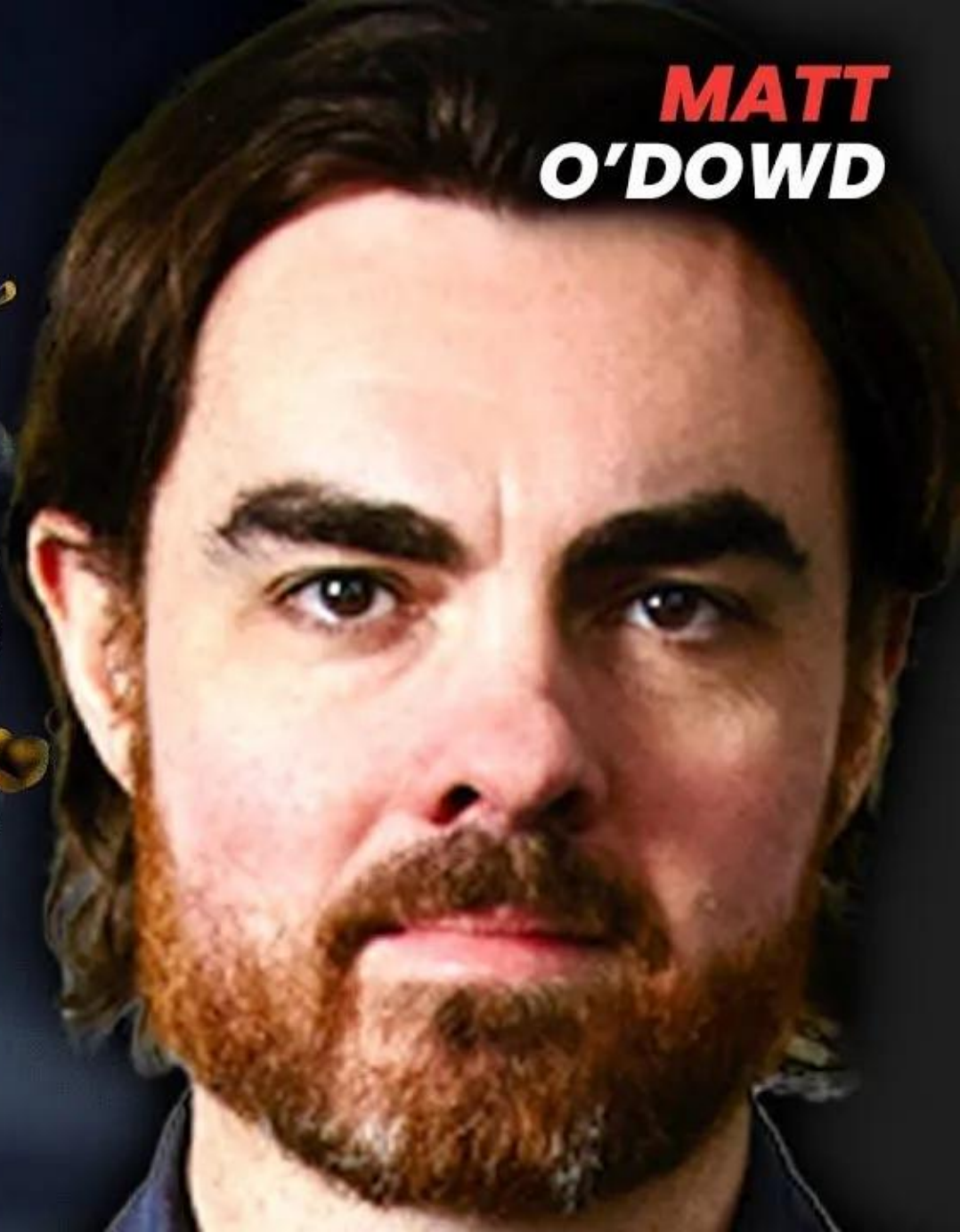


**MATT
O'DOWD**

**YOU
INVENT
REALITY**



1
00:00:05,690 --> 00:00:03,169
that whenever you grant perspective you

2
00:00:08,089 --> 00:00:05,700
grant power we've buried our heads so

3
00:00:10,430 --> 00:00:08,099
deeply you know we're sort of all we're

4
00:00:12,049 --> 00:00:10,440
all playing our own little mini games we

5
00:00:14,030 --> 00:00:12,059
like to organize the world into these

6
00:00:17,029 --> 00:00:14,040
simplified little systems of elements

7
00:00:19,130 --> 00:00:17,039
and simple rules and we sort of organize

8
00:00:20,280 --> 00:00:19,140
these mini-games of life and then you

9
00:00:21,730 --> 00:00:20,290
know we try to win them

10
00:00:25,009 --> 00:00:21,740
[Music]

11
00:00:27,230 --> 00:00:25,019
today's episode is about Free Will is

12
00:00:29,630 --> 00:00:27,240
there even a theory of everything and

13
00:00:31,189 --> 00:00:29,640

the physics of idealism that is the

14

00:00:32,810 --> 00:00:31,199

notion that Consciousness is fundamental

15

00:00:34,370 --> 00:00:32,820

and only we also touch on

16

00:00:36,590 --> 00:00:34,380

interpretations of quantum mechanics

17

00:00:38,990 --> 00:00:36,600

where the Observer has a privileged role

18

00:00:40,369 --> 00:00:39,000

in creating the universe Matt O'Dowd is

19

00:00:42,709 --> 00:00:40,379

a science communicator and an

20

00:00:44,930 --> 00:00:42,719

astrophysicist a professor at the City

21

00:00:47,450 --> 00:00:44,940

University of New York involved in

22

00:00:49,850 --> 00:00:47,460

gravitationally lensed quasars which

23

00:00:51,290 --> 00:00:49,860

touch on the crisis in cosmology which

24

00:00:53,569 --> 00:00:51,300

is something that we'll speak about in

25

00:00:56,090 --> 00:00:53,579

this episode and for sure in the next

26

00:00:58,850 --> 00:00:56,100

one at length Matt is also the host of

27

00:01:01,250 --> 00:00:58,860

PBS space-time which has over 2 million

28

00:01:03,590 --> 00:01:01,260

subscribers I think it's 2.8 and they're

29

00:01:05,509 --> 00:01:03,600

the largest physics and space show on

30

00:01:07,789 --> 00:01:05,519

YouTube and in case you're wondering who

31

00:01:09,410 --> 00:01:07,799

I am my name is Kurt J mungle I have a

32

00:01:10,910 --> 00:01:09,420

background in mathematical physics and

33

00:01:12,830 --> 00:01:10,920

this channel is theories of everything

34

00:01:14,990 --> 00:01:12,840

which is dedicated to the theoretical

35

00:01:17,330 --> 00:01:15,000

physics Endeavor of understanding

36

00:01:19,070 --> 00:01:17,340

gravity and Quantum field Theory but as

37

00:01:21,530 --> 00:01:19,080

well as we investigate Consciousness and

38

00:01:22,850 --> 00:01:21,540

the fundamental role it may have if

39

00:01:25,370 --> 00:01:22,860

you're watching this you'll see that I'm

40

00:01:27,830 --> 00:01:25,380

in a new location and all of this I

41

00:01:29,630 --> 00:01:27,840

can't wait to tell you more about in A

42

00:01:31,130 --> 00:01:29,640

Day in the Life episode we're filming a

43

00:01:33,350 --> 00:01:31,140

day in the life and you can expect to

44

00:01:35,270 --> 00:01:33,360

see that in the next couple of weeks you

45

00:01:36,770 --> 00:01:35,280

can also expect many changes behind here

46

00:01:39,050 --> 00:01:36,780

many different angles we're still

47

00:01:41,210 --> 00:01:39,060

setting it up you can also expect three

48

00:01:44,690 --> 00:01:41,220

sponsors in today's episode that is

49

00:01:46,670 --> 00:01:44,700

rocket money Henson and expressvpn again

50

00:01:48,289 --> 00:01:46,680

that'll be around the 20 minute Mark and

51
00:01:50,569 --> 00:01:48,299
then another one at the 40 minute Mark

52
00:01:52,130 --> 00:01:50,579
just telling you here as I like to know

53
00:01:54,109 --> 00:01:52,140
what the sponsors are before I watch a

54
00:01:55,609 --> 00:01:54,119
video and also when they are for full

55
00:01:57,289 --> 00:01:55,619
transparency and also to set

56
00:01:58,969 --> 00:01:57,299
expectations if you're interested in

57
00:02:01,630 --> 00:01:58,979
hearing more podcasts like this then do

58
00:02:03,670 --> 00:02:01,640
consider going to [patreon.com](https://www.patreon.com)

