relativity

1259

00:46:24,790 --> 00:46:23,760

a hundred years from now people will say

1260

00:46:27,910 --> 00:46:24,800

ah

1261

00:46:28,710 --> 00:46:27,920

i don't know let's go back to newton

1262

00:46:31,910 --> 00:46:28,720

let's believe

1263

00:46:32,390 --> 00:46:31,920

newton okay i think i think the chances

1264

00:46:35,190 --> 00:46:32,400

of that

1265

00:46:36,150 --> 00:46:35,200

are minuscule and the thing is that

1266

00:46:38,550 --> 00:46:36,160

there's been

1267

00:46:39,670 --> 00:46:38,560

incremental evidence it's fallible

1268

00:46:43,829 --> 00:46:39,680

evidence

1269

00:46:47,109 --> 00:46:43,839

pushes people

1270

00:46:49,589 --> 00:46:47,119

upwards okay it makes us brighter we

1271

00:46:52,390 --> 00:46:49,599

know more we're more sophisticated

1272

00:46:53,190 --> 00:46:52,400

in physics and i think something like

1273

00:46:56,470 --> 00:46:53,200

that

1274

00:46:58,069 --> 00:46:56,480

goes on in our moral and political lives

1275

00:47:00,550 --> 00:46:58,079

too

1276

00:47:02,470 --> 00:47:00,560

interesting okay now with regards to

1277

00:47:06,230 --> 00:47:02,480

newtonian physics becoming

1278

00:47:07,910 --> 00:47:06,240

relativity and then okay we say that one

1279

00:47:08,390 --> 00:47:07,920

is more correct because it can explain

1280

00:47:10,550 --> 00:47:08,400

more

1281

00:47:11,510 --> 00:47:10,560

so it's just that's a planet that's

1282

00:47:13,990 --> 00:47:11,520

evidence

1283

00:47:15,750 --> 00:47:14,000

is pure explanatory power what makes the

1284

00:47:18,550 --> 00:47:15,760

theory correct

1285

00:47:18,870 --> 00:47:18,560

and the reason why i say that is oh okay

1286

00:47:22,309 --> 00:47:18,880

no

1287

00:47:25,109 --> 00:47:22,319

explanatory power is a sign is evidence

1288

00:47:28,230 --> 00:47:25,119

that it's correct

1289

00:47:29,349 --> 00:47:28,240

okay um it is it this is this much is

1290

00:47:32,470 --> 00:47:29,359

logically possible

1291

00:47:34,309 --> 00:47:32,480

for anyone who's a realist that

1292

00:47:36,870 --> 00:47:34,319

all the evidence could point away from

1293

00:47:40,870 --> 00:47:38,470

everything that we count as evidence

1294

00:47:43,990 --> 00:47:40,880

like is it explanatory powerful

1295

00:47:46,630 --> 00:47:44,000

yeah um does it um

1296

00:47:48,230 --> 00:47:46,640

is it incredibly accurate you know does

1297

00:47:51,589 --> 00:47:48,240

it make

1298

00:47:52,870 --> 00:47:51,599

spectacular predictions to the 25th

1299

00:47:55,190 --> 00:47:52,880

decimal place

1300

00:47:56,950 --> 00:47:55,200

yeah might do that too and it might and

1301
00:47:59,750 --> 00:47:56,960
yet in spite of all of this it might be

1302
00:48:01,670 --> 00:47:59,760
false what are your views on free will

1303
00:48:04,150 --> 00:48:01,680
by the way

1304
00:48:04,950 --> 00:48:04,160
do you believe in it yes leave against

1305
00:48:06,630 --> 00:48:04,960
it oh

1306
00:48:07,829 --> 00:48:06,640
interesting okay now are you like daniel

1307
00:48:10,549 --> 00:48:07,839
dennett where you say well i have a

1308
00:48:13,829 --> 00:48:10,559
compatibilist view

1309
00:48:17,109 --> 00:48:13,839
no i i have here i i i

1310
00:48:17,589 --> 00:48:17,119
i feel completely at sea i speculate

1311
00:48:20,710 --> 00:48:17,599
away

1312
00:48:22,549 --> 00:48:20,720
i operate i i live my life as if i have

1313
00:48:27,829 --> 00:48:22,559

free will

1314

00:48:31,109 --> 00:48:27,839

i am i eat too much and i blame myself

1315

00:48:32,710 --> 00:48:31,119

i blame my willpower and uh while it

1316

00:48:33,190 --> 00:48:32,720

would be very nice to blame something

1317

00:48:36,230 --> 00:48:33,200

else

1318

00:48:39,349 --> 00:48:36,240

i can't i just blame myself i

1319

00:48:40,870 --> 00:48:39,359

i get angry at others i get angry

1320

00:48:43,270 --> 00:48:40,880

i mean some people i think can't help

1321

00:48:44,710 --> 00:48:43,280

what they believe others i think have

1322

00:48:46,710 --> 00:48:44,720

gone out of their way to make themselves

1323

00:48:49,349 --> 00:48:46,720

stupid and i blame them for that

1324

00:48:51,430 --> 00:48:49,359

so i'm i'm happy to blame people for not

1325

00:48:53,510 --> 00:48:51,440

doing what i think they ought to do

1326

00:48:55,510 --> 00:48:53,520

and i do think they have free will i

1327

00:48:58,710 --> 00:48:55,520

don't know how to live in a world

1328

00:49:00,950 --> 00:48:58,720

where we really don't have free will but

1329

00:49:03,589 --> 00:49:00,960

i may have i may be just

1330

00:49:04,710 --> 00:49:03,599

highly that's not an argument for free

1331

00:49:07,829 --> 00:49:04,720

will

1332

00:49:08,790 --> 00:49:07,839

that's just an argument for we have to

1333

00:49:11,990 --> 00:49:08,800

live as if

1334

00:49:12,390 --> 00:49:12,000

as if there is free will um i don't know

1335

00:49:14,790 --> 00:49:12,400

how

1336

00:49:16,549 --> 00:49:14,800

uh really to live otherwise now i've

1337

00:49:18,309 --> 00:49:16,559

seen some people who are very

1338

00:49:21,589 --> 00:49:18,319

sophisticated

1339

00:49:23,510 --> 00:49:21,599

you know talk about this subject and

1340

00:49:24,630 --> 00:49:23,520

maybe they'll be able to persuade me in

1341

00:49:27,190 --> 00:49:24,640

the long run

1342

00:49:28,790 --> 00:49:27,200

that we don't have free will or there's

1343

00:49:29,670 --> 00:49:28,800

a very good chance we don't have any

1344

00:49:31,829 --> 00:49:29,680

free will

1345

00:49:33,109 --> 00:49:31,839

but we should we can act like this and

1346

00:49:36,390 --> 00:49:33,119

this and this and this and

1347

00:49:40,069 --> 00:49:36,400

so on so i i i really

1348

00:49:42,790 --> 00:49:40,079

i i i have childish immature

1349

00:49:44,470 --> 00:49:42,800

underdeveloped views about pretty well

1350

00:49:46,309 --> 00:49:44,480

the standard

1351
00:49:47,829 --> 00:49:46,319
view that's opposed to free will is well

1352
00:49:49,510 --> 00:49:47,839
what caused you to make so-and-so

1353
00:49:51,030 --> 00:49:49,520
decision and then it's your neurology

1354
00:49:52,309 --> 00:49:51,040
okay well what caused that and you keep

1355
00:49:53,030 --> 00:49:52,319
going until you get to a cause that's

1356
00:49:56,230 --> 00:49:53,040
not you

1357
00:49:57,990 --> 00:49:56,240
yeah along that chain of causes right

1358
00:49:59,750 --> 00:49:58,000
right where does that chain of

1359
00:50:01,109 --> 00:49:59,760
reductionism because we just talked

1360
00:50:03,030 --> 00:50:01,119
about physics being

1361
00:50:04,390 --> 00:50:03,040
extremely powerful and more and more

1362
00:50:06,150 --> 00:50:04,400
accurate and there doesn't seem to be

1363
00:50:07,270 --> 00:50:06,160

room for free will so where does free

1364

00:50:09,430 --> 00:50:07,280

will

1365

00:50:11,349 --> 00:50:09,440

comport with our view of physics in the

1366

00:50:14,230 --> 00:50:11,359

way that it's formalized currently

1367

00:50:16,309 --> 00:50:14,240

no it's terrible um but it doesn't have

1368

00:50:16,790 --> 00:50:16,319

to be quite as crude as you just uh put

1369

00:50:20,230 --> 00:50:16,800

it

1370

00:50:20,790 --> 00:50:20,240

here's another issue in which i do not

1371

00:50:22,790 --> 00:50:20,800

have

1372

00:50:24,309 --> 00:50:22,800

strong views but it's sort of in the

1373

00:50:25,190 --> 00:50:24,319

background and this is the difference

1374

00:50:27,589 --> 00:50:25,200

between

1375

00:50:29,030 --> 00:50:27,599

this is the issue of reductionism and

1376

00:50:31,190 --> 00:50:29,040

emergence

1377

00:50:34,230 --> 00:50:31,200

so if you have a complete reductionist

1378

00:50:36,870 --> 00:50:34,240

view and your world is deterministic

1379

00:50:37,430 --> 00:50:36,880

it's very hard to make room for a free

1380

00:50:39,670 --> 00:50:37,440

will

1381

00:50:40,549 --> 00:50:39,680

but if you have an emergenciest view

1382

00:50:42,710 --> 00:50:40,559

that is

1383

00:50:45,030 --> 00:50:42,720

yeah physics is at the bottom but in a

1384

00:50:48,150 --> 00:50:45,040

certain level of complexity

1385

00:50:49,430 --> 00:50:48,160

there could emerge biological laws like

1386

00:50:52,309 --> 00:50:49,440

strong emergence

1387

00:50:53,990 --> 00:50:52,319

yeah and out of that could emerge uh

1388

00:50:57,510 --> 00:50:54,000

psychological laws

1389

00:50:59,589 --> 00:50:57,520

and so on and and free will would be

1390

00:51:00,950 --> 00:50:59,599

you know something that is emerging at

1391

00:51:02,790 --> 00:51:00,960

some higher level

1392

00:51:04,790 --> 00:51:02,800

it's not gonna it's not gonna it's not

1393

00:51:05,430 --> 00:51:04,800

gonna emerge out of elementary particle

1394

00:51:07,910 --> 00:51:05,440

physics

1395

00:51:09,030 --> 00:51:07,920

i mean sometimes people try to do that

1396

00:51:11,750 --> 00:51:09,040

because they take

1397

00:51:12,230 --> 00:51:11,760

quantum indeterminacy to to be uh you

1398

00:51:14,309 --> 00:51:12,240

know

1399

00:51:15,829 --> 00:51:14,319

this is stupid it's just really bad

1400

00:51:17,910 --> 00:51:15,839

arguments

1401

00:51:19,270 --> 00:51:17,920

um but if we did have some kind of

1402

00:51:22,630 --> 00:51:19,280

emergence you might have

1403

00:51:25,990 --> 00:51:22,640

you might have free will right but i

1404

00:51:29,030 --> 00:51:26,000

again i i can't make up my mind

1405

00:51:31,109 --> 00:51:29,040

okay yeah where i was gonna go is

1406

00:51:32,390 --> 00:51:31,119

there's no evidence for strong emergence

1407

00:51:33,349 --> 00:51:32,400

but there's plenty of evidence for

1408

00:51:36,870 --> 00:51:33,359

reductionism

1409

00:51:37,349 --> 00:51:36,880

like there's no link in the chain that's

1410

00:51:39,270 --> 00:51:37,359

broken

1411

00:51:40,390 --> 00:51:39,280

in the reductionist account as far as we

1412

00:51:42,549 --> 00:51:40,400

could tell

1413

00:51:43,829 --> 00:51:42,559

so then to believe that we have free

1414

00:51:45,430 --> 00:51:43,839

will i don't

1415

00:51:47,670 --> 00:51:45,440

i'm not suggesting that i don't believe

1416

00:51:49,349 --> 00:51:47,680

i'm just throwing something out so to

1417

00:51:51,109 --> 00:51:49,359

believe that we have free will

1418

00:51:52,710 --> 00:51:51,119

seems to be counter to evidence so how

1419

00:51:54,470 --> 00:51:52,720

do you jive

1420

00:51:56,309 --> 00:51:54,480

with saying that i'm a person who goes

1421

00:51:57,750 --> 00:51:56,319

wherever the evidence leads me

1422

00:51:59,270 --> 00:51:57,760

but simultaneously saying that i'm

1423

00:52:00,950 --> 00:51:59,280

someone who believes in free will and

1424

00:52:01,510 --> 00:52:00,960

when i say go wherever the evidence

1425

00:52:03,990 --> 00:52:01,520

believes

1426
00:52:05,670 --> 00:52:04,000
sorry that i'm a person i'm a person who

1427
00:52:07,349 --> 00:52:05,680
goes wherever the evidence leads

1428
00:52:08,630 --> 00:52:07,359
i mean evidence in terms of scientific

1429
00:52:09,910 --> 00:52:08,640
evidence because obviously you can be a

1430
00:52:11,109 --> 00:52:09,920
spiritualist and say well i have the

1431
00:52:14,549 --> 00:52:11,119
intuitions

1432
00:52:18,069 --> 00:52:14,559
curious so what do you say to that

1433
00:52:21,190 --> 00:52:18,079
um well i'm i i i do

1434
00:52:23,190 --> 00:52:21,200
uh um i do count myself as somebody

1435
00:52:24,710 --> 00:52:23,200
who's led by the evidence

1436
00:52:26,710 --> 00:52:24,720
scientific on the other hand on the

1437
00:52:27,349 --> 00:52:26,720
other hand i'm not i don't agree with

1438
00:52:32,470 --> 00:52:27,359

you about

1439

00:52:35,430 --> 00:52:32,480

um we it's uh there's no gaps in the

1440

00:52:36,150 --> 00:52:35,440

going from us to elementary particles i

1441

00:52:39,349 --> 00:52:36,160

mean

1442

00:52:42,710 --> 00:52:39,359

try to imagine

1443

00:52:44,630 --> 00:52:42,720

um accounting for donald trump's

1444

00:52:46,549 --> 00:52:44,640

election

1445

00:52:48,710 --> 00:52:46,559

in terms of writing down the schrodinger

1446

00:52:50,069 --> 00:52:48,720

equation for the population of the world

1447

00:52:51,910 --> 00:52:50,079

what i meant and then solving it and

1448

00:52:54,470 --> 00:52:51,920

getting out

1449

00:52:56,390 --> 00:52:54,480

donald trump what i meant was that so

1450

00:52:58,069 --> 00:52:56,400

far there's no link that's been shown

1451
00:53:01,270 --> 00:52:58,079
to be false that doesn't mean that there

1452
00:53:03,030 --> 00:53:01,280
is no no i i i i completely agree with

1453
00:53:04,150 --> 00:53:03,040
you so there's no evidence for anyway

1454
00:53:05,829 --> 00:53:04,160
and there's plenty of women it's very

1455
00:53:06,790 --> 00:53:05,839
reliable that would be like religious

1456
00:53:09,430 --> 00:53:06,800
people who argue

1457
00:53:10,630 --> 00:53:09,440
for the god of the gaps god fills in the

1458
00:53:12,309 --> 00:53:10,640
gaps in

1459
00:53:14,390 --> 00:53:12,319
our scientific knowledge yeah it's a

1460
00:53:15,750 --> 00:53:14,400
foolish way of doing it let's talk about

1461
00:53:18,069 --> 00:53:15,760
platonism do you mind defining for the

1462
00:53:21,349 --> 00:53:18,079
audience what platonism is

1463
00:53:24,470 --> 00:53:21,359

sure um

1464

00:53:26,870 --> 00:53:24,480

modern platonism as opposed to being a

1465

00:53:30,230 --> 00:53:26,880

strict follower of plato

1466

00:53:34,230 --> 00:53:30,240

modern platonism is simply the view that

1467

00:53:37,270 --> 00:53:34,240

uh there are abstract entities

1468

00:53:39,829 --> 00:53:37,280

numbers being the most obvious um

1469

00:53:41,109 --> 00:53:39,839

example of this they have exist in some

1470

00:53:44,309 --> 00:53:41,119

way shape or form

1471

00:53:47,270 --> 00:53:44,319

yep they're real they exist um

1472

00:53:49,030 --> 00:53:47,280

and there are facts about them like two

1473

00:53:51,109 --> 00:53:49,040

plus two equals four

1474

00:53:52,230 --> 00:53:51,119

there are infinitely many prime numbers

1475

00:53:56,710 --> 00:53:52,240

and so on

1476

00:53:59,109 --> 00:53:56,720

and these uh objects

1477

00:54:00,150 --> 00:53:59,119

and these facts are completely

1478

00:54:03,829 --> 00:54:00,160

independent

1479

00:54:06,549 --> 00:54:03,839

from uh intelligent creatures so

1480

00:54:07,829 --> 00:54:06,559

even if no intelligent life existed

1481

00:54:09,430 --> 00:54:07,839

anywhere in the universe

1482

00:54:12,230 --> 00:54:09,440

it would still be true that there are

1483

00:54:14,870 --> 00:54:12,240

infinitely many prime numbers

1484

00:54:16,950 --> 00:54:14,880

if you believe that you're a platonist

1485

00:54:18,470 --> 00:54:16,960

in fact there's a little litmus test for

1486

00:54:20,069 --> 00:54:18,480

audience members who've never thought

1487

00:54:23,430 --> 00:54:20,079

about it before

1488

00:54:24,549 --> 00:54:23,440

ask yourself do you think mathematicians

1489

00:54:27,990 --> 00:54:24,559

discover

1490

00:54:31,190 --> 00:54:28,000

new truths of mathematics or do they

1491

00:54:34,230 --> 00:54:31,200

somehow invent or create them

1492

00:54:36,309 --> 00:54:34,240

shakespeare created hamlet

1493

00:54:37,430 --> 00:54:36,319

if shakespeare or no intelligent being

1494

00:54:41,109 --> 00:54:37,440

had ever existed

1495

00:54:44,309 --> 00:54:41,119

hamlet would not exist on the other hand

1496

00:54:45,510 --> 00:54:44,319

the spherical shape of the earth would

1497

00:54:47,670 --> 00:54:45,520

still be a fact

1498

00:54:48,789 --> 00:54:47,680

even if no intelligent being had ever

1499

00:54:51,510 --> 00:54:48,799

existed

1500

00:54:52,150 --> 00:54:51,520

i say math is more like the shape of the

1501

00:54:55,910 --> 00:54:52,160

earth

1502

00:54:58,470 --> 00:54:55,920

and less like hamlet that's what it is

1503

00:54:59,910 --> 00:54:58,480

a mathematical realist or a platonist

1504

00:55:01,109 --> 00:54:59,920

when you say

1505

00:55:02,390 --> 00:55:01,119

something that just popped into my head

1506

00:55:03,910 --> 00:55:02,400

was the infinite monkeys on the

1507

00:55:05,750 --> 00:55:03,920

typewriter and then you can

1508

00:55:07,910 --> 00:55:05,760

make it an algae between shakespeare and

1509

00:55:10,069 --> 00:55:07,920

information so just say the works of

1510

00:55:11,270 --> 00:55:10,079

shakespeare is just one extremely large

1511

00:55:14,470 --> 00:55:11,280

number given that you can

1512

00:55:15,430 --> 00:55:14,480

translate it to bits isomorphically okay

1513

00:55:18,150 --> 00:55:15,440

and that number

1514

00:55:19,430 --> 00:55:18,160

exists so then did shakespeare actually

1515

00:55:22,710 --> 00:55:19,440

invent

1516

00:55:24,710 --> 00:55:22,720

hamlet or did he discover it no no no

1517

00:55:26,710 --> 00:55:24,720

arithmetic is rich enough that it can

1518

00:55:28,950 --> 00:55:26,720

encode hamlet

1519

00:55:31,430 --> 00:55:28,960

that's all so so technically did he

1520

00:55:33,910 --> 00:55:31,440

discover it or did he create it

1521

00:55:35,349 --> 00:55:33,920

uh hamlet amlett was created by

1522

00:55:37,190 --> 00:55:35,359

shakespeare not discovered by

1523

00:55:40,230 --> 00:55:37,200

shakespeare

1524

00:55:41,670 --> 00:55:40,240

okay but when the mathematician

1525

00:55:44,150 --> 00:55:41,680

discovers uh

1526
00:55:45,910 --> 00:55:44,160
or produces when euclid produced the

1527
00:55:47,349 --> 00:55:45,920
theorem that there are infinitely many

1528
00:55:50,230 --> 00:55:47,359
prime numbers

1529
00:55:51,349 --> 00:55:50,240
euclid discovered something he

1530
00:55:54,309 --> 00:55:51,359
discovered something that

1531
00:55:56,390 --> 00:55:54,319
exists that is true independent from him

1532
00:55:58,710 --> 00:55:56,400
he didn't make it up

1533
00:55:59,670 --> 00:55:58,720
i see it's not a cultural item of any

1534
00:56:02,870 --> 00:55:59,680
sort it's

1535
00:56:03,910 --> 00:56:02,880
it's as it's just a group way the world

1536
00:56:06,630 --> 00:56:03,920
is

1537
00:56:08,870 --> 00:56:06,640
i see i see i see but it's the abstract

1538
00:56:11,589 --> 00:56:08,880

world it's not a physical object

1539

00:56:13,990 --> 00:56:11,599

it's an abstract entity yeah now what

1540

00:56:16,069 --> 00:56:14,000

creates this platonic world

1541

00:56:17,670 --> 00:56:16,079

it's always been there nothing created

1542

00:56:19,349 --> 00:56:17,680

it yeah so how do we talk about the

1543

00:56:21,109 --> 00:56:19,359

platonic world without sounding mystical

1544

00:56:23,589 --> 00:56:21,119

without sounding theological it's like

1545

00:56:27,030 --> 00:56:23,599

it's always there it's not it's it's

1546

00:56:30,630 --> 00:56:27,040

ever-present it is timeless

1547

00:56:32,950 --> 00:56:30,640

it's an uncaused cause yeah

1548

00:56:34,630 --> 00:56:32,960

well you can imagine you can imagine the

1549

00:56:36,870 --> 00:56:34,640

the universe the physical universe

1550

00:56:38,069 --> 00:56:36,880

always existing right

1551

00:56:40,069 --> 00:56:38,079

in fact there's a good there's good

1552

00:56:42,630 --> 00:56:40,079

reason to believe that it always has

1553

00:56:44,309 --> 00:56:42,640

i know we're we we're we talk about big

1554

00:56:47,670 --> 00:56:44,319

bang cosmology and we're

1555

00:56:51,750 --> 00:56:47,680

what 13.8 billion years old

1556

00:56:53,829 --> 00:56:51,760

but if but the inflationary scenario

1557

00:56:54,789 --> 00:56:53,839

we're probably just one of you know the

1558

00:56:56,069 --> 00:56:54,799

multiverse

1559

00:56:59,589 --> 00:56:56,079

and these things have been going on

1560

00:57:00,870 --> 00:56:59,599

forever so our mini our universe is just

1561

00:57:03,589 --> 00:57:00,880

one of a

1562

00:57:05,990 --> 00:57:03,599

infinite number of pocket universes

1563

00:57:09,109 --> 00:57:06,000

pocket universes have always existed

1564

00:57:12,150 --> 00:57:09,119

and they generate more um through

1565

00:57:14,470 --> 00:57:12,160

this process called eternal inflation

1566

00:57:15,670 --> 00:57:14,480

or just go back to pre-big bang

1567

00:57:17,990 --> 00:57:15,680

cosmology

1568

00:57:19,750 --> 00:57:18,000

where we used to believe standard

1569

00:57:21,030 --> 00:57:19,760

physics believed that the universe was

1570

00:57:21,829 --> 00:57:21,040

infinitely old it didn't have a

1571

00:57:23,990 --> 00:57:21,839

beginning

1572

00:57:25,750 --> 00:57:24,000

and it won't have an end it just is

1573

00:57:27,829 --> 00:57:25,760

eternal

1574

00:57:29,109 --> 00:57:27,839

not created by god this is atheists

1575

00:57:32,150 --> 00:57:29,119

we're happy to believe this

1576

00:57:33,430 --> 00:57:32,160

it's just this is the way things are so

1577

00:57:37,190 --> 00:57:33,440

the platonic world

1578

00:57:40,230 --> 00:57:37,200

was always there or even to say the word

1579

00:57:41,109 --> 00:57:40,240

always implies formulating it in terms

1580

00:57:43,750 --> 00:57:41,119

of time

1581

00:57:45,430 --> 00:57:43,760

and it's timeless this is a there's an

1582

00:57:46,549 --> 00:57:45,440

old philosophical distinction we hardly

1583

00:57:49,829 --> 00:57:46,559

use anymore

1584

00:57:53,349 --> 00:57:49,839

between eternal and semp eternal

1585

00:57:57,829 --> 00:57:53,359

uh eternal eternal semp eternal so e

1586

00:58:06,230 --> 00:58:01,109

eternal means outside of time

1587

00:58:09,589 --> 00:58:09,190

if if uh if numbers were somehow or

1588

00:58:12,309 --> 00:58:09,599

other

1589

00:58:14,549 --> 00:58:12,319

which a small number of people believe a

1590

00:58:17,829 --> 00:58:14,559

kind of

1591

00:58:19,430 --> 00:58:17,839

part of the physical realm but a kind

1592

00:58:21,190 --> 00:58:19,440

but somehow attached to the physical

1593

00:58:22,150 --> 00:58:21,200

realm so if the physical realm didn't

1594

00:58:29,190 --> 00:58:22,160

exist

1595

00:58:31,109 --> 00:58:29,200

simp eternal version

1596

00:58:33,030 --> 00:58:31,119

so in in casual talk we say yeah it's

1597

00:58:35,829 --> 00:58:33,040

eternal it's always the case

1598

00:58:37,430 --> 00:58:35,839

but this distinction like god standard

1599

00:58:41,910 --> 00:58:37,440

view of god

1600

00:58:45,829 --> 00:58:41,920

god is eternal outside of creation

1601
00:58:48,630 --> 00:58:45,839
right uh whereas whatever god created

1602
00:58:50,069 --> 00:58:48,640
is and if god created anything that