59
00:02:05,330 --> 00:02:03,680
or you can go to

60
00:02:06,709 --> 00:02:05,340
theoriesofeverything.org and supporting

61
00:02:08,210 --> 00:02:06,719
with the contribution of whatever you

62
00:02:10,010 --> 00:02:08,220
like as the only reason that I'm able to

63
00:02:11,809 --> 00:02:10,020

do this full time is because of the

64

00:02:14,150 --> 00:02:11,819

patrons so the supporters like yourself

65

00:02:15,770 --> 00:02:14,160

as well as the sponsors thank you so

66

00:02:17,270 --> 00:02:15,780

much and enjoy this episode with Matt

67

00:02:19,130 --> 00:02:17,280

O'Dowd

68

00:02:24,470 --> 00:02:19,140

Matt

69

00:02:25,250 --> 00:02:24,480

I've been watching you for years so this

70

00:02:29,089 --> 00:02:25,260

is

71

00:02:31,610 --> 00:02:29,099

honor man it's good to speak with you

72

00:02:34,670 --> 00:02:31,620

well it's my pleasure I've been watching

73

00:02:37,070 --> 00:02:34,680

you for months right right

74

00:02:39,470 --> 00:02:37,080

and really enjoyed the stuff dude thank

75

00:02:41,449 --> 00:02:39,480

you thank you okay so I want to talk

76

00:02:43,009 --> 00:02:41,459

about PBS space time which is what I

77

00:02:45,350 --> 00:02:43,019

know you from but that's not all you do

78

00:02:46,670 --> 00:02:45,360

it's not your full-time job

79

00:02:48,830 --> 00:02:46,680

so

80

00:02:50,630 --> 00:02:48,840

firstly let's get people who are

81

00:02:52,490 --> 00:02:50,640

unacquainted with you acquainted so what

82

00:02:54,290 --> 00:02:52,500

is PBS space time and how did you get

83

00:02:57,830 --> 00:02:54,300

involved

84

00:02:59,509 --> 00:02:57,840

okay so PBS space time it's a YouTube

85

00:03:06,949 --> 00:02:59,519

show

86

00:03:08,270 --> 00:03:06,959

Studios uh we do near weekly episodes a

87

00:03:11,869 --> 00:03:08,280

few times a month

88

00:03:14,210 --> 00:03:11,879

um and we explore

89

00:03:16,670 --> 00:03:14,220

a huge range of Topics by now because

90

00:03:20,630 --> 00:03:16,680

we've been doing it for seven years uh

91

00:03:25,190 --> 00:03:20,640

and we've gone pretty deep in

92

00:03:28,070 --> 00:03:25,200

you know topics of space and time uh and

93

00:03:31,850 --> 00:03:28,080

you know so physics astronomy

94

00:03:33,649 --> 00:03:31,860

astrophysics uh but this encompasses

95

00:03:34,369 --> 00:03:33,659

encompasses a huge amount of stuff of

96

00:03:37,369 --> 00:03:34,379

course

97

00:03:40,670 --> 00:03:37,379

um is it physics is enormous but we tend

98

00:03:43,789 --> 00:03:40,680

to explore topics in

99

00:03:47,270 --> 00:03:43,799

you know cosmology and quantum mechanics

100

00:03:49,670 --> 00:03:47,280

and you know as as mind bendy as we can

101
00:03:52,789 --> 00:03:49,680
with

102
00:03:55,729 --> 00:03:52,799
the Proviso that we are strictly

103
00:03:57,470 --> 00:03:55,739
scientifically rigorous right which

104
00:03:59,750 --> 00:03:57,480
makes it much different than

105
00:04:02,449 --> 00:03:59,760
the content that at least used to be out

106
00:04:04,850 --> 00:04:02,459
on YouTube and television which was much

107
00:04:06,410 --> 00:04:04,860
more watered down and mystifying playing

108
00:04:07,789 --> 00:04:06,420
up the aspect of the wave and the

109
00:04:08,990 --> 00:04:07,799
particle and pretty much just staying at

110
00:04:11,030 --> 00:04:09,000
that and saying there could be extra

111
00:04:12,229 --> 00:04:11,040
Dimensions without showing many if any

112
00:04:14,750 --> 00:04:12,239
equations

113
00:04:17,030 --> 00:04:14,760

yeah I mean and we actually don't show

114

00:04:18,129 --> 00:04:17,040

Too Many equations but we do show some I

115

00:04:21,170 --> 00:04:18,139

think our

116

00:04:24,350 --> 00:04:21,180

philosophy is more that

117

00:04:27,110 --> 00:04:24,360

um you know people have been consuming

118

00:04:29,330 --> 00:04:27,120

science media for many decades now you

119

00:04:32,749 --> 00:04:29,340

know uh since

120

00:04:36,409 --> 00:04:32,759

since before Carl Sagan's Cosmos and

121

00:04:40,010 --> 00:04:36,419

um it's like people have been in school

122

00:04:42,530 --> 00:04:40,020

for five decades and we decided that

123

00:04:46,070 --> 00:04:42,540

some wanted to graduate

124

00:04:48,590 --> 00:04:46,080

um to stretch an analogy but we you know

125

00:04:52,670 --> 00:04:48,600

we have the philosophy that our audience

126
00:04:55,730 --> 00:04:52,680
is smart people are smart and and you

127
00:04:58,249 --> 00:04:55,740
know the only difference is that they

128
00:05:01,310 --> 00:04:58,259
didn't make poor decisions about staying

129
00:05:03,110 --> 00:05:01,320
in University for way too long and so

130
00:05:05,270 --> 00:05:03,120
that the same level of specialized

131
00:05:08,270 --> 00:05:05,280
knowledge but they do have

132
00:05:10,430 --> 00:05:08,280
good brains uh and and perhaps more to

133
00:05:13,189 --> 00:05:10,440
the point they have fantastic

134
00:05:15,230 --> 00:05:13,199
[h__\h] detectors and so they're very

135
00:05:18,469 --> 00:05:15,240
highly tuned to when you know when

136
00:05:21,050 --> 00:05:18,479
they're being talked down to right so

137
00:05:24,590 --> 00:05:21,060
that's what we wanted to do we wanted to

138
00:05:27,590 --> 00:05:24,600

um bring maybe a peek behind the curtain

139

00:05:30,110 --> 00:05:27,600

of how you know the the particular

140

00:05:33,590 --> 00:05:30,120

sciences that we love the most actually

141

00:05:36,110 --> 00:05:33,600

happen and what some of the very poppy

142

00:05:39,710 --> 00:05:36,120

results that you see in in the media

143

00:05:42,650 --> 00:05:39,720

actually mean and uh yeah we talked

144

00:05:45,290 --> 00:05:42,660

before this and we realize we have

145

00:05:48,529 --> 00:05:45,300

several commonalities so one is we both

146

00:05:50,930 --> 00:05:48,539

research physics the next is we distill

147

00:05:52,490 --> 00:05:50,940

that physics or that research down to

148

00:05:54,590 --> 00:05:52,500

something that's consumable while

149

00:05:57,110 --> 00:05:54,600

correctly portraying the phenomenon so

150

00:05:59,990 --> 00:05:57,120

that is not being patronizing about it

151
00:06:01,909 --> 00:06:00,000
and then number three is filmmaking so

152
00:06:04,550 --> 00:06:01,919
why don't you tell the audience and

153
00:06:05,749 --> 00:06:04,560
myself about this film and why it's

154
00:06:08,270 --> 00:06:05,759
important to you

155
00:06:09,170 --> 00:06:08,280
sure okay so

156
00:06:10,850 --> 00:06:09,180
um

157
00:06:13,790 --> 00:06:10,860
so I you know I

158
00:06:15,590 --> 00:06:13,800
to in answering this question to also

159
00:06:17,510 --> 00:06:15,600
partially answer your last question

160
00:06:20,689 --> 00:06:17,520
which I missed um

161
00:06:23,270 --> 00:06:20,699
I didn't start out planning to make film

162
00:06:25,850 --> 00:06:23,280
when I was a kid I wondered a lot of

163
00:06:28,969 --> 00:06:25,860

weird stuff where did the world come

164

00:06:31,010 --> 00:06:28,979

from what happened before the Universe I

165

00:06:33,469 --> 00:06:31,020

still have the same questions I had as a

166

00:06:35,809 --> 00:06:33,479

kid this documentary will lay out our

167

00:06:38,689 --> 00:06:35,819

best modern understanding of what the

168

00:06:40,730 --> 00:06:38,699

universe really is I

169

00:06:43,309 --> 00:06:40,740

um you know I started out as an

170

00:06:45,770 --> 00:06:43,319

astrophysics researcher I'm a professor

171

00:06:48,770 --> 00:06:45,780

at City University of New York

172

00:06:52,370 --> 00:06:48,780

um you know I teach physics I

173

00:06:54,590 --> 00:06:52,380

do physics I have a research program in

174

00:06:55,809 --> 00:06:54,600

astrophysics but

175

00:07:00,529 --> 00:06:55,819

um

176

00:07:01,790 --> 00:07:00,539

around seven years ago I

177

00:07:05,450 --> 00:07:01,800

um

178

00:07:10,490 --> 00:07:05,460

well I have a friend so my friend uh

179

00:07:11,409 --> 00:07:10,500

Gabe Perez is a New York cosmologist at

180

00:07:14,029 --> 00:07:11,419

the time

181

00:07:15,890 --> 00:07:14,039

was doing this little show with PBS

182

00:07:19,249 --> 00:07:15,900

called space time

183

00:07:21,770 --> 00:07:19,259

um he did several really out of this

184

00:07:24,770 --> 00:07:21,780

world episodes but

185

00:07:26,210 --> 00:07:24,780

had decided to move on and so there was

186

00:07:28,790 --> 00:07:26,220

a bit of a scramble in the New York

187

00:07:32,330 --> 00:07:28,800

astrophysics Community because we'd all

188

00:07:35,749 --> 00:07:32,340

grown up on Carl Sagan uh and you know

189

00:07:37,730 --> 00:07:35,759

we all had this little desire to

190

00:07:39,469 --> 00:07:37,740

um you know not feel the issues but we

191

00:07:42,050 --> 00:07:39,479

saw the importance of the mission you

192

00:07:44,749 --> 00:07:42,060

know there's no point learning how big

193

00:07:48,170 --> 00:07:44,759

the universe is if you don't tell anyone

194

00:07:50,809 --> 00:07:48,180

about it and so so it tends to be you

195

00:07:53,629 --> 00:07:50,819

know a a pattern among particularly

196

00:07:56,270 --> 00:07:53,639

among people in Astro that we like to

197

00:07:57,890 --> 00:07:56,280

talk about this stuff so

198

00:08:01,189 --> 00:07:57,900

so I jumped in

199

00:08:02,330 --> 00:08:01,199

um and for whatever ridiculous reasons I

200

00:08:05,270 --> 00:08:02,340

ended up

201
00:08:07,550 --> 00:08:05,280
um stepping into Gabe's shoes and that

202
00:08:09,650 --> 00:08:07,560
was seven years and what do you mean

203
00:08:11,930 --> 00:08:09,660
that there's no point in learning about

204
00:08:15,529 --> 00:08:11,940
it if you don't talk about it oh so I

205
00:08:21,409 --> 00:08:18,529
uh you know a bunch of

206
00:08:24,110 --> 00:08:21,419
Ivory Tower academics knowing how

207
00:08:28,629 --> 00:08:24,120
amazing the universe is and you know

208
00:08:31,990 --> 00:08:28,639
talking to each other about it but never

209
00:08:35,810 --> 00:08:32,000
never you know sort of let's say

210
00:08:38,570 --> 00:08:35,820
leveling up humanities

211
00:08:40,909 --> 00:08:38,580
Collective reality in that way it's it

212
00:08:42,829 --> 00:08:40,919
is it is a more beautiful thing it's

213
00:08:45,050 --> 00:08:42,839

objectively more beautiful if more

214

00:08:47,870 --> 00:08:45,060

people

215

00:08:50,990 --> 00:08:47,880

um have a more expansive understanding

216

00:08:53,210 --> 00:08:51,000

of of the crazy universe that they live

217

00:08:56,030 --> 00:08:53,220

in um you know particularly in

218

00:08:58,370 --> 00:08:56,040

astrophysics we're not we don't produce

219

00:09:01,009 --> 00:08:58,380

a lot of Industry value you know we

220

00:09:04,790 --> 00:09:01,019

don't make a lot of the new useful Nano

221

00:09:06,710 --> 00:09:04,800

materials for example and so the the

222

00:09:08,930 --> 00:09:06,720

primary use of

223

00:09:11,570 --> 00:09:08,940

the field is perspective

224

00:09:17,750 --> 00:09:11,580

okay so the story of my life so I was no

225

00:09:22,430 --> 00:09:17,760

right uh so so we we really dug into

226

00:09:25,550 --> 00:09:22,440

um to space-time and it was

227

00:09:27,590 --> 00:09:25,560

successful beyond what we imagined could

228

00:09:30,290 --> 00:09:27,600

be could be possible and you know really

229

00:09:33,230 --> 00:09:30,300

what had happened is that we'd you know

230

00:09:35,030 --> 00:09:33,240

maybe let's say we can credit ourselves

231

00:09:36,590 --> 00:09:35,040

with a little intuition here but I think

232

00:09:40,730 --> 00:09:36,600

there was also some luck that we tapped

233

00:09:43,250 --> 00:09:40,740

into a very hungry market for

234

00:09:45,530 --> 00:09:43,260

um for much more authentic science

235

00:09:48,949 --> 00:09:45,540

journalism

236

00:09:51,710 --> 00:09:48,959

um and so you know we

237

00:09:54,170 --> 00:09:51,720

um I mean you know you you need to go

238

00:09:58,370 --> 00:09:54,180

and look at our uh

239

00:10:00,410 --> 00:09:58,380

our video library on YouTube and there's

240

00:10:02,030 --> 00:10:00,420

a lot yeah there will be an overlay

241

00:10:03,769 --> 00:10:02,040

right now for the audience and I highly

242

00:10:07,790 --> 00:10:03,779

recommend you subscribe to PBS space

243

00:10:10,490 --> 00:10:07,800

time uh but it also

244

00:10:13,190 --> 00:10:10,500

you know over that time

245

00:10:14,630 --> 00:10:13,200

um took the little little spark of

246

00:10:16,130 --> 00:10:14,640

passion that I had for science

247

00:10:18,350 --> 00:10:16,140

communication which had previously been

248

00:10:21,590 --> 00:10:18,360

expressed you know doing public talks

249

00:10:23,269 --> 00:10:21,600

and you know doing observing nights uh

250

00:10:25,009 --> 00:10:23,279

for the public and things like that and

251
00:10:28,670 --> 00:10:25,019
I realized that wow there's really

252
00:10:29,329 --> 00:10:28,680
something big that can be done

253
00:10:31,850 --> 00:10:29,339
um

254
00:10:32,889 --> 00:10:31,860
and so

255
00:10:37,370 --> 00:10:32,899
um

256
00:10:40,130 --> 00:10:37,380
so this film uh it's actually

257
00:10:45,050 --> 00:10:40,140
not a PBS production it's a production

258
00:10:47,389 --> 00:10:45,060
with my PBS team as well as my partner

259
00:10:49,810 --> 00:10:47,399
bahara golipur who is a science

260
00:10:52,790 --> 00:10:49,820
journalist uh specializing in

261
00:10:55,430 --> 00:10:52,800
neuroscience and AI

262
00:10:57,769 --> 00:10:55,440
and um so this is what this is this is

263
00:11:00,110 --> 00:10:57,779

our Collective Mission but in a way it's

264

00:11:02,569 --> 00:11:00,120

the culmination of our

265

00:11:04,670 --> 00:11:02,579

our efforts

266

00:11:06,410 --> 00:11:04,680

and

267

00:11:08,150 --> 00:11:06,420

um so

268

00:11:09,889 --> 00:11:08,160

I mean I can tell you a little bit about

269

00:11:13,850 --> 00:11:09,899

the film

270

00:11:15,590 --> 00:11:13,860

um yeah I would love to hear so uh so

271

00:11:19,730 --> 00:11:15,600