1603
00:58:52,950 --> 00:58:50,079
lasted forever

1604
00:58:54,789 --> 00:58:52,960
in creation that would be semp eternal i

1605
00:58:55,270 --> 00:58:54,799
see i see wittgenstein had a quote about

1606
00:58:57,750 --> 00:58:55,280
this

1607
00:58:59,190 --> 00:58:57,760
he said if eternal means infinite

1608
00:59:02,470 --> 00:58:59,200
temporal length

1609
00:59:03,990 --> 00:59:02,480
then that that would be right

1610
00:59:05,910 --> 00:59:04,000
if it didn't mean that but instead meant

1611
00:59:08,870 --> 00:59:05,920
outside of time then anyone who lives in

1612
00:59:11,910 --> 00:59:08,880
the present moment is living eternally

1613
00:59:13,030 --> 00:59:11,920

yeah well that's beautiful also a bit

1614

00:59:14,630 --> 00:59:13,040

mystical

1615

00:59:15,910 --> 00:59:14,640

a few weeks ago i emailed or maybe a

1616

00:59:17,349 --> 00:59:15,920

couple months ago i emailed you about

1617

00:59:19,589 --> 00:59:17,359

thought experiments

1618

00:59:20,630 --> 00:59:19,599

are i don't recall how the conversation

1619

00:59:22,150 --> 00:59:20,640

started but you sent me a book on

1620

00:59:23,990 --> 00:59:22,160

thought experiments you didn't know that

1621

00:59:26,630 --> 00:59:24,000

i was thinking of writing a book i

1622

00:59:28,710 --> 00:59:26,640

actually started but your book was

1623

00:59:30,630 --> 00:59:28,720

far more articulate than mine about

1624

00:59:32,950 --> 00:59:30,640

thought experiments just

1625

00:59:33,670 --> 00:59:32,960

i recommend people who watch facebook to

1626

00:59:35,030 --> 00:59:33,680

read it's like

1627

00:59:37,190 --> 00:59:35,040

it's like spit back second book on

1628

00:59:40,950 --> 00:59:37,200

manifolds it's a short read

1629

00:59:44,069 --> 00:59:43,030

something i've been trying to develop is

1630

00:59:46,710 --> 00:59:44,079

is there a way

1631

00:59:48,870 --> 00:59:46,720

of formulating the laws of physics from

1632

00:59:50,150 --> 00:59:48,880

pure thought experiments

1633

00:59:51,589 --> 00:59:50,160

what drove me to think that was the

1634

00:59:53,430 --> 00:59:51,599

galileo experiment the thought

1635

00:59:55,190 --> 00:59:53,440

experiment with galileo

1636

00:59:56,950 --> 00:59:55,200

and you had already thought about this

1637

00:59:58,230 --> 00:59:56,960

as well and in fact you just started

1638

01:00:00,150 --> 00:59:58,240

writing a book about it's not like you

1639

01:00:03,589 --> 01:00:00,160

you solved the problem otherwise

1640

01:00:03,990 --> 01:00:03,599

we we'd invent plenty of new technology

1641

01:00:06,230 --> 01:00:04,000

but

1642

01:00:09,829 --> 01:00:06,240

you've made what i think is progress so

1643

01:00:13,990 --> 01:00:11,430

do you think that ultimately the laws of

1644

01:00:15,589 --> 01:00:14,000

physics can be generated from

1645

01:00:18,069 --> 01:00:15,599

armchair philosophy just sitting back

1646

01:00:20,870 --> 01:00:18,079

and thinking a thought experiment

1647

01:00:21,750 --> 01:00:20,880

uh certainly not all uh in fact not even

1648

01:00:24,470 --> 01:00:21,760

most

1649

01:00:25,589 --> 01:00:24,480

but just every now and then i think we

1650

01:00:27,349 --> 01:00:25,599

we can

1651
01:00:29,349 --> 01:00:27,359
learn something about the world in a

1652
01:00:33,349 --> 01:00:29,359
non-empirical way

1653
01:00:36,470 --> 01:00:33,359
and my favorite example

1654
01:00:39,349 --> 01:00:36,480
is galileo and falling objects

1655
01:00:40,789 --> 01:00:39,359
galileos galileo is a wonderful thought

1656
01:00:44,230 --> 01:00:40,799
experimenter

1657
01:00:46,069 --> 01:00:44,240
maybe the best ever uh he's absolutely

1658
01:00:47,750 --> 01:00:46,079
terrific uh einstein was a very good

1659
01:00:50,390 --> 01:00:47,760
thought experimenter too

1660
01:00:53,270 --> 01:00:50,400
um they're probably in the same league

1661
01:00:56,390 --> 01:00:53,280
but if anything i think galileo is

1662
01:00:58,870 --> 01:00:56,400
a notch above um

1663
01:01:00,390 --> 01:00:58,880

the my favorite thought experiment of

1664

01:01:02,150 --> 01:01:00,400

all time

1665

01:01:03,670 --> 01:01:02,160

and i remember hearing it when i was an

1666

01:01:06,309 --> 01:01:03,680

undergraduate and thought it was the

1667

01:01:10,150 --> 01:01:06,319

most dazzling thing i'd ever heard

1668

01:01:12,470 --> 01:01:10,160

and this is the uh argument for

1669

01:01:13,589 --> 01:01:12,480

all objects regardless of how heavy they

1670

01:01:15,829 --> 01:01:13,599

are fall

1671

01:01:17,589 --> 01:01:15,839

at the same rate so it's a thought

1672

01:01:19,589 --> 01:01:17,599

experiment

1673

01:01:22,069 --> 01:01:19,599

you imagine yourself going up on the

1674

01:01:24,309 --> 01:01:22,079

leaning tower of pisa if you like

1675

01:01:25,510 --> 01:01:24,319

and you're dropping a cannonball which

1676

01:01:27,990 --> 01:01:25,520

is quite heavy

1677

01:01:29,430 --> 01:01:28,000

and a musket ball which is relatively

1678

01:01:32,630 --> 01:01:29,440

quite a bit lighter

1679

01:01:33,030 --> 01:01:32,640

now the the common sense view and the

1680

01:01:36,470 --> 01:01:33,040

view

1681

01:01:37,990 --> 01:01:36,480

in uh in aristotle are the same it says

1682

01:01:40,390 --> 01:01:38,000

that heavy objects will just

1683

01:01:42,309 --> 01:01:40,400

fall faster than light objects and we've

1684

01:01:43,109 --> 01:01:42,319

got a lot of experience to that effect

1685

01:01:45,910 --> 01:01:43,119

you know

1686

01:01:46,870 --> 01:01:45,920

i mean if you do throw a cannonball and

1687

01:01:49,270 --> 01:01:46,880

a feather

1688

01:01:51,349 --> 01:01:49,280

you know you know that the cannonball is

1689

01:01:54,870 --> 01:01:51,359

going to hit the ground a lot sooner

1690

01:01:57,349 --> 01:01:54,880

um so galileo says all right

1691

01:01:58,470 --> 01:01:57,359

if uh heavy objects fall faster than

1692

01:02:00,950 --> 01:01:58,480

light objects

1693

01:02:02,710 --> 01:02:00,960

let's imagine a compound object

1694

01:02:06,950 --> 01:02:02,720

consisting of a cannonball

1695

01:02:10,390 --> 01:02:06,960

and a musket ball glued together okay

1696

01:02:12,710 --> 01:02:10,400

um and drop it now we've got three

1697

01:02:16,390 --> 01:02:12,720

things we've got a a cannonball

1698

01:02:18,549 --> 01:02:16,400

a musket ball and this composite objects

1699

01:02:19,589 --> 01:02:18,559

now on the principle the heavy objects

1700

01:02:21,349 --> 01:02:19,599

fall faster

1701

01:02:23,670 --> 01:02:21,359

this composite object is going to fall

1702

01:02:26,150 --> 01:02:23,680

fastest of all of the three

1703

01:02:28,150 --> 01:02:26,160

but unfortunately it's not it's going to

1704

01:02:30,230 --> 01:02:28,160

be slowed down by the fact that

1705

01:02:31,910 --> 01:02:30,240

the cannonball part of the composite

1706

01:02:33,990 --> 01:02:31,920

algae wants to fall

1707

01:02:36,150 --> 01:02:34,000

at its fast rate but it's going to be

1708

01:02:37,029 --> 01:02:36,160

held back by this little musket ball

1709

01:02:39,270 --> 01:02:37,039

attached to it

1710

01:02:41,430 --> 01:02:39,280

who's wanting to fall at a slower rate

1711

01:02:43,349 --> 01:02:41,440

so it's like jumping out of a window

1712

01:02:45,270 --> 01:02:43,359

with a little tiny parachute it's going

1713

01:02:48,470 --> 01:02:45,280

to slow you down

1714

01:02:50,069 --> 01:02:48,480

um and so that's absurd the composite

1715

01:02:53,029 --> 01:02:50,079

object will be both faster

1716

01:02:54,950 --> 01:02:53,039

and slower than the heavy canon ball by

1717

01:02:56,710 --> 01:02:54,960

itself

1718

01:02:57,990 --> 01:02:56,720

there it's and that was the end of

1719

01:02:59,589 --> 01:02:58,000

common sense

1720

01:03:01,109 --> 01:02:59,599

about falling objects and the end of

1721

01:03:04,710 --> 01:03:01,119

aristotle

1722

01:03:07,750 --> 01:03:04,720

on freefall and but the solution

1723

01:03:09,589 --> 01:03:07,760

how fast do things fall is obvious

1724

01:03:11,670 --> 01:03:09,599

when you've reached this point and

1725

01:03:13,510 --> 01:03:11,680

here's the here's where the

1726

01:03:15,750 --> 01:03:13,520

where a physical intuition actually

1727

01:03:16,789 --> 01:03:15,760

comes in and you don't need to perform

1728

01:03:19,029 --> 01:03:16,799

the experiment

1729

01:03:20,789 --> 01:03:19,039

you just think about it and you realize

1730

01:03:24,150 --> 01:03:20,799

oh they all have to fall

1731

01:03:27,029 --> 01:03:24,160

at the same rate and that'll

1732

01:03:29,349 --> 01:03:27,039

and that's how things fall right at the

1733

01:03:29,670 --> 01:03:29,359

same rate regardless of how heavy they

1734

01:03:31,109 --> 01:03:29,680

are

1735

01:03:32,710 --> 01:03:31,119

to me this is still one of the most

1736

01:03:34,309 --> 01:03:32,720

beautiful thought experiments as well

1737

01:03:35,990 --> 01:03:34,319

and it's what led me on the journey

1738

01:03:37,270 --> 01:03:36,000

of thinking i wonder how much more of

1739

01:03:39,349 --> 01:03:37,280

physics can be gleaned

1740

01:03:41,510 --> 01:03:39,359

by just thinking about what's consistent

1741

01:03:45,510 --> 01:03:41,520

what contradicts

1742

01:03:48,230 --> 01:03:45,520

oh a ton of things um galileo's other

1743

01:03:49,829 --> 01:03:48,240

i think his other very very famous

1744

01:03:52,870 --> 01:03:49,839

thought experiment is the uh

1745

01:03:55,829 --> 01:03:52,880

inside the ship um where

1746

01:03:56,870 --> 01:03:55,839

he can't tell by hypothesis he can't

1747

01:04:01,029 --> 01:03:56,880

tell whether the ship

1748

01:04:04,069 --> 01:04:01,039

is stationary in the port or moving

1749

01:04:05,510 --> 01:04:04,079

across a very smooth ocean and he says

1750

01:04:08,789 --> 01:04:05,520

okay i'm inside

1751

01:04:11,190 --> 01:04:08,799

and birds are flying around inside

1752

01:04:12,150 --> 01:04:11,200

front to back and it's the same whether

1753

01:04:15,589 --> 01:04:12,160

i'm sailing or

1754

01:04:17,670 --> 01:04:15,599

at port i throw up a ball to my friend

1755

01:04:19,910 --> 01:04:17,680

back and forth same whether we're moving

1756

01:04:22,630 --> 01:04:19,920

or import fish are in a

1757

01:04:22,950 --> 01:04:22,640

in an aquarium tank inside the ship and

1758

01:04:25,029 --> 01:04:22,960

there

1759

01:04:25,990 --> 01:04:25,039

they swim back and forth in the tank and

1760

01:04:27,589 --> 01:04:26,000

it doesn't matter whether

1761

01:04:30,309 --> 01:04:27,599

we're stationary and moving everything

1762

01:04:33,430 --> 01:04:30,319

is the same on the inside

1763

01:04:35,029 --> 01:04:33,440

and that's his argument for um

1764

01:04:36,630 --> 01:04:35,039

what has become the principle of

1765

01:04:39,349 --> 01:04:36,640

relativity that

1766

01:04:40,870 --> 01:04:39,359

inertial frames the laws of nature are

1767

01:04:43,029 --> 01:04:40,880

exactly the same

1768

01:04:44,470 --> 01:04:43,039

in any inertial frame whether it's a

1769

01:04:47,270 --> 01:04:44,480

stationary one

1770

01:04:47,589 --> 01:04:47,280

at rest in port or moving smoothly over

1771

01:04:51,270 --> 01:04:47,599

the

1772

01:04:52,710 --> 01:04:51,280

impetus for him

1773

01:04:54,390 --> 01:04:52,720

thinking of this thought experiment was

1774

01:04:55,029 --> 01:04:54,400

it because he was suggesting the earth

1775

01:04:56,630 --> 01:04:55,039

is moving

1776

01:04:58,069 --> 01:04:56,640

and people were wondering well shouldn't

1777

01:04:59,270 --> 01:04:58,079

we be moving if the earth is moving or

1778

01:05:00,870 --> 01:04:59,280

was it something else

1779

01:05:02,390 --> 01:05:00,880

that's exactly right there was another

1780

01:05:04,870 --> 01:05:02,400

thought experiment prior

1781

01:05:06,309 --> 01:05:04,880

not galileo's but prior to galileo this

1782

01:05:08,789 --> 01:05:06,319

is a medieval thought experiment

1783

01:05:12,150 --> 01:05:08,799

sometimes called the tower

1784

01:05:13,990 --> 01:05:12,160

experiment and and that is if the earth

1785

01:05:17,750 --> 01:05:14,000

is moving either around the sun or

1786

01:05:20,390 --> 01:05:17,760

spinning on its own axis either way um

1787

01:05:21,510 --> 01:05:20,400

and you dropped an object from a from a

1788

01:05:24,390 --> 01:05:21,520

tower

1789

01:05:27,270 --> 01:05:24,400

then as the earth moved the object would

1790

01:05:29,029 --> 01:05:27,280

fall way behind the base of the tower

1791

01:05:31,109 --> 01:05:29,039

right never does that it always falls

1792

01:05:32,630 --> 01:05:31,119

right down at the base

1793

01:05:34,069 --> 01:05:32,640

right and you can use a similar ship

1794

01:05:36,630 --> 01:05:34,079

argument where if you're on a ship and

1795

01:05:38,390 --> 01:05:36,640

the ship is sailing and you drop a ball

1796

01:05:39,670 --> 01:05:38,400

it'll fall behind the ship or where the

1797

01:05:40,309 --> 01:05:39,680

tail end of the ship was that's right

1798

01:05:42,789 --> 01:05:40,319

the tower

1799

01:05:43,750 --> 01:05:42,799

that's what the the the equivalent tower

1800

01:05:45,510 --> 01:05:43,760

argument would use

1801
01:05:47,430 --> 01:05:45,520
but galileo says no no it's not going to

1802
01:05:50,150 --> 01:05:47,440
be like that at all if you're

1803
01:05:51,109 --> 01:05:50,160
uh if you're just inside the ship you

1804
01:05:54,069 --> 01:05:51,119
can't see out

1805
01:05:56,309 --> 01:05:54,079
you drop a ball it'll land at your feet

1806
01:05:58,950 --> 01:05:56,319
uh and if you're moving over the sea at

1807
01:06:00,789 --> 01:05:58,960
20 knots uh and you drop a ball it's

1808
01:06:04,069 --> 01:06:00,799
still going to land at your feet

1809
01:06:05,990 --> 01:06:04,079
either way right right and and

1810
01:06:07,430 --> 01:06:06,000
and that's that and then more general of

1811
01:06:08,870 --> 01:06:07,440
course you just make the claim

1812
01:06:10,710 --> 01:06:08,880
the laws of nature are going to be the

1813
01:06:13,190 --> 01:06:10,720

same in any inertial

1814

01:06:15,190 --> 01:06:13,200
frame of reference and that's the

1815

01:06:15,829 --> 01:06:15,200
principle of relativity that's galileo's

1816

01:06:21,829 --> 01:06:15,839
version

1817

01:06:23,109 --> 01:06:21,839
when einstein gave us a special

1818

01:06:24,789 --> 01:06:23,119
relativity

1819

01:06:27,109 --> 01:06:24,799
he hung on to the principle of

1820

01:06:30,710 --> 01:06:27,119
relativity because it was in danger

1821

01:06:32,630 --> 01:06:30,720
it was in danger from

1822

01:06:35,270 --> 01:06:32,640
maxwell's electrodynamics which seemed

1823

01:06:36,870 --> 01:06:35,280
to need a universal ether as if there

1824

01:06:40,150 --> 01:06:36,880
was a single frame

1825

01:06:44,150 --> 01:06:40,160
in which physics was correctly described

1826

01:06:46,069 --> 01:06:44,160

and um and and moving a moving anything

1827

01:06:49,990 --> 01:06:46,079

that was moving in the ether frame

1828

01:06:53,029 --> 01:06:50,000

you wouldn't get the right um

1829

01:06:54,470 --> 01:06:53,039

results that is that you'd have to take

1830

01:06:57,990 --> 01:06:54,480

that into account

1831

01:07:00,630 --> 01:06:58,000

the laws of nature now let's get to

1832

01:07:01,270 --> 01:07:00,640

with the absolute space and the bucket

1833

01:07:02,230 --> 01:07:01,280

so newton

1834

01:07:04,470 --> 01:07:02,240

had a thought experiment that

1835

01:07:06,950 --> 01:07:04,480

demonstrated absolute space

1836

01:07:08,870 --> 01:07:06,960

okay so this is a another extremely

1837

01:07:12,549 --> 01:07:08,880

famous thought experiment

1838

01:07:14,390 --> 01:07:12,559

and for this i can show a diagram

1839

01:07:15,829 --> 01:07:14,400

from the book or from any other place i

1840

01:07:16,950 --> 01:07:15,839

don't want to take from the copyright

1841

01:07:19,750 --> 01:07:16,960

holder

1842

01:07:21,510 --> 01:07:19,760

no no have you got it there no i mean

1843

01:07:23,109 --> 01:07:21,520

i'll show it when where when i'm editing

1844

01:07:25,829 --> 01:07:23,119

oh yeah yeah yeah you can show

1845

01:07:27,349 --> 01:07:25,839

it from my book don't worry sure yeah i

1846

01:07:30,710 --> 01:07:27,359

you i grant you permission

1847

01:07:34,069 --> 01:07:33,670

now um so newton gave two versions of

1848

01:07:37,430 --> 01:07:34,079

this

1849

01:07:39,190 --> 01:07:37,440

one was the bucket okay and and so

1850

01:07:40,870 --> 01:07:39,200

uh the way the way you should think of

1851

01:07:44,710 --> 01:07:40,880

it is you've got a bucket

1852

01:07:48,309 --> 01:07:44,720

um and you can you can twist the rope

1853

01:07:51,349 --> 01:07:48,319

okay and the and here's the bucket and

1854

01:07:53,190 --> 01:07:51,359

the water is very smooth on top

1855

01:07:55,510 --> 01:07:53,200

and you let the bucket go because it's

1856

01:07:57,270 --> 01:07:55,520

the only thing in the universe for this

1857

01:07:58,549 --> 01:07:57,280

for the well for the bucket there's all

1858

01:07:59,190 --> 01:07:58,559

there's there's newton and there's

1859

01:08:01,109 --> 01:07:59,200

everything

1860

01:08:02,549 --> 01:08:01,119

around okay never mind let me do the

1861

01:08:03,910 --> 01:08:02,559

bucket and then i'll switch to the other

1862

01:08:07,510 --> 01:08:03,920

one

1863

01:08:09,750 --> 01:08:07,520

which is the empty universe okay so um

1864

01:08:13,029 --> 01:08:09,760

at first the water is flat and the

1865

01:08:17,269 --> 01:08:13,039

bucket starts to rotate

1866

01:08:19,349 --> 01:08:17,279

and gradually so so and so initially

1867

01:08:21,189 --> 01:08:19,359

before anything happens the water and

1868

01:08:24,470 --> 01:08:21,199

the bucket are at rest with

1869

01:08:27,110 --> 01:08:24,480

respect to one another

1870

01:08:28,309 --> 01:08:27,120

then they start to rotate and they're

1871

01:08:30,229 --> 01:08:28,319

rotating together

1872

01:08:33,269 --> 01:08:30,239

both the bucket and the water and the

1873

01:08:35,349 --> 01:08:33,279

water starts climbing the walls

1874

01:08:36,870 --> 01:08:35,359

and then you stop the bucket and the

1875

01:08:39,590 --> 01:08:36,880

water's still climbing

1876

01:08:40,550 --> 01:08:39,600

and then it gradually subsides the flat

1877

01:08:44,470 --> 01:08:40,560

again

1878

01:08:47,510 --> 01:08:44,480

now the question is how do we how do we

1879

01:08:49,510 --> 01:08:47,520

explain the difference between

1880

01:08:51,990 --> 01:08:49,520

the water and bucket being at rest

1881

01:08:54,870 --> 01:08:52,000

initially and the water's flat

1882

01:08:56,709 --> 01:08:54,880

and later on the water and bucket are at

1883

01:08:59,910 --> 01:08:56,719

rest with respect to one another

1884

01:09:02,229 --> 01:08:59,920

but but the water is concave okay the

1885

01:09:04,229 --> 01:09:02,239

water is climbing up the walls

1886

01:09:06,550 --> 01:09:04,239

how do you explain the difference and

1887

01:09:08,390 --> 01:09:06,560

newton says okay um

1888

01:09:09,910 --> 01:09:08,400

you know what's going to happen here's

1889

01:09:11,829 --> 01:09:09,920

the explanation

1890

01:09:13,749 --> 01:09:11,839

in the first case the water bucket

1891

01:09:17,749 --> 01:09:13,759

system is not

1892

01:09:19,990 --> 01:09:17,759

rotating with respect to space

1893

01:09:21,110 --> 01:09:20,000

and later when the wall water's climbing

1894

01:09:23,430 --> 01:09:21,120

the walls

1895

01:09:26,070 --> 01:09:23,440

the whole system is rotating with

1896

01:09:28,550 --> 01:09:26,080

respect to space itself

1897

01:09:30,630 --> 01:09:28,560

and then conclusion therefore space

1898

01:09:34,229 --> 01:09:30,640

exists

1899

01:09:37,030 --> 01:09:34,239

it's not just you know something that uh

1900

01:09:38,309 --> 01:09:37,040

you know we're we use as a convenience

1901

01:09:41,269 --> 01:09:38,319

or something like that

1902

01:09:42,470 --> 01:09:41,279

actually let me go back and make sure

1903

01:09:44,709 --> 01:09:42,480

and and people can

1904

01:09:45,990 --> 01:09:44,719

figure out what their instinctive view

1905

01:09:49,910 --> 01:09:46,000

is

1906

01:09:52,390 --> 01:09:49,920

a newtonian on the one hand

1907

01:09:53,349 --> 01:09:52,400

and a leibnizian relationalist on the

1908

01:09:56,630 --> 01:09:53,359

other hand

1909

01:09:59,030 --> 01:09:56,640

okay question

1910

01:09:59,910 --> 01:09:59,040

if there was nothing in the whole

1911

01:10:02,470 --> 01:09:59,920

universe no

1912

01:10:03,270 --> 01:10:02,480

object existed anywhere in the universe

1913

01:10:06,709 --> 01:10:03,280

would space

1914

01:10:08,950 --> 01:10:06,719

still exist could space still exist

1915

01:10:09,750 --> 01:10:08,960

and i find that when i ask my students

1916

01:10:12,870 --> 01:10:09,760

that question

1917

01:10:15,350 --> 01:10:12,880

about half of them say yeah empty space

1918

01:10:16,310 --> 01:10:15,360

no problem this could be empty space and

1919

01:10:18,470 --> 01:10:16,320

the other half said

1920

01:10:20,149 --> 01:10:18,480

that's ridiculous there couldn't be such

1921

01:10:21,910 --> 01:10:20,159

a thing as empty space

1922

01:10:23,669 --> 01:10:21,920

if there's no objects there's just no

1923

01:10:25,669 --> 01:10:23,679

space period

1924

01:10:27,910 --> 01:10:25,679

this sounds like the tree falling in the

1925

01:10:29,750 --> 01:10:27,920

woods

1926

01:10:31,350 --> 01:10:29,760

the space-time version connection to

1927

01:10:33,189 --> 01:10:31,360

that you're right

1928

01:10:34,790 --> 01:10:33,199

and there's some there's a counterpart

1929

01:10:38,070 --> 01:10:34,800

to that for time

1930

01:10:39,830 --> 01:10:38,080

if i say to my class okay imagine

1931

01:10:43,110 --> 01:10:39,840

that nothing ever happened everything

1932

01:10:46,470 --> 01:10:43,120

was just frozen solid

1933

01:10:47,990 --> 01:10:46,480

could time still pass after class will

1934

01:10:50,790 --> 01:10:48,000

say no

1935

01:10:51,110 --> 01:10:50,800

no events no time the other half will

1936

01:10:54,070 --> 01:10:51,120

say

1937

01:10:55,669 --> 01:10:54,080

yeah time's still passing but nothing's

1938

01:10:57,750 --> 01:10:55,679

happening

1939

01:10:59,430 --> 01:10:57,760

very different instincts people have

1940

01:11:00,470 --> 01:10:59,440

about this and that one's also about 50

1941

01:11:05,590 --> 01:11:00,480

50.

1942

01:11:07,430 --> 01:11:05,600

oh yeah yeah yeah yeah they're highly

1943

01:11:10,229 --> 01:11:07,440

correlated okay

1944

01:11:11,030 --> 01:11:10,239

yeah so if you think empty space makes

1945

01:11:12,870 --> 01:11:11,040

sense

1946

01:11:14,950 --> 01:11:12,880

and you think time without events makes

1947

01:11:17,590 --> 01:11:14,960

sense you're a newtonian

1948

01:11:18,870 --> 01:11:17,600

you're with newton and if you think that

1949

01:11:22,470 --> 01:11:18,880

um

1950

01:11:24,830 --> 01:11:22,480

no objects no space or no events no time

1951

01:11:26,070 --> 01:11:24,840

you're an instinctive leibnizian a

1952

01:11:29,510 --> 01:11:26,080

relationalist

1953

01:11:31,590 --> 01:11:29,520

and what about you uh my instincts are

1954

01:11:33,030 --> 01:11:31,600

mostly with newton

1955

01:11:34,630 --> 01:11:33,040

it's also another thing that's

1956

01:11:37,270 --> 01:11:34,640

interesting about this is that

1957

01:11:40,229 --> 01:11:37,280

um my class will be typically half

1958

01:11:43,030 --> 01:11:40,239

physics staff philosophy students

1959

01:11:43,990 --> 01:11:43,040

it doesn't break along that line at all

1960

01:11:46,229 --> 01:11:44,000

oh interesting

1961

01:11:47,750 --> 01:11:46,239

half the physicists are newtonians in

1962

01:11:48,630 --> 01:11:47,760

instinct and half of them are live

1963

01:11:50,149 --> 01:11:48,640

nations

1964

01:11:51,990 --> 01:11:50,159

and the philosophy students exactly the

1965

01:11:53,350 --> 01:11:52,000

same half of them are newtonians half of

1966

01:11:55,030 --> 01:11:53,360

them are labnets again

1967

01:11:56,709 --> 01:11:55,040

have you done this with mathematicians

1968

01:11:59,110 --> 01:11:56,719

i'm curious

1969

01:12:00,390 --> 01:11:59,120

what they're have happened

1970

01:12:03,110 --> 01:12:00,400

mathematicians i do it with

1971

01:12:06,310 --> 01:12:03,120

mathematicians for other things

1972

01:12:07,189 --> 01:12:06,320

and often that are philosophically

1973

01:12:10,470 --> 01:12:07,199

interesting

1974

01:12:12,630 --> 01:12:10,480

and i am often surprised at

1975

01:12:14,550 --> 01:12:12,640

the split in the mathematical audience

1976

01:12:15,750 --> 01:12:14,560

exactly corresponds to the split in the

1977

01:12:17,350 --> 01:12:15,760

philosophy audience

1978

01:12:18,870 --> 01:12:17,360

that is you can't tell from someone's

1979

01:12:20,709 --> 01:12:18,880

answer whether they're a mathematician

1980

01:12:22,310 --> 01:12:20,719

or a philosopher

1981

01:12:23,990 --> 01:12:22,320

by the way do you consider are you a

1982

01:12:25,669 --> 01:12:24,000

professor of philosophy of math or

1983

01:12:28,630 --> 01:12:25,679

philosophy of physics or both

1984

01:12:29,270 --> 01:12:28,640

no just philosophy but my specialty

1985

01:12:31,669 --> 01:12:29,280

inside

1986

01:12:32,790 --> 01:12:31,679

is things like math and physics i see

1987

01:12:34,870 --> 01:12:32,800

some i mean some

1988

01:12:36,470 --> 01:12:34,880

philosophers are you know they

1989

01:12:37,030 --> 01:12:36,480

specialize in the history of philosophy

1990

01:12:40,709 --> 01:12:37,040

or in

1991

01:12:43,830 --> 01:12:40,719

ethics and so on uh math and physics are

1992

01:12:45,750 --> 01:12:43,840

my specialties inside as an aside

1993

01:12:47,350 --> 01:12:45,760

another aside why did you end up

1994

01:12:49,270 --> 01:12:47,360

choosing to go into the philosophy of

1995

01:12:50,870 --> 01:12:49,280

math instead of math is it just purely

1996

01:12:54,310 --> 01:12:50,880

based on what interested you

1997

01:12:57,669 --> 01:12:57,110

that's a really interesting question i

1998

01:13:00,950 --> 01:12:57,679

think

1999

01:13:01,669 --> 01:13:00,960

it was pretty much that right at the

2000

01:13:05,030 --> 01:13:01,679

beginning

2001

01:13:06,390 --> 01:13:05,040

and you so then you have to pick majors

2002

01:13:09,510 --> 01:13:06,400

and stuff like that

2003

01:13:13,030 --> 01:13:09,520

i thought i can do

2004

01:13:15,030 --> 01:13:13,040

anything in the world as a philosopher

2005

01:13:18,470 --> 01:13:15,040

and no one will say yeah you're not

2006

01:13:20,310 --> 01:13:18,480

doing philosophy anymore

2007

01:13:22,310 --> 01:13:20,320

one of my first questions for this that

2008

01:13:23,750 --> 01:13:22,320

i wrote down it's has any philosophical

2009

01:13:26,229 --> 01:13:23,760

question ever been solved

2010

01:13:27,110 --> 01:13:26,239

and this relates to that because i'm

2011

01:13:28,390 --> 01:13:27,120

curious to know

2012

01:13:30,310 --> 01:13:28,400

it's something i've been thinking about

2013

01:13:31,669 --> 01:13:30,320

i didn't search this on google and it's

2014

01:13:33,590 --> 01:13:31,679

not clear the only one that i can think

2015

01:13:35,430 --> 01:13:33,600

of is maybe zeno's paradox with saying

2016

01:13:35,910 --> 01:13:35,440

well you're only accounting for finite

2017

01:13:39,030 --> 01:13:35,920

time

2018

01:13:43,669 --> 01:13:39,040

but have any major philosophical

2019

01:13:49,350 --> 01:13:47,510

um i'd be more confident in saying

2020

01:13:50,950 --> 01:13:49,360

a lot of views have been decisively

2021

01:13:53,030 --> 01:13:50,960

refuted

2022

01:13:54,470 --> 01:13:53,040

so there's a lot of people in philosophy

2023

01:13:56,790 --> 01:13:54,480

saying well

2024

01:13:59,030 --> 01:13:56,800

we don't know that we're we know we know

2025

01:14:01,990 --> 01:13:59,040

that we're making progress

2026
01:14:03,669 --> 01:14:02,000
in this limited sense that we now know

2027
01:14:06,470 --> 01:14:03,679
certain things are false that we didn't

2028
01:14:08,229 --> 01:14:06,480
know were false

2029
01:14:09,990 --> 01:14:08,239
you know 50 years ago or something like

2030
01:14:13,590 --> 01:14:10,000
that but i mean there are lots

2031
01:14:16,709 --> 01:14:13,600
i have lots of philosophical views uh

2032
01:14:19,590 --> 01:14:16,719
about which i'm fairly confident

2033
01:14:21,430 --> 01:14:19,600
and i think those might count people

2034
01:14:24,870 --> 01:14:21,440
would disagree with me of course

2035
01:14:27,830 --> 01:14:24,880
right but there'd be a there'd be a

2036
01:14:28,870 --> 01:14:27,840
some significant number of people who

2037
01:14:32,950 --> 01:14:28,880
say yeah

2038
01:14:34,709 --> 01:14:32,960

we think that's right in defensive

2039

01:14:36,149 --> 01:14:34,719

yeah i mean to take one of the one of

2040

01:14:39,270 --> 01:14:36,159

the most important

2041

01:14:42,470 --> 01:14:39,280

and oldest is plato's um

2042

01:14:44,630 --> 01:14:42,480

plato's refutation uh

2043

01:14:46,550 --> 01:14:44,640

for the need for god in order to have

2044

01:14:48,470 --> 01:14:46,560

objective ethics

2045

01:14:50,149 --> 01:14:48,480

it's in the dialogue called the

2046

01:14:52,790 --> 01:14:50,159

euthyphro

2047

01:14:54,630 --> 01:14:52,800

and it's a very simple little argument

2048

01:14:56,149 --> 01:14:54,640

and it doesn't it doesn't refute the

2049

01:14:59,270 --> 01:14:56,159

existence of god it just

2050

01:15:01,990 --> 01:14:59,280

says no no no objective ethics

2051
01:15:03,110 --> 01:15:02,000
objective right and wrong is completely

2052
01:15:05,189 --> 01:15:03,120
independent from god

2053
01:15:07,350 --> 01:15:05,199
god's got nothing to do with it it's a

2054
01:15:10,070 --> 01:15:07,360
wonderful little argument

2055
01:15:11,510 --> 01:15:10,080
and um if you are an atheist you're

2056
01:15:13,189 --> 01:15:11,520
happy with the conclusion

2057
01:15:15,030 --> 01:15:13,199
right we can have objective ethics we

2058
01:15:16,390 --> 01:15:15,040
don't need god

2059
01:15:19,189 --> 01:15:16,400
and if you do believe in god you could

2060
01:15:21,189 --> 01:15:19,199
say well i still believe in god and i

2061
01:15:22,550 --> 01:15:21,199
believe in objective ethics the intimate

2062
01:15:24,229 --> 01:15:22,560
connection that i thought was there

2063
01:15:27,590 --> 01:15:24,239

actually isn't there but

2064

01:15:29,669 --> 01:15:27,600

everything else is wonderful

2065

01:15:31,910 --> 01:15:29,679

or someone can reject the conclusion and

2066

01:15:33,270 --> 01:15:31,920

say yes god can advocate for

2067

01:15:35,270 --> 01:15:33,280

the murder of a child and that would

2068

01:15:35,830 --> 01:15:35,280

still be good because god advocated for

2069

01:15:37,750 --> 01:15:35,840

it

2070

01:15:39,350 --> 01:15:37,760

that's the essence of the euthyphro

2071

01:15:40,550 --> 01:15:39,360

argument because everyone will bark at

2072

01:15:42,790 --> 01:15:40,560

that

2073

01:15:44,709 --> 01:15:42,800

and they'll they think they they think

2074

01:15:45,350 --> 01:15:44,719

well something is moral because god says

2075

01:15:49,110 --> 01:15:45,360

so

2076

01:15:50,790 --> 01:15:49,120

you you had uh you had to rape every

2077

01:15:52,229 --> 01:15:50,800

woman you can see

2078

01:15:54,149 --> 01:15:52,239

then that would be a good thing to do is

2079

01:15:55,510 --> 01:15:54,159

that what you believe and no one will

2080

01:15:57,189 --> 01:15:55,520

believe that

2081

01:15:59,350 --> 01:15:57,199

and then they realize that this is

2082

01:16:01,430 --> 01:15:59,360

stupid i can't what i've been saying all

2083

01:16:03,990 --> 01:16:01,440

along is a really stupid view

2084

01:16:06,070 --> 01:16:04,000

the most we can get out of god is god is

2085

01:16:08,950 --> 01:16:06,080

a truthful reporter

2086

01:16:10,229 --> 01:16:08,960

of objective moral rules like we can

2087

01:16:11,990 --> 01:16:10,239

trust god to tell us

2088

01:16:14,310 --> 01:16:12,000

what the moral rules are but god isn't

2089

01:16:15,590 --> 01:16:14,320

making them they have to be independent

2090

01:16:17,350 --> 01:16:15,600

that's a really it's a it's a

2091

01:16:19,910 --> 01:16:17,360

wonderfully interesting problem

2092

01:16:20,790 --> 01:16:19,920

that's underappreciated i think

2093

01:16:24,310 --> 01:16:20,800

theologians

2094

01:16:26,390 --> 01:16:24,320

and there's another one

2095

01:16:28,310 --> 01:16:26,400

that they even more don't want to touch

2096

01:16:32,149 --> 01:16:28,320

and that is um

2097

01:16:37,430 --> 01:16:35,030

the one about ethics is a lot like what

2098

01:16:39,510 --> 01:16:37,440

leibniz thought about god's power

2099

01:16:41,030 --> 01:16:39,520

if you'd say liveness do you think god

2100

01:16:44,310 --> 01:16:41,040

is all-powerful you say you betcha

2101

01:16:47,430 --> 01:16:45,750

whiteness wouldn't say that though

2102

01:16:48,470 --> 01:16:47,440

because life is a qualification which

2103

01:16:50,630 --> 01:16:48,480

i'm going to give you in a second

2104

01:16:52,229 --> 01:16:50,640

okay okay you say descartes can god do

2105

01:16:53,110 --> 01:16:52,239

everything say you betcha he can do

2106

01:16:55,910 --> 01:16:53,120

anything

2107

01:16:56,470 --> 01:16:55,920

and then you say well can he make it

2108

01:16:58,709 --> 01:16:56,480

rain

2109

01:17:00,310 --> 01:16:58,719

it's a sunny day right here can you make

2110

01:17:01,750 --> 01:17:00,320

it rain sure you can make it rain

2111

01:17:03,030 --> 01:17:01,760

liveness could he make it rain you

2112

01:17:04,070 --> 01:17:03,040

better you can make a rain just like

2113

01:17:07,110 --> 01:17:04,080

that

2114

01:17:08,630 --> 01:17:07,120

um and then you say to descartes could

2115

01:17:11,750 --> 01:17:08,640

he make it rain

2116

01:17:13,430 --> 01:17:11,760

and not rain simultaneously

2117

01:17:15,189 --> 01:17:13,440

descartes would say yes he can even do

2118

01:17:15,669 --> 01:17:15,199

that i can't imagine what it would be

2119

01:17:17,830 --> 01:17:15,679

like

2120

01:17:19,669 --> 01:17:17,840

but he can do it and leibniz would say

2121

01:17:21,910 --> 01:17:19,679

no he can't do that

2122

01:17:23,590 --> 01:17:21,920

he can make it rain he can make it not

2123

01:17:24,870 --> 01:17:23,600

rain but he can't pull off a

2124

01:17:28,070 --> 01:17:24,880

contradiction

2125

01:17:29,750 --> 01:17:28,080

so god god can do anything that's

2126

01:17:33,030 --> 01:17:29,760

possible

2127

01:17:35,030 --> 01:17:33,040

that's god's power right and and that

2128

01:17:36,870 --> 01:17:35,040

and the light in its view about what god

2129

01:17:39,110 --> 01:17:36,880

can do in the physical realm

2130

01:17:41,910 --> 01:17:39,120

is very much like well liveness i think

2131

01:17:44,310 --> 01:17:41,920

with all the same view about ethics

2132

01:17:46,550 --> 01:17:44,320

you know god can advocate almost

2133

01:17:49,590 --> 01:17:46,560

anything but god actually couldn't make

2134

01:17:50,470 --> 01:17:49,600

murder okay god couldn't make torturing

2135

01:17:53,510 --> 01:17:50,480

kittens

2136

01:17:56,070 --> 01:17:53,520

morally okay he doesn't have that kind

2137

01:17:59,430 --> 01:17:57,910

you know when we're talking about

2138

01:18:00,470 --> 01:17:59,440

whether or not philosophical problems

2139

01:18:03,030 --> 01:18:00,480

have been solved

2140

01:18:04,550 --> 01:18:03,040

something i found online which it's

2141

01:18:05,910 --> 01:18:04,560

funny it's a reason why

2142

01:18:07,669 --> 01:18:05,920

philosophical problems have not been

2143

01:18:09,189 --> 01:18:07,679

solved is that as soon as they have been

2144

01:18:10,709 --> 01:18:09,199

solved they get relegated to something

2145

01:18:12,390 --> 01:18:10,719

like physics or math

2146

01:18:13,990 --> 01:18:12,400

for example you know physics was called

2147

01:18:14,229 --> 01:18:14,000

natural philosophy before anyone would

2148

01:18:15,430 --> 01:18:14,239

know

2149

01:18:17,350 --> 01:18:15,440

that's a good that's actually a really

2150

01:18:18,790 --> 01:18:17,360

good point the hardest problems state in

2151
01:18:20,070 --> 01:18:18,800
philosophy the ones that are unsolvable

2152
01:18:20,630 --> 01:18:20,080
stay in philosophy as soon as they're

2153
01:18:22,310 --> 01:18:20,640
solved

2154
01:18:24,149 --> 01:18:22,320
they get outside the realm of philosophy

2155
01:18:26,550 --> 01:18:24,159
and that's why philosophical problems

2156
01:18:29,590 --> 01:18:26,560
seem to have never been solved

2157
01:18:31,990 --> 01:18:29,600
that's a really good point um uh

2158
01:18:33,669 --> 01:18:32,000
in fact that's how a lot of philosophers

2159
01:18:36,229 --> 01:18:33,679
think of their discipline

2160
01:18:38,229 --> 01:18:36,239
as giving birth to the sciences once

2161
01:18:42,390 --> 01:18:38,239
once we sort something out

2162
01:18:43,990 --> 01:18:42,400
um it takes off uh a life of its own

2163
01:18:45,669 --> 01:18:44,000

sometimes when i talk to hardcore

2164

01:18:47,270 --> 01:18:45,679

physicists they don't like to deal with

2165

01:18:49,830 --> 01:18:47,280

concepts that are

2166

01:18:51,189 --> 01:18:49,840

maybe you might call them thick although

2167

01:18:51,830 --> 01:18:51,199

i might be using your terminology

2168

01:18:53,750 --> 01:18:51,840

incorrectly

2169

01:18:54,870 --> 01:18:53,760

i might i'm gonna call them ambiguous

2170

01:18:58,709 --> 01:18:54,880

like for example

2171

01:19:01,590 --> 01:18:58,719

consciousness or free will or

2172

01:19:02,470 --> 01:19:01,600

yeah yeah those are those right and they

2173

01:19:03,189 --> 01:19:02,480

would just say i don't know what it

2174

01:19:04,709 --> 01:19:03,199

means to

2175

01:19:06,229 --> 01:19:04,719

i don't know what that means and so let

2176

01:19:08,630 --> 01:19:06,239

me just stay with my

2177

01:19:10,229 --> 01:19:08,640

rulers and protractors but the

2178

01:19:11,830 --> 01:19:10,239

philosophers are willing to deal with

2179

01:19:13,030 --> 01:19:11,840

what seems meaningless and try and find

2180

01:19:15,030 --> 01:19:13,040

meaning and then

2181

01:19:16,790 --> 01:19:15,040

and concretize what's ambiguous or

2182

01:19:19,510 --> 01:19:16,800

disambiguate what's ambiguous

2183

01:19:19,830 --> 01:19:19,520

and then it goes into another realm yeah

2184

01:19:21,910 --> 01:19:19,840

yeah

2185

01:19:23,189 --> 01:19:21,920

that's right and i don't particularly

2186

01:19:24,950 --> 01:19:23,199

like the the

2187

01:19:26,390 --> 01:19:24,960

this there's a dismissal that an

2188

01:19:29,430 --> 01:19:26,400

arrogance that comes from the purely

2189

01:19:31,510 --> 01:19:29,440

mathematical and purely physical

2190

01:19:32,709 --> 01:19:31,520

professors that i've spoken to where

2191

01:19:35,910 --> 01:19:32,719

they don't want to deal with

2192

01:19:37,270 --> 01:19:35,920

certain concepts that seem that are

2193

01:19:39,030 --> 01:19:37,280

ill-defined

2194

01:19:41,030 --> 01:19:39,040

they'll just say well i don't deal with

2195

01:19:42,470 --> 01:19:41,040

that and that's meaningless and so you

2196

01:19:44,390 --> 01:19:42,480

can pursue that but that's a religious

2197

01:19:45,189 --> 01:19:44,400

pursuit to even talk about consciousness

2198

01:19:49,430 --> 01:19:45,199

or

2199

01:19:52,470 --> 01:19:49,440

does life mean

2200

01:19:53,750 --> 01:19:52,480

well uh yeah that seems rather

2201

01:19:56,870 --> 01:19:53,760

short-sighted because

2202

01:19:58,149 --> 01:19:56,880

uh so many i mean i i can understand

2203

01:20:00,950 --> 01:19:58,159

them

2204

01:20:02,310 --> 01:20:00,960

saying uh i i don't want to deal with

2205

01:20:05,430 --> 01:20:02,320

consciousness

2206

01:20:06,629 --> 01:20:05,440

as a physicist uh i'm very happy to talk

2207

01:20:10,790 --> 01:20:06,639

about it

2208

01:20:14,229 --> 01:20:10,800

it's probably

2209

01:20:16,310 --> 01:20:14,239

outside the realm of physics i'm also

2210

01:20:18,310 --> 01:20:16,320

very interested to talk about politics

2211

01:20:20,310 --> 01:20:18,320

and how we should organize society

2212

01:20:21,990 --> 01:20:20,320

but i wouldn't derive it from the

2213

01:20:25,990 --> 01:20:22,000

schrodinger equation exactly

2214

01:20:29,430 --> 01:20:26,000

right okay now the bucket

2215

01:20:32,550 --> 01:20:29,440

okay so anyway the the bucket um

2216

01:20:36,229 --> 01:20:32,560

the the uh newton's final conclusion

2217

01:20:38,550 --> 01:20:36,239

okay water still initially water concave

2218

01:20:39,830 --> 01:20:38,560

at the end what's the difference

2219

01:20:42,149 --> 01:20:39,840

explanation

2220

01:20:44,830 --> 01:20:42,159

the bucket is not rotating then the

2221

01:20:47,830 --> 01:20:44,840

bucket is rotating with respect to space

2222

01:20:49,030 --> 01:20:47,840

itself and therefore space exists it's

2223

01:20:51,510 --> 01:20:49,040

meant to be

2224

01:20:53,430 --> 01:20:51,520

an argument for the existence of space

2225

01:20:55,430 --> 01:20:53,440

as a thing in its own right

2226

01:20:57,350 --> 01:20:55,440

sp as well as all these material objects

2227

01:21:00,709 --> 01:20:57,360

all around us there is also

2228

01:21:02,709 --> 01:21:00,719

space it's an extra thing

2229

01:21:03,750 --> 01:21:02,719

like that said that's rubbish there's

2230

01:21:07,189 --> 01:21:03,760

nothing to space

2231

01:21:07,830 --> 01:21:07,199

except um the relations among physical

2232

01:21:10,629 --> 01:21:07,840

things

2233

01:21:11,430 --> 01:21:10,639

nothing left over there's nothing so

2234

01:21:13,590 --> 01:21:11,440

likeness

2235

01:21:15,270 --> 01:21:13,600

didn't agree with the conclusion of the

2236

01:21:16,470 --> 01:21:15,280

thought experiment or he just didn't

2237

01:21:19,110 --> 01:21:16,480

get presented with this thought

2238

01:21:19,830 --> 01:21:19,120

experiment no that's that's really a

2239

01:21:22,310 --> 01:21:19,840

good point

2240

01:21:23,350 --> 01:21:22,320

um they had a wonderfully interesting

2241

01:21:25,830 --> 01:21:23,360

correspondence

2242

01:21:26,390 --> 01:21:25,840

back and forth it's called the leibniz

2243

01:21:30,310 --> 01:21:26,400

clark

2244

01:21:33,750 --> 01:21:30,320

close to newton

2245

01:21:38,310 --> 01:21:33,760

we don't really know whether

2246

01:21:41,189 --> 01:21:38,320

clark was simply taking dictation

2247

01:21:42,870 --> 01:21:41,199

from newton he might have been or he

2248

01:21:44,310 --> 01:21:42,880

might have just talked to newton about

2249

01:21:46,149 --> 01:21:44,320

how to formulate answers

2250

01:21:47,430 --> 01:21:46,159

but there's about six letters back and

2251

01:21:49,350 --> 01:21:47,440

forth between them

2252

01:21:51,510 --> 01:21:49,360

and they keep getting longer and longer

2253

01:21:53,669 --> 01:21:51,520

uh leibniz died

2254

01:21:56,149 --> 01:21:53,679

it never it never came to an end it just

2255

01:21:59,590 --> 01:21:56,159

leibniz just unfortunately died

2256

01:22:01,830 --> 01:21:59,600

um and leidness has wonderful answers to

2257

01:22:05,430 --> 01:22:01,840

a whole lot of stuff

2258

01:22:07,350 --> 01:22:05,440

that uh newton talks about

2259

01:22:08,629 --> 01:22:07,360

uh but why vanessa's a brilliant

2260

01:22:09,750 --> 01:22:08,639

brilliant person

2261

01:22:11,669 --> 01:22:09,760

when people are talking about the

2262

01:22:12,149 --> 01:22:11,679

luminaries they mention einstein and

2263

01:22:15,510 --> 01:22:12,159

newton

2264

01:22:16,950 --> 01:22:15,520
but leibniz is to me on the same

2265

01:22:19,510 --> 01:22:16,960
category of newton

2266

01:22:20,149 --> 01:22:19,520
oh he is he's unquestionably one of the

2267

01:22:23,830 --> 01:22:20,159
all-time

2268

01:22:25,910 --> 01:22:23,840
spectacular greats yeah yeah

2269

01:22:27,350 --> 01:22:25,920
universally right he's just brilliant in

2270

01:22:30,950 --> 01:22:27,360
everything

2271

01:22:33,510 --> 01:22:30,960
yeah okay okay okay so anyway but but

2272

01:22:35,270 --> 01:22:33,520
that's the bucket but you see newton uh

2273

01:22:37,430 --> 01:22:35,280
newton nsaid

2274

01:22:38,870 --> 01:22:37,440
gave a second version it's the same

2275

01:22:40,149 --> 01:22:38,880
argument but this is the really

2276

01:22:43,990 --> 01:22:40,159

interesting one

2277

01:22:46,870 --> 01:22:44,000

so uh he says uh you imagine two spheres

2278

01:22:47,350 --> 01:22:46,880

connected by uh a chord or a rod or

2279

01:22:49,990 --> 01:22:47,360

something

2280

01:22:50,950 --> 01:22:50,000

a chord negative chord or any lasting

2281

01:22:55,110 --> 01:22:50,960

and he says

2282

01:22:57,990 --> 01:22:55,120

um uh there there's a tension

2283

01:22:58,709 --> 01:22:58,000

in the elastic okay it's stretched um

2284

01:23:00,390 --> 01:22:58,719

the material

2285

01:23:02,870 --> 01:23:00,400

sorry sorry is this in your thought

2286

01:23:03,270 --> 01:23:02,880

experiment book as well that i can place

2287

01:23:14,070 --> 01:23:03,280

it

2288

01:23:15,910 --> 01:23:14,080

the two spheres

2289

01:23:17,110 --> 01:23:15,920

and they could be made out of some

2290

01:23:19,189 --> 01:23:17,120

massive thing

2291

01:23:21,430 --> 01:23:19,199

you could be would if they don't attract

2292

01:23:24,070 --> 01:23:21,440

or retail but there's a tension

2293

01:23:25,910 --> 01:23:24,080

okay the chord is stretched okay okay

2294

01:23:29,189 --> 01:23:25,920

okay how could you explain this

2295

01:23:30,870 --> 01:23:29,199

there's nothing in the universe it's an

2296

01:23:32,950 --> 01:23:30,880

empty universe how do you explain it

2297

01:23:35,270 --> 01:23:32,960

newton says easy the whole thing is

2298

01:23:38,550 --> 01:23:35,280

rotating

2299

01:23:40,229 --> 01:23:38,560

and you see the the individual objects

2300

01:23:41,830 --> 01:23:40,239

try to move in straight lines they try

2301
01:23:44,310 --> 01:23:41,840
to move inertially

2302
01:23:46,070 --> 01:23:44,320
and hence they're it's stretching the uh

2303
01:23:48,550 --> 01:23:46,080
the cord between them

2304
01:23:49,590 --> 01:23:48,560
and that's how you account for it well

2305
01:23:53,350 --> 01:23:49,600
what's the cause

2306
01:23:56,709 --> 01:23:53,360
of this inertial motion space itself

2307
01:24:00,229 --> 01:23:56,719
space is the source of inertial motion

2308