the idea I mean the film is called

272

00:11:22,670 --> 00:11:19,740

inventing reality and the idea is

273

00:11:25,009 --> 00:11:22,680

you know it as I said it's a synthesis

274

00:11:27,110 --> 00:11:25,019

um not just of what we've learned but um

275

00:11:30,650 --> 00:11:27,120

it's an attempt to sort of

276

00:11:34,730 --> 00:11:30,660

put it together step back take stock and

277

00:11:36,470 --> 00:11:34,740

look for pass forward so so maybe a

278

00:11:38,990 --> 00:11:36,480

simple way to say it is that it's a

279

00:11:40,850 --> 00:11:39,000

movie about Humanity's search for what

280

00:11:43,370 --> 00:11:40,860

is fundamental

281

00:11:46,069 --> 00:11:43,380

um and of course there are many ways

282

00:11:48,530 --> 00:11:46,079

that we seek truth but the focus of this

283

00:11:50,650 --> 00:11:48,540

film is the pursuit of the most

284

00:11:53,630 --> 00:11:50,660

fundamental levels of reality through

285

00:11:55,069 --> 00:11:53,640

particularly physics but also science in

286

00:11:55,790 --> 00:11:55,079

general

287

00:11:59,090 --> 00:11:55,800

um

288

00:12:01,130 --> 00:11:59,100

and okay so you know it's about the

289

00:12:03,650 --> 00:12:01,140

question what is reality but it's also

290

00:12:07,130 --> 00:12:03,660

about the meta questions

291

00:12:09,590 --> 00:12:07,140

um so digging into the potential answers

292

00:12:11,269 --> 00:12:09,600

to the question itself but also to

293

00:12:12,710 --> 00:12:11,279

question that question

294

00:12:13,430 --> 00:12:12,720

so

295

00:12:15,670 --> 00:12:13,440

um

296

00:12:18,530 --> 00:12:15,680

physics is

297

00:12:21,230 --> 00:12:18,540

insanely successful almost unbelievably

298

00:12:25,130 --> 00:12:21,240

successful in its predictive power about

299

00:12:27,170 --> 00:12:25,140

nature but uh there's there's a sense

300

00:12:30,530 --> 00:12:27,180

and I think a growing sense that physics

301
00:12:32,810 --> 00:12:30,540
has stalled in I think what some once

302
00:12:35,990 --> 00:12:32,820
thought was this final Sprint to a

303
00:12:38,990 --> 00:12:36,000
theory of everything you know to to

304
00:12:40,930 --> 00:12:39,000
neatly tie up reality in a bow have this

305
00:12:44,389 --> 00:12:40,940
final equation that described everything

306
00:12:46,850 --> 00:12:44,399
uh and so uh so now many physicists are

307
00:12:50,329 --> 00:12:46,860
asking how do we approach the question

308
00:12:52,250 --> 00:12:50,339
differently and not just physicists a

309
00:12:54,889 --> 00:12:52,260
lot of the thinking is Reaching Across

310
00:12:57,110 --> 00:12:54,899
into other disciplines drawing on other

311
00:12:58,910 --> 00:12:57,120
disciplines okay can you give an example

312
00:13:01,970 --> 00:12:58,920
of that because you said you would like

313
00:13:04,009 --> 00:13:01,980

to investigate fundamental reality from

314

00:13:06,889 --> 00:13:04,019

not just a physics perspective but a

315

00:13:09,350 --> 00:13:06,899

science perspective in general what

316

00:13:14,210 --> 00:13:09,360

would that look like if not physics

317

00:13:17,870 --> 00:13:14,220

great question so so I guess um

318

00:13:19,430 --> 00:13:17,880

there's a lot many ways to uh answer

319

00:13:23,269 --> 00:13:19,440

that but

320

00:13:25,970 --> 00:13:23,279

let's just use one so uh

321

00:13:29,329 --> 00:13:25,980

quantum mechanics is

322

00:13:31,730 --> 00:13:29,339

weird beyond comprehension in a very

323

00:13:35,870 --> 00:13:31,740

literal sense we still don't get it

324

00:13:38,449 --> 00:13:35,880

um but it's clear that there is a

325

00:13:41,629 --> 00:13:38,459

an uncanny and fundamental Link Between

326

00:13:43,550 --> 00:13:41,639

The Observer and the nature of the

327

00:13:44,449 --> 00:13:43,560

observed the so-called measurement

328

00:13:46,370 --> 00:13:44,459

problem

329

00:13:49,550 --> 00:13:46,380

and this is a

330

00:13:52,610 --> 00:13:49,560

an unresolved uh

331

00:13:55,449 --> 00:13:52,620

um conundrum that was sort of swept

332

00:13:59,530 --> 00:13:55,459

under the rug you know back in the 1920s

333

00:14:02,090 --> 00:13:59,540

uh when we realized that there was

334

00:14:03,550 --> 00:14:02,100

some kind of

335

00:14:06,710 --> 00:14:03,560

in between

336

00:14:09,650 --> 00:14:06,720

observations there there is there's a

337

00:14:11,329 --> 00:14:09,660

level of indeterminacy to Nature in

338

00:14:14,210 --> 00:14:11,339

which nature

339

00:14:16,850 --> 00:14:14,220

appears to occupy multiple States at

340

00:14:20,150 --> 00:14:16,860

once or no State and it's only defined

341

00:14:22,730 --> 00:14:20,160

on observation and all of this all this

342

00:14:25,449 --> 00:14:22,740

beautiful weird stuff and

343

00:14:28,250 --> 00:14:25,459

um there there was a lot of debate about

344

00:14:31,190 --> 00:14:28,260

you know basically swing between a type

345

00:14:33,949 --> 00:14:31,200

of idealism and a type of realism

346

00:14:35,690 --> 00:14:33,959

um questioning the reality of reality

347

00:14:38,389 --> 00:14:35,700

um and how fundamental The Observer is

348

00:14:40,449 --> 00:14:38,399

but this was pushed aside uh because

349

00:14:43,370 --> 00:14:40,459

quantum mechanics was

350

00:14:46,009 --> 00:14:43,380

incredibly successful at predicting the

351
00:14:48,710 --> 00:14:46,019
behavior of the universe and so you know

352
00:14:51,350 --> 00:14:48,720
the old added shut up and calculate uh

353
00:14:53,509 --> 00:14:51,360
really drove the the philosophy of how

354
00:14:56,930 --> 00:14:53,519
quantum mechanics evolved um

355
00:14:59,389 --> 00:14:56,940
in that we just used it we we used it to

356
00:15:00,889 --> 00:14:59,399
make amazing predictions I think it's

357
00:15:03,170 --> 00:15:00,899
reasonable to say we used quantum

358
00:15:05,750 --> 00:15:03,180
mechanics to build our modern world you

359
00:15:11,030 --> 00:15:05,760
know transition calculate mindset is

360
00:15:13,610 --> 00:15:11,040
what it is yeah yeah it is so it so

361
00:15:15,889 --> 00:15:13,620
for quite some time it was

362
00:15:17,810 --> 00:15:15,899
considered career suicide for an

363
00:15:20,870 --> 00:15:17,820

academic to ask questions like but what

364

00:15:23,030 --> 00:15:20,880

does quantum mechanics actually mean

365

00:15:25,730 --> 00:15:23,040

um what is happening between

366

00:15:28,430 --> 00:15:25,740

measurements for example sort of the the

367

00:15:31,129 --> 00:15:28,440

what we call the interpretation of

368

00:15:33,590 --> 00:15:31,139

quantum mechanics so the equations work

369

00:15:35,509 --> 00:15:33,600

you know the Schrodinger equation or the

370

00:15:38,389 --> 00:15:35,519

equations of quantum field Theory they

371

00:15:40,310 --> 00:15:38,399

work incredibly well but asking the

372

00:15:41,930 --> 00:15:40,320

question what do these equations mean

373

00:15:44,210 --> 00:15:41,940

what is the

374

00:15:46,490 --> 00:15:44,220

physical story that they

375

00:15:47,930 --> 00:15:46,500

are the world

376

00:15:50,509 --> 00:15:47,940

I'm not sure if you've seen the

377

00:15:52,009 --> 00:15:50,519

interview on toll with Tim Maudlin I

378

00:15:53,389 --> 00:15:52,019

have not seen that one yet okay well he

379

00:15:55,069 --> 00:15:53,399

would say so he's a philosopher of

380

00:15:57,230 --> 00:15:55,079

physics and he would say quantum theory

381

00:16:00,050 --> 00:15:57,240

they don't teach you quantum theory they

382

00:16:01,370 --> 00:16:00,060

teach you a method of calculating and a

383

00:16:03,650 --> 00:16:01,380

true theory should give you an account

384

00:16:05,870 --> 00:16:03,660

of ontology so a true theory is a

385

00:16:07,970 --> 00:16:05,880

combination of math and metaphysics or

386

00:16:10,490 --> 00:16:07,980

at least like a supposed account of the

387

00:16:12,350 --> 00:16:10,500

metaphysics and he said that's what most

388

00:16:13,670 --> 00:16:12,360

interested him in physics and they would

389

00:16:16,129 --> 00:16:13,680

talk about that on the first lecture

390

00:16:17,870 --> 00:16:16,139

just to get you involved and then after

391

00:16:20,210 --> 00:16:17,880

that it's calculating greens functions

392

00:16:21,470 --> 00:16:20,220

yeah and he said I'm not terribly

393

00:16:24,470 --> 00:16:21,480

interested in that I want to know what

394

00:16:26,090 --> 00:16:24,480

is going on yeah and he said now if you

395

00:16:27,650 --> 00:16:26,100

ask a physics Professor what is going on

396

00:16:29,629 --> 00:16:27,660

they say go to the philosophy Department

397

00:16:31,670 --> 00:16:29,639

that's not for here yeah they said

398

00:16:34,009 --> 00:16:31,680

that's not how it's been historically

399

00:16:35,689 --> 00:16:34,019

for all of physics even though physics

400

00:16:37,610 --> 00:16:35,699

wasn't coined until fairly recently but

401
00:16:40,310 --> 00:16:37,620
for since even Newton wanted to know

402
00:16:43,310 --> 00:16:40,320
what the heck is going on and Houston

403
00:16:47,329 --> 00:16:43,320
acknowledged that he didn't know what

404
00:16:51,050 --> 00:16:47,339
his so-called theory of gravity meant it

405
00:16:52,910 --> 00:16:51,060
it it he acknowledged that it was not

406
00:16:55,189 --> 00:16:52,920
pontological in any way it was

407
00:16:57,230 --> 00:16:55,199
descriptive and in the in the same way

408
00:17:00,350 --> 00:16:57,240
as

409
00:17:02,509 --> 00:17:00,360
um you know is Newton's law of universal

410
00:17:04,789 --> 00:17:02,519
gravitation is descriptive of gravity it

411
00:17:07,309 --> 00:17:04,799
doesn't explain why gravity happens

412
00:17:08,870 --> 00:17:07,319
quantum mechanics is descriptive of the

413
00:17:12,650 --> 00:17:08,880

behavior of subatomic particles but

414

00:17:14,929 --> 00:17:12,660

doesn't explain the why internet privacy

415

00:17:17,390 --> 00:17:14,939

is a growing concern as we mostly live

416

00:17:19,189 --> 00:17:17,400

our lives online however there are many

417

00:17:21,409 --> 00:17:19,199

ways that we can be attacked or

418

00:17:23,030 --> 00:17:21,419

monitored I personally don't go online

419

00:17:25,549 --> 00:17:23,040

doing what's sensitive without

420

00:17:27,590 --> 00:17:25,559

attempting to use a VPN the reason being

421

00:17:29,390 --> 00:17:27,600

that many internet service providers can

422

00:17:31,250 --> 00:17:29,400

view what you're viewing or view the

423

00:17:33,250 --> 00:17:31,260

websites that you visit and in addition

424

00:17:35,990 --> 00:17:33,260

sell your information to other people

425

00:17:37,789 --> 00:17:36,000

expressvpn is an app that reroutes your

426
00:17:40,610 --> 00:17:37,799
internet connection through their secure

427
00:17:43,909 --> 00:17:40,620
servers so your ISP can't see the sites

428
00:17:46,310 --> 00:17:43,919
that you visit with 100 data encryption

429
00:17:48,470 --> 00:17:46,320
you can allow expressvpn to run

430
00:17:50,510 --> 00:17:48,480
seamlessly in the background with a

431
00:17:52,070 --> 00:17:50,520
single tap of the button and their

432
00:17:54,110 --> 00:17:52,080
software is one of the best that money

433
00:17:55,730 --> 00:17:54,120
can buy with compatibility across

434
00:17:57,730 --> 00:17:55,740
virtually every single device whether

435
00:18:00,169 --> 00:17:57,740
it's your phone or your computer

436
00:18:03,710 --> 00:18:00,179
expressvpn keeps all of your information

437
00:18:05,930 --> 00:18:03,720
100 encrypted with the most powerful

438
00:18:08,510 --> 00:18:05,940

encryption available protect your online

439

00:18:10,909 --> 00:18:08,520

activity today with the VPN rated number

440

00:18:12,370 --> 00:18:10,919

one by Business Insider visit the tow

441

00:18:14,810 --> 00:18:12,380

exclusive link

442

00:18:16,909 --> 00:18:14,820

expressvpn.com theories of everything

443

00:18:19,430 --> 00:18:16,919

and you can get an extra three months

444

00:18:22,570 --> 00:18:19,440

off for free off of the one-year package

445

00:18:30,409 --> 00:18:26,409

expressvpn.com theories of everything

446

00:18:32,450 --> 00:18:30,419

expressvpn.com theories of everything

447

00:18:35,090 --> 00:18:32,460

most of us share in the problem of being

448

00:18:37,490 --> 00:18:35,100

so digitally active that we over consume

449

00:18:38,870 --> 00:18:37,500

or over produce content which in turn

450

00:18:40,909 --> 00:18:38,880

leads to an overwhelming amount of

451

00:18:43,310 --> 00:18:40,919

monthly monetary subscription this

452

00:18:44,690 --> 00:18:43,320

Channel's theme is exploration at least

453

00:18:46,610 --> 00:18:44,700

one of the main themes and it's

454

00:18:48,409 --> 00:18:46,620

difficult to paragonate when we're

455

00:18:49,970 --> 00:18:48,419

handling the more routine and monotonous

456

00:18:51,710 --> 00:18:49,980

items this is exactly why we're

457

00:18:53,990 --> 00:18:51,720

partnering with today's sponsor rocket

458

00:18:55,610 --> 00:18:54,000

money formerly known as true bill rocket

459

00:18:57,409 --> 00:18:55,620

money automates the process of financial

460

00:18:59,210 --> 00:18:57,419

saving and tackles the various

461

00:19:01,430 --> 00:18:59,220

subscriptions that inevitably pile up

462

00:19:04,130 --> 00:19:01,440

for all of us like Netflix phone bills

463

00:19:06,590 --> 00:19:04,140

patreon subscriptions that aren't too

464

00:19:08,090 --> 00:19:06,600

Etc rocket money displays all of your

465

00:19:10,190 --> 00:19:08,100

subscriptions tells you where you're

466

00:19:12,230 --> 00:19:10,200

losing money and how to cancel them with

467

00:19:14,029 --> 00:19:12,240

a single click of a button most of us

468

00:19:15,710 --> 00:19:14,039

think that we spend approximately eighty

469

00:19:17,150 --> 00:19:15,720

dollars a month on subscriptions but it

470

00:19:19,130 --> 00:19:17,160

turns out that the average figure is in

471

00:19:20,810 --> 00:19:19,140

excess of two hundred dollars get rid of

472

00:19:24,070 --> 00:19:20,820

useless subscriptions with rocket money