01:24:03,110 --> 01:24:00,239
and inertial forces and stuff like that

2309
01:24:04,310 --> 01:24:03,120
this is the if now if you're if you're

2310
01:24:06,070 --> 01:24:04,320
um

2311
01:24:09,750 --> 01:24:06,080
if you're someone like leibniz you're

2312
01:24:14,070 --> 01:24:12,629
because space see for newton space has

2313
01:24:16,629 --> 01:24:14,080

real properties

2314

01:24:18,310 --> 01:24:16,639

it can cause things it causes things to

2315

01:24:20,390 --> 01:24:18,320

move in straight lines

2316

01:24:21,910 --> 01:24:20,400

that's why if you throw an object no

2317

01:24:22,870 --> 01:24:21,920

force on it it'll move in a straight

2318

01:24:26,470 --> 01:24:22,880

line

2319

01:24:27,669 --> 01:24:26,480

it's space that sort of guides it as it

2320

01:24:30,470 --> 01:24:27,679

were that way

2321

01:24:32,070 --> 01:24:30,480

okay and if there were no space um it

2322

01:24:33,590 --> 01:24:32,080

there'd be no accounting for why it

2323

01:24:34,149 --> 01:24:33,600

moves in a straight line rather than

2324

01:24:37,590 --> 01:24:34,159

just

2325

01:24:40,709 --> 01:24:37,600

at random leidness leibniz

2326

01:24:43,430 --> 01:24:40,719

died before he could really tackle

2327

01:24:45,430 --> 01:24:43,440

that issue and he who knows he might

2328

01:24:47,030 --> 01:24:45,440

have even been won over by it

2329

01:24:48,550 --> 01:24:47,040

you wanted to know about how einstein

2330

01:24:50,950 --> 01:24:48,560

reacted to this

2331

01:24:52,229 --> 01:24:50,960

right einstein changed his mind but

2332

01:24:54,950 --> 01:24:52,239

early on

2333

01:24:56,790 --> 01:24:54,960

and this is at the in the very first

2334

01:24:59,110 --> 01:24:56,800

couple of pages in the

2335

01:25:00,709 --> 01:24:59,120

in the paper on general relativity for

2336

01:25:02,229 --> 01:25:00,719

the audience just to clarify

2337

01:25:04,390 --> 01:25:02,239

the newton bucket experiment

2338

01:25:07,750 --> 01:25:04,400

demonstrated at least for newton

2339

01:25:10,390 --> 01:25:07,760

the presence of absolute space

2340

01:25:11,510 --> 01:25:10,400

that's right space is a thing in its own

2341

01:25:15,350 --> 01:25:11,520

right

2342

01:25:18,629 --> 01:25:15,360

yeah um what what

2343

01:25:21,510 --> 01:25:18,639

what einstein does is he he

2344

01:25:23,110 --> 01:25:21,520

rejects the whole setup so he imagines

2345

01:25:24,550 --> 01:25:23,120

two spheres that are rotating with

2346

01:25:26,950 --> 01:25:24,560

respect to one another

2347

01:25:29,590 --> 01:25:26,960

and one is perfectly spherical and the

2348

01:25:34,470 --> 01:25:29,600

other one's a kind of um

2349

01:25:39,350 --> 01:25:34,480

um an ellipse of revolution

2350

01:25:41,350 --> 01:25:39,360

okay so it's elongated at its equator

2351

01:25:44,149 --> 01:25:41,360

okay just like our earth spinning on its

2352

01:25:47,189 --> 01:25:44,159

axis it's a little wider at the equator

2353

01:25:49,110 --> 01:25:47,199

so einstein imagines these two things uh

2354

01:25:50,790 --> 01:25:49,120

in an otherwise empty space and he says

2355

01:25:53,430 --> 01:25:50,800

how can you explain this

2356

01:25:54,229 --> 01:25:53,440

and then he says you can't you must

2357

01:25:57,750 --> 01:25:54,239

appeal

2358

01:25:58,149 --> 01:25:57,760

to distant matter in the presence of

2359

01:26:01,990 --> 01:25:58,159

this is

2360

01:26:04,950 --> 01:26:02,000

of this

2361

01:26:06,070 --> 01:26:04,960

you must appeal to distant matter that

2362

01:26:11,669 --> 01:26:06,080

you can

2363

01:26:13,669 --> 01:26:11,679

and one of the uh objects the the

2364

01:26:16,870 --> 01:26:13,679

ellipse of revolution

2365

01:26:18,870 --> 01:26:16,880

um that object not the spherical one but

2366

01:26:20,550 --> 01:26:18,880

that object is rotating with respect to

2367

01:26:24,149 --> 01:26:20,560

that distant mass

2368

01:26:27,430 --> 01:26:26,470

that causes the inertial motion it's the

2369

01:26:32,310 --> 01:26:27,440

presence of a

2370

01:26:33,430 --> 01:26:32,320

of billions of distribution okay

2371

01:26:35,590 --> 01:26:33,440

let me see if i have this correct

2372

01:26:37,350 --> 01:26:35,600

because i don't recall this so are you

2373

01:26:38,870 --> 01:26:37,360

is what you're saying something like we

2374

01:26:39,189 --> 01:26:38,880

don't know if we're rotating unless we

2375

01:26:42,229 --> 01:26:39,199

see

2376

01:26:43,910 --> 01:26:42,239

stars rotating above us

2377

01:26:45,430 --> 01:26:43,920

yeah or is this completely is it because

2378

01:26:48,390 --> 01:26:45,440

it's outside that's einstein

2379

01:26:50,310 --> 01:26:48,400

yeah okay what about the centripetal

2380

01:26:52,149 --> 01:26:50,320

force or centrifugal force

2381

01:26:53,830 --> 01:26:52,159

so what does he say about that we

2382

01:26:55,830 --> 01:26:53,840

wouldn't feel it

2383

01:26:57,030 --> 01:26:55,840

it's not caused by rotation with respect

2384

01:26:58,950 --> 01:26:57,040

to space

2385

01:27:00,149 --> 01:26:58,960

it's caused by rotation with respect to

2386

01:27:03,669 --> 01:27:00,159

distant matter

2387

01:27:06,709 --> 01:27:03,679

in fact this is mark

2388

01:27:07,669 --> 01:27:06,719

marx mark made an empirical claim about

2389

01:27:09,830 --> 01:27:07,679

this

2390

01:27:11,189 --> 01:27:09,840

and i don't think it's very practical so

2391

01:27:13,350 --> 01:27:11,199

no one can ever do it

2392

01:27:16,070 --> 01:27:13,360

but mark said imagine that you did

2393

01:27:19,990 --> 01:27:16,080

newton's bucket

2394

01:27:21,910 --> 01:27:20,000

in a bucket where the where the walls of

2395

01:27:24,950 --> 01:27:21,920

the bucket were several miles

2396

01:27:28,310 --> 01:27:24,960

thick okay okay

2397

01:27:31,510 --> 01:27:28,320

so imagine them 100 miles thick

2398

01:27:33,030 --> 01:27:31,520

incredible mass then you and you rotate

2399

01:27:35,350 --> 01:27:33,040

this thing

2400

01:27:37,189 --> 01:27:35,360

yeah okay so in newton's bucket when you

2401

01:27:38,310 --> 01:27:37,199

rotate it the wall the water starts to

2402

01:27:40,709 --> 01:27:38,320

climb the wall

2403

01:27:41,350 --> 01:27:40,719

yeah lock said if you've got enough mass

2404

01:27:45,430 --> 01:27:41,360

in the bucket

2405

01:27:48,629 --> 01:27:45,440

itself the water would stay level

2406

01:27:50,709 --> 01:27:48,639

uh-huh therefore it's not

2407

01:27:53,110 --> 01:27:50,719

rotation with respect to space it's

2408

01:27:56,149 --> 01:27:53,120

rotation with respect to

2409

01:27:58,830 --> 01:27:56,159

external masses this is the bucket it

2410

01:28:03,910 --> 01:28:02,229

yeah but you need you need such a big

2411

01:28:06,229 --> 01:28:03,920

bucket

2412

01:28:07,830 --> 01:28:06,239

you know you couldn't you couldn't you

2413

01:28:10,229 --> 01:28:07,840

couldn't ask

2414

01:28:11,350 --> 01:28:10,239

the government to to pay for this

2415

01:28:13,110 --> 01:28:11,360

experiment

2416

01:28:15,669 --> 01:28:13,120

they would be they would be turfed out

2417

01:28:18,070 --> 01:28:15,679

of power in the next election when that

2418

01:28:19,430 --> 01:28:18,080

when the population got wind of it in

2419

01:28:21,189 --> 01:28:19,440

your thought experiment book

2420

01:28:23,030 --> 01:28:21,199

you fractionate into two there's

2421

01:28:24,470 --> 01:28:23,040

constructive destructive types of

2422

01:28:26,470 --> 01:28:24,480

thought experiments and then and then

2423

01:28:28,550 --> 01:28:26,480

constructive conjecture and so on

2424

01:28:29,510 --> 01:28:28,560

did you come up with that or was that

2425

01:28:32,550 --> 01:28:29,520

something you found

2426

01:28:34,390 --> 01:28:32,560

um there's a little bit in the uh um

2427

01:28:36,790 --> 01:28:34,400

well i should tell you when when i when

2428

01:28:39,430 --> 01:28:36,800

i first decided

2429

01:28:40,950 --> 01:28:39,440

what let me back up a little more when i

2430

01:28:41,990 --> 01:28:40,960

first heard about the galileo thought

2431

01:28:43,590 --> 01:28:42,000

experiment of the

2432

01:28:45,830 --> 01:28:43,600

falling bodies i thought that's the most

2433

01:28:49,590 --> 01:28:45,840

wonderful thing i'd ever heard

2434

01:28:52,229 --> 01:28:49,600

and then after i got tenure i thought

2435

01:28:52,870 --> 01:28:52,239

okay they can't fire me now return i'm

2436

01:28:54,790 --> 01:28:52,880

going to do

2437

01:28:55,990 --> 01:28:54,800

what i wanted to do for a long time and

2438

01:28:57,990 --> 01:28:56,000

i start thinking about

2439

01:28:59,990 --> 01:28:58,000

thought experiments and there's

2440

01:29:01,669 --> 01:29:00,000

virtually no literature on it

2441

01:29:03,590 --> 01:29:01,679

there's you know people make the odd

2442

01:29:05,030 --> 01:29:03,600

offhand remark and of course there are

2443

01:29:05,510 --> 01:29:05,040

lots of thought experiments floating

2444

01:29:07,350 --> 01:29:05,520

around

2445

01:29:09,110 --> 01:29:07,360

but nobody had ever written about it in

2446

01:29:10,550 --> 01:29:09,120

a collection what's their nature you

2447

01:29:13,669 --> 01:29:10,560

know how do they work and

2448

01:29:16,709 --> 01:29:13,679

stuff like that and i was shocked

2449

01:29:17,990 --> 01:29:16,719

that i could read uh almost everything

2450

01:29:19,990 --> 01:29:18,000

that had ever been written about thought

2451

01:29:23,430 --> 01:29:20,000

experiments in a long weekend

2452

01:29:23,990 --> 01:29:23,440

it was almost nothing a bit by mock and

2453

01:29:25,990 --> 01:29:24,000

a bit by

2454

01:29:27,189 --> 01:29:26,000

you know a few other people and that's

2455

01:29:29,990 --> 01:29:27,199

it

2456

01:29:31,990 --> 01:29:30,000

and um so the the few people who had

2457

01:29:33,990 --> 01:29:32,000

commented on it

2458

01:29:35,430 --> 01:29:34,000

usually divided things up into the

2459

01:29:37,669 --> 01:29:35,440

positive negative

2460

01:29:38,550 --> 01:29:37,679

kind of thought experiment thought

2461

01:29:40,229 --> 01:29:38,560

experiments which

2462

01:29:42,709 --> 01:29:40,239

you know get try to give you a new

2463

01:29:43,030 --> 01:29:42,719

theory versus thought experiments which

2464

01:29:46,149 --> 01:29:43,040

just

2465

01:29:49,189 --> 01:29:46,159

destroy an old theory

2466

01:29:50,470 --> 01:29:49,199

okay so schrodinger's cat is a negative

2467

01:29:52,229 --> 01:29:50,480

thought experiment in the sense that

2468

01:29:55,830 --> 01:29:52,239

it's just supposed to undermine

2469

01:29:58,229 --> 01:29:55,840

standard quantum mechanics um but other

2470

01:29:59,430 --> 01:29:58,239

other thought experiments like like

2471

01:30:01,830 --> 01:29:59,440

heisenberg's

2472

01:30:03,189 --> 01:30:01,840

mic gamma ray microscope which gives you

2473

01:30:05,830 --> 01:30:03,199

the uncertainty principle

2474

01:30:08,149 --> 01:30:05,840

that's more positive give you a new

2475

01:30:10,149 --> 01:30:08,159

positive result type thought experiments

2476

01:30:11,270 --> 01:30:10,159

so that there was a beginning of a

2477

01:30:13,350 --> 01:30:11,280

taxonomy

2478

01:30:17,510 --> 01:30:13,360

you know there then i then i just

2479

01:30:20,629 --> 01:30:19,110

okay you fine-tuned only the

2480

01:30:21,990 --> 01:30:20,639

constructive part well the destructive

2481

01:30:26,229 --> 01:30:22,000

part goes down to direct

2482

01:30:29,030 --> 01:30:26,239

so it's like i don't know what direction

2483

01:30:30,470 --> 01:30:29,040

and then one of the constructives goes

2484

01:30:35,189 --> 01:30:30,480

down to direct as well

2485

01:30:36,950 --> 01:30:35,199

yeah um i i think i can't remember now

2486

01:30:39,110 --> 01:30:36,960

whether i i mean there were some

2487

01:30:40,790 --> 01:30:39,120

distinctions i didn't bother making

2488

01:30:43,189 --> 01:30:40,800

but might have made in passing when i

2489

01:30:45,110 --> 01:30:43,199

was describing that taxonomy

2490

01:30:47,030 --> 01:30:45,120

um the negative thought experiments i

2491

01:30:47,990 --> 01:30:47,040

might have put them lumped them all

2492

01:30:51,030 --> 01:30:48,000

together is just

2493

01:30:54,390 --> 01:30:51,040

negative yeah um there's probably

2494

01:30:56,070 --> 01:30:54,400

uh an important difference between

2495

01:30:58,070 --> 01:30:56,080

uh negative thought experiments that

2496

01:31:00,830 --> 01:30:58,080

follow from the theory itself

2497

01:31:02,229 --> 01:31:00,840

which just shows that they're internally

2498

01:31:03,990 --> 01:31:02,239

incoherent

2499

01:31:05,750 --> 01:31:04,000

and negative thought experiments which

2500

01:31:09,669 --> 01:31:05,760

show a clash

2501
01:31:11,910 --> 01:31:09,679
between uh a theory and other

2502
01:31:13,350 --> 01:31:11,920
more or less established knowledge so i

2503
01:31:14,149 --> 01:31:13,360
would i could fine-tune there and you

2504
01:31:17,189 --> 01:31:14,159
could probably

2505
01:31:19,350 --> 01:31:17,199
make more distinctions and

2506
01:31:21,189 --> 01:31:19,360
anytime you're setting up a tech a

2507
01:31:22,070 --> 01:31:21,199
taxonomy there's a kind of balance

2508
01:31:24,070 --> 01:31:22,080
between

2509
01:31:25,990 --> 01:31:24,080
you know to what extent can this be

2510
01:31:27,590 --> 01:31:26,000
simplified and enlightening

2511
01:31:29,270 --> 01:31:27,600
and to what extent do you go into so

2512
01:31:31,830 --> 01:31:29,280
much detail it just becomes

2513
01:31:32,950 --> 01:31:31,840

you get lost and you get lost in the

2514

01:31:34,629 --> 01:31:32,960

detail

2515

01:31:35,990 --> 01:31:34,639

have you been keeping up with theories

2516

01:31:37,510 --> 01:31:36,000

of everything

2517

01:31:40,550 --> 01:31:37,520

there's been a couple of new ones this

2518

01:31:42,830 --> 01:31:40,560

year yeah a little bit

2519

01:31:46,070 --> 01:31:42,840

have you read up on wolframs or eric

2520

01:31:51,669 --> 01:31:49,669

no uh well from wilson's views

2521

01:31:53,590 --> 01:31:51,679

uh he just thinks that the world is an

2522

01:31:57,510 --> 01:31:53,600

automaton

2523

01:31:59,510 --> 01:31:57,520

and um uh he he sees digital computers

2524

01:32:01,990 --> 01:31:59,520

is answering all questions i

2525

01:32:03,750 --> 01:32:02,000

i'm i'm still sufficiently wedded to

2526

01:32:06,950 --> 01:32:03,760

continuity

2527

01:32:09,990 --> 01:32:06,960

in a lot of places that i don't i think

2528

01:32:13,270 --> 01:32:10,000

digitizing things is is only

2529

01:32:15,110 --> 01:32:13,280

a nifty approximation and uh good for

2530

01:32:16,709 --> 01:32:15,120

solving a lot of practical problems

2531

01:32:18,629 --> 01:32:16,719

but i don't think it's going to reveal

2532

01:32:21,590 --> 01:32:18,639

the deeper truth i may be wrong

2533

01:32:22,149 --> 01:32:21,600

i may be wrong um i have uh physics

2534

01:32:23,910 --> 01:32:22,159

friends

2535

01:32:25,350 --> 01:32:23,920

who do believe that space time is

2536

01:32:28,950 --> 01:32:25,360

discrete

2537

01:32:32,070 --> 01:32:28,960

yep and uh if they're right

2538

01:32:35,189 --> 01:32:32,080

then understanding the world in as a

2539

01:32:37,430 --> 01:32:35,199

gigantic digital computer um

2540

01:32:38,390 --> 01:32:37,440

that makes uh that becomes a little more

2541

01:32:40,070 --> 01:32:38,400

plausible

2542

01:32:41,669 --> 01:32:40,080

now you definitely should read that

2543

01:32:43,270 --> 01:32:41,679

paper that you sent me which i thought

2544

01:32:44,709 --> 01:32:43,280

that you knew nicholas jessen

2545

01:32:45,990 --> 01:32:44,719

and you were completely familiar with

2546

01:32:47,510 --> 01:32:46,000

his work but anyway just for the

2547

01:32:49,110 --> 01:32:47,520

audience remember i i did

2548

01:32:50,629 --> 01:32:49,120

i read it at the time i remember saying

2549

01:33:01,590 --> 01:32:50,639

i do remember sending it to you

2550

01:33:04,629 --> 01:33:03,830

is a physicist who was answering a

2551

01:33:06,550 --> 01:33:04,639

question that i was

2552

01:33:07,750 --> 01:33:06,560

curious about which is why i asked jim

2553

01:33:11,110 --> 01:33:07,760

here i said hey

2554

01:33:12,950 --> 01:33:11,120

is there any other

2555

01:33:14,790 --> 01:33:12,960

logical foundation of physics other than

2556

01:33:15,830 --> 01:33:14,800

classical logic

2557

01:33:17,110 --> 01:33:15,840

because i'm wondering i'm always i'm

2558

01:33:18,870 --> 01:33:17,120

curious like what's holding us back from

2559

01:33:20,950 --> 01:33:18,880

theories of everything and i'm trying to

2560

01:33:23,110 --> 01:33:20,960

tackle it from as many angles as i

2561

01:33:24,390 --> 01:33:23,120

as i can and so i thought maybe this is

2562

01:33:25,910 --> 01:33:24,400

one and you said well there is this

2563

01:33:28,149 --> 01:33:25,920

person named nicholas jessen who thinks

2564

01:33:29,990 --> 01:33:28,159

that intuitionist logic is a way to go

2565

01:33:31,750 --> 01:33:30,000

and i want to write that now i'm getting

2566

01:33:34,390 --> 01:33:31,760

i'm now it's coming back yes yes

2567

01:33:35,189 --> 01:33:34,400

okay and so what he was saying he has a

2568

01:33:38,390 --> 01:33:35,199

few different

2569

01:33:39,750 --> 01:33:38,400

reasons for believing that first of all

2570

01:33:41,590 --> 01:33:39,760

real numbers aren't real

2571

01:33:43,750 --> 01:33:41,600

and the reason for this is to say is

2572

01:33:44,870 --> 01:33:43,760

because there's only a finite amount of

2573

01:33:46,310 --> 01:33:44,880

information that can be in

2574

01:33:47,750 --> 01:33:46,320

any finite volume so let's say it's a

2575

01:33:48,149 --> 01:33:47,760

real number if it's an arbitrary real

2576

01:33:49,669 --> 01:33:48,159

number

2577

01:33:51,669 --> 01:33:49,679

then it's going to collapse into a black

2578

01:33:54,149 --> 01:33:51,679

hole if for whatever reason the particle

2579

01:33:56,390 --> 01:33:54,159

somehow carries that information with it

2580

01:33:57,990 --> 01:33:56,400

okay well you can leave and leave that

2581

01:34:00,310 --> 01:33:58,000

aside

2582

01:34:02,310 --> 01:34:00,320

he says that all of deterministic

2583

01:34:04,790 --> 01:34:02,320

physics like classical physics

2584

01:34:06,470 --> 01:34:04,800

actually is completely compatible with

2585

01:34:08,070 --> 01:34:06,480

an indeterministic view

2586

01:34:10,149 --> 01:34:08,080

forget about quantum mechanics and the

2587

01:34:11,430 --> 01:34:10,159

reason is that all we can do is test it

2588

01:34:14,470 --> 01:34:11,440

to a certain precision

2589

01:34:15,910 --> 01:34:14,480

let's say 30 decimal places that's

2590

01:34:17,750 --> 01:34:15,920

being a bit generous well let's say 30

2591

01:34:21,510 --> 01:34:17,760

decimal places for classical physics

2592

01:34:25,990 --> 01:34:21,520

then you can easily

2593

01:34:29,830 --> 01:34:26,000

construct indeterminate

2594

01:34:32,870 --> 01:34:29,840

um indeterminate functions so here's one

2595

01:34:34,070 --> 01:34:32,880

i can't say it because

2596

01:34:35,350 --> 01:34:34,080

i can't say it i would just have to

2597

01:34:37,189 --> 01:34:35,360

write the function out but let's say you

2598

01:34:38,790 --> 01:34:37,199

have the real line so zero to one

2599

01:34:40,790 --> 01:34:38,800

and then you you somehow stretch the

2600

01:34:42,070 --> 01:34:40,800

real line and then you cut the real line

2601
01:34:43,910 --> 01:34:42,080
in half

2602
01:34:45,430 --> 01:34:43,920
i'll have to tell you what the function

2603
01:34:47,030 --> 01:34:45,440
is but either way

2604
01:34:48,629 --> 01:34:47,040
that real line you can describe any

2605
01:34:51,910 --> 01:34:48,639
number as zero point

2606
01:34:54,470 --> 01:34:51,920
b one b two be like the digits of okay

2607
01:34:54,950 --> 01:34:54,480
great what that function effectively

2608
01:34:57,189 --> 01:34:54,960
does

2609
01:34:58,870 --> 01:34:57,199
is remove the first digit so instead of

2610
01:35:02,229 --> 01:34:58,880
it being zero point b one b two b

2611
01:35:07,430 --> 01:35:02,239
three it's zero point b2 b3 b4

2612
01:35:13,189 --> 01:35:10,870
given that let's say finite

2613
01:35:14,950 --> 01:35:13,199

let's say non-real numbers are

2614

01:35:15,830 --> 01:35:14,960

completely compatible with classical

2615

01:35:19,189 --> 01:35:15,840

physics because

2616

01:35:22,390 --> 01:35:19,199

we don't know where the end

2617

01:35:26,229 --> 01:35:22,400

of the error bar effectively gives

2618

01:35:28,550 --> 01:35:26,239

a a real number or if it's just

2619

01:35:29,669 --> 01:35:28,560

cut off you understand you understand

2620

01:35:32,070 --> 01:35:29,679

what i'm saying sorry if i'm

2621

01:35:32,709 --> 01:35:32,080

if i'm not explaining correctly okay

2622

01:35:34,310 --> 01:35:32,719

given that

2623

01:35:35,990 --> 01:35:34,320

then we can have these simple systems

2624

01:35:38,629 --> 01:35:36,000

that actually are not just

2625

01:35:40,229 --> 01:35:38,639

chaotic because we don't have sufficient

2626

01:35:44,149 --> 01:35:40,239

information but because

2627

01:35:46,550 --> 01:35:44,159

within it it genuinely is indeterminate

2628

01:35:48,229 --> 01:35:46,560

for example that function like if you

2629

01:35:49,270 --> 01:35:48,239

just choose an arbitrary okay so you get

2630

01:35:50,629 --> 01:35:49,280

the idea

2631

01:35:53,030 --> 01:35:50,639

okay so then he was saying that

2632

01:35:54,390 --> 01:35:53,040

indeterminacy is not incompatible with

2633

01:35:56,310 --> 01:35:54,400

classical physics even though

2634

01:35:57,830 --> 01:35:56,320

we like to think of classical physics as

2635

01:36:00,950 --> 01:35:57,840

being a determinant theory

2636

01:36:02,870 --> 01:36:00,960

you can't it's so then he goes on to say

2637

01:36:05,109 --> 01:36:02,880

calling physics deterministic or

2638

01:36:08,070 --> 01:36:05,119

indeterministic is not a scientific

2639

01:36:09,669 --> 01:36:08,080

question because both models predict the

2640

01:36:10,870 --> 01:36:09,679

exact same reality that we see

2641

01:36:12,310 --> 01:36:10,880

classically forget about quantum

2642

01:36:14,870 --> 01:36:12,320

mechanics

2643

01:36:16,709 --> 01:36:14,880

and then he goes on to make a connection

2644

01:36:18,390 --> 01:36:16,719

between that and free will

2645

01:36:20,310 --> 01:36:18,400

he's a proponent of free will much like

2646

01:36:22,709 --> 01:36:20,320

yourself and he says it can be saved

2647

01:36:24,709 --> 01:36:22,719

the clas the libertarian version of free

2648

01:36:28,070 --> 01:36:24,719

will not the compatibilist that is that

2649

01:36:29,990 --> 01:36:28,080

i choose from the possible world

2650

01:36:31,189 --> 01:36:30,000

well anyway that's extremely intriguing

2651

01:36:32,790 --> 01:36:31,199

to me like one

2652

01:36:35,109 --> 01:36:32,800

so i thank you so much for that and i'm

2653

01:36:37,430 --> 01:36:35,119

going to talk to nicholas about that

2654

01:36:38,709 --> 01:36:37,440

good oh that that's i'm i'm i'm glad you

2655

01:36:41,990 --> 01:36:38,719

got so much out of it

2656

01:36:45,350 --> 01:36:42,000

my instincts are to uh disagree uh

2657

01:36:47,669 --> 01:36:45,360

quite strongly um to start with i'm

2658

01:36:50,229 --> 01:36:47,679

a a realist and a platonist about math

2659

01:36:53,189 --> 01:36:50,239

not a constructivist not an intuitionist

2660

01:36:54,070 --> 01:36:53,199

so i think all those decimal expansion

2661

01:36:56,629 --> 01:36:54,080

to infinity

2662

01:36:57,510 --> 01:36:56,639

it exists um but it exists in plato's

2663

01:36:59,590 --> 01:36:57,520

heaven

2664

01:37:01,510 --> 01:36:59,600

so i don't know how he's i don't know

2665

01:37:04,149 --> 01:37:01,520

where black holes would come in unless

2666

01:37:05,990 --> 01:37:04,159

he's trying to physicalize the numbers

2667

01:37:08,390 --> 01:37:06,000

and then the decimal representation

2668

01:37:10,870 --> 01:37:08,400

would require an infinite amount of ink

2669