473

00:19:26,990 --> 00:19:24,080

now go to rocketmoney.com everything

474

00:19:30,890 --> 00:19:27,000

seriously it could save you hundreds per

475

00:19:32,990 --> 00:19:30,900

year that's rocketmoney.com everything

476

00:19:36,350 --> 00:19:33,000

cancel your unnecessary subscriptions

477

00:19:38,210 --> 00:19:36,360

right now at rockmoney.com everything

478

00:19:40,970 --> 00:19:38,220

I've almost never had a problem with

479

00:19:43,190 --> 00:19:40,980

superposition because I see the math as

480

00:19:44,990 --> 00:19:43,200

a description and then it's only an

481

00:19:46,490 --> 00:19:45,000

issue if you try and make some

482

00:19:48,169 --> 00:19:46,500

correspondence between a map and say

483

00:19:49,549 --> 00:19:48,179

what the heck is going on so some people

484

00:19:51,590 --> 00:19:49,559

would say yeah but it's not as simple as

485

00:19:53,630 --> 00:19:51,600

if you have two goals so two plus two

486

00:19:56,210 --> 00:19:53,640

goats equals four goats that I

487

00:19:58,669 --> 00:19:56,220

understand however even there

488

00:20:02,510 --> 00:19:58,679

two plus two equals four but two plus

489

00:20:05,270 --> 00:20:02,520

two also equals five plus minus one

490

00:20:07,370 --> 00:20:05,280

just as easily and so you can say well

491

00:20:09,470 --> 00:20:07,380

what the heck is five goats and then a

492

00:20:11,750 --> 00:20:09,480

minus one goat does it live in a

493

00:20:13,130 --> 00:20:11,760

superposition of five and a minus one so

494

00:20:16,010 --> 00:20:13,140

unless you have a problem with even

495

00:20:17,570 --> 00:20:16,020

ordinary addition then to me I don't

496

00:20:19,610 --> 00:20:17,580

have a problem with superposition I just

497

00:20:21,590 --> 00:20:19,620

see it as okay this is a description so

498

00:20:22,850 --> 00:20:21,600

what do you think about that what do you

499

00:20:23,870 --> 00:20:22,860

make of that I think it's a great

500

00:20:26,450 --> 00:20:23,880

example

501
00:20:27,890 --> 00:20:26,460
um and it and and it conveniently gets

502
00:20:32,630 --> 00:20:27,900
to the point that I was rounding on

503
00:20:35,270 --> 00:20:32,640
anyway uh which is that we have

504
00:20:37,310 --> 00:20:35,280
and intuition about mathematics we have

505
00:20:38,510 --> 00:20:37,320
our own inbuilt math engine in our

506
00:20:41,870 --> 00:20:38,520
brains

507
00:20:43,970 --> 00:20:41,880
um and it it's you know we know that

508
00:20:45,890 --> 00:20:43,980
that our intuitions about math do not

509
00:20:48,529 --> 00:20:45,900
Encompass all math for example we don't

510
00:20:49,850 --> 00:20:48,539
have an intuition about imaginary

511
00:20:54,710 --> 00:20:49,860
numbers

512
00:20:57,590 --> 00:20:54,720
serviceable mathematical tools and in in

513
00:20:59,270 --> 00:20:57,600

you know in a sense there

514

00:21:02,029 --> 00:20:59,280

you're real in that they're important

515

00:21:06,830 --> 00:21:02,039

for understanding quantum mechanics but

516

00:21:14,090 --> 00:21:11,270

the worlds that we describe the the

517

00:21:15,650 --> 00:21:14,100

worlds that you know out the our

518

00:21:18,590 --> 00:21:15,660

subjective World which is a model and

519

00:21:20,570 --> 00:21:18,600

our scientific models

520

00:21:23,330 --> 00:21:20,580

um uh

521

00:21:26,870 --> 00:21:23,340

so heavily influenced by what we

522

00:21:28,490 --> 00:21:26,880

intuitively think is possible but we

523

00:21:31,850 --> 00:21:28,500

don't we shouldn't necessarily trust

524

00:21:34,130 --> 00:21:31,860

what we think is possible based on

525

00:21:36,409 --> 00:21:34,140

you know the the the math and physics

526

00:21:38,210 --> 00:21:36,419

engine that Evolution gave us

527

00:21:41,330 --> 00:21:38,220

um and so this is one

528

00:21:44,029 --> 00:21:41,340

uh interdisciplinary area we need to

529

00:21:46,549 --> 00:21:44,039

maybe talk to neuroscientists and you

530

00:21:49,310 --> 00:21:46,559

know people who are uh to cognitive

531

00:21:52,549 --> 00:21:49,320

scientists and and and and even people

532

00:21:56,630 --> 00:21:52,559

who are working in AI to understand what

533

00:21:59,029 --> 00:21:56,640

some of the biases might be in how

534

00:22:01,310 --> 00:21:59,039

a neural network like our own constructs

535

00:22:03,470 --> 00:22:01,320

its reality so that's what you meant

536

00:22:05,270 --> 00:22:03,480

when you said there is physics to

537

00:22:06,770 --> 00:22:05,280

understand fundamental reality but if we

538

00:22:08,990 --> 00:22:06,780

also want to understand what do we mean

539

00:22:10,909 --> 00:22:09,000

when we say fundamental reality we can

540

00:22:13,250 --> 00:22:10,919

use tools of Neuroscience to understand

541

00:22:16,250 --> 00:22:13,260

our own biases well that's so that

542

00:22:17,870 --> 00:22:16,260

aspect of understanding ourselves is

543

00:22:20,930 --> 00:22:17,880

important what are our biases but also

544

00:22:23,870 --> 00:22:20,940

if we want to approach

545

00:22:26,750 --> 00:22:23,880

things like the the measurement problem

546

00:22:28,789 --> 00:22:26,760

I think you know maybe

547

00:22:30,950 --> 00:22:28,799

understanding how we construct our

548

00:22:34,130 --> 00:22:30,960

subjective reality won't get us there

549

00:22:38,330 --> 00:22:34,140

maybe it'll be helpful but

550

00:22:39,350 --> 00:22:38,340

there are I I feel like there are

551
00:22:42,529 --> 00:22:39,360
um

552
00:22:43,549 --> 00:22:42,539
areas in for example

553
00:22:46,549 --> 00:22:43,559
well

554
00:22:48,409 --> 00:22:46,559
statistics probability Theory I mean you

555
00:22:52,510 --> 00:22:48,419
know these things physicists are pretty

556
00:22:55,250 --> 00:22:52,520
quick to to draw on for example various

557
00:22:59,330 --> 00:22:55,260
Bayesian interpretations of quantum

558
00:23:00,890 --> 00:22:59,340
mechanics but I also think that we can

559
00:23:02,270 --> 00:23:00,900
draw on

560
00:23:04,730 --> 00:23:02,280
um

561
00:23:09,049 --> 00:23:04,740
what you might broadly call systems

562
00:23:11,810 --> 00:23:09,059
theory so how complex systems emerge

563
00:23:14,510 --> 00:23:11,820

um to understand

564

00:23:15,830 --> 00:23:14,520

the different hierarchies of complexity

565

00:23:17,810 --> 00:23:15,840

okay

566

00:23:20,149 --> 00:23:17,820

um I mean this is there are so many

567

00:23:22,549 --> 00:23:20,159

rabbit holes that I'm avoiding leaping

568

00:23:26,149 --> 00:23:22,559

right down I'm happy to go down them uh

569

00:23:28,669 --> 00:23:26,159

one by one but sure but they're deep

570

00:23:31,909 --> 00:23:28,679

do you find that you're having a

571

00:23:33,730 --> 00:23:31,919

terrible amount of fun when you're

572

00:23:36,529 --> 00:23:33,740

delving into the more

573

00:23:38,450 --> 00:23:36,539

metaphysical side of physics and

574

00:23:39,830 --> 00:23:38,460

interpretations so this film in

575

00:23:42,169 --> 00:23:39,840

particular than you are with your own

576

00:23:46,510 --> 00:23:43,909

uh

577

00:23:49,370 --> 00:23:46,520

it's funny yeah so you know I

578

00:23:51,890 --> 00:23:49,380

pursued astrophysics because it it

579

00:23:54,230 --> 00:23:51,900

honestly just seemed like the most fun

580

00:23:58,310 --> 00:23:54,240

asking big questions about really big

581

00:23:59,930 --> 00:23:58,320

things but but over time I've become

582

00:24:02,510 --> 00:23:59,940

more and more interested in the

583

00:24:05,090 --> 00:24:02,520

fundamental and and making space time

584

00:24:09,350 --> 00:24:05,100

has been a big part of that also

585

00:24:11,510 --> 00:24:09,360

um and so I I have no regrets the the

586

00:24:15,770 --> 00:24:11,520

universe is awesome

587

00:24:18,890 --> 00:24:15,780

um and it's it's really fun to solve big

588

00:24:21,230 --> 00:24:18,900

problems about the universe and also the

589

00:24:24,289 --> 00:24:21,240

the skills I picked up doing that sort

590

00:24:26,690 --> 00:24:24,299

of work I I'm able to bring to bear on

591

00:24:28,310 --> 00:24:26,700

some of these other questions that said

592

00:24:31,669 --> 00:24:28,320

you know I'm not

593

00:24:32,990 --> 00:24:31,679

a Quantum theorist I'm not even what you

594

00:24:35,390 --> 00:24:33,000

know most people would call a

595

00:24:38,570 --> 00:24:35,400

theoretical physicist uh which means

596

00:24:41,870 --> 00:24:38,580

there are there are some skills that

597

00:24:44,750 --> 00:24:41,880

I'm going to have to work harder on uh

598

00:24:46,070 --> 00:24:44,760

and so this movie is about

599

00:24:47,270 --> 00:24:46,080

you know in a way it's a personal

600

00:24:48,529 --> 00:24:47,280

Journey

601
00:24:52,430 --> 00:24:48,539
um

602
00:24:53,870 --> 00:24:52,440
in that I I really want to take stock of

603
00:25:00,590 --> 00:24:53,880
the field

604
00:25:02,690 --> 00:25:00,600
get a sense of where Humanity stands in

605
00:25:04,250 --> 00:25:02,700
this question and what the paths forward

606
00:25:05,090 --> 00:25:04,260
could be

607
00:25:07,789 --> 00:25:05,100
um

608
00:25:10,130 --> 00:25:07,799
and yeah so there's that personal level

609
00:25:13,970 --> 00:25:10,140
but I also feel like it

610
00:25:15,409 --> 00:25:13,980
you know it's it's a contribution I

611
00:25:17,630 --> 00:25:15,419
think at some level

612
00:25:19,250 --> 00:25:17,640
um it's you know we're by no means the

613
00:25:20,750 --> 00:25:19,260

only people talking about this stuff but

614

00:25:23,990 --> 00:25:20,760

I think there's

615

00:25:25,669 --> 00:25:24,000

a rising Collective interest in this big

616

00:25:28,909 --> 00:25:25,679

picture

617

00:25:31,490 --> 00:25:28,919

um asking questions like you know

618

00:25:34,310 --> 00:25:31,500

what are we doing anyway what what what

619

00:25:36,830 --> 00:25:34,320

what is the goal of

620

00:25:38,390 --> 00:25:36,840

Being Human and asking questions about

621

00:25:39,169 --> 00:25:38,400

the world and

622

00:25:40,909 --> 00:25:39,179

um

623

00:25:43,909 --> 00:25:40,919

and

624

00:25:45,769 --> 00:25:43,919

you know I think I think anything we can

625

00:25:48,529 --> 00:25:45,779

do to sort of bring that Collective

626

00:25:50,690 --> 00:25:48,539

curiosity together is is useful

627

00:25:52,909 --> 00:25:50,700

especially these days

628

00:25:55,850 --> 00:25:52,919

help me understand how one goes from

629

00:25:57,710 --> 00:25:55,860

physics or even science which is to be a

630

00:26:01,930 --> 00:25:57,720

description again how does one go from

631

00:26:06,649 --> 00:26:01,940

that description to an ought

632

00:26:07,970 --> 00:26:06,659

well I think I mean the the easy answer

633

00:26:10,010 --> 00:26:07,980

is just

634

00:26:11,510 --> 00:26:10,020

that whenever you grant perspective you

635

00:26:14,990 --> 00:26:11,520

grant power

636

00:26:18,049 --> 00:26:15,000

um you know it's the same reason we do

637

00:26:19,370 --> 00:26:18,059

science communication on YouTube

638

00:26:22,070 --> 00:26:19,380

um and

639

00:26:25,010 --> 00:26:22,080

uh

640

00:26:28,070 --> 00:26:25,020

you know I feel like it's no secret that

641

00:26:29,529 --> 00:26:28,080

we are a deeply factionalized species

642

00:26:34,850 --> 00:26:29,539

right now

643

00:26:39,350 --> 00:26:35,450

um

644

00:26:41,330 --> 00:26:39,360

and and you know we've we've we've

645

00:26:43,370 --> 00:26:41,340

buried our heads so deeply you know

646

00:26:46,190 --> 00:26:43,380

we're sort of all we're all playing our

647

00:26:49,730 --> 00:26:46,200

own little mini games you know where

648

00:26:53,169 --> 00:26:49,740

where we're overwhelmed you know by by

649

00:26:55,850 --> 00:26:53,179

the buzz of all media by

650

00:26:58,250 --> 00:26:55,860

just the stuff going around the world

651
00:27:00,049 --> 00:26:58,260
right now and so we we like to organize

652
00:27:02,330 --> 00:27:00,059
the world into these simplified little

653
00:27:05,570 --> 00:27:02,340
systems of elements and simple rules and

654
00:27:06,950 --> 00:27:05,580
we sort of organized these mini-games of

655
00:27:09,890 --> 00:27:06,960
life and then you know we try to win

656
00:27:12,470 --> 00:27:09,900
them like whether we're winning games of

657
00:27:14,810 --> 00:27:12,480
political Dynamics at work or you know

658
00:27:18,169 --> 00:27:14,820
trying to just stay solvent and collect

659
00:27:20,330 --> 00:27:18,179
enough retirement or you know the the

660
00:27:23,269 --> 00:27:20,340
game of empowering your chosening group

661
00:27:25,549 --> 00:27:23,279
so we we

662
00:27:27,110 --> 00:27:25,559
um we diminish the world so that so that

663
00:27:29,570 --> 00:27:27,120

we can handle it

664

00:27:30,890 --> 00:27:29,580

um and

665

00:27:35,450 --> 00:27:30,900

I guess

666

00:27:38,149 --> 00:27:35,460

the thing that science can do is that it

667

00:27:42,710 --> 00:27:38,159

can show us

668

00:27:45,110 --> 00:27:42,720

bigger Landscapes right we we are only

669

00:27:47,149 --> 00:27:45,120

able so if you can imagine the infinite

670

00:27:49,190 --> 00:27:47,159

landscape of you know possible ways to

671

00:27:53,690 --> 00:27:49,200

live your life possible things you can

672

00:27:56,149 --> 00:27:53,700

do ways to be uh we we tend to

673

00:27:59,750 --> 00:27:56,159

um to blinker up and Define these

674

00:28:02,990 --> 00:27:59,760

um these manageable sub Landscapes and

675

00:28:05,630 --> 00:28:03,000

we you know navigate those little spaces

676
00:28:08,269 --> 00:28:05,640
um but of course we inevitably come to

677
00:28:11,269 --> 00:28:08,279
believe that our chosen little sliver

678
00:28:13,029 --> 00:28:11,279
is the world as it really is

679
00:28:16,210 --> 00:28:13,039
okay we we

680
00:28:19,850 --> 00:28:16,220
mistake the sub game for the game and

681
00:28:22,669 --> 00:28:19,860
our compactification of reality

682
00:28:27,010 --> 00:28:22,679
in our minds becomes reality and

683
00:28:30,769 --> 00:28:27,020
um and I am as guilty as most in that

684
00:28:33,230 --> 00:28:30,779