01:37:11,830 --> 01:37:10,880

in a very small space and collapse into

2670

01:37:14,149 --> 01:37:11,840

a black hole

2671

01:37:16,390 --> 01:37:14,159

some now i'm i'm i'm sort of joking and

2672

01:37:19,990 --> 01:37:16,400

saying yeah i understand

2673

01:37:23,189 --> 01:37:20,000

but the thing is um i think uh

2674

01:37:26,390 --> 01:37:23,199

you need real numbers

2675

01:37:28,950 --> 01:37:26,400

irrational real numbers in uh

2676

01:37:32,470 --> 01:37:28,960

in physics um think of try try to

2677

01:37:35,590 --> 01:37:32,480

imagine doing physics without pi

2678

01:37:36,950 --> 01:37:35,600

which is uh an irrational number

2679

01:37:39,030 --> 01:37:36,960

okay it's got an infinite decimal

2680

01:37:39,990 --> 01:37:39,040

expansion try to try to imagine doing

2681

01:37:43,350 --> 01:37:40,000

physics

2682

01:37:45,109 --> 01:37:43,360

without um the square root of two

2683

01:37:46,709 --> 01:37:45,119

square root of two comes up all over the

2684

01:37:47,990 --> 01:37:46,719

place in just in quantum mechanics

2685

01:37:50,709 --> 01:37:48,000

you've got a

2686

01:37:51,189 --> 01:37:50,719

two-state system you know it can it

2687

01:37:53,350 --> 01:37:51,199

could be

2688

01:37:55,189 --> 01:37:53,360

an upper or down and you describe the

2689

01:37:58,310 --> 01:37:55,199

state as one over root two

2690

01:37:59,990 --> 01:37:58,320

up plus one over root two down

2691

01:38:01,590 --> 01:38:00,000

and then to get the probability you

2692

01:38:04,709 --> 01:38:01,600

square that so

2693

01:38:06,629 --> 01:38:04,719

square one over root two squared is one

2694

01:38:08,070 --> 01:38:06,639

becomes one half and that of course you

2695

01:38:10,229 --> 01:38:08,080

can measure accurately but you're gonna

2696

01:38:10,629 --> 01:38:10,239

always represent it as one over root two

2697

01:38:14,229 --> 01:38:10,639

you

2698

01:38:16,870 --> 01:38:14,239

he may say

2699

01:38:19,030 --> 01:38:16,880

ah but i'm only appealing to an

2700

01:38:21,350 --> 01:38:19,040

approximation of one over root two

2701

01:38:23,430 --> 01:38:21,360

like i only need five if i went five

2702

01:38:25,030 --> 01:38:23,440

decimal places

2703

01:38:27,030 --> 01:38:25,040

and so i'm really it's really a rational

2704

01:38:29,430 --> 01:38:27,040

number that's all i need for

2705

01:38:32,870 --> 01:38:29,440

complete empirical adequacy it would be

2706

01:38:37,030 --> 01:38:32,880

hard to argue with him over that

2707

01:38:40,149 --> 01:38:37,040

i think my my best argument against him

2708

01:38:41,350 --> 01:38:40,159

would be the utter simplicity of the

2709

01:38:44,390 --> 01:38:41,360

real numbers

2710

01:38:45,350 --> 01:38:44,400

as opposed to truncating them and

2711

01:38:48,950 --> 01:38:45,360

turning them into

2712

01:38:51,510 --> 01:38:48,960

uh rational numbers to do physics

2713

01:38:53,430 --> 01:38:51,520

but but from an empirical point of view

2714

01:38:55,990 --> 01:38:53,440

i may have to concede

2715

01:38:58,070 --> 01:38:56,000

that there's not going to be any

2716

01:39:01,430 --> 01:38:58,080

empirical distinction

2717

01:39:02,550 --> 01:39:01,440

right between the two right okay i'm

2718

01:39:04,550 --> 01:39:02,560

gonna read from your

2719

01:39:06,149 --> 01:39:04,560

book oh before i get to that you did

2720

01:39:07,910 --> 01:39:06,159

mention that there are some examples of

2721

01:39:10,470 --> 01:39:07,920

non-platonic forms of mathematical

2722

01:39:13,990 --> 01:39:12,229

i i can't conceive of that so do you

2723

01:39:16,229 --> 01:39:14,000

mind expounding you said

2724

01:39:17,109 --> 01:39:16,239

you said that mill or kitcher kitcher

2725

01:39:21,430 --> 01:39:17,119

yes that's right or

2726

01:39:24,870 --> 01:39:21,440

oh yes yes yes yes sure okay uh he um um

2727

01:39:26,790 --> 01:39:24,880

mill is easy he's the classic example

2728

01:39:28,390 --> 01:39:26,800

so he's he'd be you'd call him a

2729

01:39:30,950 --> 01:39:28,400

mathematical realist

2730

01:39:32,390 --> 01:39:30,960

almost everybody who which mill is this

2731

01:39:34,629 --> 01:39:32,400

uh john stuart mill

2732

01:39:36,790 --> 01:39:34,639

okay okay almost everybody who's a

2733

01:39:39,270 --> 01:39:36,800

mathematical realist uses

2734

01:39:40,709 --> 01:39:39,280

realism platonism roughly

2735

01:39:41,990 --> 01:39:40,719

interchangeably

2736

01:39:43,990 --> 01:39:42,000

i mean they might they might want to

2737

01:39:46,470 --> 01:39:44,000

make some fine distinctions

2738

01:39:47,669 --> 01:39:46,480

uh and that's because almost everybody

2739

01:39:50,390 --> 01:39:47,679

who is a realist

2740

01:39:51,270 --> 01:39:50,400

is happy to be called a platoonist but

2741

01:39:53,430 --> 01:39:51,280

there is

2742

01:39:55,430 --> 01:39:53,440

mill is a mathematical realist who is

2743

01:39:58,950 --> 01:39:55,440

absolutely not a platonist

2744

01:40:02,149 --> 01:39:58,960

so for nil numbers are really just um

2745

01:40:02,709 --> 01:40:02,159

a kind of abstraction from the physical

2746

01:40:06,709 --> 01:40:02,719

realm

2747

01:40:09,830 --> 01:40:06,719

like colors so when i say

2748

01:40:10,709 --> 01:40:09,840

2 plus two equals four i'm actually

2749

01:40:13,990 --> 01:40:10,719

talking about

2750

01:40:16,470 --> 01:40:14,000

physical stuff so two apples

2751

01:40:17,350 --> 01:40:16,480

it's just a short form for a more

2752

01:40:22,310 --> 01:40:17,360

general

2753

01:40:24,149 --> 01:40:22,320

two apples equals four apples

2754

01:40:26,070 --> 01:40:24,159

two liters of water plus two liters of

2755

01:40:29,189 --> 01:40:26,080

water is four liters of water

2756

01:40:30,950 --> 01:40:29,199

etc etc etc i just i just simplify it to

2757

01:40:32,870 --> 01:40:30,960

two plus two equals four

2758

01:40:35,189 --> 01:40:32,880

but it is learned empirically and it's

2759

01:40:38,310 --> 01:40:35,199

about the physical empirical world

2760

01:40:42,470 --> 01:40:38,320

that's mill okay

2761

01:40:44,390 --> 01:40:42,480

um fraga made a lot of fun of him

2762

01:40:46,070 --> 01:40:44,400

nobody believes bill they think it's

2763

01:40:48,470 --> 01:40:46,080

preposterous view

2764

01:40:49,189 --> 01:40:48,480

uh but you see how it's realist in the

2765

01:40:51,750 --> 01:40:49,199

sense that

2766

01:40:53,109 --> 01:40:51,760

it's about reality and it's meant to be

2767

01:40:54,470 --> 01:40:53,119

literally true

2768

01:40:56,229 --> 01:40:54,480

yeah i just don't see how it's not

2769

01:40:58,229 --> 01:40:56,239

platonistic so can you help me out

2770

01:40:59,910 --> 01:40:58,239

because if it's saying that the

2771

01:41:02,709 --> 01:40:59,920

generalities are true what does he mean

2772

01:41:04,310 --> 01:41:02,719

by true where do they exist

2773

01:41:07,910 --> 01:41:04,320

so if you're saying that if i said if i

2774

01:41:10,470 --> 01:41:07,920

said these apples are red

2775

01:41:11,990 --> 01:41:10,480

yeah okay that's a straightforward

2776

01:41:14,629 --> 01:41:12,000

empirical realm

2777

01:41:15,910 --> 01:41:14,639

uh the the the fact that they're really

2778

01:41:18,950 --> 01:41:15,920

lengthy

2779

01:41:20,709 --> 01:41:18,960

right here this this is it and if i said

2780

01:41:22,470 --> 01:41:20,719

these two apples and these two apples

2781

01:41:25,510 --> 01:41:22,480

make four apples

2782

01:41:27,189 --> 01:41:25,520

it's all about what's right here okay

2783

01:41:30,070 --> 01:41:27,199

there's nothing about plato's heaven in

2784

01:41:31,750 --> 01:41:30,080

that it's all right here

2785

01:41:33,910 --> 01:41:31,760

it's just that when i say two plus two

2786

01:41:35,990 --> 01:41:33,920

equals four without reference to apples

2787

01:41:39,109 --> 01:41:36,000

or liters of water or

2788

01:41:39,750 --> 01:41:39,119

or or chocolate biscuit or anything like

2789

01:41:42,310 --> 01:41:39,760

that

2790

01:41:44,390 --> 01:41:42,320

um it's it's a it's kind of abstracted

2791

01:41:47,750 --> 01:41:44,400

from but it's really about

2792

01:41:49,350 --> 01:41:47,760

the physical realm uh uh okay so let me

2793

01:41:52,470 --> 01:41:49,360

see if i get the difference

2794

01:41:55,750 --> 01:41:52,480

okay okay the platonist would say

2795

01:41:58,790 --> 01:41:55,760

you're reflecting some other truer world

2796

01:42:00,550 --> 01:41:58,800

and mill would say you're

2797

01:42:01,910 --> 01:42:00,560

predicated on this world it's true but

2798

01:42:02,709 --> 01:42:01,920

it's dependent on this world not some

2799

01:42:04,550 --> 01:42:02,719

other world

2800

01:42:05,910 --> 01:42:04,560

is that what you mean yeah but mill

2801
01:42:08,070 --> 01:42:05,920
would say and there's no other world

2802
01:42:11,189 --> 01:42:08,080
it's just this one

2803
01:42:13,270 --> 01:42:11,199
um uh the closest i can think of

2804
01:42:14,390 --> 01:42:13,280
for an analogy would be talking about

2805
01:42:16,470 --> 01:42:14,400
colors

2806
01:42:19,189 --> 01:42:16,480
so i mean i can say this apple is red

2807
01:42:21,430 --> 01:42:19,199
that banana is yellow

2808
01:42:23,109 --> 01:42:21,440
but i can say at a slightly more

2809
01:42:24,229 --> 01:42:23,119
abstract level but i'm still here in the

2810
01:42:28,629 --> 01:42:24,239
world

2811
01:42:31,109 --> 01:42:28,639
red plus yellow make orange

2812
01:42:31,830 --> 01:42:31,119
see i'm i'm still here in the imperial

2813
01:42:34,310 --> 01:42:31,840

world

2814

01:42:36,229 --> 01:42:34,320

yeah i see even though i'm not talking

2815

01:42:37,430 --> 01:42:36,239

about a particular apple or a particular

2816

01:42:40,149 --> 01:42:37,440

banana but

2817

01:42:41,270 --> 01:42:40,159

red plus yellow make orange so why is

2818

01:42:42,950 --> 01:42:41,280

that ridiculous

2819

01:42:44,550 --> 01:42:42,960

why is mills what you said that mill is

2820

01:42:46,310 --> 01:42:44,560

laughed at by fraga and many other

2821

01:42:47,910 --> 01:42:46,320

mathematicians

2822

01:42:50,629 --> 01:42:47,920

if the universe if the universe is

2823

01:42:50,950 --> 01:42:50,639

finite if if we thought it was finite if

2824

01:42:53,669 --> 01:42:50,960

we

2825

01:42:54,229 --> 01:42:53,679

just standard big bang the universe is

2826

01:42:59,510 --> 01:42:54,239

finite

2827

01:43:02,790 --> 01:42:59,520

many things in it

2828

01:43:06,310 --> 01:43:02,800

that means there's the biggest number

2829

01:43:10,790 --> 01:43:06,320

and i say oh let's call it

2830

01:43:13,990 --> 01:43:10,800

n biggest number that's it i say well

2831

01:43:15,590 --> 01:43:14,000

what about n plus one do you think n

2832

01:43:17,910 --> 01:43:15,600

plus one is bigger than

2833

01:43:19,350 --> 01:43:17,920

n and of course you'd say of course it

2834

01:43:22,470 --> 01:43:19,360

is

2835

01:43:23,990 --> 01:43:22,480

and mill doesn't know how what's mill

2836

01:43:26,390 --> 01:43:24,000

going to say there's no such numbers

2837

01:43:27,830 --> 01:43:26,400

in plus one you're just making it up i

2838

01:43:32,709 --> 01:43:27,840

see

2839

01:43:33,350 --> 01:43:32,719

believe there are infinitely many prime

2840

01:43:37,510 --> 01:43:33,360

numbers

2841

01:43:40,950 --> 01:43:37,520

know actually what to do with this

2842

01:43:42,790 --> 01:43:40,960

if the universe is finite

2843

01:43:45,189 --> 01:43:42,800

if the world if the universe is infinite

2844

01:43:46,390 --> 01:43:45,199

he got lucky and maybe he can get around

2845

01:43:49,270 --> 01:43:46,400

that problem

2846

01:43:51,350 --> 01:43:49,280

but he's going to have a lot of problems

2847

01:43:54,310 --> 01:43:51,360

why does the universe being finite mean

2848

01:43:56,950 --> 01:43:54,320

that there has to be a finite

2849

01:43:58,390 --> 01:43:56,960

conceptual number because even with the

2850

01:44:04,229 --> 01:43:58,400

if you think of numbers

2851
01:44:04,709 --> 01:44:04,239
uh as ref with reference to the physical

2852
01:44:05,990 --> 01:44:04,719
world

2853
01:44:08,310 --> 01:44:06,000
okay if you think of them as

2854
01:44:10,629 --> 01:44:08,320
independently existing in plato's heaven

2855
01:44:12,629 --> 01:44:10,639
no problem the world could be the world

2856
01:44:15,030 --> 01:44:12,639
could just cease to exist and still

2857
01:44:16,709 --> 01:44:15,040
all all those all those things in plato

2858
01:44:18,870 --> 01:44:16,719
seven would be just fine

2859
01:44:20,870 --> 01:44:18,880
could you still not save it by saying

2860
01:44:21,910 --> 01:44:20,880
for example right now on my desktop i

2861
01:44:24,550 --> 01:44:21,920
have a few items

2862
01:44:25,669 --> 01:44:24,560
and then there's a there's n factorial

2863
01:44:27,830 --> 01:44:25,679

way of

2864

01:44:29,430 --> 01:44:27,840

well not your n but a little little case

2865

01:44:31,669 --> 01:44:29,440

n way factorial way of

2866

01:44:33,669 --> 01:44:31,679

of arranging them and then you just keep

2867

01:44:35,590 --> 01:44:33,679

adding so no matter what even when you

2868

01:44:37,189 --> 01:44:35,600

okay yeah yeah you can keep doing the

2869

01:44:39,669 --> 01:44:37,199

combinatorics

2870

01:44:43,830 --> 01:44:39,679

um ad nauseam but you're still never

2871

01:44:48,070 --> 01:44:45,669

because let's say we okay i'm just

2872

01:44:50,390 --> 01:44:48,080

trying to grapple with this so let's say

2873

01:44:51,270 --> 01:44:50,400

we come up with large n so that's your n

2874

01:44:54,310 --> 01:44:51,280

then i say

2875

01:44:55,270 --> 01:44:54,320

well let's still permute that a bit more

2876

01:44:57,590 --> 01:44:55,280

and then we get n

2877

01:44:58,790 --> 01:44:57,600

factorial the big n factorial and then

2878

01:45:00,070 --> 01:44:58,800

we say well that's a maximum then we

2879

01:45:02,550 --> 01:45:00,080

just factorial again and we still get

2880

01:45:04,790 --> 01:45:02,560

infinity so we still get any possible

2881

01:45:08,070 --> 01:45:04,800

number can be reached with this number

2882

01:45:10,629 --> 01:45:08,080

they have to be tied somehow to the

2883

01:45:11,510 --> 01:45:10,639

empirical world remember he's a staunch

2884

01:45:14,310 --> 01:45:11,520

imperial

2885

01:45:14,950 --> 01:45:14,320

empiricist and he doesn't like platonism

2886

01:45:18,229 --> 01:45:14,960

he doesn't like

2887

01:45:21,830 --> 01:45:18,239

abstract entities so um if i had

2888

01:45:25,669 --> 01:45:21,840

um if i have two apples

2889

01:45:27,910 --> 01:45:25,679

if i have two apples i can say okay one

2890

01:45:29,590 --> 01:45:27,920

two and then i can bunch them together

2891

01:45:30,709 --> 01:45:29,600

and say i can say now that's a third

2892

01:45:32,790 --> 01:45:30,719

object

2893

01:45:34,709 --> 01:45:32,800

okay okay so he would have a he would

2894

01:45:36,790 --> 01:45:34,719

have a problem with possibilities

2895

01:45:37,750 --> 01:45:36,800

the reason why yeah yeah yeah yeah

2896

01:45:39,109 --> 01:45:37,760

that's right because

2897

01:45:41,270 --> 01:45:39,119

they have to be concrete i have to be

2898

01:45:41,990 --> 01:45:41,280

measuring four apples i could say that

2899

01:45:43,430 --> 01:45:42,000

possibly

2900

01:45:44,709 --> 01:45:43,440

you can arrange them in eight but that's

2901
01:45:45,109 --> 01:45:44,719
because there exists something else

2902
01:45:47,910 --> 01:45:45,119
that's

2903
01:45:49,350 --> 01:45:47,920
i can concretize is eight sure okay okay

2904
01:45:50,629 --> 01:45:49,360
okay that's right

2905
01:45:52,870 --> 01:45:50,639
okay i get it i get it now i'm going to

2906
01:45:53,350 --> 01:45:52,880
read the last part of of your book which

2907
01:45:56,070 --> 01:45:53,360
i found

2908
01:45:56,470 --> 01:45:56,080
wonderful you say this my suggestion is

2909
01:45:58,709 --> 01:45:56,480
very

2910
01:46:00,070 --> 01:45:58,719
simple distant correlations are caused

2911
01:46:02,790 --> 01:46:00,080
by the laws of nature

2912
01:46:04,550 --> 01:46:02,800
i realize this almost sounds silly one

2913
01:46:05,750 --> 01:46:04,560

wants to say the correlations are the

2914

01:46:07,830 --> 01:46:05,760

laws of nature

2915

01:46:09,109 --> 01:46:07,840

but this if you recall in the preceding

2916

01:46:10,950 --> 01:46:09,119

chapters is not true

2917

01:46:13,030 --> 01:46:10,960

a law of nature is an independently

2918

01:46:14,629 --> 01:46:13,040

existing abstract entity a thing

2919

01:46:16,470 --> 01:46:14,639

in its own right which is responsible

2920

01:46:18,470 --> 01:46:16,480

for physical regularities

2921

01:46:19,990 --> 01:46:18,480

okay now this was in regards to

2922

01:46:23,270 --> 01:46:20,000

something called

2923

01:46:24,550 --> 01:46:23,280

the entanglement of bells inequality but

2924

01:46:26,390 --> 01:46:24,560

we can forget about that what you're

2925

01:46:30,390 --> 01:46:26,400

suggesting is that the physical laws

2926

01:46:31,830 --> 01:46:30,400

themselves are akin to entities

2927

01:46:33,350 --> 01:46:31,840

and i haven't heard that expressed

2928

01:46:34,149 --> 01:46:33,360

before and i think that's going to take

2929

01:46:36,950 --> 01:46:34,159

me maybe

2930

01:46:37,990 --> 01:46:36,960

maybe weeks or months to to fully

2931

01:46:39,990 --> 01:46:38,000

apprehend

2932

01:46:41,030 --> 01:46:40,000

and and perhaps even contribute some of

2933

01:46:42,709 --> 01:46:41,040

my own ideas to

2934

01:46:44,950 --> 01:46:42,719

it's a it's a brazen statement and i'm

2935

01:46:49,109 --> 01:46:44,960

i'm a fan of audacity so

2936

01:46:50,870 --> 01:46:49,119

can you expound on this yeah um

2937

01:46:52,709 --> 01:46:50,880

i'm not sure i i wrote that quite a

2938

01:46:55,350 --> 01:46:52,719

while ago and my views on quantum

2939

01:46:57,750 --> 01:46:55,360
mechanics are constantly in flux

2940

01:46:58,550 --> 01:46:57,760
so i'm not sure i would uh agree with

2941

01:47:00,470 --> 01:46:58,560
that

2942

01:47:03,350 --> 01:47:00,480
in particular however with the general

2943

01:47:05,189 --> 01:47:03,360
idea i certainly still

2944

01:47:06,709 --> 01:47:05,199
i still think that is true so let me

2945

01:47:09,350 --> 01:47:06,719
explain um

2946

01:47:10,709 --> 01:47:09,360
what i'm trying to get at for most

2947

01:47:13,830 --> 01:47:10,719
philosophers

2948

01:47:16,070 --> 01:47:13,840
they really really like david hume

2949

01:47:17,030 --> 01:47:16,080
david hume has a view about the nature

2950

01:47:19,510 --> 01:47:17,040
of causation

2951
01:47:21,590 --> 01:47:19,520
and the nature of laws of nature which

2952
01:47:23,590 --> 01:47:21,600
is very empiricist

2953
01:47:25,189 --> 01:47:23,600
and what it really amounts to is that a

2954
01:47:28,629 --> 01:47:25,199
law of nature is nothing but

2955
01:47:33,189 --> 01:47:28,639
a an empirical regularity so if i say

2956
01:47:35,510 --> 01:47:33,199
um um all ravens are black

2957
01:47:36,390 --> 01:47:35,520
or it's a law of nature that ravens are

2958
01:47:39,590 --> 01:47:36,400
black

2959
01:47:43,109 --> 01:47:39,600
what it just means is that um uh

2960
01:47:46,310 --> 01:47:43,119
every time i see a raven it's black

2961
01:47:49,270 --> 01:47:46,320
that's it that's all there is to it um

2962
01:47:50,870 --> 01:47:49,280
it's just away with causation yeah

2963
01:47:55,030 --> 01:47:50,880

causation is like that too

2964

01:47:58,629 --> 01:47:55,040

um fire is fire feels hot every time i

2965

01:48:01,750 --> 01:47:58,639

stick my hand in a fire it feels hot

2966

01:48:03,590 --> 01:48:01,760

the heat doesn't cause the pain it's

2967

01:48:05,990 --> 01:48:03,600

just correlated with the pain

2968

01:48:07,830 --> 01:48:06,000

okay every time i stick my hand in the

2969

01:48:10,629 --> 01:48:07,840

fire i feel pain

2970

01:48:12,550 --> 01:48:10,639

um it's just it's just this regularity

2971

01:48:13,510 --> 01:48:12,560

there's nothing more to causation than

2972

01:48:15,669 --> 01:48:13,520

the regularity

2973

01:48:17,590 --> 01:48:15,679

there's nothing more to a law of nature

2974

01:48:21,350 --> 01:48:17,600

than irregularity

2975

01:48:23,030 --> 01:48:21,360

so if i said explain why this raven is

2976

01:48:26,629 --> 01:48:23,040

black

2977

01:48:27,830 --> 01:48:26,639

hume would have to say um all ravens are

2978

01:48:33,910 --> 01:48:27,840

black

2979

01:48:35,910 --> 01:48:33,920

that's the only explanation he can give

2980

01:48:37,350 --> 01:48:35,920

his laws of nature are really just

2981

01:48:40,709 --> 01:48:37,360

summaries of

2982

01:48:42,310 --> 01:48:40,719

what we experience they can't really

2983

01:48:43,910 --> 01:48:42,320

explain anything they don't have any

2984

01:48:45,990 --> 01:48:43,920

explanations

2985

01:48:47,430 --> 01:48:46,000

they're like data points and then

2986

01:48:50,950 --> 01:48:47,440

generalizations

2987

01:48:54,070 --> 01:48:50,960

and then and then the law is nothing but

2988

01:48:56,790 --> 01:48:54,080

uh a summary of the data points okay

2989

01:48:57,990 --> 01:48:56,800

yeah there's no there's no explanatory

2990

01:48:59,910 --> 01:48:58,000

power there

2991

01:49:01,750 --> 01:48:59,920

okay now uh if you're a staunch

2992

01:49:04,950 --> 01:49:01,760

empiricist you're happy with that

2993

01:49:07,030 --> 01:49:04,960

you say science is in the business of of

2994

01:49:08,790 --> 01:49:07,040

organizing experience and predicting

2995

01:49:09,030 --> 01:49:08,800

experience but we're not in the business

2996

01:49:12,229 --> 01:49:09,040

of

2997

01:49:16,070 --> 01:49:12,239

actually explaining things okay

2998

01:49:19,350 --> 01:49:16,080

get explanation that's not our business

2999

01:49:21,030 --> 01:49:19,360

okay um i hate that view i think we're

3000

01:49:22,310 --> 01:49:21,040

in the business of explaining and

3001
01:49:24,310 --> 01:49:22,320
understanding

3002
01:49:26,310 --> 01:49:24,320
and stuff like that so a lot of

3003
01:49:30,310 --> 01:49:26,320
hard-nosed empiricists would call me

3004
01:49:34,149 --> 01:49:30,320
oh it's just mushy sentimental nonsense

3005
01:49:36,229 --> 01:49:34,159
but i'm sticking to my sentimentality

3006
01:49:38,390 --> 01:49:36,239
and i want understanding and i want

3007
01:49:41,589 --> 01:49:38,400
explanations and so on

3008
01:49:42,629 --> 01:49:41,599
so here's an alternative view of laws of

3009
01:49:48,229 --> 01:49:42,639
nature

3010
01:49:49,510 --> 01:49:48,239
they're actually connections between

3011
01:49:52,070 --> 01:49:49,520
properties

3012
01:49:53,109 --> 01:49:52,080
so i'll stick to the raven example even

3013
01:49:55,270 --> 01:49:53,119

though

3014

01:49:57,189 --> 01:49:55,280

it's it's probably a poor example but

3015

01:50:00,470 --> 01:49:57,199

it's very easy to understand

3016

01:50:03,030 --> 01:50:00,480

and illustrate so when i say uh

3017

01:50:05,510 --> 01:50:03,040

so there's properties raven there's the

3018

01:50:07,270 --> 01:50:05,520

property of ravenhood

3019

01:50:09,030 --> 01:50:07,280

okay that is the property of being a

3020

01:50:11,270 --> 01:50:09,040

raven being a member of a

3021

01:50:13,510 --> 01:50:11,280

set of ravens is ravenhood sure okay

3022

01:50:17,109 --> 01:50:13,520

okay and there's the property of

3023

01:50:19,430 --> 01:50:17,119

being black okay okay so the law of

3024

01:50:21,510 --> 01:50:19,440

nature is not the regularity

3025

01:50:22,790 --> 01:50:21,520

that all ravens are black the law of

3026
01:50:26,550 --> 01:50:22,800
nature is

3027
01:50:28,950 --> 01:50:26,560
that the property of being a raven

3028
01:50:30,950 --> 01:50:28,960
is connected to the property of being

3029
01:50:33,270 --> 01:50:30,960
black

3030
01:50:34,229 --> 01:50:33,280
and that then that that's the law of

3031
01:50:38,070 --> 01:50:34,239
nature

3032
01:50:41,350 --> 01:50:38,080
regularity

3033
01:50:43,510 --> 01:50:41,360
that all ravens are black it's the law

3034
01:50:46,149 --> 01:50:43,520
that explains why the raven is black why

3035
01:50:47,669 --> 01:50:46,159