but really I'd say any type of education

685
00:28:35,149 --> 00:28:33,240
broadens perspective and shows us

686
00:28:37,250 --> 00:28:35,159
grander games

687
00:28:38,990 --> 00:28:37,260
um and that there are enormous

688
00:28:40,610 --> 00:28:39,000

Landscapes of possibility you know

689

00:28:41,690 --> 00:28:40,620

outside whatever erupt we happen to be

690

00:28:45,590 --> 00:28:41,700

in

691

00:28:49,430 --> 00:28:45,600

and so uh so

692

00:28:52,730 --> 00:28:49,440

exposing people to new information

693

00:28:54,470 --> 00:28:52,740

um is is usually always good okay there

694

00:28:57,169 --> 00:28:54,480

are exceptions but science I find

695

00:28:59,630 --> 00:28:57,179

particularly important and Powerful

696

00:29:01,610 --> 00:28:59,640

because it's

697

00:29:03,470 --> 00:29:01,620

in a way it's General so it's not

698

00:29:06,529 --> 00:29:03,480

science isn't about the subject matter

699

00:29:08,330 --> 00:29:06,539

it's about the methodologies okay the

700

00:29:09,350 --> 00:29:08,340

methodology is if you like of Truth

701
00:29:12,289 --> 00:29:09,360

finding

702
00:29:14,390 --> 00:29:12,299

um and those methods can be applied at

703
00:29:17,450 --> 00:29:14,400

least at some level to any question or

704
00:29:21,350 --> 00:29:17,460

any field uh in ways that improve our

705
00:29:25,010 --> 00:29:21,360

ability to explore the Landscapes of you

706
00:29:28,669 --> 00:29:26,210

um and so

707
00:29:33,830 --> 00:29:28,679

uh

708
00:29:35,630 --> 00:29:33,840

so I mean granting people the access to

709
00:29:38,090 --> 00:29:35,640

some of the

710
00:29:39,889 --> 00:29:38,100

just the things we've learned in the in

711
00:29:41,930 --> 00:29:39,899

science that are incredibly powerful the

712
00:29:44,810 --> 00:29:41,940

methodology is the ways of thinking even

713
00:29:48,409 --> 00:29:44,820

just the habits of thought are

714

00:29:51,470 --> 00:29:48,419

um just super powerful tools for

715

00:29:54,409 --> 00:29:51,480

improving how people even live their

716

00:29:55,730 --> 00:29:54,419

lives because these these ideas become

717

00:29:58,370 --> 00:29:55,740

embedded

718

00:29:59,450 --> 00:29:58,380

it becomes subliminal

719

00:30:04,070 --> 00:29:59,460

um

720

00:30:06,169 --> 00:30:04,080

and but I guess I maybe the way I think

721

00:30:08,149 --> 00:30:06,179

about science is that it's uh like a

722

00:30:09,710 --> 00:30:08,159

formalization of how our brains work

723

00:30:11,690 --> 00:30:09,720

naturally

724

00:30:13,430 --> 00:30:11,700

um if you think of our minds as tools

725

00:30:15,409 --> 00:30:13,440

for navigating the world and and that's

726

00:30:19,430 --> 00:30:15,419

the physical world the social world and

727

00:30:23,090 --> 00:30:19,440

you know worlds of arbitrary abstraction

728

00:30:25,610 --> 00:30:23,100

um and so so cognition which is the

729

00:30:27,049 --> 00:30:25,620

process of asking questions seeking

730

00:30:29,990 --> 00:30:27,059

evidence formulating models and

731

00:30:33,470 --> 00:30:30,000

hypotheses and making choices

732

00:30:35,330 --> 00:30:33,480

um which sounds more like science and

733

00:30:37,610 --> 00:30:35,340

you know in our brains that's all

734

00:30:39,590 --> 00:30:37,620

happening constantly and mostly

735

00:30:40,190 --> 00:30:39,600

subconsciously

736

00:30:42,409 --> 00:30:40,200

um

737

00:30:45,710 --> 00:30:42,419

and

738

00:30:47,930 --> 00:30:45,720

that we don't just do this individually

739

00:30:50,149 --> 00:30:47,940

so we

740

00:30:52,730 --> 00:30:50,159

aging this sort of collective cognition

741

00:30:55,549 --> 00:30:52,740

you know through discussion with each

742

00:30:59,990 --> 00:30:55,559

other in an explicit way but also you

743

00:31:01,730 --> 00:31:00,000

could argue that we are cogitating as a

744

00:31:03,649 --> 00:31:01,740

society through ART and religion and

745

00:31:06,590 --> 00:31:03,659

politics and

746

00:31:08,269 --> 00:31:06,600

um you know so we can think about

747

00:31:09,590 --> 00:31:08,279

culture I guess is this Collective

748

00:31:11,350 --> 00:31:09,600

cognition

749

00:31:13,850 --> 00:31:11,360

um and

750

00:31:16,070 --> 00:31:13,860

even a

751
00:31:19,730 --> 00:31:16,080
you know I like to think of culture as a

752
00:31:22,130 --> 00:31:19,740
search algorithm for for truth okay so

753
00:31:25,490 --> 00:31:22,140
if part of culture is a world model okay

754
00:31:29,090 --> 00:31:25,500
and every culture has its consensus

755
00:31:32,510 --> 00:31:29,100
reality then uh then

756
00:31:35,510 --> 00:31:32,520
you know that that little kind of local

757
00:31:37,909 --> 00:31:35,520
minimum in the possibility space of what

758
00:31:41,990 --> 00:31:37,919
the world is and how to live

759
00:31:45,110 --> 00:31:42,000
is something that that culture found

760
00:31:47,269 --> 00:31:45,120
and so you know cultural Evolution I

761
00:31:49,730 --> 00:31:47,279
guess sort of navigates the landscape of

762
00:31:51,350 --> 00:31:49,740
possible ways to

763
00:31:52,909 --> 00:31:51,360

think about the world and about

764

00:31:55,430 --> 00:31:52,919

ourselves

765

00:31:57,590 --> 00:31:55,440

um and and so

766

00:32:01,070 --> 00:31:57,600

if science then

767

00:32:04,430 --> 00:32:01,080

in some ways systematizes cognition and

768

00:32:05,870 --> 00:32:04,440

can make us better at it individually or

769

00:32:08,149 --> 00:32:05,880

collectively

770

00:32:10,070 --> 00:32:08,159

then we get better at mapping the

771

00:32:12,529 --> 00:32:10,080

landscape

772

00:32:13,389 --> 00:32:12,539

um here's the fact that occurs to me if

773

00:32:18,350 --> 00:32:13,399

science

774

00:32:20,510 --> 00:32:18,360

is the epitome of making systematic what

775

00:32:22,789 --> 00:32:20,520

is our cognition and what we're trying

776

00:32:24,470 --> 00:32:22,799

to do or what you're up to with this

777

00:32:26,510 --> 00:32:24,480

documentary is not only investigating

778

00:32:29,330 --> 00:32:26,520

reality but trying to avoid some of our

779

00:32:31,430 --> 00:32:29,340

own cognitive biases but I imagine if

780

00:32:33,889 --> 00:32:31,440

science is modeling the way that our

781

00:32:37,310 --> 00:32:33,899

brains work but our brains have a bias

782

00:32:40,010 --> 00:32:37,320

then how does one scientifically not

783

00:32:42,470 --> 00:32:40,020

have this bias built in it's super hard

784

00:32:46,490 --> 00:32:42,480

and science is no guarantee against this

785

00:32:51,950 --> 00:32:49,310

one to me one of the most incredible

786

00:32:53,510 --> 00:32:51,960

things about the Scientific Revolution

787

00:32:57,289 --> 00:32:53,520

is that

788

00:32:59,570 --> 00:32:57,299

it gave us at least the potential for

789

00:33:01,310 --> 00:32:59,580

meta awareness

790

00:33:03,950 --> 00:33:01,320

um of

791

00:33:05,570 --> 00:33:03,960

of the fact that there even is a

792

00:33:09,169 --> 00:33:05,580

possibility landscape

793

00:33:12,289 --> 00:33:09,179

you know versus a singular ground truth

794

00:33:13,789 --> 00:33:12,299

um and the potential for the awareness

795

00:33:17,149 --> 00:33:13,799

that there's a distinction between

796

00:33:20,630 --> 00:33:17,159

reality versus a model of reality

797

00:33:23,029 --> 00:33:20,640

philosophy also okay so so I think you

798

00:33:25,909 --> 00:33:23,039

know uh I'm maybe

799

00:33:26,950 --> 00:33:25,919

mixing together the the the

800

00:33:31,070 --> 00:33:26,960

um

801
00:33:31,850 --> 00:33:31,080
breakthroughs of of Enlightenment and

802
00:33:33,649 --> 00:33:31,860
um

803
00:33:40,909 --> 00:33:33,659
and

804
00:33:43,430 --> 00:33:40,919
fields of of rational thought

805
00:33:47,149 --> 00:33:43,440
um allow us to at least in principle

806
00:33:49,549 --> 00:33:47,159
know about that biases are possible this

807
00:33:52,210 --> 00:33:49,559
might be inaccurate

808
00:33:57,289 --> 00:33:52,220
um so you you know I I talk about

809
00:34:02,389 --> 00:34:00,350
um so I feel like science allows us to

810
00:34:04,370 --> 00:34:02,399
upgrade that search algorithm so that

811
00:34:07,270 --> 00:34:04,380
we're less likely to get stuck in a

812
00:34:10,430 --> 00:34:07,280
local minimum but because we introduce

813
00:34:13,129 --> 00:34:10,440

exploration into like with the the

814

00:34:15,010 --> 00:34:13,139

explicit ability to explore to our

815

00:34:17,990 --> 00:34:15,020

little a little

816

00:34:18,770 --> 00:34:18,000

uh search algorithm

817

00:34:21,230 --> 00:34:18,780

um

818

00:34:25,010 --> 00:34:21,240

robot whatever it is a little Valley

819

00:34:27,349 --> 00:34:25,020

crawler and uh and it also allows us to

820

00:34:30,349 --> 00:34:27,359

explicitly incorporate uncertainties

821

00:34:31,909 --> 00:34:30,359

into whatever the loss function of that

822

00:34:34,909 --> 00:34:31,919

search algorithm

823

00:34:39,710 --> 00:34:34,919

um so it's like a a meta expansion of

824

00:34:41,329 --> 00:34:39,720

our ability to uh to explore possibility

825

00:34:43,909 --> 00:34:41,339

space

826

00:34:46,609 --> 00:34:43,919

so okay another thought that occurs to

827

00:34:48,369 --> 00:34:46,619

me is this is not a thought that

828

00:34:50,570 --> 00:34:48,379

this is not a Viewpoint that I have

829

00:34:52,490 --> 00:34:50,580

necessarily but it's one that I'm sure

830

00:34:55,490 --> 00:34:52,500

that someone or some people who watched

831

00:34:57,410 --> 00:34:55,500

me have thought okay so we have a

832

00:34:59,450 --> 00:34:57,420

cultural model of reality every culture

833

00:35:01,430 --> 00:34:59,460

has this when we have science we have

834

00:35:04,790 --> 00:35:01,440

something that we believe is a cultural

835

00:35:07,430 --> 00:35:04,800

so it's non-cultural it's objective

836

00:35:09,290 --> 00:35:07,440

however they would say yeah but that's a

837

00:35:11,510 --> 00:35:09,300

eurocentric way of thinking because

838

00:35:13,430 --> 00:35:11,520

we're though of course we're going to

839

00:35:15,530 --> 00:35:13,440

say our culture is the one that has the

840

00:35:17,450 --> 00:35:15,540

objective method so what would your

841

00:35:19,089 --> 00:35:17,460

response be to that

842

00:35:22,130 --> 00:35:19,099

|||||

843

00:35:24,109 --> 00:35:22,140

really value this

844

00:35:28,010 --> 00:35:24,119

um being brought to

845

00:35:31,910 --> 00:35:28,020

attention because it's true that

846

00:35:34,430 --> 00:35:31,920

uh that you know when we talk about

847

00:35:38,030 --> 00:35:34,440

science it's not one thing

848

00:35:41,089 --> 00:35:38,040

okay so there sort of is a eurocentric

849

00:35:43,910 --> 00:35:41,099

culture that comes under the label of

850

00:35:45,770 --> 00:35:43,920

science but that's not all that's not

851
00:35:46,490 --> 00:35:45,780
all that science is

852
00:35:48,310 --> 00:35:46,500
um

853
00:35:53,750 --> 00:35:48,320
and

854
00:35:59,510 --> 00:35:53,760
so science is also a

855
00:36:02,390 --> 00:35:59,520
revolution in our ability to to cogitate

856
00:36:04,250 --> 00:36:02,400
um on on many levels

857
00:36:07,250 --> 00:36:04,260
um and that

858
00:36:12,589 --> 00:36:07,260
is bundled with other

859
00:36:15,950 --> 00:36:12,599
cultural factors uh in in some ways for

860
00:36:19,910 --> 00:36:15,960
instance but but it also but it also

861
00:36:23,630 --> 00:36:19,920
has its independent existence and the

862
00:36:26,450 --> 00:36:23,640
value of the kind of the raw upgrade

863
00:36:28,970 --> 00:36:26,460

that science gave us is that

864

00:36:31,970 --> 00:36:28,980

in in principle and I've been careful to

865

00:36:34,910 --> 00:36:31,980

say in principle in principle it allows

866

00:36:37,990 --> 00:36:34,920

us the type of meta awareness that can

867

00:36:39,730 --> 00:36:38,000

lead us to those sorts of biases

868

00:36:43,190 --> 00:36:39,740

and

869

00:36:46,849 --> 00:36:43,200

you know I I don't want to say that

870

00:36:49,609 --> 00:36:46,859

uh the the Western Scientific Method is

871

00:36:52,250 --> 00:36:49,619

how brains work it's absolutely not as

872

00:36:55,490 --> 00:36:52,260

simple as that but there are there are

873

00:36:58,670 --> 00:36:55,500

correlations that are powerful and that

874

00:36:59,329 --> 00:36:58,680

I I think are

875

00:37:01,550 --> 00:36:59,339

um

876

00:37:05,870 --> 00:37:01,560

you know transcultural

877

00:37:08,990 --> 00:37:05,880

and and that uh their uh wisdom

878

00:37:11,630 --> 00:37:09,000

Traditions that talk about these things

879

00:37:13,910 --> 00:37:11,640

in very different ways

880

00:37:17,210 --> 00:37:13,920

um that right you should spend more time

881

00:37:20,990 --> 00:37:17,220

trying to translate between yeah that's

882

00:37:23,569 --> 00:37:21,000

my response as well well firstly one is

883

00:37:26,030 --> 00:37:23,579

to say that science is not all in the

884

00:37:27,470 --> 00:37:26,040

sense that well that's not only my point

885

00:37:29,450 --> 00:37:27,480

of view Hillary Putnam said something

886

00:37:31,130 --> 00:37:29,460

similar and same with Feynman he had

887

00:37:33,230 --> 00:37:31,140

this famous quotation about logic is not

888

00:37:37,270 --> 00:37:33,240

all that one needs hearts

889

00:37:40,310 --> 00:37:37,280

and secondly that to call science

890

00:37:43,609 --> 00:37:40,320

eurocentric is to not recognize the

891

00:37:46,670 --> 00:37:43,619

contributions from many other cultures

892

00:37:48,710 --> 00:37:46,680

yeah yeah I mean I I was echoing uh your

893

00:37:49,430 --> 00:37:48,720

language a little bit there

894

00:37:52,010 --> 00:37:49,440

um

895

00:37:54,109 --> 00:37:52,020

you know the fact is that

896

00:37:56,690 --> 00:37:54,119

you know a bunch of

897

00:38:00,050 --> 00:37:56,700

old white European men dominated science

898

00:38:02,990 --> 00:38:00,060

for quite some time and there's still

899

00:38:04,370 --> 00:38:03,000

you know that that influence in some of

900

00:38:06,589 --> 00:38:04,380

the

901
00:38:08,930 --> 00:38:06,599
institutions of science

902
00:38:11,510 --> 00:38:08,940
Henson shaving is a family-owned

903
00:38:13,370 --> 00:38:11,520
Aerospace parts manufacturer that's made

904
00:38:16,010 --> 00:38:13,380
parts for the International Space

905
00:38:17,450 --> 00:38:16,020
Station and the Mars rover and now

906
00:38:20,270 --> 00:38:17,460
they're bringing that Precision

907
00:38:22,970 --> 00:38:20,280
Engineering to your shaving experience

908
00:38:24,829 --> 00:38:22,980
so here's a personal story I gave the

909
00:38:26,930 --> 00:38:24,839
razor to Sam who's working behind the

910
00:38:28,609 --> 00:38:26,940
scenes here at the toe podcast I didn't

911
00:38:30,290 --> 00:38:28,619
tell him who it was from I just said you

912
00:38:31,849 --> 00:38:30,300
need a razor he said sure then I asked

913
00:38:34,310 --> 00:38:31,859

him hey how was that razor the next

914

00:38:37,130 --> 00:38:34,320

couple days later he's like Kurt that is

915

00:38:38,510 --> 00:38:37,140

the best razor I have ever used and then

916

00:38:41,510 --> 00:38:38,520

I said by the way that's a sponsor

917

00:38:42,950 --> 00:38:41,520

Henson then he said that is fantastic

918

00:38:44,870 --> 00:38:42,960

and he looked it up and they're an

919

00:38:47,210 --> 00:38:44,880

aerospace engineering company so that's

920

00:38:49,730 --> 00:38:47,220

in a Side Story that's a true story it's

921

00:38:52,130 --> 00:38:49,740

packaged extremely carefully the handle

922

00:38:55,250 --> 00:38:52,140

looks beautiful the assembly takes 10

923

00:38:57,530 --> 00:38:55,260

seconds and the blade is as precise as

924

00:38:59,569 --> 00:38:57,540

I've ever seen in a commercial razor by

925

00:39:01,730 --> 00:38:59,579

using Aerospace grade CNC machines

926
00:39:04,310 --> 00:39:01,740
Henson makes metal razors that extend

927
00:39:06,530 --> 00:39:04,320
less than the thickness of a human hair

928
00:39:09,109 --> 00:39:06,540
that means it's a secure and stable

929
00:39:10,790 --> 00:39:09,119
Blade with no vibrations so the Razer

930
00:39:12,710 --> 00:39:10,800
has built-in channels and it evacuates

931
00:39:14,930 --> 00:39:12,720
hair and cream which makes clogging

932
00:39:17,450 --> 00:39:14,940
virtually impossible you blow it out and

933
00:39:19,790 --> 00:39:17,460
it's cleared that's what she said Henson

934
00:39:22,430 --> 00:39:19,800
shaving wants to produce the best razors

935
00:39:25,609 --> 00:39:22,440
not the best razor business so that

936
00:39:28,069 --> 00:39:25,619
means no plastics no subscriptions no

937
00:39:30,349 --> 00:39:28,079
proprietary blades and no planned

938
00:39:32,510 --> 00:39:30,359

obsolescence and it's extremely

939

00:39:34,069 --> 00:39:32,520

affordable The Henson Razer works with

940

00:39:35,870 --> 00:39:34,079

the standard dual Edge blades that give

941

00:39:38,589 --> 00:39:35,880

you that old-school shave with the

942

00:39:41,270 --> 00:39:38,599

benefits of this new school Tech visit

943

00:39:43,069 --> 00:39:41,280

hensonshaving.com everything if you use

944

00:39:45,650 --> 00:39:43,079

that code you'll get two years worth of

945

00:39:48,349 --> 00:39:45,660

blades for free just make sure to add

946

00:39:53,710 --> 00:39:48,359

them to your cart that's 100 free blades

947

00:39:59,329 --> 00:39:55,430

h-e-n-s-o-n-s-h-a-v-i-n-g.com slash

948

00:40:00,950 --> 00:39:59,339

everything and use the code everything

949

00:40:03,710 --> 00:40:00,960

curious if you think a Theory of

950

00:40:05,150 --> 00:40:03,720

Everything exists firstly secondly if we

951
00:40:07,370 --> 00:40:05,160
could know it so that presumes that

952
00:40:09,349 --> 00:40:07,380
there exists one

953
00:40:14,089 --> 00:40:09,359
yeah well

954
00:40:16,370 --> 00:40:14,099
so uh so I mean it depends what you mean

955
00:40:17,089 --> 00:40:16,380
by a theory of everything I guess

956
00:40:19,310 --> 00:40:17,099
um

957
00:40:23,569 --> 00:40:19,320
you know

958
00:40:25,849 --> 00:40:23,579
is there a single equation that drives

959
00:40:27,589 --> 00:40:25,859
all of reality

960
00:40:28,849 --> 00:40:27,599
and that knowing the equation would be

961
00:40:30,650 --> 00:40:28,859
enough to

962
00:40:31,970 --> 00:40:30,660
to make a new universe if you could

963
00:40:33,290 --> 00:40:31,980

implement it

964

00:40:34,730 --> 00:40:33,300

um

965

00:40:39,950 --> 00:40:34,740

I

966

00:40:40,550 --> 00:40:39,960

it's possible

967

00:40:41,870 --> 00:40:40,560

um

968

00:40:50,690 --> 00:40:41,880

I

969

00:40:55,490 --> 00:40:50,700

behind the idea that there is a

970

00:41:02,810 --> 00:40:59,329

description that can be wrapped up in a

971

00:41:05,030 --> 00:41:02,820

way that a human brain can comprehend

972

00:41:06,829 --> 00:41:05,040

uh you know I think it

973

00:41:10,550 --> 00:41:06,839

you know I was talking about the idea

974

00:41:14,270 --> 00:41:10,560

that that we necessarily

975

00:41:18,410 --> 00:41:14,280

uh only see a subset of reality and only

976
00:41:20,569 --> 00:41:18,420
model set of reality okay now in in

977
00:41:23,270 --> 00:41:20,579
the world that we walk through that we

978
00:41:24,950 --> 00:41:23,280
inhabit our own uh subjective experience

979
00:41:26,329 --> 00:41:24,960
and the

980
00:41:29,510 --> 00:41:26,339
um

981
00:41:32,569 --> 00:41:29,520
the the network of relationships that we

982
00:41:34,730 --> 00:41:32,579
think govern the world so it's both you

983
00:41:37,130 --> 00:41:34,740
know in our in our own mental

984
00:41:40,010 --> 00:41:37,140
constructions of the world but also

985
00:41:41,810 --> 00:41:40,020
in each separate academic field these

986
00:41:44,990 --> 00:41:41,820
are these are slices

987
00:41:48,589 --> 00:41:45,000
and we see that that these regularities

988
00:41:52,069 --> 00:41:48,599

emerge from whatever's really there

989

00:41:54,770 --> 00:41:52,079

and in in very particular ways we can

990

00:41:55,790 --> 00:41:54,780

capture those regularities and turn them

991

00:41:58,849 --> 00:41:55,800

into

992

00:41:59,750 --> 00:41:58,859

an academic field or whatever

993

00:42:02,630 --> 00:41:59,760

um

994

00:42:05,510 --> 00:42:02,640

and so what physics has said is that all

995

00:42:08,510 --> 00:42:05,520

right this is what we've been doing for

996

00:42:11,990 --> 00:42:08,520

all of the history of you know

997

00:42:14,810 --> 00:42:12,000

human inquiry is trying to find these

998

00:42:17,990 --> 00:42:14,820

different ways to slice reality into

999

00:42:19,670 --> 00:42:18,000

into networks of relationships

1000

00:42:22,430 --> 00:42:19,680

we think

1001

00:42:27,010 --> 00:42:22,440

that all of it emerges from a single

1002

00:42:30,710 --> 00:42:27,020

most fundamental uh rule essentially

1003

00:42:34,450 --> 00:42:30,720

and that might be true but I don't think

1004

00:42:36,589 --> 00:42:34,460

it's clear that it's true

1005

00:42:38,450 --> 00:42:36,599

I think

1006

00:42:40,550 --> 00:42:38,460

you know that might be one of the biases

1007

00:42:43,010 --> 00:42:40,560

our we've trained ourselves to believe

1008

00:42:46,390 --> 00:42:43,020

that that might be the case but you know

1009

00:42:51,770 --> 00:42:48,770

some emerging

1010

00:42:53,329 --> 00:42:51,780

ideas that really put to question the

1011

00:42:57,770 --> 00:42:53,339

notion of what

1012

00:42:59,329 --> 00:42:57,780

fundamental really means all right Steph

1013

00:43:01,250 --> 00:42:59,339

so

1014

00:43:02,050 --> 00:43:01,260

you know the

1015

00:43:05,569 --> 00:43:02,060

the

1016

00:43:08,030 --> 00:43:05,579

reductionist philosophy that we can you

1017

00:43:09,890 --> 00:43:08,040

know first we physically seek smaller

1018

00:43:12,370 --> 00:43:09,900

and smaller elements of reality than

1019

00:43:17,510 --> 00:43:12,380

seek

1020

00:43:19,730 --> 00:43:17,520

uh deeper levels of causation uh

1021

00:43:21,950 --> 00:43:19,740

until we find the bottom

1022

00:43:24,349 --> 00:43:21,960

um you know we should be ultimately the

1023

00:43:26,510 --> 00:43:24,359

most simple ideally

1024

00:43:31,609 --> 00:43:28,609

so

1025

00:43:34,910 --> 00:43:31,619

there are there are cases where it's not

1026

00:43:37,609 --> 00:43:34,920

true that the most simplest description

1027

00:43:41,750 --> 00:43:37,619

of reality is the most fundamental okay

1028

00:43:44,329 --> 00:43:41,760

so if you want to model say fluid flow

1029

00:43:46,309 --> 00:43:44,339

please use Bernoulli's equation rather

1030

00:43:48,170 --> 00:43:46,319

than Quantum field Theory even though in

1031

00:43:50,930 --> 00:43:48,180

principle you could use the latter the

1032

00:43:53,630 --> 00:43:50,940

latter is in principle more fundamental

1033

00:43:56,809 --> 00:43:53,640

um so you know these regularities arise

1034

00:43:58,370 --> 00:43:56,819

and and prove simpler than their

1035

00:43:59,569 --> 00:43:58,380

substrates the rules governing their

1036

00:44:02,329 --> 00:43:59,579

substrates if you wanted to do a

1037

00:44:03,470 --> 00:44:02,339

particular calculation in them

1038

00:44:07,790 --> 00:44:03,480

um

1039

00:44:09,589 --> 00:44:07,800

so so as you go up in in size scale or

1040

00:44:12,589 --> 00:44:09,599

in other other scales also complexity

1041

00:44:14,390 --> 00:44:12,599

scale you see things simplify and then

1042

00:44:18,710 --> 00:44:14,400

unsimplify

1043

00:44:20,690 --> 00:44:18,720

um and but but in in a way that means

1044

00:44:23,930 --> 00:44:20,700

that these what we would call these

1045

00:44:26,510 --> 00:44:23,940

layers of say emergent complexity are

1046

00:44:28,849 --> 00:44:26,520

not in in any way predictable from the

1047

00:44:31,670 --> 00:44:28,859

lower layers

1048

00:44:34,010 --> 00:44:31,680

um so Stephen Wolfram talks about the

1049

00:44:37,430 --> 00:44:34,020

idea of computational irreducibility

1050

00:44:39,589 --> 00:44:37,440

okay there there are things about the

1051
00:44:41,450 --> 00:44:39,599
universe that you can't predict without

1052
00:44:45,609 --> 00:44:41,460
literally running the universe and that

1053
00:44:49,870 --> 00:44:45,619
includes some of the the

1054
00:44:55,370 --> 00:44:49,880
incredibly beautiful and regular

1055
00:44:59,150 --> 00:44:55,380
patterns that emerge that um you know

1056
00:45:01,010 --> 00:44:59,160
for example fluid flow or life uh that

1057
00:45:02,329 --> 00:45:01,020
that you could never predict by looking

1058
00:45:04,849 --> 00:45:02,339
at a quark

1059
00:45:10,069 --> 00:45:04,859
so

1060
00:45:10,609 --> 00:45:10,079
the first point that

1061
00:45:15,530 --> 00:45:10,619
um

1062
00:45:17,990 --> 00:45:15,540
that the I guess what what was this

1063
00:45:21,230 --> 00:45:18,000

you might call this Newtonian Paradigm

1064

00:45:22,430 --> 00:45:21,240

where you know once you know how all the

1065

00:45:25,910 --> 00:45:22,440

little billiard balls are moving around

1066

00:45:29,930 --> 00:45:25,920

you can predict the universe is

1067

00:45:31,550 --> 00:45:29,940

only sort of true but in a meaningful

1068

00:45:32,270 --> 00:45:31,560

way it's not true

1069

00:45:33,950 --> 00:45:32,280

um

1070

00:45:35,870 --> 00:45:33,960

so

1071

00:45:37,130 --> 00:45:35,880

you know there are there are examples

1072

00:45:40,010 --> 00:45:37,140

like

1073

00:45:43,130 --> 00:45:40,020

um all right so let's let's dig down to

1074

00:45:45,950 --> 00:45:43,140

something closer to the fundamental

1075

00:45:48,050 --> 00:45:45,960

let's get into physics

1076

00:45:54,109 --> 00:45:50,390

highly speculative physics so like take

1077

00:45:56,150 --> 00:45:54,119

the the ads CFT correspondence right so

1078

00:45:59,930 --> 00:45:56,160

the holographic principle

1079

00:46:01,490 --> 00:45:59,940

so um so this is the idea that well let

1080

00:46:04,250 --> 00:46:01,500

let me give you the sort of popular

1081

00:46:08,390 --> 00:46:04,260

media View and the idea is that the that

1082

00:46:10,970 --> 00:46:08,400

our universe could be a hologram

1083

00:46:13,609 --> 00:46:10,980

uh that's projected inwards from

1084

00:46:15,829 --> 00:46:13,619

something happening on the the 2D

1085

00:46:18,650 --> 00:46:15,839

surface of the boundary

1086

00:46:20,630 --> 00:46:18,660

um and and therefore our universe is an

1087

00:46:22,190 --> 00:46:20,640

illusion and it's that service out there

1088

00:46:22,790 --> 00:46:22,200

that's real

1089

00:46:25,550 --> 00:46:22,800

um

1090

00:46:27,230 --> 00:46:25,560

and it's more complicated than that uh

1091

00:46:30,770 --> 00:46:27,240

obviously the the number of dimensions

1092

00:46:33,710 --> 00:46:30,780

and and the curvature of the Interior

1093

00:46:36,530 --> 00:46:33,720

but yeah but anyway the idea the idea

1094

00:46:37,370 --> 00:46:36,540

sure I presented usually presented is

1095

00:46:42,829 --> 00:46:37,380

that

1096

00:46:45,050 --> 00:46:42,839

whatever's real is out there

1097

00:46:48,170 --> 00:46:45,060

um that's that's absolutely not what ads

1098

00:46:50,870 --> 00:46:48,180

CFT is saying what it's saying is that

1099

00:46:52,430 --> 00:46:50,880

in what we call the bulk which is the

1100

00:46:55,670 --> 00:46:52,440

volume which is which would in this case

1101
00:46:58,309 --> 00:46:55,680
would be our universe we it's explained

1102
00:47:04,010 --> 00:46:58,319
by a gravitational Theory okay general

1103
00:47:05,690 --> 00:47:04,020
relativity and the surface is explained

1104
00:47:08,150 --> 00:47:05,700
by a field Theory a conformal field

1105
00:47:10,609 --> 00:47:08,160
Theory and it's not that

1106
00:47:13,910 --> 00:47:10,619
one causes the other

1107
00:47:16,490 --> 00:47:13,920
the um what adcft is saying is that they

1108
00:47:18,890 --> 00:47:16,500
are dual to each other so they are

1109
00:47:20,809 --> 00:47:18,900
called a duality they're equivalent

1110
00:47:23,390 --> 00:47:20,819
descriptions of exactly the same thing

1111
00:47:26,270 --> 00:47:23,400