is why is this raven black

3036
01:50:50,629 --> 01:50:47,679
it's a raven it has the property of

3037
01:50:53,430 --> 01:50:50,639
ravenhood and that necessitates

3038
01:50:54,070 --> 01:50:53,440

the property of blackness okay okay

3039

01:50:57,750 --> 01:50:54,080

that's

3040

01:51:00,709 --> 01:50:57,760

sounds like

3041

01:51:01,270 --> 01:51:00,719

hokey nonsense but the thing is you're

3042

01:51:03,510 --> 01:51:01,280

actually

3043

01:51:04,870 --> 01:51:03,520

um introducing something new in the

3044

01:51:08,629 --> 01:51:04,880

world

3045

01:51:12,229 --> 01:51:08,639

um over and above the mirror regularity

3046

01:51:14,149 --> 01:51:12,239

and that has explanatory power

3047

01:51:15,910 --> 01:51:14,159

okay so the way that i'm thinking about

3048

01:51:17,750 --> 01:51:15,920

this is that there's a set of all black

3049

01:51:18,629 --> 01:51:17,760

objects and then ravens are a subset of

3050

01:51:21,109 --> 01:51:18,639

that

3051
01:51:21,830 --> 01:51:21,119
but i don't see what what's different

3052
01:51:24,790 --> 01:51:21,840
than what

3053
01:51:26,950 --> 01:51:24,800
a human is saying there'll be a property

3054
01:51:29,430 --> 01:51:26,960
a property of ravenhood

3055
01:51:30,149 --> 01:51:29,440
and a property of blackness and it's not

3056
01:51:34,629 --> 01:51:30,159
just

3057
01:51:36,470 --> 01:51:34,639
a coincidence but but there's a kind of

3058
01:51:38,149 --> 01:51:36,480
what's sometimes called a gnomonic

3059
01:51:41,189 --> 01:51:38,159
connection

3060
01:51:43,910 --> 01:51:41,199
uh this is like a physical necessity

3061
01:51:44,870 --> 01:51:43,920
uh between the property of ravenhood and

3062
01:51:48,390 --> 01:51:44,880
the property

3063
01:51:50,310 --> 01:51:48,400

of uh blackness there's a

3064

01:51:51,589 --> 01:51:50,320

necessity between the property of

3065

01:51:55,189 --> 01:51:51,599

electron hood

3066

01:51:57,669 --> 01:51:55,199

and negative charge okay

3067

01:51:59,109 --> 01:51:57,679

okay it's not just it's not just a an

3068

01:52:02,310 --> 01:51:59,119

accidental correlation

3069

01:52:04,950 --> 01:52:02,320

there's something deep yeah

3070

01:52:06,790 --> 01:52:04,960

i guess where i'm having trouble is i'm

3071

01:52:07,830 --> 01:52:06,800

for an electron it's like we define it

3072

01:52:09,910 --> 01:52:07,840

as that which has

3073

01:52:11,830 --> 01:52:09,920

this if we found an electron with a with

3074

01:52:13,270 --> 01:52:11,840

negative two instead of negative one

3075

01:52:15,030 --> 01:52:13,280

we wouldn't call it an electron we call

3076

01:52:18,149 --> 01:52:15,040

it something else

3077

01:52:18,550 --> 01:52:18,159

probably that's true um but that but

3078

01:52:26,070 --> 01:52:18,560

that's

3079

01:52:28,149 --> 01:52:26,080

course all of this is fallible

3080

01:52:29,589 --> 01:52:28,159

when i say all ravens are black it's a

3081

01:52:31,910 --> 01:52:29,599

law of nature that rage

3082

01:52:33,430 --> 01:52:31,920

could be mistaken we could we could find

3083

01:52:35,510 --> 01:52:33,440

in madagascar

3084

01:52:37,910 --> 01:52:35,520

you know ravens that are uh green or

3085

01:52:39,990 --> 01:52:37,920

something like that

3086

01:52:41,270 --> 01:52:40,000

but you're saying okay hypothetically so

3087

01:52:42,709 --> 01:52:41,280

i'm trying to i'm trying to understand

3088

01:52:44,629 --> 01:52:42,719

this so hypothetically you're saying

3089

01:52:45,990 --> 01:52:44,639

there that a property of ravenhood is

3090

01:52:48,790 --> 01:52:46,000

that it's black

3091

01:52:49,109 --> 01:52:48,800

okay okay so what does this have to do

3092

01:52:52,310 --> 01:52:49,119

with

3093

01:52:55,830 --> 01:52:52,320

causality

3094

01:52:57,830 --> 01:52:55,840

uh okay so um

3095

01:52:59,990 --> 01:52:57,840

let me let me back up and make and make

3096

01:53:01,830 --> 01:53:00,000

this view of laws of nature a bit more

3097

01:53:05,109 --> 01:53:01,840

plausible

3098

01:53:07,270 --> 01:53:05,119

the hume view so you see hume view it's

3099

01:53:08,310 --> 01:53:07,280

just a regularity that all ravens are

3100

01:53:10,950 --> 01:53:08,320

black

3101
01:53:11,990 --> 01:53:10,960
now let us suppose you're you're doing

3102
01:53:15,030 --> 01:53:12,000
this video from your

3103
01:53:16,870 --> 01:53:15,040
house right or your apartment

3104
01:53:19,669 --> 01:53:16,880
let's suppose that every human being

3105
01:53:23,430 --> 01:53:19,679
who's ever been in that apartment

3106
01:53:27,189 --> 01:53:23,440
has worn socks okay

3107
01:53:29,830 --> 01:53:27,199
yeah so is it a law of nature

3108
01:53:30,470 --> 01:53:29,840
that everyone who enters kurt's

3109
01:53:33,589 --> 01:53:30,480
apartment

3110
01:53:35,270 --> 01:53:33,599
wears socks of nature

3111
01:53:38,390 --> 01:53:35,280
in this house it is it doesn't sound

3112
01:53:40,310 --> 01:53:38,400
like hello nature but it's a regularity

3113
01:53:43,350 --> 01:53:40,320

and that apartment might be blown up

3114

01:53:45,589 --> 01:53:43,360

tomorrow so that in its entire history

3115

01:53:47,990 --> 01:53:45,599

it was always true every time someone

3116

01:53:50,709 --> 01:53:48,000

entered that apartment they wore socks

3117

01:53:51,589 --> 01:53:50,719

see oh that's not a law of nature that's

3118

01:53:53,750 --> 01:53:51,599

just one of those

3119

01:53:55,430 --> 01:53:53,760

accidents how can i distinguish a

3120

01:53:58,390 --> 01:53:55,440

genuine law of nature

3121

01:53:59,669 --> 01:53:58,400

which is irregularity for hume from

3122

01:54:03,109 --> 01:53:59,679

these accidental

3123

01:54:05,750 --> 01:54:03,119

things hume has no answer

3124

01:54:07,750 --> 01:54:05,760

there's no way you can separate the two

3125

01:54:07,990 --> 01:54:07,760

but if you believe that laws of nature

3126

01:54:11,350 --> 01:54:08,000

are

3127

01:54:14,310 --> 01:54:11,360

properties then i would say it's it's

3128

01:54:14,950 --> 01:54:14,320

the law of nature uh about ravens being

3129

01:54:17,430 --> 01:54:14,960

black

3130

01:54:19,189 --> 01:54:17,440

the property of ravenhood necessitates

3131

01:54:22,229 --> 01:54:19,199

the property of blackness

3132

01:54:25,109 --> 01:54:22,239

okay however the property of entering

3133

01:54:26,470 --> 01:54:25,119

kurt's apartment does not necessitate

3134

01:54:28,310 --> 01:54:26,480

the property

3135

01:54:29,750 --> 01:54:28,320

where saw that was just contingent that

3136

01:54:32,310 --> 01:54:29,760

was just that's right

3137

01:54:33,589 --> 01:54:32,320

and so now you know still uh empirical

3138

01:54:35,350 --> 01:54:33,599

science has to discover

3139

01:54:37,430 --> 01:54:35,360

what are the accidental regularities

3140

01:54:40,390 --> 01:54:37,440

versus one or the laws

3141

01:54:42,310 --> 01:54:40,400

that can be really hard but the thing is

3142

01:54:43,910 --> 01:54:42,320

there is a metaphysical difference

3143

01:54:45,750 --> 01:54:43,920

between the two

3144

01:54:47,030 --> 01:54:45,760

and hume hasn't got a metaphysical

3145

01:54:49,270 --> 01:54:47,040

difference between the two

3146

01:54:52,070 --> 01:54:49,280

it's just wow it's just a big

3147

01:54:55,350 --> 01:54:54,229

okay so now what does that have to do

3148

01:54:58,950 --> 01:54:55,360

with

3149

01:55:01,270 --> 01:54:58,960

laws of nature

3150

01:55:02,149 --> 01:55:01,280

so it is the law of nature that a's our

3151

01:55:09,589 --> 01:55:02,159

b's

3152

01:55:11,030 --> 01:55:09,599

yes yeah what i'm curious about what i

3153

01:55:11,830 --> 01:55:11,040

found most fascinating was that it was

3154

01:55:15,109 --> 01:55:11,840

as if you're saying

3155

01:55:17,430 --> 01:55:15,119

e equals m c squared is it's like an

3156

01:55:18,550 --> 01:55:17,440

object itself that comes in and

3157

01:55:21,189 --> 01:55:18,560

influences

3158

01:55:23,350 --> 01:55:21,199

the world yeah yeah um it's hard to

3159

01:55:25,910 --> 01:55:23,360

figure out what

3160

01:55:27,189 --> 01:55:25,920

what the law of nature would be i mean i

3161

01:55:30,310 --> 01:55:27,199

can say it's a law of nature

3162

01:55:33,669 --> 01:55:30,320

e equals mc square um

3163

01:55:35,589 --> 01:55:33,679

it may be hard to figure out uh

3164

01:55:37,830 --> 01:55:35,599

putting it in these metaphysical terms

3165

01:55:40,629 --> 01:55:37,840

the property of energy and how it's

3166

01:55:41,350 --> 01:55:40,639

related to the property of mass and the

3167

01:55:43,830 --> 01:55:41,360

property of

3168

01:55:45,510 --> 01:55:43,840

speed of light and stuff like that but

3169

01:55:47,430 --> 01:55:45,520

they'll

3170

01:55:48,629 --> 01:55:47,440

on this view there would be such a

3171

01:55:54,790 --> 01:55:48,639

relation

3172

01:55:55,589 --> 01:55:54,800

energy as a property and mass as a

3173

01:55:56,950 --> 01:55:55,599

property

3174

01:56:01,430 --> 01:55:56,960

have you heard of lee smullen's

3175

01:56:03,990 --> 01:56:01,440

principle of precedence

3176

01:56:05,750 --> 01:56:04,000

i know him well and i have heard of it

3177

01:56:08,950 --> 01:56:05,760

and i have forgotten what it is

3178

01:56:10,550 --> 01:56:08,960

okay it's it's something like that

3179

01:56:12,229 --> 01:56:10,560

one of the reasons the electron

3180

01:56:14,629 --> 01:56:12,239

collapses in the way that it does

3181

01:56:15,350 --> 01:56:14,639

or that sorry this explains decoherence

3182

01:56:18,390 --> 01:56:15,360

i believe

3183

01:56:19,189 --> 01:56:18,400

that the reason why a large object

3184

01:56:21,750 --> 01:56:19,199

collapses

3185

01:56:22,950 --> 01:56:21,760

is because by chance somewhere else in

3186

01:56:25,189 --> 01:56:22,960

the universe a large

3187

01:56:25,990 --> 01:56:25,199

object has collapsed in a similar manner

3188

01:56:27,750 --> 01:56:26,000

and it's

3189

01:56:29,430 --> 01:56:27,760

felt at some other part of the universe

3190

01:56:30,550 --> 01:56:29,440

the patterns are felt and so they

3191

01:56:32,390 --> 01:56:30,560

collapse similarly

3192

01:56:34,149 --> 01:56:32,400

and that explains some of the

3193

01:56:36,870 --> 01:56:34,159

regularities to use that word

3194

01:56:38,229 --> 01:56:36,880

okay that's the principle um i i don't

3195

01:56:41,830 --> 01:56:38,239

know what to say about that

3196

01:56:43,830 --> 01:56:41,840

um i should i i just gonna i'm just

3197

01:56:45,189 --> 01:56:43,840

gonna have to go and and

3198

01:56:47,430 --> 01:56:45,199

right right right right well what i was

3199

01:56:48,790 --> 01:56:47,440

wondering is i'm curious if that merges

3200

01:56:50,950 --> 01:56:48,800

both platonists

3201

01:56:52,790 --> 01:56:50,960

and non-platonist because it's as if

3202

01:56:53,910 --> 01:56:52,800

it's formulating something that's true

3203

01:56:55,990 --> 01:56:53,920

and putting it into this

3204

01:56:57,270 --> 01:56:56,000

world that we now look to to represent

3205

01:56:59,109 --> 01:56:57,280

reality

3206

01:57:00,870 --> 01:56:59,119

but it was it was being invented at some

3207

01:57:01,270 --> 01:57:00,880

point yeah invention and discovery

3208

01:57:04,390 --> 01:57:01,280

that's

3209

01:57:07,510 --> 01:57:04,400

put it i'm

3210

01:57:08,950 --> 01:57:07,520

inclined to think it's not because as i

3211

01:57:11,990 --> 01:57:08,960

said i know him quite well

3212

01:57:12,950 --> 01:57:12,000

and we argue over the issue of platonism

3213

01:57:16,229 --> 01:57:12,960

all the time

3214

01:57:17,990 --> 01:57:16,239

he's very antiplatenuous yeah

3215

01:57:19,669 --> 01:57:18,000

um many are physicists generally

3216

01:57:20,070 --> 01:57:19,679

antiplateauous and mathematicians are

3217

01:57:23,189 --> 01:57:20,080

pro

3218

01:57:26,229 --> 01:57:23,199

no no they're a mixed bag on it

3219

01:57:27,910 --> 01:57:26,239

they're all over the place most most

3220

01:57:29,270 --> 01:57:27,920

working physicists i would say don't

3221

01:57:31,830 --> 01:57:29,280

have strong views

3222

01:57:33,270 --> 01:57:31,840

about the nature of mathematics that for

3223

01:57:35,510 --> 01:57:33,280

them it's a tool

3224

01:57:37,510 --> 01:57:35,520

they use it they just sort of grab it

3225

01:57:39,589 --> 01:57:37,520

out of the tool bag use what they want

3226

01:57:41,350 --> 01:57:39,599

and don't have philosophical views about

3227

01:57:42,709 --> 01:57:41,360

it they if you if they work in

3228

01:57:45,750 --> 01:57:42,719

fundamental physics

3229

01:57:47,510 --> 01:57:45,760

as lee smalling does he has very strong

3230

01:57:48,870 --> 01:57:47,520

philosophical views about the nature of

3231

01:57:51,589 --> 01:57:48,880

physics

3232

01:57:52,070 --> 01:57:51,599

you know is he a realist is he you know

3233

01:57:54,149 --> 01:57:52,080

what

3234

01:57:55,589 --> 01:57:54,159

and so on he's unquestionably a

3235

01:57:56,390 --> 01:57:55,599

scientific realist when it comes to

3236

01:57:58,229 --> 01:57:56,400

physics

3237

01:58:00,709 --> 01:57:58,239

but he's an anti-realist when it comes

3238

01:58:04,070 --> 01:58:00,719

to mathematics interesting

3239

01:58:07,350 --> 01:58:04,080

same with uh carlo rodelli

3240

01:58:11,030 --> 01:58:07,360

who uh uh smolin and roveli uh

3241

01:58:12,870 --> 01:58:11,040

often work together uh ravelli's

3242

01:58:14,950 --> 01:58:12,880

i've gotten to know roveli quite well

3243

01:58:17,990 --> 01:58:14,960

because he now lives in london here

3244

01:58:20,149 --> 01:58:18,000

he's my name cool um

3245

01:58:21,270 --> 01:58:20,159

and he's uh he's unquestionably a

3246

01:58:24,709 --> 01:58:21,280

scientific realist

3247

01:58:28,149 --> 01:58:24,719

when it comes to physics um

3248

01:58:31,030 --> 01:58:28,159

but hostile to platonism

3249

01:58:31,990 --> 01:58:31,040

but this is true for both ravelli and

3250

01:58:33,910 --> 01:58:32,000

smolin

3251

01:58:36,070 --> 01:58:33,920

they can't quite put their finger on

3252

01:58:37,910 --> 01:58:36,080

what it is they dislike about platonism

3253

01:58:40,629 --> 01:58:37,920

so much

3254

01:58:41,910 --> 01:58:40,639

so they're not winning the argument yet

3255

01:58:43,589 --> 01:58:41,920

so it's just an

3256

01:58:45,270 --> 01:58:43,599

a feeling that they have but they

3257

01:58:46,790 --> 01:58:45,280

dislike it because it has a mystical

3258

01:58:50,070 --> 01:58:46,800

quality to it

3259

01:58:51,910 --> 01:58:50,080

not sure okay

3260

01:59:01,350 --> 01:58:51,920

jim thank you again so much i appreciate

3261

01:59:05,669 --> 01:59:03,030

do you think we can derive an is from an

3262

01:59:09,030 --> 01:59:05,679

odds or an odd from an is

3263

01:59:12,310 --> 01:59:09,040

that's a really hard question uh

3264

01:59:15,109 --> 01:59:12,320

the simple answer is no

3265

01:59:17,270 --> 01:59:15,119

um because one is an imperative sentence

3266

01:59:19,430 --> 01:59:17,280

and the other's a declarative sentence

3267

01:59:20,629 --> 01:59:19,440

i mean just logically grammatically

3268

01:59:22,870 --> 01:59:20,639

they're they're going to be

3269

01:59:24,870 --> 01:59:22,880

different kinds of things we can come

3270

01:59:32,629 --> 01:59:24,880

close

3271

01:59:34,790 --> 01:59:32,639

let me let me actually back up and talk

3272

01:59:38,550 --> 01:59:34,800

about it in a very indirect way

3273

01:59:40,310 --> 01:59:38,560

okay um there's a traditional view

3274

01:59:42,870 --> 01:59:40,320

that there's a distinction between facts

3275

01:59:45,030 --> 01:59:42,880

and values it's the same thing

3276

01:59:47,910 --> 01:59:45,040

there's just a cleavage between the two

3277

01:59:51,430 --> 01:59:47,920

and science is totally concerned

3278

01:59:54,070 --> 01:59:51,440

with the facts and morality and

3279

01:59:56,870 --> 01:59:54,080

maybe religion and and other things

3280

02:00:00,870 --> 01:59:56,880

could be concerned with values

3281

02:00:04,390 --> 02:00:00,880

the trouble with that view is that um

3282

02:00:07,350 --> 02:00:04,400

too many things in science it's messy

3283

02:00:09,990 --> 02:00:07,360

um there are all kinds of values even in

3284

02:00:13,189 --> 02:00:10,000

just doing science itself

3285

02:00:15,830 --> 02:00:13,199

so for instance i can tell you about how

3286

02:00:18,070 --> 02:00:15,840

to find out an infinitude of facts

3287

02:00:18,950 --> 02:00:18,080

and maybe one of them you might be

3288

02:00:21,990 --> 02:00:18,960

interested in

3289

02:00:23,109 --> 02:00:22,000

so what is the distance between the tip

3290

02:00:26,149 --> 02:00:23,119

of my nose

3291

02:00:27,589 --> 02:00:26,159

and the center of mass of the sun now

3292

02:00:29,189 --> 02:00:27,599

i'm going to move

3293

02:00:31,270 --> 02:00:29,199

no i can ask you about the center of

3294

02:00:31,990 --> 02:00:31,280

mass of your nose and the center of mass

3295

02:00:33,910 --> 02:00:32,000

of that guy

3296

02:00:35,510 --> 02:00:33,920

on the street from his nose to the

3297

02:00:37,830 --> 02:00:35,520

center of mass of the moon

3298

02:00:39,030 --> 02:00:37,840

you could measure all of those things

3299

02:00:40,790 --> 02:00:39,040

and they would all be

3300

02:00:42,229 --> 02:00:40,800

factually correct if you measured

3301

02:00:45,350 --> 02:00:42,239

correctly

3302

02:00:47,430 --> 02:00:45,360

but after one or two of these you

3303

02:00:48,390 --> 02:00:47,440

that's enough and you're going to make a

3304

02:00:50,310 --> 02:00:48,400

value choice

3305

02:00:51,430 --> 02:00:50,320

that pursuing more of these is not

3306

02:00:52,709 --> 02:00:51,440

worthwhile

3307

02:00:55,189 --> 02:00:52,719

and that there are other things that are

3308

02:00:56,149 --> 02:00:55,199

more valuable so all facts aren't on a

3309

02:00:59,270 --> 02:00:56,159

par

3310

02:01:01,510 --> 02:00:59,280

some are clearly better than others

3311

02:01:03,430 --> 02:01:01,520

and and you as a scientist are going to

3312

02:01:04,390 --> 02:01:03,440

make these kinds of value judgments all

3313

02:01:05,990 --> 02:01:04,400

the time

3314

02:01:07,589 --> 02:01:06,000

and you're going to make methodological

3315

02:01:08,550 --> 02:01:07,599

value judgments which are even more

3316

02:01:10,310 --> 02:01:08,560

important

3317

02:01:11,669 --> 02:01:10,320

like you're going to say okay i've got

3318

02:01:14,470 --> 02:01:11,679

two theories here which one

3319

02:01:16,470 --> 02:01:14,480

should i believe oh this one's simpler

3320

02:01:19,030 --> 02:01:16,480

well that's actually a value judgment

3321

02:01:19,990 --> 02:01:19,040

that simplicity is to be preferred to

3322

02:01:21,510 --> 02:01:20,000

complexity

3323

02:01:23,510 --> 02:01:21,520

when you're talking about scientific

3324

02:01:25,030 --> 02:01:23,520

theories so right away

3325

02:01:26,470 --> 02:01:25,040

so all right so we've got these two

3326

02:01:27,510 --> 02:01:26,480

theories i choose this one on the basis

3327

02:01:30,149 --> 02:01:27,520

of simplicity

3328

02:01:31,430 --> 02:01:30,159

and now now i say oh well the facts

3329

02:01:33,109 --> 02:01:31,440

according to this theory

3330

02:01:35,270 --> 02:01:33,119

are different than the facts according

3331

02:01:37,750 --> 02:01:35,280

to that theory what are the facts

3332

02:01:40,149 --> 02:01:37,760

well i've just decided on this theory so

3333

02:01:42,790 --> 02:01:40,159

now i found out what the facts are

3334

02:01:43,350 --> 02:01:42,800

but it is it is value-laden in the sense

3335

02:01:46,070 --> 02:01:43,360

that i've

3336

02:01:47,270 --> 02:01:46,080

chosen this theory on the basis of its

3337

02:01:50,550 --> 02:01:47,280

simplicity

3338

02:01:53,910 --> 02:01:50,560

so you see how the values begin to

3339

02:01:56,390 --> 02:01:53,920

to to infect the um the facts

3340

02:01:58,310 --> 02:01:56,400

themselves and once you get into fairly

3341

02:02:00,229 --> 02:01:58,320

sophisticated science

3342

02:02:02,149 --> 02:02:00,239

and met and you're making methodological

3343

02:02:04,390 --> 02:02:02,159

choices about how to pursue

3344

02:02:05,990 --> 02:02:04,400

this you'll find that there's all kinds

3345

02:02:08,550 --> 02:02:06,000

of values that are getting

3346

02:02:10,070 --> 02:02:08,560

tied up in there and it's very very hard

3347

02:02:12,790 --> 02:02:10,080

to disentangle them

3348

02:02:14,629 --> 02:02:12,800

so in essence no it's not possible to

3349

02:02:17,750 --> 02:02:14,639

derive an art from an is

3350

02:02:20,470 --> 02:02:17,760

that's right you can't on the other hand

3351

02:02:21,510 --> 02:02:20,480

the more important question is can you

3352

02:02:24,629 --> 02:02:21,520

disentangle

3353

02:02:26,310 --> 02:02:24,639

your oughts from your is-is and the

3354

02:02:29,109 --> 02:02:26,320

answer to that question is i think

3355

02:02:30,950 --> 02:02:29,119

no and so now making a big fuss about

3356

02:02:34,310 --> 02:02:30,960

the distinction between israel

3357

02:02:35,990 --> 02:02:34,320

is probably a bad idea so when you're

3358

02:02:39,109 --> 02:02:36,000

looking at another scientist

3359

02:02:41,270 --> 02:02:39,119

don't ask just give me the facts

3360

02:02:42,709 --> 02:02:41,280

because a good scientist wouldn't be

3361

02:02:44,470 --> 02:02:42,719

able to

3362

02:02:45,990 --> 02:02:44,480

who had a sophisticated view of this

3363

02:02:48,709 --> 02:02:46,000

issue would not be able to tell

3364

02:02:49,270 --> 02:02:48,719

you what are the clear facts and how

3365

02:02:52,470 --> 02:02:49,280

much

3366

02:02:53,270 --> 02:02:52,480

the facts as presented in fact depended

3367

02:02:56,709 --> 02:02:53,280

upon

3368

02:02:58,550 --> 02:02:56,719

value decisions made along the history

3369

02:03:00,950 --> 02:02:58,560

the whole history of science

3370

02:03:01,589 --> 02:03:00,960

up to that point now that doesn't mean

3371

02:03:05,669 --> 02:03:01,599

you can

3372

02:03:08,310 --> 02:03:05,679

just say well i'm a racist

3373

02:03:10,310 --> 02:03:08,320

i'm proud of my values and i'm gonna and

3374

02:03:11,589 --> 02:03:10,320

i'm gonna let that guide my research you

3375

02:03:13,189 --> 02:03:11,599

know from here on in

3376

02:03:15,109 --> 02:03:13,199

you can't get away with that stuff

3377

02:03:17,270 --> 02:03:15,119

though lots of people try

3378

02:03:19,430 --> 02:03:17,280

but i do mean that there's going to be a

3379

02:03:21,030 --> 02:03:19,440

lot of values that you're not even aware

3380

02:03:24,229 --> 02:03:21,040

of

3381

02:03:26,149 --> 02:03:24,239

and they have um they have been

3382

02:03:27,109 --> 02:03:26,159

sprinkled through the entire history of

3383

02:03:29,109 --> 02:03:27,119

science

3384

02:03:30,629 --> 02:03:29,119

up until the present day and it'll

3385

02:03:32,149 --> 02:03:30,639

continue to be like that

3386

02:03:33,669 --> 02:03:32,159

what's your problem with sam harris you

3387

02:03:34,550 --> 02:03:33,679

said that you have he's a militant

3388

02:03:39,830 --> 02:03:34,560

atheist

3389

02:03:41,109 --> 02:03:39,840

have no trouble with sam harris on that

3390

02:03:43,430 --> 02:03:41,119

front

3391

02:03:45,189 --> 02:03:43,440

the only thing i dislike about sam

3392

02:03:46,470 --> 02:03:45,199

harris and oh by the way he was the

3393

02:03:49,189 --> 02:03:46,480

voice of reason

3394

02:03:50,390 --> 02:03:49,199

uh in his uh discussion with jordan

3395

02:03:51,510 --> 02:03:50,400

peterson

3396

02:03:53,510 --> 02:03:51,520

so you agreed with them there oh

3397

02:03:55,189 --> 02:03:53,520

completely yeah yeah

3398

02:03:57,430 --> 02:03:55,199

much more than i was expecting because

3399

02:03:59,270 --> 02:03:57,440

i've seen sam harris before and

3400

02:04:01,189 --> 02:03:59,280

he sort of irritates me you don't like

3401

02:04:03,669 --> 02:04:01,199

his views on something

3402

02:04:04,470 --> 02:04:03,679

well you see there's a lot of militant

3403

02:04:06,790 --> 02:04:04,480

atheists

3404