and neither is more fundamental than the

1112
00:47:28,069 --> 00:47:26,280
other that to me is part of the problem

1113
00:47:30,770 --> 00:47:28,079

of the common purveyors of science

1114

00:47:32,270 --> 00:47:30,780

trying to mystify the public by saying

1115

00:47:34,370 --> 00:47:32,280

that the universe is unreal and it's

1116

00:47:35,750 --> 00:47:34,380

holographic well you just said there's a

1117

00:47:37,130 --> 00:47:35,760

duality what makes you think that the

1118

00:47:39,050 --> 00:47:37,140

boundary is more fundamental than the

1119

00:47:41,750 --> 00:47:39,060

bulk space you can't say that one is

1120

00:47:45,290 --> 00:47:41,760

more than the other if there's a duel

1121

00:47:46,010 --> 00:47:45,300

yeah exactly exactly right and

1122

00:47:48,109 --> 00:47:46,020

um

1123

00:47:52,250 --> 00:47:48,119

and and sometimes one does look more

1124

00:47:54,589 --> 00:47:52,260

real for example it's I mean ads safety

1125

00:47:56,390 --> 00:47:54,599

is a hugely useful Paradigm even if it

1126
00:47:58,490 --> 00:47:56,400
may not apply directly to our universe

1127
00:48:01,250 --> 00:47:58,500
because it's much easier to do

1128
00:48:03,109 --> 00:48:01,260
computations in one of these

1129
00:48:05,630 --> 00:48:03,119
representations than the other in some

1130
00:48:07,790 --> 00:48:05,640
cases and in other cases the other

1131
00:48:10,809 --> 00:48:07,800
representation is the one that's

1132
00:48:13,910 --> 00:48:10,819
tractable okay so in

1133
00:48:15,290 --> 00:48:13,920
uh the um

1134
00:48:17,690 --> 00:48:15,300
the

1135
00:48:20,290 --> 00:48:17,700
strong interaction limit

1136
00:48:22,849 --> 00:48:20,300
of one where you can't do

1137
00:48:24,550 --> 00:48:22,859
calculations you can't use for example

1138
00:48:28,670 --> 00:48:24,560

perturbation Theory to do calculations

1139

00:48:30,109 --> 00:48:28,680

like like inside a black hole uh in on

1140

00:48:32,089 --> 00:48:30,119

the on the other side in this case if

1141

00:48:34,490 --> 00:48:32,099

you have a black hole in the in the bulk

1142

00:48:36,410 --> 00:48:34,500

in our universe then its representation

1143

00:48:37,730 --> 00:48:36,420

on its surface

1144

00:48:40,910 --> 00:48:37,740

is

1145

00:48:44,030 --> 00:48:40,920

um weekly interacting structure that you

1146

00:48:46,490 --> 00:48:44,040

can do computations with okay and so uh

1147

00:48:48,349 --> 00:48:46,500

so neither is more fundamental just

1148

00:48:49,910 --> 00:48:48,359

sometimes one is useful and sometimes

1149

00:48:52,609 --> 00:48:49,920

the other is useful

1150

00:48:54,410 --> 00:48:52,619

uh and this isn't this isn't a fringe

1151

00:48:57,470 --> 00:48:54,420

example I mean it's a it's just a cool

1152

00:49:01,130 --> 00:48:57,480

example that these dualities

1153

00:49:03,770 --> 00:49:01,140

um which is not the sense of Duality or

1154

00:49:05,770 --> 00:49:03,780

dualism in philosophy at all it it means

1155

00:49:07,849 --> 00:49:05,780

that that two

1156

00:49:11,630 --> 00:49:07,859

seemingly different

1157

00:49:14,030 --> 00:49:11,640

descriptions uh like wildly even

1158

00:49:16,490 --> 00:49:14,040

contradictably different descriptions

1159

00:49:18,230 --> 00:49:16,500

represent the same thing uh two

1160

00:49:20,930 --> 00:49:18,240

different stories describe the same

1161

00:49:23,210 --> 00:49:20,940

thing so so string theory is Rife with

1162

00:49:25,490 --> 00:49:23,220

Duality is like at the limit of the

1163

00:49:28,190 --> 00:49:25,500

energy scales we see Elementary strings

1164

00:49:32,210 --> 00:49:28,200

and emergent strings sort of morph into

1165

00:49:34,130 --> 00:49:32,220

each other but also in you know more

1166

00:49:37,430 --> 00:49:34,140

accepted physics like in quantum

1167

00:49:39,230 --> 00:49:37,440

mechanics the idea of complementarity is

1168

00:49:44,030 --> 00:49:39,240

a duality

1169

00:49:46,309 --> 00:49:44,040

um so you know usually encapsulated or

1170

00:49:47,930 --> 00:49:46,319

summarized in uh the Heisenberg

1171

00:49:49,730 --> 00:49:47,940

uncertainty principle but the idea that

1172

00:49:53,089 --> 00:49:49,740

we can represent

1173

00:49:54,890 --> 00:49:53,099

all of matter as either a linear

1174

00:49:56,150 --> 00:49:54,900

combination of

1175

00:49:59,089 --> 00:49:56,160

uh

1176

00:50:00,470 --> 00:49:59,099

Quantum fields in position space or

1177

00:50:03,050 --> 00:50:00,480

their vibrational modes in position

1178

00:50:06,230 --> 00:50:03,060

space okay and that's a representation

1179

00:50:08,569 --> 00:50:06,240

of the universe or equally equivalently

1180

00:50:09,650 --> 00:50:08,579

we can do the same thing in momentum

1181

00:50:11,410 --> 00:50:09,660

space and

1182

00:50:14,030 --> 00:50:11,420

they're they're

1183

00:50:15,829 --> 00:50:14,040

very different stories about what the

1184

00:50:17,870 --> 00:50:15,839

world looks like but they're equivalent

1185

00:50:20,450 --> 00:50:17,880

and not and no one would argue that one

1186

00:50:23,150 --> 00:50:20,460

is more fundamental than the other

1187

00:50:25,250 --> 00:50:23,160

um while there are some people who on

1188

00:50:27,230 --> 00:50:25,260

the more again of a more esoteric end

1189

00:50:29,870 --> 00:50:27,240

who like to emphasize that it's all

1190

00:50:32,210 --> 00:50:29,880

vibrations and it's all waves yeah you

1191

00:50:33,290 --> 00:50:32,220

can Fourier transform so you can make it

1192

00:50:35,930 --> 00:50:33,300

discrete again

1193

00:50:38,150 --> 00:50:35,940

yeah exactly you know and then and then

1194

00:50:40,750 --> 00:50:38,160

you know we let's not even get started

1195

00:50:44,450 --> 00:50:40,760

on like the S Matrix or the

1196

00:50:45,950 --> 00:50:44,460

amplitudehedron which uh which are ways

1197

00:50:49,490 --> 00:50:45,960

to describe the interactions between

1198

00:50:54,430 --> 00:50:49,500

particles which don't even require space

1199

00:50:57,950 --> 00:50:54,440

and time and uh and waves and and

1200

00:51:00,829 --> 00:50:57,960

fall out in which you can

1201
00:51:03,230 --> 00:51:00,839
summarize pages and pages of calculation

1202
00:51:04,910 --> 00:51:03,240
with a few lines of calculation which

1203
00:51:06,650 --> 00:51:04,920
implies that these things should be more

1204
00:51:08,870 --> 00:51:06,660
fundamental but I don't think that's

1205
00:51:10,430 --> 00:51:08,880
clear I think that their their stories

1206
00:51:12,829 --> 00:51:10,440
about what's happening that have

1207
00:51:15,650 --> 00:51:12,839
incredible mathematical utility what

1208
00:51:17,569 --> 00:51:15,660
they are is a regularity

1209
00:51:20,450 --> 00:51:17,579
that we've discovered

1210
00:51:22,910 --> 00:51:20,460
uh you sound like Bernardo Castro have

1211
00:51:26,030 --> 00:51:22,920
you watched a bunch of his talks or his

1212
00:51:29,329 --> 00:51:26,040
podcasts I've seen I think I watched

1213
00:51:31,549 --> 00:51:29,339

your interview with Bernardo actually

1214

00:51:34,790 --> 00:51:31,559

um I think I agree with some of what he

1215

00:51:37,370 --> 00:51:34,800

says and I disagree with some other what

1216

00:51:39,230 --> 00:51:37,380

are the agreements that you think are

1217

00:51:44,270 --> 00:51:39,240

seen as controversial

1218

00:51:46,089 --> 00:51:44,280

so I I like his characterization of

1219

00:51:49,089 --> 00:51:46,099

um

1220

00:51:52,210 --> 00:51:49,099

Minds as

1221

00:51:55,970 --> 00:51:52,220

dissociative boundaries or or

1222

00:51:58,430 --> 00:51:55,980

agents in dissociative boundaries so you

1223

00:51:59,750 --> 00:51:58,440

know my understanding is that Bernardo

1224

00:52:02,690 --> 00:51:59,760

uh

1225

00:52:04,490 --> 00:52:02,700

rates Consciousness as the most

1226
00:52:07,309 --> 00:52:04,500
fundamental

1227
00:52:11,030 --> 00:52:07,319
um and so you know you talk about

1228
00:52:13,730 --> 00:52:11,040
the universe is this is this thing made

1229
00:52:17,569 --> 00:52:13,740
of Consciousness and then Consciousness

1230
00:52:19,130 --> 00:52:17,579
arises in the universe and and it and so

1231
00:52:21,470 --> 00:52:19,140
the idea of dissociative boundaries is

1232
00:52:23,329 --> 00:52:21,480
that like you you could if you had your

1233
00:52:25,309 --> 00:52:23,339
own internal dissociative boundaries you

1234
00:52:27,770 --> 00:52:25,319
could maybe have something like a split

1235
00:52:30,829 --> 00:52:27,780
personality or you know you wouldn't

1236
00:52:32,809 --> 00:52:30,839
remember that you'd done and you and and

1237
00:52:36,069 --> 00:52:32,819
things like that and so the idea that

1238
00:52:37,849 --> 00:52:36,079

it's a it's a nice

1239

00:52:38,690 --> 00:52:37,859

characterization

1240

00:52:42,950 --> 00:52:38,700

um

1241

00:52:46,790 --> 00:52:42,960

what I don't buy is that Baseline

1242

00:52:48,290 --> 00:52:46,800

statement that the universe that the

1243

00:52:51,290 --> 00:52:48,300

fundamental element of the universe is

1244

00:52:54,530 --> 00:52:51,300

consciousness I don't I don't see why

1245

00:52:57,109 --> 00:52:54,540

it's needed and I don't think there's a

1246

00:52:58,309 --> 00:52:57,119

good justification

1247

00:53:01,490 --> 00:52:58,319

um

1248

00:53:03,049 --> 00:53:01,500

yeah we could go further

1249

00:53:04,309 --> 00:53:03,059

you want to go further as to your

1250

00:53:05,870 --> 00:53:04,319

disagreements or your agreements or

1251
00:53:08,270 --> 00:53:05,880
something else

1252
00:53:10,910 --> 00:53:08,280
okay well just in the context of of what

1253
00:53:11,809 --> 00:53:10,920
we're discussing

1254
00:53:14,329 --> 00:53:11,819
um

1255
00:53:17,390 --> 00:53:14,339
so I think you know we're talking about

1256
00:53:19,790 --> 00:53:17,400
these dual descriptions of the world uh

1257
00:53:21,530 --> 00:53:19,800
so

1258
00:53:25,609 --> 00:53:21,540
um

1259
00:53:31,010 --> 00:53:25,619
you know I would say that

1260
00:53:37,790 --> 00:53:35,809
like a dynamical causal system okay so

1261
00:53:41,450 --> 00:53:37,800
something describable with a set of

1262
00:53:44,089 --> 00:53:41,460
Dynamics sure dynamics of you know

1263
00:53:46,370 --> 00:53:44,099

thoughts basically okay that that that

1264

00:53:49,370 --> 00:53:46,380

cause and influence each other and you

1265

00:53:50,890 --> 00:53:49,380

could and and you know the the field of

1266

00:53:53,750 --> 00:53:50,900

psychology

1267

00:53:57,410 --> 00:53:53,760

you could imagine as

1268

00:53:59,690 --> 00:53:57,420

uh an extremely early version of some

1269

00:54:02,030 --> 00:53:59,700

field where you came up with the the

1270

00:54:03,710 --> 00:54:02,040

internal dynamics of the mind okay but

1271

00:54:04,790 --> 00:54:03,720

but still

1272

00:54:08,450 --> 00:54:04,800

um

1273

00:54:09,829 --> 00:54:08,460

so so if you describe the mind as this

1274

00:54:13,190 --> 00:54:09,839

dynamical system

1275

00:54:17,270 --> 00:54:13,200

where there's

1276

00:54:19,609 --> 00:54:17,280

like genuine causal power

1277

00:54:21,230 --> 00:54:19,619

in within that system defined within

1278

00:54:24,290 --> 00:54:21,240

that system

1279

00:54:25,790 --> 00:54:24,300

um then uh

1280

00:54:29,270 --> 00:54:25,800

then

1281

00:54:31,849 --> 00:54:29,280

the The Duel to that would be a

1282

00:54:33,650 --> 00:54:31,859

you know our brains where you have this

1283

00:54:34,970 --> 00:54:33,660

dynamics of neurons and action

1284

00:54:36,950 --> 00:54:34,980

potentials

1285

00:54:40,190 --> 00:54:36,960

okay and so

1286

00:54:44,150 --> 00:54:40,200

um so I so you know my my

1287

00:54:46,069 --> 00:54:44,160

uh feeling on the matter is that

1288

00:54:48,730 --> 00:54:46,079

that well I can't believe I'm saying

1289

00:54:52,549 --> 00:54:48,740

what I think Consciousness is but I'm

1290

00:54:55,790 --> 00:54:52,559

horribly unqualified but but I but who's

1291

00:54:59,450 --> 00:54:55,800

qualified yeah right anyone with it so

1292

00:55:02,030 --> 00:54:59,460

let's go uh so uh so so either feeling

1293

00:55:03,950 --> 00:55:02,040

that yeah and and plenty of people have

1294

00:55:07,849 --> 00:55:03,960

said this before that that uh

1295

00:55:11,809 --> 00:55:07,859

Consciousness is what a type of

1296

00:55:15,849 --> 00:55:11,819

information flow feels like uh you know

1297

00:55:19,790 --> 00:55:15,859

more particularly I think it's what a uh

1298

00:55:22,069 --> 00:55:19,800

a type of data structure feels like when

1299

00:55:25,130 --> 00:55:22,079

it tells itself a story about itself

1300

00:55:27,170 --> 00:55:25,140

yeah do you see a circularity there

1301
00:55:29,569 --> 00:55:27,180
because we're defining Consciousness in

1302
00:55:30,770 --> 00:55:29,579
terms of so-and-so itself feels like and

1303
00:55:33,829 --> 00:55:30,780
then the question is well what does it

1304
00:55:37,190 --> 00:55:33,839
feel right right so the hard problem

1305
00:55:38,690 --> 00:55:37,200
let's let's uh let's solve it you know I

1306
00:55:41,150 --> 00:55:38,700
I have someone by the way who's

1307
00:55:43,730 --> 00:55:41,160
premiering in two hours from now named

1308
00:55:45,290 --> 00:55:43,740
Terence Deacon look at who he believes

1309
00:55:46,490 --> 00:55:45,300
he's solved the heart problem several

1310
00:55:47,690 --> 00:55:46,500
people believe they've solved the heart

1311
00:55:49,309 --> 00:55:47,700
problem and usually it means that

1312
00:55:52,010 --> 00:55:49,319
they've that they have a completely

1313
00:55:53,630 --> 00:55:52,020

different ontology oh I mean I'm looking

1314

00:55:55,010 --> 00:55:53,640

forward to watching it I'm gonna you're

1315

00:55:57,410 --> 00:55:55,020

not Terence Deacon have you heard of him

1316

00:56:00,109 --> 00:55:57,420

uh name's familiar but no he's a

1317

00:56:02,510 --> 00:56:00,119

linguist well he's a neuroanthropologist

1318

00:56:03,950 --> 00:56:02,520

and he studied under Chomsky he says he

1319

00:56:06,650 --> 00:56:03,960

disagrees with Chomsky about everything