02:04:08,069 --> 02:04:06,800

and often they're condemned as a group

3405

02:04:11,350 --> 02:04:08,079

hitchins

3406

02:04:14,550 --> 02:04:11,360

dawkins you know and harris dennett

3407

02:04:16,629 --> 02:04:14,560

and uh and sam harris um but

3408

02:04:17,830 --> 02:04:16,639

harris harris worries me unlike the

3409

02:04:19,910 --> 02:04:17,840

others um

3410

02:04:21,350 --> 02:04:19,920

and the thing that worries me is that he

3411

02:04:24,550 --> 02:04:21,360

has a special

3412

02:04:25,589 --> 02:04:24,560

hatred for muslims i don't i think

3413

02:04:28,069 --> 02:04:25,599

muslims have

3414

02:04:29,589 --> 02:04:28,079

ridiculous religious views just like

3415

02:04:31,750 --> 02:04:29,599

christians have ridiculous

3416

02:04:32,709 --> 02:04:31,760

religious views as do hindus and

3417

02:04:35,910 --> 02:04:32,719

buddhists and so on

3418

02:04:39,270 --> 02:04:35,920

they're all just ridiculous but

3419

02:04:41,830 --> 02:04:39,280

but i think in especially in this age

3420

02:04:43,030 --> 02:04:41,840

in the current conditions to to for

3421

02:04:45,990 --> 02:04:43,040

anyone to pick on

3422

02:04:47,109 --> 02:04:46,000

muslims uh especially in the united

3423

02:04:50,310 --> 02:04:47,119

states

3424

02:04:52,390 --> 02:04:50,320

it's um it's bordering on you know a

3425

02:04:55,430 --> 02:04:52,400

kind of

3426

02:04:56,950 --> 02:04:55,440

um a real bigotry that uh is

3427

02:04:58,470 --> 02:04:56,960

is worse than unhealthy what if you're

3428

02:05:00,229 --> 02:04:58,480

just criticizing islam and not the

3429

02:05:03,830 --> 02:05:00,239

muslim people themselves

3430

02:05:04,470 --> 02:05:03,840

uh this is tricky um you can criticize

3431

02:05:09,270 --> 02:05:04,480

islam

3432

02:05:11,109 --> 02:05:09,280

the belief held by people so

3433

02:05:12,390 --> 02:05:11,119

you can't criticize islam without

3434

02:05:14,950 --> 02:05:12,400

criticizing

3435

02:05:16,390 --> 02:05:14,960

um people who are or muslim maybe that's

3436

02:05:18,790 --> 02:05:16,400

one of the problems is that

3437

02:05:19,510 --> 02:05:18,800

intellectuals like yourself like i we

3438

02:05:21,669 --> 02:05:19,520

like to debate

3439

02:05:22,870 --> 02:05:21,679

ideas and it's difficult to detach our

3440

02:05:25,430 --> 02:05:22,880

eagles from the ideas

3441

02:05:27,270 --> 02:05:25,440

but we know that okay when a better idea

3442

02:05:28,790 --> 02:05:27,280

comes along we adopt that and we

3443

02:05:30,709 --> 02:05:28,800

take a little hit to the ego but we're

3444

02:05:33,030 --> 02:05:30,719

different than our ideas

3445

02:05:34,629 --> 02:05:33,040

so there is a separation between the

3446

02:05:37,830 --> 02:05:34,639

people and then the

3447

02:05:39,350 --> 02:05:37,840

uh sure sure uh and i have no no trouble

3448

02:05:42,550 --> 02:05:39,360

with that the trouble is

3449

02:05:44,790 --> 02:05:42,560

when you're talking to an in a mass

3450

02:05:47,830 --> 02:05:44,800

media and talking to a mass audience

3451
02:05:49,510 --> 02:05:47,840
and you start railing against islam it

3452
02:05:52,390 --> 02:05:49,520
just spills over

3453
02:05:53,750 --> 02:05:52,400
to a dislike of that guy who's sitting

3454
02:05:57,510 --> 02:05:53,760
next to you who happens

3455
02:06:00,629 --> 02:05:57,520
to be a muslim yeah so i don't trust him

3456
02:06:01,910 --> 02:06:00,639
um i so i just want to make sure i

3457
02:06:03,350 --> 02:06:01,920
understand it so something like when you

3458
02:06:06,390 --> 02:06:03,360
criticize islam

3459
02:06:07,830 --> 02:06:06,400
it's easily construed as criticizing

3460
02:06:09,350 --> 02:06:07,840
muslim people and then the effects of

3461
02:06:10,790 --> 02:06:09,360
you criticizing islam is

3462
02:06:12,470 --> 02:06:10,800
that other people are going to look at

3463
02:06:13,750 --> 02:06:12,480

muslim people with a negative light

3464

02:06:16,310 --> 02:06:13,760

that's right

3465

02:06:17,830 --> 02:06:16,320

yeah i mean i don't like islam any more

3466

02:06:19,910 --> 02:06:17,840

than i like christianity

3467

02:06:21,270 --> 02:06:19,920

but if i had a company and i'm going to

3468

02:06:22,870 --> 02:06:21,280

hire people i'm not going to

3469

02:06:24,229 --> 02:06:22,880

discriminate against muslims

3470

02:06:25,990 --> 02:06:24,239

i wouldn't hire a christian over a

3471

02:06:28,149 --> 02:06:26,000

muslim right that seems to me to be just

3472

02:06:30,229 --> 02:06:28,159

grotesque bigotry i would hire an

3473

02:06:33,189 --> 02:06:30,239

atheist over anybody

3474

02:06:34,629 --> 02:06:33,199

but when it comes to religions i i think

3475

02:06:35,990 --> 02:06:34,639

if you're going to criticize them

3476

02:06:37,430 --> 02:06:36,000

you criticize them all religions are

3477

02:06:37,990 --> 02:06:37,440

equal in that they're all equally

3478

02:06:41,109 --> 02:06:38,000

equally

3479

02:06:41,430 --> 02:06:41,119

uh groundless and yeah i think they've

3480

02:06:42,629 --> 02:06:41,440

done

3481

02:06:44,629 --> 02:06:42,639

i think religion is one of the worst

3482

02:06:47,430 --> 02:06:44,639

things that's ever happened to us

3483

02:06:48,629 --> 02:06:47,440

humanity yeah done a great deal of harm

3484

02:06:52,229 --> 02:06:48,639

let's get to platonism

3485

02:06:54,390 --> 02:06:52,239

your domain this is what you are

3486

02:06:56,310 --> 02:06:54,400

so let's explain what platonism is and

3487

02:06:57,910 --> 02:06:56,320

then let's give people a test so that

3488

02:07:00,069 --> 02:06:57,920

they can find out if they're platonist

3489

02:07:03,189 --> 02:07:00,079

or not

3490

02:07:06,310 --> 02:07:03,199

all right well when i uh when i teach

3491

02:07:08,470 --> 02:07:06,320

topics related to this i usually ask my

3492

02:07:09,350 --> 02:07:08,480

my students on the very f at the very

3493

02:07:10,830 --> 02:07:09,360

beginning

3494

02:07:12,390 --> 02:07:10,840

whether they think mathematics is

3495

02:07:16,629 --> 02:07:12,400

discovered

3496

02:07:20,550 --> 02:07:16,639

physics

3497

02:07:22,629 --> 02:07:20,560

or is it invented like the game of chess

3498

02:07:23,830 --> 02:07:22,639

and i'll get very mixed reactions what

3499

02:07:26,870 --> 02:07:23,840

is it 50 50

3500

02:07:28,790 --> 02:07:26,880

no i'd say more on the discovery side

3501

02:07:30,229 --> 02:07:28,800

but a very sizable number on the

3502

02:07:30,790 --> 02:07:30,239

invention side let's say two-thirds

3503

02:07:33,910 --> 02:07:30,800

one-third

3504

02:07:35,750 --> 02:07:33,920

something like that and

3505

02:07:37,030 --> 02:07:35,760

and then i tell them things that often

3506

02:07:39,109 --> 02:07:37,040

surprise them

3507

02:07:40,629 --> 02:07:39,119

and that is that working mathematicians

3508

02:07:44,229 --> 02:07:40,639

are overwhelmingly

3509

02:07:46,629 --> 02:07:44,239

platonous that is a platonist is

3510

02:07:49,510 --> 02:07:46,639

very briefly believes that mathematics

3511

02:07:52,709 --> 02:07:49,520

is there waiting to be discovered

3512

02:07:53,830 --> 02:07:52,719

it's independent from us mathematical

3513

02:07:56,870 --> 02:07:53,840

facts

3514

02:07:58,470 --> 02:07:56,880

would be true even if no one ever

3515

02:08:00,069 --> 02:07:58,480

discovered them even if there were no

3516

02:08:02,390 --> 02:08:00,079

intelligent creatures

3517

02:08:04,950 --> 02:08:02,400

in the entire history of the universe pi

3518

02:08:06,629 --> 02:08:04,960

would still be an irrational number

3519

02:08:08,069 --> 02:08:06,639

um on the other hand chess would not

3520

02:08:08,870 --> 02:08:08,079

exist if there were no intelligent

3521

02:08:12,550 --> 02:08:08,880

beings

3522

02:08:14,790 --> 02:08:12,560

okay most working mathematicians now you

3523

02:08:16,790 --> 02:08:14,800

you were a math student so you may have

3524

02:08:18,709 --> 02:08:16,800

picked this up from your teachers

3525

02:08:20,709 --> 02:08:18,719

most working mathematicians are in fact

3526

02:08:22,470 --> 02:08:20,719

platonous they believe that

3527

02:08:24,149 --> 02:08:22,480

when they do mathematical research

3528

02:08:24,709 --> 02:08:24,159

they're investigating something that's

3529

02:08:26,629 --> 02:08:24,719

there

3530

02:08:27,750 --> 02:08:26,639

waiting to be discovered and if they get

3531

02:08:32,069 --> 02:08:27,760

it right

3532

02:08:35,189 --> 02:08:34,390

okay so that's that's a that's platonism

3533

02:08:37,109 --> 02:08:35,199

in a nutshell

3534

02:08:38,790 --> 02:08:37,119

and you're a platonist i am a plague so

3535

02:08:40,310 --> 02:08:38,800

what does it mean to exist

3536

02:08:41,750 --> 02:08:40,320

what does that mean because i actually

3537

02:08:42,870 --> 02:08:41,760

consider myself to be a plaintiff i

3538

02:08:43,189 --> 02:08:42,880

would actually think that the game of

3539

02:08:45,030 --> 02:08:43,199

chess

3540

02:08:47,189 --> 02:08:45,040

does exist in some form in the fact in

3541

02:08:48,709 --> 02:08:47,199

in the sense that there are these rules

3542

02:08:50,390 --> 02:08:48,719

and game theoretically you can construct

3543

02:08:52,149 --> 02:08:50,400

a model of chess and so that

3544

02:08:53,910 --> 02:08:52,159

you can if you can form a mathematical

3545

02:08:57,030 --> 02:08:53,920

model of it then it exists

3546

02:08:58,709 --> 02:08:57,040

you're right you're right uh so my

3547

02:09:02,870 --> 02:08:58,719

example

3548

02:09:06,149 --> 02:09:02,880

for

3549

02:09:06,709 --> 02:09:06,159

extrapolate it and say that everything

3550

02:09:09,910 --> 02:09:06,719

that

3551

02:09:13,430 --> 02:09:09,920

possibly is logical exists

3552

02:09:15,669 --> 02:09:13,440

well there is a view um about possible

3553

02:09:18,950 --> 02:09:15,679

worlds

3554

02:09:22,790 --> 02:09:18,960

okay so um whenever we speak

3555

02:09:25,589 --> 02:09:22,800

in a certain mode like i say

3556

02:09:27,669 --> 02:09:25,599

there are no elephants in this room but

3557

02:09:29,350 --> 02:09:27,679

it is possible that there is an elephant

3558

02:09:31,830 --> 02:09:29,360

in this room it's not actual

3559

02:09:33,669 --> 02:09:31,840

but it is possible what does that mean

3560

02:09:36,229 --> 02:09:33,679

right now

3561

02:09:37,030 --> 02:09:36,239

what does that even mean well one view

3562

02:09:39,350 --> 02:09:37,040

says

3563

02:09:41,030 --> 02:09:39,360

you have to understand reality as made

3564

02:09:43,750 --> 02:09:41,040

up of possible worlds

3565

02:09:44,870 --> 02:09:43,760

the actual world is one world and

3566

02:09:48,550 --> 02:09:44,880

another world

3567

02:09:50,390 --> 02:09:48,560

exactly like this one

3568

02:09:52,069 --> 02:09:50,400

there's a counterpart i'm in it

3569

02:09:54,069 --> 02:09:52,079

multiverse theory of quantum mechanics

3570

02:09:55,990 --> 02:09:54,079

yeah completely different yeah yeah this

3571

02:09:57,030 --> 02:09:56,000

is a this is a logical thing not a

3572

02:09:59,109 --> 02:09:57,040

physics thing

3573

02:10:00,390 --> 02:09:59,119

um so there's another possible world

3574

02:10:02,069 --> 02:10:00,400

that's exactly like this one

3575

02:10:03,510 --> 02:10:02,079

except there's an elephant over there in

3576

02:10:05,350 --> 02:10:03,520

the corner okay

3577

02:10:06,790 --> 02:10:05,360

otherwise they're exactly the same that

3578

02:10:10,069 --> 02:10:06,800

is a possible world

3579

02:10:12,069 --> 02:10:10,079

and when i and for me to say

3580

02:10:13,430 --> 02:10:12,079

it is possible that there is an elephant

3581

02:10:16,149 --> 02:10:13,440

in this room

3582

02:10:17,669 --> 02:10:16,159

that is a true sentence because there

3583

02:10:20,069 --> 02:10:17,679

exists a possible world

3584

02:10:21,430 --> 02:10:20,079

with an elephant in it yeah okay can we

3585

02:10:23,189 --> 02:10:21,440

not extrapolate that to god

3586

02:10:24,790 --> 02:10:23,199

that it's true that god exists that's

3587

02:10:26,709 --> 02:10:24,800

really an interesting question and it's

3588

02:10:29,189 --> 02:10:26,719

actually debated

3589

02:10:30,870 --> 02:10:29,199

because it sounds like well maybe

3590

02:10:32,790 --> 02:10:30,880

atheism is true in this world

3591

02:10:34,550 --> 02:10:32,800

but maybe there's another world and

3592

02:10:37,589 --> 02:10:34,560

which there is a god

3593

02:10:37,910 --> 02:10:37,599

that's going to be problematic uh but

3594

02:10:40,950 --> 02:10:37,920

it's

3595

02:10:42,629 --> 02:10:40,960

logically terrible

3596

02:10:44,069 --> 02:10:42,639

at least there's it's not clear it's not

3597

02:10:45,350 --> 02:10:44,079

clear that it's logically tenable and

3598

02:10:46,629 --> 02:10:45,360

that's why it's controversial

3599

02:10:48,550 --> 02:10:46,639

because intuitively it seems like it

3600

02:10:49,109 --> 02:10:48,560

ought to be yeah if an elephant can be

3601

02:10:50,870 --> 02:10:49,119

here

3602

02:10:52,149 --> 02:10:50,880

then why can't we make an abstract

3603

02:10:53,830 --> 02:10:52,159

notion of something yeah there could

3604

02:10:57,109 --> 02:10:53,840

have been a god there just isn't

3605

02:10:58,390 --> 02:10:57,119

okay that sounds sensible but if there

3606

02:11:00,149 --> 02:10:58,400

could have been a god

3607

02:11:01,430 --> 02:11:00,159

then there will be a god in a possible

3608

02:11:03,510 --> 02:11:01,440

world

3609

02:11:04,790 --> 02:11:03,520

the trouble with that is the way we

3610

02:11:07,589 --> 02:11:04,800

conceptualize god

3611

02:11:08,470 --> 02:11:07,599

is god is a necessary being and that

3612

02:11:11,990 --> 02:11:08,480

means if god

3613

02:11:13,510 --> 02:11:12,000

exists at all god must exist in every

3614

02:11:15,910 --> 02:11:13,520

possible world

3615

02:11:18,069 --> 02:11:15,920

it's a kind of all or nothing entity

3616

02:11:20,149 --> 02:11:18,079

because of the way

3617

02:11:21,910 --> 02:11:20,159

because omnipresence the presence of god

3618

02:11:23,109 --> 02:11:21,920

not just omnipresent but i mean in every

3619

02:11:25,669 --> 02:11:23,119

world

3620

02:11:27,109 --> 02:11:25,679

whether there is a god or not it's not

3621

02:11:29,109 --> 02:11:27,119

an option

3622

02:11:31,350 --> 02:11:29,119

it's either in no world or in every

3623

02:11:34,629 --> 02:11:31,360

world mathematics is like this

3624

02:11:34,950 --> 02:11:34,639

see if pi is an irrational number then

3625

02:11:36,470 --> 02:11:34,960

pi

3626

02:11:37,990 --> 02:11:36,480

is an irrational number in every

3627

02:11:40,550 --> 02:11:38,000

possible world there's no world in which

3628

02:11:41,830 --> 02:11:40,560

it's equal to three and a quarter or

3629

02:11:44,709 --> 02:11:41,840

something like that

3630

02:11:45,990 --> 02:11:44,719

okay it's always irrational and it's the

3631

02:11:48,390 --> 02:11:46,000

same with god

3632

02:11:49,830 --> 02:11:48,400

uh either god just can't exist it's

3633

02:11:50,390 --> 02:11:49,840

impossible it's like a contradiction

3634

02:11:52,149 --> 02:11:50,400

wait

3635

02:11:54,069 --> 02:11:52,159

how's that how's that commensurate with

3636

02:11:54,390 --> 02:11:54,079

the elephant though because to me if you

3637

02:11:56,470 --> 02:11:54,400

can

3638

02:11:58,470 --> 02:11:56,480

construct an elephant in another world

3639

02:12:00,069 --> 02:11:58,480

how do you know that that elephant

3640

02:12:02,229 --> 02:12:00,079

being true now we have to get to some

3641

02:12:05,270 --> 02:12:02,239

physics but how do you know

3642

02:12:08,149 --> 02:12:05,280

that that elephant can logically exist

3643

02:12:10,069 --> 02:12:08,159

just like logically pi is irrational

3644

02:12:11,430 --> 02:12:10,079

okay what we can prove that pi is

3645

02:12:12,790 --> 02:12:11,440

irrational now we're saying there's an

3646

02:12:14,069 --> 02:12:12,800

elephant in this room

3647

02:12:15,189 --> 02:12:14,079

and we're saying that that's possible

3648

02:12:16,709 --> 02:12:15,199

how do we know that's possible how do we

3649

02:12:19,109 --> 02:12:16,719

know that's a possibility just like

3650

02:12:20,390 --> 02:12:19,119

we know for sure pi is irrational um

3651

02:12:23,830 --> 02:12:20,400

okay uh

3652

02:12:26,229 --> 02:12:23,840

fair enough prima facie it's possible

3653

02:12:27,910 --> 02:12:26,239

like you can't think of any principled

3654

02:12:29,350 --> 02:12:27,920

objection to there being an elephant in

3655

02:12:31,990 --> 02:12:29,360

this room

3656

02:12:32,550 --> 02:12:32,000

you say well how did it get here you

3657

02:12:34,709 --> 02:12:32,560

know uh

3658

02:12:35,990 --> 02:12:34,719

answer they it's a small elephant they

3659

02:12:37,350 --> 02:12:36,000

brought it up in the elevator

3660

02:12:39,510 --> 02:12:37,360

walked it over here and it's been

3661

02:12:41,430 --> 02:12:39,520

sitting here since we started talking

3662

02:12:43,030 --> 02:12:41,440

you can easily imagine a scenario in

3663

02:12:46,149 --> 02:12:43,040

which you know something like that

3664

02:12:47,750 --> 02:12:46,159

is is the case so

3665

02:12:49,510 --> 02:12:47,760

the possibility of an elephant in this

3666

02:12:52,470 --> 02:12:49,520

room

3667

02:12:53,830 --> 02:12:52,480

is is a pretty clear case of of a

3668

02:12:57,350 --> 02:12:53,840

possibility

3669

02:12:57,830 --> 02:12:57,360

um but the god the the god one that's

3670

02:13:00,390 --> 02:12:57,840

our

3671

02:13:02,229 --> 02:13:00,400

that's a really hard not to crack

3672

02:13:04,069 --> 02:13:02,239

because it seems like god

3673

02:13:05,350 --> 02:13:04,079

because remember god is defined in a

3674

02:13:07,669 --> 02:13:05,360

certain way

3675

02:13:09,589 --> 02:13:07,679

in fact some people even define god as

3676

02:13:11,350 --> 02:13:09,599

the necessary being

3677

02:13:13,430 --> 02:13:11,360

and then anything that's necessary must

3678

02:13:17,589 --> 02:13:13,440

be true in every possible world this is

3679

02:13:22,069 --> 02:13:17,599

standard logic talk about possibility

3680

02:13:24,709 --> 02:13:22,079

um and god would have the same status as

3681

02:13:26,149 --> 02:13:24,719

2 plus 2 equals 4. if it's true anywhere

3682

02:13:29,189 --> 02:13:26,159

it's true everywhere

3683

02:13:30,790 --> 02:13:29,199

2 plus 2 equals 5. if it's false

3684

02:13:33,830 --> 02:13:30,800

anywhere it's false

3685

02:13:34,310 --> 02:13:33,840

everywhere okay and uh so god is either

3686

02:13:37,109 --> 02:13:34,320

like

3687

02:13:38,870 --> 02:13:37,119

one or the other i'm come down on the

3688

02:13:41,189 --> 02:13:38,880

side that god's like

3689

02:13:42,550 --> 02:13:41,199

a contradiction and absurdity well that

3690

02:13:44,229 --> 02:13:42,560

only disproves the

3691

02:13:45,990 --> 02:13:44,239

christian notion of god so what about

3692

02:13:47,669 --> 02:13:46,000

these hindu notions of god or others oh

3693

02:13:49,270 --> 02:13:47,679

yeah that's fine yeah so then they could

3694

02:13:51,990 --> 02:13:49,280

exist they could exist

3695

02:13:52,790 --> 02:13:52,000

yeah you're against an omnipresent

3696

02:13:55,430 --> 02:13:52,800

necessary

3697

02:13:57,430 --> 02:13:55,440

don't say omnipresent say uh um

3698

02:13:58,870 --> 02:13:57,440

omnipresent just means god is everywhere

3699

02:14:01,589 --> 02:13:58,880

in space

3700

02:14:01,910 --> 02:14:01,599

that's that's unchristian and unmuslim

3701

02:14:04,390 --> 02:14:01,920

um

3702

02:14:05,990 --> 02:14:04,400

the standard view is god is external

3703

02:14:09,750 --> 02:14:06,000

outside of space and time

3704

02:14:12,629 --> 02:14:09,760

and and can observe us cognizes us

3705

02:14:14,310 --> 02:14:12,639

but isn't in here participating okay

3706

02:14:14,870 --> 02:14:14,320

might intervene for a miracle here and

3707

02:14:17,270 --> 02:14:14,880

there

3708

02:14:18,870 --> 02:14:17,280

but the idea that god is one of us like

3709

02:14:20,629 --> 02:14:18,880

that song god is one of us just a

3710

02:14:23,510 --> 02:14:20,639

stranger on the bus and so on

3711

02:14:24,709 --> 02:14:23,520

that's that's heresy for christians

3712

02:14:26,149 --> 02:14:24,719

wouldn't christians say that you're made

3713

02:14:27,990 --> 02:14:26,159

in the image of god there's a little bit

3714

02:14:29,750 --> 02:14:28,000

of god in you and every time you act

3715

02:14:32,069 --> 02:14:29,760

god is almost acting through you when

3716

02:14:33,350 --> 02:14:32,079

you make a decision it's like you're

3717

02:14:35,109 --> 02:14:33,360

a consciousness that's gonna they're

3718

02:14:36,950 --> 02:14:35,119

they're gonna take that as a metaphor

3719

02:14:38,950 --> 02:14:36,960

i'm just debating what if it's not what

3720

02:14:40,229 --> 02:14:38,960

if that is the christian notion of god

3721

02:14:42,149 --> 02:14:40,239

that actually there's a little spark

3722

02:14:44,550 --> 02:14:42,159

there is an external god but also he's

3723

02:14:46,709 --> 02:14:44,560

in you as well

3724

02:14:48,149 --> 02:14:46,719

okay could that exist in these possible

3725

02:14:48,709 --> 02:14:48,159

worlds is that commensurate with the

3726

02:14:50,390 --> 02:14:48,719

idea of

3727

02:14:52,629 --> 02:14:50,400

not not if it's not if it's part and

3728

02:14:54,709 --> 02:14:52,639

parcel of a certain kind of god who

3729

02:14:55,750 --> 02:14:54,719

can't exist in principle but a lesser

3730

02:14:57,669 --> 02:14:55,760

god

3731

02:15:00,229 --> 02:14:57,679

uh i mean look you know the difference

3732

02:15:03,189 --> 02:15:00,239

between deism and theism

3733

02:15:04,470 --> 02:15:03,199

uh theism is like standard religion

3734

02:15:08,390 --> 02:15:04,480

organized religion

3735

02:15:11,109 --> 02:15:08,400

uh god is uh god cares about you

3736

02:15:11,910 --> 02:15:11,119

okay god is a person and it's a personal

3737

02:15:15,669 --> 02:15:11,920

god

3738

02:15:16,390 --> 02:15:15,679

answer your prayers you know all that

3739

02:15:19,270 --> 02:15:16,400

sort of stuff

3740

02:15:20,950 --> 02:15:19,280

that's that's a theistic view a deistic

3741

02:15:22,870 --> 02:15:20,960

view of god just says

3742

02:15:24,550 --> 02:15:22,880

there is a kind of supernatural creator

3743

02:15:27,270 --> 02:15:24,560

of all of this

3744

02:15:29,750 --> 02:15:27,280

but he doesn't give a damn about us

3745

02:15:31,750 --> 02:15:29,760

maybe he died after he created it

3746

02:15:33,189 --> 02:15:31,760

maybe even he's a committee you know

3747

02:15:34,790 --> 02:15:33,199

maybe there's 27 of them

3748

02:15:37,510 --> 02:15:34,800

and they fought over the details and

3749

02:15:39,510 --> 02:15:37,520

that's why a lot goes wrong

3750

02:15:41,030 --> 02:15:39,520

and it doesn't intervene set things up

3751

02:15:44,390 --> 02:15:41,040

to just run like a

3752

02:15:47,990 --> 02:15:44,400

a magnificent clock that's that's a

3753

02:15:51,030 --> 02:15:48,000

deism yeah okay so 18th century

3754

02:15:52,629 --> 02:15:51,040

uh would-be atheists were often dias

3755

02:15:54,310 --> 02:15:52,639

and that's because darwin hadn't come

3756

02:15:55,030 --> 02:15:54,320

along yet and they they couldn't make

3757

02:15:57,589 --> 02:15:55,040

sense of

3758

02:15:58,870 --> 02:15:57,599

design in nature and they thought you

3759

02:16:00,790 --> 02:15:58,880

have to have an intelligent

3760

02:16:02,229 --> 02:16:00,800

designer for this they couldn't escape

3761

02:16:03,750 --> 02:16:02,239

that they certainly didn't believe a

3762

02:16:05,910 --> 02:16:03,760

word of christianity

3763

02:16:08,310 --> 02:16:05,920

but they did believe in some kind of

3764

02:16:09,990 --> 02:16:08,320

intelligent creator of all of this

3765

02:16:11,510 --> 02:16:10,000

and that's a very common view in the

3766

02:16:13,430 --> 02:16:11,520

enlightenment the american

3767

02:16:15,030 --> 02:16:13,440

founding fathers you know like jefferson

3768

02:16:17,750 --> 02:16:15,040

[Music]

3769

02:16:19,510 --> 02:16:17,760

franklin washington they were deists

3770

02:16:20,950 --> 02:16:19,520

they weren't christians

3771

02:16:23,109 --> 02:16:20,960

americans don't even know their own

3772

02:16:24,709 --> 02:16:23,119

history they make a big deal of being a

3773

02:16:25,430 --> 02:16:24,719

christian nation actually they started

3774

02:16:28,550 --> 02:16:25,440

out as a

3775

02:16:31,669 --> 02:16:28,560

as an anti-christian nation

3776

02:16:32,520 --> 02:16:31,679

so you must love america

3777

02:16:39,509 --> 02:16:32,530

not with trump

3778

02:16:45,830 --> 02:16:43,110

i should explain sokol's motivation okay

3779

02:16:48,070 --> 02:16:45,840

so sokol is very left-wing very

3780

02:16:51,910 --> 02:16:48,080

concerned with social issues

3781

02:16:55,589 --> 02:16:51,920

and um he was worried that um

3782

02:16:56,950 --> 02:16:55,599

well like me he is also i'm also

3783

02:17:00,230 --> 02:16:56,960

quite concerned with a whole lot of

3784

02:17:03,270 --> 02:17:00,240

social issues and i worry about students

3785

02:17:06,629 --> 02:17:03,280

who who would become

3786

02:17:09,110 --> 02:17:06,639

you know um socially active in in a

3787

02:17:09,669 --> 02:17:09,120

efficient and productive way because

3788

02:17:11,429 --> 02:17:09,679

they're pro

3789

02:17:12,950 --> 02:17:11,439

science they're willing to you know get

3790

02:17:16,150 --> 02:17:12,960

the facts right

3791

02:17:18,870 --> 02:17:16,160

and do serious investigations into

3792

02:17:21,349 --> 02:17:18,880

the social situation and so on the

3793

02:17:25,349 --> 02:17:21,359

trouble with postmodernism it becomes

3794

02:17:29,349 --> 02:17:25,359

a bit lazy uh it's given to

3795

02:17:33,589 --> 02:17:29,359

sloganeering it's given to

3796

02:17:35,589 --> 02:17:33,599

analyses that um that

3797

02:17:37,669 --> 02:17:35,599

well i don't know they they see certain

3798

02:17:38,790 --> 02:17:37,679

things as as political that aren't

3799

02:17:42,070 --> 02:17:38,800

political

3800

02:17:45,030 --> 02:17:42,080

and and and often just pick up the wrong

3801
02:17:46,309 --> 02:17:45,040
end of the stick anyway sokol as you

3802
02:17:49,589 --> 02:17:46,319
already indicated

3803
02:17:51,349 --> 02:17:49,599
submitted this ridiculous paper and said

3804
02:17:54,870 --> 02:17:51,359
i'd like to publish this and it made

3805
02:17:58,230 --> 02:17:54,880
all kinds of claims um using

3806
02:18:00,549 --> 02:17:58,240
quasi technical jargon

3807
02:18:02,629 --> 02:18:00,559
and some of the things you would know so

3808
02:18:04,150 --> 02:18:02,639
he said mathematics supports a woman's

3809
02:18:07,110 --> 02:18:04,160
right to an abortion

3810
02:18:08,309 --> 02:18:07,120
it's in the form of the axiom of choice

3811
02:18:10,309 --> 02:18:08,319
do you know this

3812
02:18:12,150 --> 02:18:10,319
okay now you having a math background

3813
02:18:13,910 --> 02:18:12,160

you understand that the axiom of choice

3814

02:18:16,309 --> 02:18:13,920

has got nothing to do with

3815

02:18:17,429 --> 02:18:16,319

free will choice and whether you have an

3816

02:18:20,950 --> 02:18:17,439

abortion

3817

02:18:23,589 --> 02:18:20,960

um so it was full of jargon

3818

02:18:25,910 --> 02:18:23,599

just ridiculous jargon like this and the

3819

02:18:28,230 --> 02:18:25,920

and the editors published it

3820

02:18:29,589 --> 02:18:28,240

i've always had a bit of a guilty

3821

02:18:31,349 --> 02:18:29,599

conscience about it even though i

3822

02:18:33,750 --> 02:18:31,359

completely support sokol

3823

02:18:35,270 --> 02:18:33,760

and his motivation i was editing a

3824

02:18:37,349 --> 02:18:35,280

journal at the time

3825

02:18:38,389 --> 02:18:37,359

and when i saw the headline in the new

3826

02:18:40,950 --> 02:18:38,399

york times

3827

02:18:41,429 --> 02:18:40,960

it was on the front page and all i could

3828

02:18:55,910 --> 02:18:41,439

i

3829

02:18:58,230 --> 02:18:55,920

understand

3830

02:18:59,750 --> 02:18:58,240

the peer review process and why you

3831

02:19:02,230 --> 02:18:59,760

would ignore the

3832

02:19:03,030 --> 02:19:02,240

the process in certain cases and do

3833

02:19:05,429 --> 02:19:03,040

something else

3834

02:19:07,270 --> 02:19:05,439

and it's not intellectual corruption is

3835

02:19:09,669 --> 02:19:07,280

just something else that's going on

3836

02:19:10,629 --> 02:19:09,679

so if you've got a journal a physics

3837

02:19:14,230 --> 02:19:10,639

journal

3838

02:19:17,669 --> 02:19:14,240

it's a very well established discipline

3839

02:19:18,150 --> 02:19:17,679

with methodological guidelines that have

3840

02:19:20,150 --> 02:19:18,160

been

3841

02:19:22,309 --> 02:19:20,160

laid down they're reliable and if

3842

02:19:23,910 --> 02:19:22,319

somebody follows them they can be okay

3843

02:19:25,990 --> 02:19:23,920

if they violate them badly

3844

02:19:27,190 --> 02:19:26,000

you think look this is a piece of

3845

02:19:29,429 --> 02:19:27,200

garbage we're not going to take it

3846

02:19:33,349 --> 02:19:29,439

seriously but if you're starting a new

3847

02:19:35,270 --> 02:19:33,359

field like postmodern accounts

3848

02:19:37,270 --> 02:19:35,280

of post-modern accounts of science or

3849

02:19:39,190 --> 02:19:37,280

something like that you don't have a

3850

02:19:40,950 --> 02:19:39,200

long tradition that you can

3851

02:19:42,790 --> 02:19:40,960

point to and say this is this sort of

3852

02:19:44,469 --> 02:19:42,800

thing works that sort of thing does

3853

02:19:45,910 --> 02:19:44,479

you're you're you're you know you're in

3854

02:19:48,150 --> 02:19:45,920

virgin territory

3855

02:19:49,349 --> 02:19:48,160

and people who are doing that actually

3856

02:19:52,070 --> 02:19:49,359

need to be

3857

02:19:52,790 --> 02:19:52,080

you know encouraged and given courage to

3858

02:19:55,510 --> 02:19:52,800

explore

3859

02:19:57,110 --> 02:19:55,520

yeah and given a lot of free reign don't

3860

02:20:00,309 --> 02:19:57,120

come down on them too hard

3861

02:20:02,150 --> 02:20:00,319

for for you know um publishing

3862

02:20:03,510 --> 02:20:02,160

stuff that turns out to be crap now what

3863

02:20:06,389 --> 02:20:03,520

about the grievance study

3864

02:20:09,429 --> 02:20:06,399

affair well i'm i'm in favor of um

3865

02:20:11,349 --> 02:20:09,439

giving them a lot of free reign

3866

02:20:12,630 --> 02:20:11,359

by by grievance studies you mean things

3867

02:20:14,790 --> 02:20:12,640

like women's studies

3868

02:20:16,710 --> 02:20:14,800

black studies aboriginal studies and so

3869

02:20:18,870 --> 02:20:16,720

on no i think what's the reason folks

3870

02:20:20,710 --> 02:20:18,880

that came out yeah yeah i don't know i

3871

02:20:22,389 --> 02:20:20,720

don't know it well i read a very short

3872

02:20:23,990 --> 02:20:22,399

article on it

3873

02:20:25,590 --> 02:20:24,000

but i don't like the spirit behind

3874

02:20:27,349 --> 02:20:25,600

attacking them

3875

02:20:29,110 --> 02:20:27,359

i think they do need to be attacked

3876

02:20:31,910 --> 02:20:29,120

every now and then and

3877

02:20:32,870 --> 02:20:31,920

they certainly can't shouldn't just

3878

02:20:36,070 --> 02:20:32,880

think that they can

3879

02:20:37,030 --> 02:20:36,080

do any old crap at all but often they're

3880

02:20:39,990 --> 02:20:37,040

trying

3881

02:20:41,590 --> 02:20:40,000

to do stuff and they don't have set

3882

02:20:43,590 --> 02:20:41,600

guidelines to know

3883

02:20:45,110 --> 02:20:43,600

when when something is going to work

3884

02:20:45,830 --> 02:20:45,120

well and when something isn't going to

3885

02:20:48,550 --> 02:20:45,840

work well

3886

02:20:50,070 --> 02:20:48,560

they want to encourage a very generous

3887

02:20:52,150 --> 02:20:50,080

and broad

3888

02:20:53,590 --> 02:20:52,160

conversation about issues and i think

3889

02:20:55,910 --> 02:20:53,600

that's fair

3890

02:20:56,630 --> 02:20:55,920

and it's intellectually healthy and in

3891

02:20:59,110 --> 02:20:56,640

line with

3892

02:21:00,950 --> 02:20:59,120

academic freedom and in and and and it's

3893

02:21:02,950 --> 02:21:00,960

part and parcel with academic freedom

3894

02:21:04,230 --> 02:21:02,960

the only thing i have against

3895

02:21:06,070 --> 02:21:04,240

postmodernism

3896

02:21:07,429 --> 02:21:06,080

not not these other not these

3897

02:21:08,230 --> 02:21:07,439

disciplines like women's studies or

3898

02:21:09,590 --> 02:21:08,240

anything like that

3899

02:21:11,349 --> 02:21:09,600

i think it's terrific i think we should

3900

02:21:14,550 --> 02:21:11,359

have women's studies and so on

3901
02:21:15,429 --> 02:21:14,560
um but i am on the pro-science side of

3902
02:21:17,910 --> 02:21:15,439
the left

3903
02:21:19,590 --> 02:21:17,920
and that's because i think once you if

3904
02:21:22,469 --> 02:21:19,600
you're if you're a serious

3905
02:21:23,030 --> 02:21:22,479
post-modern who says oh truth truth

3906
02:21:25,830 --> 02:21:23,040
smooth

3907
02:21:26,389 --> 02:21:25,840
you know uh facts smacks you know

3908
02:21:28,790 --> 02:21:26,399
whatever

3909
02:21:29,990 --> 02:21:28,800
um you end up shooting yourself in the

3910
02:21:32,550 --> 02:21:30,000
foot

3911
02:21:33,429 --> 02:21:32,560
it's really really important to get

3912
02:21:36,150 --> 02:21:33,439
things like

3913
02:21:37,990 --> 02:21:36,160

global warming right in order to you

3914

02:21:41,910 --> 02:21:38,000

know to understand what's going on

3915

02:21:44,389 --> 02:21:41,920

and to and to tackle it um politically

3916

02:21:46,230 --> 02:21:44,399

to solve these problems i don't i don't

3917

02:21:49,270 --> 02:21:46,240

see that postmoderns have ever done

3918

02:21:51,990 --> 02:21:49,280

anything useful in combating

3919

02:21:53,750 --> 02:21:52,000

climate change the facts about racism

3920

02:21:54,710 --> 02:21:53,760

the facts about the climate the facts

3921

02:21:56,790 --> 02:21:54,720

about

3922

02:21:57,910 --> 02:21:56,800

the pharmaceutical industry those things

3923

02:22:04,469 --> 02:21:57,920

are really important

3924

02:22:08,710 --> 02:22:06,870

there might be some truth to this so i

3925

02:22:11,990 --> 02:22:08,720

usually back off

3926
02:22:12,550 --> 02:22:12,000
and say well you know some approximation

3927
02:22:15,750 --> 02:22:12,560
to

3928
02:22:18,870 --> 02:22:15,760
an egalitarian socialist world um

3929
02:22:20,870 --> 02:22:18,880
and maybe some people are five times as

3930
02:22:22,790 --> 02:22:20,880
well off as other people

3931
02:22:25,349 --> 02:22:22,800
but that would be such an incredible

3932
02:22:28,630 --> 02:22:25,359
improvement over the current situation

3933
02:22:30,550 --> 02:22:28,640
that i'd be i'd go happily to my grave

3934
02:22:33,429 --> 02:22:30,560
you know if the difference between the

3935
02:22:36,870 --> 02:22:33,439
poorest and the richest we're only

3936
02:22:38,790 --> 02:22:36,880
five-fold in wealth as you know it's

3937
02:22:41,670 --> 02:22:38,800
much much much much greater than that

3938
02:22:45,349 --> 02:22:41,680

now um i also think

3939

02:22:48,790 --> 02:22:45,359

uh what i care about most of all

3940

02:22:50,230 --> 02:22:48,800

um uh you see a lot of people care about

3941

02:22:51,750 --> 02:22:50,240

rights and they care about freedom and

3942

02:22:54,550 --> 02:22:51,760

freedom of speech and

3943

02:22:55,830 --> 02:22:54,560

and so on and i think those things are

3944

02:22:58,469 --> 02:22:55,840

important

3945

02:22:59,750 --> 02:22:58,479

but i think human well-being trumps

3946

02:23:02,070 --> 02:22:59,760

everything

3947

02:23:03,429 --> 02:23:02,080

if all humans are reasonably well-off

3948

02:23:05,830 --> 02:23:03,439

and they're happy

3949

02:23:07,110 --> 02:23:05,840

and content then that's the kind of

3950

02:23:09,830 --> 02:23:07,120

world i want

3951
02:23:11,190 --> 02:23:09,840
if they if we have to sacrifice some

3952
02:23:13,270 --> 02:23:11,200
rights

3953
02:23:14,870 --> 02:23:13,280
say you even limit freedom of speech to

3954
02:23:17,429 --> 02:23:14,880
some extent for that

3955
02:23:17,990 --> 02:23:17,439
i'd be willing to do that i think going

3956
02:23:19,830 --> 02:23:18,000
to the wall

3957
02:23:22,630 --> 02:23:19,840
for complete freedom of speech for

3958
02:23:26,389 --> 02:23:22,640
instance is a complete mistake

3959
02:23:28,070 --> 02:23:26,399
i like canada's laws uh we have a great

3960
02:23:30,550 --> 02:23:28,080
a great deal of freedom of speech here

3961
02:23:32,950 --> 02:23:30,560
but not complete so for instance

3962
02:23:33,990 --> 02:23:32,960
that we have hate laws i'm i'm in favor

3963
02:23:35,910 --> 02:23:34,000

of hate laws

3964

02:23:37,750 --> 02:23:35,920

now i have lots of philosophical

3965

02:23:38,150 --> 02:23:37,760

colleagues and american friends and so

3966

02:23:39,910 --> 02:23:38,160

on

3967

02:23:41,429 --> 02:23:39,920

who think the us is much better in this

3968

02:23:43,590 --> 02:23:41,439

regard there's just no

3969

02:23:45,349 --> 02:23:43,600

constraints on your speech i mean you

3970

02:23:47,349 --> 02:23:45,359

can't you can't libel someone

3971

02:23:49,510 --> 02:23:47,359

you can't incite violence yeah you can't

3972

02:23:51,510 --> 02:23:49,520

incite violence but but you can

3973

02:23:52,790 --> 02:23:51,520

you can deny the holocaust in the united

3974

02:23:55,110 --> 02:23:52,800

states

3975

02:23:56,950 --> 02:23:55,120

you could declare that muslims are a

3976

02:23:57,910 --> 02:23:56,960

treacherous group of people and they

3977

02:24:00,550 --> 02:23:57,920

ought to be

3978

02:24:02,070 --> 02:24:00,560

uh oppressed and so on uh you can't say

3979

02:24:03,750 --> 02:24:02,080

that in canada you could be

3980

02:24:05,110 --> 02:24:03,760

you know prosecuted under the law for

3981

02:24:08,389 --> 02:24:05,120

that i favor

3982

02:24:10,710 --> 02:24:08,399

those constraints on freedom of speech

3983

02:24:11,750 --> 02:24:10,720

and i would favor probably other

3984

02:24:13,750 --> 02:24:11,760

constraints too

3985

02:24:14,950 --> 02:24:13,760

on other kinds of things that we

3986

02:24:18,630 --> 02:24:14,960

consider free

3987

02:24:21,750 --> 02:24:18,640

for in exchange for an enormous

3988

02:24:25,110 --> 02:24:21,760

increase in human well-being that we're

3989

02:24:27,429 --> 02:24:25,120

happier healthier we have richer lives

3990

02:24:28,710 --> 02:24:27,439

people can intellectually develop and

3991

02:24:30,469 --> 02:24:28,720

physically develop

3992

02:24:32,870 --> 02:24:30,479

you know to the best of their abilities

3993

02:24:35,110 --> 02:24:32,880

that's the kind of world i want

3994

02:24:36,389 --> 02:24:35,120

that's a very much a left-wing view of

3995

02:24:40,230 --> 02:24:36,399

things

3996

02:24:42,550 --> 02:24:40,240

um i think that ought to be

3997

02:24:44,710 --> 02:24:42,560

you know as far as you go but it's going

3998

02:24:48,070 --> 02:24:44,720

a hell of a long way

3999

02:24:49,030 --> 02:24:48,080

um usually when the left is is uh

4000

02:24:51,670 --> 02:24:49,040

attacked for

4001
02:24:53,910 --> 02:24:51,680
going too far it's either they want they

4002
02:24:55,910 --> 02:24:53,920
want to use a great deal of force to

4003
02:24:57,110 --> 02:24:55,920
bring about egalitarianism that's one

4004
02:24:59,830 --> 02:24:57,120
way and the other way

4005
02:25:01,110 --> 02:24:59,840
is the political correctness they're

4006
02:25:03,349 --> 02:25:01,120
accused of excessive

4007
02:25:04,630 --> 02:25:03,359
political correctness i think that's

4008
02:25:06,630 --> 02:25:04,640
just

4009
02:25:08,309 --> 02:25:06,640
almost always that's a false charge

4010
02:25:10,469 --> 02:25:08,319
that's just a bogus charge

4011
02:25:11,670 --> 02:25:10,479
that's like donald trump you know

4012
02:25:14,950 --> 02:25:11,680
complaining that

4013
02:25:16,710 --> 02:25:14,960

millions of people uh are streaming

4014

02:25:19,190 --> 02:25:16,720

across the mexican border

4015

02:25:21,990 --> 02:25:19,200

murdering and raping it's just a lie

4016

02:25:25,670 --> 02:25:22,000

right it's just a grotesque lie

4017

02:25:27,270 --> 02:25:25,680

okay um there is something

4018

02:25:28,710 --> 02:25:27,280

we never actually talked about this but

4019

02:25:30,150 --> 02:25:28,720

i'm going to interject this

4020

02:25:32,389 --> 02:25:30,160

because this is an illusion back to what

4021

02:25:34,790 --> 02:25:32,399

we were talking about earlier

4022

02:25:37,030 --> 02:25:34,800

political correctness is not a threat to

4023

02:25:39,590 --> 02:25:37,040

the university

4024

02:25:40,630 --> 02:25:39,600

we're incredibly free to do whatever the

4025

02:25:43,910 --> 02:25:40,640

hell we want

4026
02:25:44,630 --> 02:25:43,920
nobody is being uh suppressed inside a

4027
02:25:46,710 --> 02:25:44,640
university

4028
02:25:49,030 --> 02:25:46,720
it's a remarkable universities are

4029
02:25:50,550 --> 02:25:49,040
remarkable institutions i think they're

4030
02:25:51,830 --> 02:25:50,560
wonderful institutions but what about

4031
02:25:53,750 --> 02:25:51,840
what happened with jordan peterson where

4032
02:25:56,309 --> 02:25:53,760
they didn't even want him to speak

4033
02:25:56,950 --> 02:25:56,319
and they shut they had a whole protest

4034
02:25:58,309 --> 02:25:56,960
against him

4035
02:26:00,550 --> 02:25:58,319
and they want to get him fired yeah

4036
02:26:03,510 --> 02:26:00,560
that's probably a bad idea

4037
02:26:04,630 --> 02:26:03,520
he should he should probably be allowed

4038
02:26:07,429 --> 02:26:04,640

to speak

4039

02:26:07,910 --> 02:26:07,439

um probably yeah i i will say probably

4040

02:26:10,870 --> 02:26:07,920

and

4041

02:26:12,550 --> 02:26:10,880

because i'm not absolutely definite um

4042

02:26:14,230 --> 02:26:12,560

very likely i think

4043

02:26:15,910 --> 02:26:14,240

but i'm i won't say that about

4044

02:26:19,030 --> 02:26:15,920

absolutely everybody

4045

02:26:21,190 --> 02:26:19,040

so for instance um uh let's take what's

4046

02:26:23,270 --> 02:26:21,200

his name spencer

4047

02:26:25,190 --> 02:26:23,280

richard smith richard spencer who's a

4048

02:26:28,469 --> 02:26:25,200

right who's a white nationalist

4049

02:26:32,150 --> 02:26:28,479

yes yeah see i have serious qualms about

4050

02:26:38,950 --> 02:26:35,270

um we

4051
02:26:40,550 --> 02:26:38,960
universities that is are in a kind of a

4052
02:26:43,429 --> 02:26:40,560
bind here

4053
02:26:45,270 --> 02:26:43,439
if we let if the universities let

4054
02:26:48,469 --> 02:26:45,280
richard spencer speak

4055
02:26:50,389 --> 02:26:48,479
he gets a kind of prestige and cachet

4056
02:26:51,990 --> 02:26:50,399
so you're worried about legitimizing

4057
02:26:53,670 --> 02:26:52,000
yeah a little bit he gets

4058
02:26:55,110 --> 02:26:53,680
just by allowing him to speak at a

4059
02:26:58,150 --> 02:26:55,120
university

4060
02:26:59,990 --> 02:26:58,160
um and then but if we turn him down then

4061
02:27:02,790 --> 02:27:00,000
we get branded as being

4062
02:27:04,070 --> 02:27:02,800
is censoring him political correctness

4063
02:27:08,309 --> 02:27:04,080

and so on

4064

02:27:12,469 --> 02:27:11,030

and often right wing right wingers know

4065

02:27:14,710 --> 02:27:12,479

we can't win

4066

02:27:16,070 --> 02:27:14,720

and often they don't even care whether

4067

02:27:18,950 --> 02:27:16,080

they're allowed to speak or not

4068

02:27:20,150 --> 02:27:18,960

because they know they're going to win

4069

02:27:22,790 --> 02:27:20,160

just by

4070

02:27:24,150 --> 02:27:22,800

either speaking or being turned down and

4071

02:27:25,349 --> 02:27:24,160

then they go to the press and say we're

4072

02:27:27,429 --> 02:27:25,359

being censored

4073

02:27:29,270 --> 02:27:27,439

and then they get you know they win some

4074

02:27:32,309 --> 02:27:29,280

notoriety for this

4075

02:27:35,190 --> 02:27:32,319

anyway i don't think that um

4076

02:27:37,429 --> 02:27:35,200

intellectual real intellectual life of

4077

02:27:39,910 --> 02:27:37,439

the university is in any way harmed by

4078

02:27:41,429 --> 02:27:39,920

so-called political correctness the real

4079

02:27:43,830 --> 02:27:41,439

dangers to universities

4080

02:27:46,070 --> 02:27:43,840

is completely tangential to this the

4081

02:27:47,270 --> 02:27:46,080

real dangers is the commercialization of

4082

02:27:49,590 --> 02:27:47,280

research

4083

02:27:51,830 --> 02:27:49,600

we haven't talked about that at all and

4084

02:27:54,710 --> 02:27:51,840

that's that's a that's a really big deal

4085

02:27:56,070 --> 02:27:54,720

and it's an incredibly deep subject then

4086

02:27:57,349 --> 02:27:56,080

you probably don't want to go into it

4087

02:27:58,150 --> 02:27:57,359

and you have a talk about that right

4088

02:28:00,469 --> 02:27:58,160

well you know i

4089

02:28:02,070 --> 02:28:00,479

i i used to do a lot of work i i haven't

4090

02:28:03,349 --> 02:28:02,080

done much recently but i used to do a

4091

02:28:05,750 --> 02:28:03,359

lot of work on this you have one that's

4092

02:28:07,110 --> 02:28:05,760

public that people can go to

4093

02:28:08,790 --> 02:28:07,120

that people can search on youtube yeah

4094

02:28:10,150 --> 02:28:08,800

yeah i can i can i don't

4095

02:28:11,510 --> 02:28:10,160

not off the top of my head but i can

4096

02:28:12,070 --> 02:28:11,520

find something and we'll put the links

4097

02:28:13,910 --> 02:28:12,080

in the description

4098

02:28:15,990 --> 02:28:13,920

i'll give you a link yeah but the

4099

02:28:17,270 --> 02:28:16,000

commercialization of research is having

4100

02:28:19,110 --> 02:28:17,280

a tremendous effect

4101
02:28:20,389 --> 02:28:19,120
uh pharmaceuticals i think are just

4102
02:28:23,030 --> 02:28:20,399
about the worst

4103
02:28:24,870 --> 02:28:23,040
yeah it skews research so health

4104
02:28:25,590 --> 02:28:24,880
problems are not tackled by the best

4105
02:28:32,790 --> 02:28:25,600
solution

4106
02:28:36,230 --> 02:28:32,800
but maybe diet exercise

4107
02:28:38,550 --> 02:28:36,240
for depression things like exercise

4108
02:28:41,030 --> 02:28:38,560
are at least as effective as the the

4109
02:28:43,349 --> 02:28:41,040
best um uh antidepressants

4110
02:28:45,110 --> 02:28:43,359
without science but you can't yeah but

4111
02:28:47,270 --> 02:28:45,120
you can't make um

4112
02:28:49,030 --> 02:28:47,280
you can't patent it and so it's having

4113
02:28:50,550 --> 02:28:49,040

an effect on what kind of research is

4114

02:28:53,030 --> 02:28:50,560

actually carried out

4115

02:28:53,990 --> 02:28:53,040

that is a real worry so if we're

4116

02:28:57,030 --> 02:28:54,000

interested in

4117

02:28:59,110 --> 02:28:57,040

the truth and not just the truth but

4118

02:29:00,790 --> 02:28:59,120

truths that are good for human beings

4119

02:29:01,429 --> 02:29:00,800

you know that improves the quality of

4120

02:29:04,230 --> 02:29:01,439

our lives

4121

02:29:05,349 --> 02:29:04,240

our health for instance then we have to

4122

02:29:07,349 --> 02:29:05,359

really really really

4123

02:29:08,469 --> 02:29:07,359

worry and get a grip it's just far too

4124

02:29:11,510 --> 02:29:08,479

much money

4125

02:29:13,429 --> 02:29:11,520

coming in from industry and um

4126
02:29:14,950 --> 02:29:13,439
they're they're in fact often they don't

4127
02:29:17,670 --> 02:29:14,960
give all that much money

4128
02:29:18,309 --> 02:29:17,680
but um they'll they top up like the

4129
02:29:22,230 --> 02:29:18,319
government

4130
02:29:24,550 --> 02:29:22,240
funding

4131
02:29:25,750 --> 02:29:24,560
and that's arm's length that there's the

4132
02:29:26,550 --> 02:29:25,760
government doesn't interfere with that

4133
02:29:28,150 --> 02:29:26,560
they just give

4134
02:29:30,070 --> 02:29:28,160
you know the national research council

4135
02:29:31,510 --> 02:29:30,080
money and then they distribute it in a

4136
02:29:34,309 --> 02:29:31,520
peer-reviewed way to

4137
02:29:35,510 --> 02:29:34,319
physics and chemistry and so on but uh

4138
02:29:37,990 --> 02:29:35,520

often um

4139

02:29:38,950 --> 02:29:38,000

individual researchers will go to will

4140

02:29:40,150 --> 02:29:38,960

will apply for money from a

4141

02:29:41,270 --> 02:29:40,160

pharmaceutical company so they're

4142

02:29:42,630 --> 02:29:41,280

getting a ton of money

4143

02:29:44,150 --> 02:29:42,640

from the government and the

4144

02:29:44,950 --> 02:29:44,160

pharmaceutical company will often give

4145

02:29:47,670 --> 02:29:44,960

them

4146

02:29:49,349 --> 02:29:47,680

significant top-ups and it'll change the

4147

02:29:52,389 --> 02:29:49,359

direction of the research

4148

02:29:54,389 --> 02:29:52,399

and that's having a very bad effect and

4149

02:29:58,550 --> 02:29:54,399

we're just getting crap

4150

02:30:00,870 --> 02:29:58,560

uh drugs often these days because of it

4151
02:30:02,630 --> 02:30:00,880
you're not a fan of the fda do you feel

4152
02:30:04,070 --> 02:30:02,640
like that the fda is not so bad the fda

4153
02:30:05,429 --> 02:30:04,080
doesn't have enough

4154
02:30:07,429 --> 02:30:05,439
i i remember hearing a talk that the

4155
02:30:09,510 --> 02:30:07,439
fda's restrictions are too much are too

4156
02:30:10,790 --> 02:30:09,520
restrictive because they're limiting the

4157
02:30:13,190 --> 02:30:10,800
amount of drugs that can come

4158
02:30:14,070 --> 02:30:13,200
into market oh no they're not

4159
02:30:16,550 --> 02:30:14,080
restrictive enough

4160
02:30:17,190 --> 02:30:16,560
in that sense um drug companies will

4161
02:30:20,389 --> 02:30:17,200
complain

4162
02:30:22,389 --> 02:30:20,399
that they're slow and restrictive

4163
02:30:24,070 --> 02:30:22,399

and so on no we need to we need to

4164

02:30:25,910 --> 02:30:24,080

change the fda rules

4165

02:30:27,429 --> 02:30:25,920

well the americans need to change them

4166

02:30:31,270 --> 02:30:27,439

uh right now

4167

02:30:33,510 --> 02:30:31,280

the they they are mandated to license

4168

02:30:34,870 --> 02:30:33,520

anything that goes through a clinical

4169

02:30:37,670 --> 02:30:34,880

trial

4170

02:30:39,670 --> 02:30:37,680

and is is considered effective when

4171

02:30:42,230 --> 02:30:39,680

compared with a placebo

4172

02:30:42,870 --> 02:30:42,240

that can be incredibly minuscule you

4173

02:30:44,950 --> 02:30:42,880

know

4174

02:30:45,990 --> 02:30:44,960

and and yet billions of dollars will be

4175

02:30:48,389 --> 02:30:46,000

spent on on

4176
02:30:49,349 --> 02:30:48,399
on these drugs and if this drug gets

4177
02:30:51,190 --> 02:30:49,359
patented

4178
02:30:52,550 --> 02:30:51,200
and there's only generics to compete

4179
02:30:54,150 --> 02:30:52,560
with it then

4180
02:30:55,750 --> 02:30:54,160
they'll pour a ton of money into

4181
02:30:57,910 --> 02:30:55,760
advertising

4182
02:30:59,670 --> 02:30:57,920
doctors will start prescribing this and

4183
02:31:02,309 --> 02:30:59,680
doctors can be

4184
02:31:03,750 --> 02:31:02,319
corrupted by their prescription habits

4185
02:31:07,830 --> 02:31:03,760
and get money from the

4186
02:31:09,830 --> 02:31:07,840
pharmaceuticals yeah

4187
02:31:11,270 --> 02:31:09,840
you know about the cheerleaders yeah

4188
02:31:14,309 --> 02:31:11,280

that's remarkable

4189

02:31:17,270 --> 02:31:14,319

um and uh and these

4190

02:31:18,469 --> 02:31:17,280

often uh the a very old generic drug is

4191

02:31:21,510 --> 02:31:18,479

much much better than

4192

02:31:22,230 --> 02:31:21,520

these new newer drugs uh fewer side

4193

02:31:25,349 --> 02:31:22,240

effects

4194

02:31:28,550 --> 02:31:25,359

better positive effect incredibly cheap

4195

02:31:30,630 --> 02:31:28,560

you know to to produce and so on uh it's

4196

02:31:32,309 --> 02:31:30,640

a it's really a tragedy

4197

02:31:33,990 --> 02:31:32,319

it's hard to know how to combat it i

4198

02:31:35,510 --> 02:31:34,000

think i i think i know how to combat it

4199

02:31:36,790 --> 02:31:35,520

in canada

4200

02:31:38,870 --> 02:31:36,800

hard to know how to combat it in the

4201
02:31:41,190 --> 02:31:38,880
united states because the united states

4202
02:31:43,190 --> 02:31:41,200
economy is so structured around

4203
02:31:45,750 --> 02:31:43,200
intellectual property rights

4204
02:31:48,070 --> 02:31:45,760
i've tried to figure out how much of

4205
02:31:50,230 --> 02:31:48,080
american exports to the world

4206
02:31:51,429 --> 02:31:50,240
is in the form of ip rights because

4207
02:31:52,469 --> 02:31:51,439
whenever you buy anything that's

4208
02:31:54,630 --> 02:31:52,479
american

4209
02:31:55,990 --> 02:31:54,640
i mean you buy a piece of plastic but

4210
02:31:59,190 --> 02:31:56,000
it's got but its value

4211
02:32:01,590 --> 02:31:59,200
is in the form of ip rights mostly and

4212
02:32:02,710 --> 02:32:01,600
um so what percentage of the economy is

4213
02:32:07,030 --> 02:32:02,720

actually

4214

02:32:08,790 --> 02:32:07,040

across the board on patents but on drugs

4215

02:32:11,349 --> 02:32:08,800

i think it's uh it's a terrible mistake

4216

02:32:14,389 --> 02:32:11,359

and we should eliminate patents on drugs

4217

02:32:18,230 --> 02:32:14,399

um one of the reasons is

4218

02:32:20,230 --> 02:32:18,240

unlike say my new iphone full of patents

4219

02:32:21,510 --> 02:32:20,240

yeah but i can tell whether the damn

4220

02:32:23,030 --> 02:32:21,520

thing works yeah

4221

02:32:24,790 --> 02:32:23,040

you know i just turn it on and it works

4222

02:32:27,990 --> 02:32:24,800

or it doesn't work but

4223

02:32:28,950 --> 02:32:28,000

in the case of almost every drug there's

4224

02:32:31,270 --> 02:32:28,960

no way for

4225

02:32:32,870 --> 02:32:31,280

an individual to determine whether he or

4226

02:32:34,870 --> 02:32:32,880

she is benefiting from this drug

4227

02:32:37,030 --> 02:32:34,880

all you can do is look at it in a very

4228

02:32:39,190 --> 02:32:37,040

statistical way and there's an incentive

4229

02:32:40,790 --> 02:32:39,200

to produce a drug that works as long as

4230

02:32:44,230 --> 02:32:40,800

you take it

4231

02:32:45,110 --> 02:32:44,240

true and that's not good uh oh i see

4232

02:32:48,630 --> 02:32:45,120

what you mean

4233

02:32:50,870 --> 02:32:48,640

yes um treating chronic diseases is

4234

02:32:52,070 --> 02:32:50,880

is much better than curing something

4235

02:32:53,990 --> 02:32:52,080

with a vaccine

4236

02:32:55,429 --> 02:32:54,000

for instance yeah yeah all kinds of

4237

02:32:58,790 --> 02:32:55,439

problems like this

4238

02:33:00,469 --> 02:32:58,800

um anyway commercialization that's

4239

02:33:01,990 --> 02:33:00,479

i think is the real threat to

4240

02:33:04,150 --> 02:33:02,000

intellectual life

4241

02:33:06,070 --> 02:33:04,160

um and not political correctness which

4242

02:33:16,070 --> 02:33:06,080

is really really small potatoes

4243

02:33:19,510 --> 02:33:18,469

you said that you had some trouble with

4244

02:33:22,309 --> 02:33:19,520

jordan peterson's

4245

02:33:23,670 --> 02:33:22,319

point of view of truth oh well watching

4246

02:33:26,389 --> 02:33:23,680

uh

4247

02:33:27,750 --> 02:33:26,399

watching a video that you directed me to

4248

02:33:30,790 --> 02:33:27,760

and i'm glad

4249

02:33:31,349 --> 02:33:30,800

this was a video a discussion between

4250

02:33:35,110 --> 02:33:31,359

him

4251

02:33:37,030 --> 02:33:35,120

and sam harris who you also don't

4252

02:33:38,469 --> 02:33:37,040

necessarily like uh i have special

4253

02:33:38,950 --> 02:33:38,479

problems with harris maybe to talk about

4254

02:33:42,230 --> 02:33:38,960

that

4255

02:33:44,469 --> 02:33:42,240

later yeah so this was uh

4256

02:33:45,349 --> 02:33:44,479

harris invited him on and harris seems

4257

02:33:46,950 --> 02:33:45,359

to be

4258

02:33:48,469 --> 02:33:46,960

one of these people who doesn't like

4259

02:33:50,070 --> 02:33:48,479

political correctness

4260

02:33:51,670 --> 02:33:50,080

and thought that jordan peterson might

4261

02:33:54,750 --> 02:33:51,680

be good

4262

02:33:56,710 --> 02:33:54,760

a nice ally perhaps because he too is

4263

02:34:00,389 --> 02:33:56,720

anti-political correctness

4264

02:34:03,270 --> 02:34:00,399

and so on but then they got bogged down

4265

02:34:04,469 --> 02:34:03,280

on this notion of truth and and as far

4266

02:34:07,349 --> 02:34:04,479

as i can tell

4267

02:34:08,790 --> 02:34:07,359

peterson is just wacko on the concept of

4268

02:34:12,230 --> 02:34:08,800

truth

4269

02:34:15,270 --> 02:34:12,240

um i should just explain

4270

02:34:16,710 --> 02:34:15,280

when people talk about truth they're not

4271

02:34:19,190 --> 02:34:16,720

talking about particular truths

4272

02:34:21,030 --> 02:34:19,200

like we can argue whether or not the the

4273

02:34:22,790 --> 02:34:21,040

neutrino has mass

4274

02:34:24,630 --> 02:34:22,800

okay we don't know what's true and we

4275

02:34:27,270 --> 02:34:24,640

don't know what's false and we can argue

4276

02:34:29,349 --> 02:34:27,280

about that and produce evidence

4277

02:34:31,110 --> 02:34:29,359

this is arguing about the very concept

4278

02:34:32,950 --> 02:34:31,120

of truth itself what does it mean for

4279

02:34:36,389 --> 02:34:32,960

something to be true

4280

02:34:39,590 --> 02:34:36,399

and a normal person normal philosophers

4281

02:34:41,590 --> 02:34:39,600

standard philosophers take us

4282

02:34:43,590 --> 02:34:41,600

more or less a common sense view about

4283

02:34:46,790 --> 02:34:43,600

truth so a sentence

4284

02:34:50,230 --> 02:34:46,800

a statement a belief

4285

02:34:51,990 --> 02:34:50,240

is true because it corresponds to the

4286

02:34:55,830 --> 02:34:52,000

way things are

4287

02:34:58,389 --> 02:34:55,840

so the sentence there is a

4288

02:34:59,190 --> 02:34:58,399

recording device on the table that's the

4289

02:35:02,550 --> 02:34:59,200

sentence

4290

02:35:05,590 --> 02:35:02,560

in fact

4291

02:35:07,990 --> 02:35:05,600

a table a recording device and one is

4292

02:35:09,750 --> 02:35:08,000

on top of the other it's a very simple

4293

02:35:12,389 --> 02:35:09,760

conception of truth

4294

02:35:14,389 --> 02:35:12,399

there are other conceptions some people

4295

02:35:17,270 --> 02:35:14,399

say no no

4296

02:35:18,550 --> 02:35:17,280

truth has got to be linked to evidence

4297

02:35:22,150 --> 02:35:18,560

so the sentence

4298

02:35:25,429 --> 02:35:22,160

there is a recording device on the table

4299

02:35:28,550 --> 02:35:25,439

is true if and only if there's

4300

02:35:31,110 --> 02:35:28,560

some method of gathering

4301
02:35:33,349 --> 02:35:31,120
evidence to establish that truth lacking

4302
02:35:35,830 --> 02:35:33,359
that evidence it's not true

4303
02:35:37,270 --> 02:35:35,840
if you're a realist about truth as i am

4304
02:35:39,750 --> 02:35:37,280
then

4305
02:35:41,670 --> 02:35:39,760
a sentence could be true even though the

4306
02:35:43,990 --> 02:35:41,680
evidence isn't there for it

4307
02:35:45,429 --> 02:35:44,000
you shouldn't believe it if you don't

4308
02:35:46,389 --> 02:35:45,439
have the evidence that's a different

4309
02:35:49,349 --> 02:35:46,399
matter

4310
02:35:50,870 --> 02:35:49,359
but truth and evidence are are things

4311
02:35:52,550 --> 02:35:50,880
that you can pry apart

4312
02:35:55,110 --> 02:35:52,560
so what is peterson's conception truth

4313
02:35:58,150 --> 02:35:55,120

as you understand it crazy idea

4314

02:35:59,990 --> 02:35:58,160

um that he calls darwinian

4315

02:36:01,590 --> 02:36:00,000

and so a sentence is true if it has

4316

02:36:04,790 --> 02:36:01,600

survival value

4317

02:36:09,270 --> 02:36:04,800

he's thinking of this as a very crude uh

4318

02:36:12,389 --> 02:36:09,280

thing um there is there are some

4319

02:36:12,630 --> 02:36:12,399

uh philosophical ideas about truth that

4320

02:36:15,510 --> 02:36:12,640

are

4321

02:36:17,110 --> 02:36:15,520

maybe a little close to that you know

4322

02:36:19,030 --> 02:36:17,120

that he might if he knew about them

4323

02:36:21,270 --> 02:36:19,040

he could say oh that's i sort of believe

4324

02:36:24,230 --> 02:36:21,280

that pragmatism

4325

02:36:24,870 --> 02:36:24,240

pragmatism often um identifies truth

4326

02:36:28,550 --> 02:36:24,880

with what

4327

02:36:31,030 --> 02:36:28,560

is workable detectable

4328

02:36:31,590 --> 02:36:31,040

serviceable to life serviceable to life

4329

02:36:34,870 --> 02:36:31,600

but it's

4330

02:36:38,230 --> 02:36:34,880

more much more sophisticated than mere

4331

02:36:40,790 --> 02:36:38,240

crude darwinian survival value um

4332

02:36:41,349 --> 02:36:40,800

but you can sort of see some kinship

4333

02:36:44,469 --> 02:36:41,359

between

4334

02:36:46,389 --> 02:36:44,479

peterson's view and

4335

02:36:48,230 --> 02:36:46,399

and pragmatism now the trouble with

4336

02:36:50,630 --> 02:36:48,240

peterson's crude view is

4337

02:36:52,630 --> 02:36:50,640

there's a ton of stuff we know that's

4338

02:36:54,710 --> 02:36:52,640

independent of survival value

4339

02:36:56,070 --> 02:36:54,720

in fact may even be true contrary to

4340

02:36:57,830 --> 02:36:56,080

survival value

4341

02:36:59,830 --> 02:36:57,840

so just think of all the things you know

4342

02:37:02,950 --> 02:36:59,840

about quantum field theory

4343

02:37:06,150 --> 02:37:02,960

that that wouldn't help you in this in

4344

02:37:08,790 --> 02:37:06,160

life's struggle at all you could

4345

02:37:09,590 --> 02:37:08,800

if you were in if you're in the jungle

4346

02:37:11,429 --> 02:37:09,600

trying to

4347

02:37:13,270 --> 02:37:11,439

you know uh like like our distant

4348

02:37:16,550 --> 02:37:13,280

ancestors you're not going to

4349

02:37:16,950 --> 02:37:16,560

survive thank thank goodness uh based on

4350

02:37:23,110 --> 02:37:16,960

your

4351
02:37:25,429 --> 02:37:23,120
you could make out a jordan type case

4352
02:37:28,630 --> 02:37:25,439
for a lot of crude simple beliefs

4353
02:37:29,590 --> 02:37:28,640
like um trust your color perception to

4354
02:37:32,230 --> 02:37:29,600
distinguish

4355
02:37:33,670 --> 02:37:32,240
edible things from non-edible things you

4356
02:37:38,309 --> 02:37:33,680
know that sort of level

4357
02:37:40,790 --> 02:37:38,319
that's fine but to be to to enter into

4358
02:37:42,309 --> 02:37:40,800
the realm of sophisticated science which

4359
02:37:45,030 --> 02:37:42,319
he certainly wants to

4360
02:37:46,630 --> 02:37:45,040
participate in he's got to have an awful

4361
02:37:48,630 --> 02:37:46,640
lot more

4362
02:37:50,870 --> 02:37:48,640
subtle and sophisticated view of what

4363
02:38:01,510 --> 02:37:50,880

he's doing than his simple darwinian