1320

00:56:09,230 --> 00:56:06,660

except politics he's extremely extremely

1321

00:56:11,569 --> 00:56:09,240

bright and has an extreme what I call a

1322

00:56:13,609 --> 00:56:11,579

Velton it's an all-encompassing world

1323

00:56:15,109 --> 00:56:13,619

view such that it's a framework through

1324

00:56:18,049 --> 00:56:15,119

which you interpret the world so it's

1325

00:56:20,270 --> 00:56:18,059

more than simply a world view it's this

1326
00:56:22,010 --> 00:56:20,280
philosophy that you have such that you

1327
00:56:23,569 --> 00:56:22,020
can pose virtually any question to

1328
00:56:25,549 --> 00:56:23,579
someone someone who has a belt on

1329
00:56:27,710 --> 00:56:25,559
showing and someone like say Sam Harris

1330
00:56:29,329 --> 00:56:27,720
or Jordan Peterson you can ask Jordan

1331
00:56:31,130 --> 00:56:29,339
Peterson a question about anything like

1332
00:56:33,290 --> 00:56:31,140
why do birds fly like that he would say

1333
00:56:35,809 --> 00:56:33,300
it's because the edible mother he has a

1334
00:56:38,450 --> 00:56:35,819
framework I mean that can be a useful

1335
00:56:42,230 --> 00:56:38,460
thing but don't you think in a way it is

1336
00:56:43,490 --> 00:56:42,240
being stuck in part of the landscape uh

1337
00:56:44,870 --> 00:56:43,500
maybe a very useful part of the

1338
00:56:46,670 --> 00:56:44,880

landscape but

1339

00:56:49,430 --> 00:56:46,680

um so right you mentioned it's extremely

1340

00:56:52,010 --> 00:56:49,440

useful yes so when you don't have one at

1341

00:56:54,530 --> 00:56:52,020

least like for myself it's a

1342

00:56:56,690 --> 00:56:54,540

destabilizing place to be you're in

1343

00:56:59,150 --> 00:56:56,700

constant you're tentative your

1344

00:56:59,990 --> 00:56:59,160

rudderless but you're also not kidding

1345

00:57:02,270 --> 00:57:00,000

yourself

1346

00:57:04,430 --> 00:57:02,280

well I don't I don't know

1347

00:57:06,770 --> 00:57:04,440

I I don't know because then that depends

1348

00:57:08,809 --> 00:57:06,780

on so does our model of reality create

1349

00:57:10,910 --> 00:57:08,819

reality so it doesn't mean that if you

1350

00:57:13,190 --> 00:57:10,920

have a model it just is so there's

1351
00:57:15,470 --> 00:57:13,200
something called phenomenology so my

1352
00:57:19,069 --> 00:57:15,480
thought is that

1353
00:57:24,650 --> 00:57:21,290
I think it's clear that at some level

1354
00:57:27,290 --> 00:57:24,660
information that is undergoing a certain

1355
00:57:29,990 --> 00:57:27,300
Dynamics

1356
00:57:31,069 --> 00:57:30,000
itself feels like something

1357
00:57:34,849 --> 00:57:31,079
um and

1358
00:57:37,549 --> 00:57:34,859
you know I I think it it is

1359
00:57:39,170 --> 00:57:37,559
maybe enough for that that data

1360
00:57:41,270 --> 00:57:39,180
structure to

1361
00:57:43,569 --> 00:57:41,280
inspect itself

1362
00:57:47,390 --> 00:57:43,579
keep a story of itself

1363
00:57:49,309 --> 00:57:47,400

uh you know as it as it computes its way

1364

00:57:52,609 --> 00:57:49,319

to its next state and its next state and

1365

00:57:55,910 --> 00:57:52,619

it next in its next state it it has it

1366

00:58:00,230 --> 00:57:55,920

has this self-monitoring capability uh

1367

00:58:02,390 --> 00:58:00,240

and and ends up

1368

00:58:04,430 --> 00:58:02,400

telling itself that it's conscious okay

1369

00:58:09,049 --> 00:58:04,440

because it it inspects its own

1370

00:58:11,510 --> 00:58:09,059

inspection of itself uh add input item

1371

00:58:13,609 --> 00:58:11,520

um and so so

1372

00:58:14,690 --> 00:58:13,619

if

1373

00:58:17,510 --> 00:58:14,700

um

1374

00:58:21,890 --> 00:58:17,520

you know if information can be conscious

1375

00:58:24,710 --> 00:58:21,900

in some way and the universe is in at

1376

00:58:27,349 --> 00:58:24,720

least some sense informational it it can

1377

00:58:29,930 --> 00:58:27,359

be you know it can be thought to encode

1378

00:58:32,809 --> 00:58:29,940

information any particle encodes some

1379

00:58:36,230 --> 00:58:32,819

type of information even if it's only

1380

00:58:38,510 --> 00:58:36,240

about its own existence then uh you can

1381

00:58:40,130 --> 00:58:38,520

imagine this spectrum of Consciousness

1382

00:58:42,230 --> 00:58:40,140

uh

1383

00:58:45,650 --> 00:58:42,240

and so

1384

00:58:47,650 --> 00:58:45,660

the so bernardo's sort of

1385

00:58:52,190 --> 00:58:47,660

pan psychism

1386

00:58:55,970 --> 00:58:52,200

is

1387

00:58:56,930 --> 00:58:55,980

one in which he says that he says that

1388

00:58:59,210 --> 00:58:56,940

um

1389

00:59:02,990 --> 00:58:59,220

that the Consciousness is the most

1390

00:59:07,130 --> 00:59:03,000

fundamental element not the material

1391

00:59:09,710 --> 00:59:07,140

um I think you can be a pan psychist and

1392

00:59:13,250 --> 00:59:09,720

and not say that I think

1393

00:59:16,930 --> 00:59:13,260

we you know back to our discussion of

1394

00:59:19,430 --> 00:59:16,940

dualities these you can have two

1395

00:59:20,690 --> 00:59:19,440

completely different stories about the

1396

00:59:23,030 --> 00:59:20,700

world

1397

00:59:26,150 --> 00:59:23,040

um and completely different mathematical

1398

00:59:29,150 --> 00:59:26,160

Frameworks for describing its Dynamics

1399

00:59:30,109 --> 00:59:29,160

but they are ultimately describing the

1400

00:59:32,569 --> 00:59:30,119

same thing

1401

00:59:35,089 --> 00:59:32,579

and I think that's the case with

1402

00:59:36,109 --> 00:59:35,099

Consciousness I think

1403

00:59:46,190 --> 00:59:36,119

um

1404

00:59:48,170 --> 00:59:46,200

uh which we we can't argue has it has

1405

00:59:50,270 --> 00:59:48,180

Consciousness and you start taking

1406

00:59:53,049 --> 00:59:50,280

things away you scale down its ability

1407

00:59:57,230 --> 00:59:53,059

to tell stories about itself to

1408

01:00:00,010 --> 00:59:57,240

self-inspect okay you can for example

1409

01:00:04,069 --> 01:00:00,020

go on a Meditation Retreat and learn to

1410

01:00:07,309 --> 01:00:04,079

be be purely in the moment and and

1411

01:00:09,829 --> 01:00:07,319

only aware and and you can learn to

1412

01:00:12,170 --> 01:00:09,839

suppress all of the chatter all of the

1413

01:00:15,829 --> 01:00:12,180

internal dialogue you can suppress all

1414

01:00:18,170 --> 01:00:15,839

cognition uh you know essential periods

1415

01:00:20,690 --> 01:00:18,180

to a point where you are only perceiving

1416

01:00:22,970 --> 01:00:20,700

okay so you you still have a qualia

1417

01:00:27,289 --> 01:00:22,980

but you're not telling yourself a story

1418

01:00:28,789 --> 01:00:27,299

about that about that you're just you're

1419

01:00:31,309 --> 01:00:28,799

essentially just

1420

01:00:33,470 --> 01:00:31,319

being the data structure that your brain

1421

01:00:34,789 --> 01:00:33,480

has assembled about the outside world

1422

01:00:41,150 --> 01:00:34,799

without

1423

01:00:43,549 --> 01:00:41,160

that this is clearly it's clear that our

1424

01:00:46,730 --> 01:00:43,559

subjective worlds are informational okay

1425

01:00:47,809 --> 01:00:46,740

that all of this detail needs coded and

1426

01:00:52,370 --> 01:00:47,819

so

1427

01:00:54,230 --> 01:00:52,380

is there anything special about that

1428

01:00:57,049 --> 01:00:54,240

information structure that's just the

1429

01:01:00,049 --> 01:00:57,059

output of your you know visual cortex

1430

01:01:03,470 --> 01:01:00,059

etc etc that that you know presents you

1431

01:01:06,950 --> 01:01:03,480

this this image of the visual world is

1432

01:01:09,230 --> 01:01:06,960

that data structure conscious uh or that

1433

01:01:11,210 --> 01:01:09,240

data structure plus your you know your

1434

01:01:13,609 --> 01:01:11,220

attention module which is

1435

01:01:17,089 --> 01:01:13,619

so so you can you can really pair things

1436

01:01:20,390 --> 01:01:17,099

down so that you only have the the

1437

01:01:21,950 --> 01:01:20,400

minimum amounts that that you know you

1438

01:01:23,329 --> 01:01:21,960

can you can possibly have and still be a

1439

01:01:25,789 --> 01:01:23,339

person

1440

01:01:27,170 --> 01:01:25,799

um and it seems that that is still

1441

01:01:29,210 --> 01:01:27,180

conscious

1442

01:01:30,770 --> 01:01:29,220

okay so what's what's the difference

1443

01:01:33,770 --> 01:01:30,780

then

1444

01:01:36,130 --> 01:01:33,780

to the data structure that represents

1445

01:01:38,630 --> 01:01:36,140

your the the

1446

01:01:40,670 --> 01:01:38,640

uh the subjective world that your brain

1447

01:01:43,250 --> 01:01:40,680

assembled and

1448

01:01:45,770 --> 01:01:43,260

a data structure that contains similar

1449

01:01:47,329 --> 01:01:45,780

information that's not in a person well

1450

01:01:50,930 --> 01:01:47,339

the difference is that

1451

01:01:53,210 --> 01:01:50,940

it's not constantly telling itself a

1452

01:01:56,210 --> 01:01:53,220

story about what it says and it has no

1453

01:01:58,069 --> 01:01:56,220

memory so if you if you I mean imagine

1454

01:02:00,289 --> 01:01:58,079

for example that the entire universe was

1455

01:02:01,789 --> 01:02:00,299

conscious and was aware of itself you

1456

01:02:03,770 --> 01:02:01,799

know it told oh that was a star that

1457

01:02:06,589 --> 01:02:03,780

exploded I just made a Galaxy

1458

01:02:09,230 --> 01:02:06,599

but then you take away that story and it

1459

01:02:10,609 --> 01:02:09,240

just is the data structure of all this

1460

01:02:13,190 --> 01:02:10,619

stuff

1461

01:02:15,910 --> 01:02:13,200

uh what will be the difference between

1462

01:02:18,470 --> 01:02:15,920

just being Mata

1463

01:02:20,530 --> 01:02:18,480

unconscious matter and you know this

1464

01:02:23,809 --> 01:02:20,540

completely memoryless

1465

01:02:26,990 --> 01:02:23,819

uh you know conscious thing and my

1466

01:02:29,930 --> 01:02:27,000

argument is that there's no difference

1467

01:02:32,870 --> 01:02:29,940

and the thing that has no memory or

1468

01:02:36,470 --> 01:02:32,880

capacity to self-inspect

1469

01:02:39,349 --> 01:02:36,480

isn't really conscious but that at least

1470

01:02:41,329 --> 01:02:39,359

gives you a way to have a spectrum of

1471

01:02:43,970 --> 01:02:41,339

Consciousness like as soon as something

1472

01:02:46,130 --> 01:02:43,980

starts to have both a model of the world

1473

01:02:48,289 --> 01:02:46,140

and can tell itself a story about its

1474

01:02:50,750 --> 01:02:48,299

model of the world then it can start

1475

01:02:52,609 --> 01:02:50,760

telling itself it's conscious and and by

1476

01:02:54,829 --> 01:02:52,619

the way it's not that's not an illusion

1477

01:02:58,130 --> 01:02:54,839

the the whole idea that Consciousness is

1478

01:03:01,670 --> 01:02:58,140

an illusion I think is as as bad a

1479

01:03:03,770 --> 01:03:01,680

fallacy as saying that the you know the

1480

01:03:06,410 --> 01:03:03,780

holographic principle bulk is an

1481

01:03:10,069 --> 01:03:06,420

illusion and the boundary is not in that

1482

01:03:12,230 --> 01:03:10,079

case where the universe is conscious and

1483

01:03:13,970 --> 01:03:12,240

it's not conscious of anything you're

1484

01:03:15,530 --> 01:03:13,980

saying that it's as if there's two

1485

01:03:17,569 --> 01:03:15,540

states of Consciousness one that's about

1486

01:03:19,849 --> 01:03:17,579

something and then one that is just

1487

01:03:20,990 --> 01:03:19,859

conscious pure Consciousness and that's

1488

01:03:23,930 --> 01:03:21,000

something that you can access when

1489

01:03:28,510 --> 01:03:23,940

you're in meditation well I feel like

1490

01:03:33,410 --> 01:03:31,910

I think it's a poorly defined concept

1491

01:03:35,930 --> 01:03:33,420

uh it's

1492

01:03:37,849 --> 01:03:35,940

you know it it really emerges when we

1493

01:03:39,230 --> 01:03:37,859

get to start telling ourselves that we

1494

01:03:42,170 --> 01:03:39,240

have it

1495

01:03:44,690 --> 01:03:42,180

and and

1496

01:03:47,450 --> 01:03:44,700

you know we could we we can observe our

1497

01:03:49,309 --> 01:03:47,460

our own Consciousness because we are we

1498

01:03:51,470 --> 01:03:49,319

literally are part of

1499

01:03:54,289 --> 01:03:51,480

the data structure

1500

01:03:55,730 --> 01:03:54,299

that this Consciousness is okay it's not

1501

01:03:58,490 --> 01:03:55,740

like we're

1502

01:04:00,829 --> 01:03:58,500

a separate you know homunculus observing

1503

01:04:03,410 --> 01:04:00,839

the the data structure that our brain

1504

01:04:06,049 --> 01:04:03,420

synthesize we are that data structure

1505

01:04:08,150 --> 01:04:06,059

okay we that that literally is what we

1506

01:04:10,549 --> 01:04:08,160

are and inside that data structure

1507

01:04:13,309 --> 01:04:10,559

there's a model of ourselves

1508

01:04:14,089 --> 01:04:13,319

okay which we can also inspect

1509

01:04:16,010 --> 01:04:14,099

um

1510

01:04:17,930 --> 01:04:16,020

and so I think

1511

01:04:23,210 --> 01:04:17,940

uh

1512

01:04:24,230 --> 01:04:23,220

Consciousness is just a it is in this

1513

01:04:26,510 --> 01:04:24,240

sense

1514

01:04:28,730 --> 01:04:26,520

an emergent phenomenon

1515

01:04:31,609 --> 01:04:28,740

but there's no

1516

01:04:34,069 --> 01:04:31,619

no very hard line I I think for when it

1517

01:04:36,890 --> 01:04:34,079

emerges you know I'm I started all the

1518

01:04:42,170 --> 01:04:36,900

saying I'm no expert and and then

1519

01:04:43,190 --> 01:04:42,180

gave you this super uh long treatises as

1520

01:04:46,789 --> 01:04:43,200

though

1521

01:04:49,849 --> 01:04:46,799

um I know anything but uh

1522

01:04:53,390 --> 01:04:49,859

this is the picture that fills the least

1523

01:04:55,309 --> 01:04:53,400

contradictory to me uh

1524

01:04:57,890 --> 01:04:55,319

so then in this view is there such a

1525

01:05:00,410 --> 01:04:57,900

thing as free will

1526

01:05:02,750 --> 01:05:00,420

in this view yes correct my

1527

01:05:04,309 --> 01:05:02,760

misunderstanding friend the way that I

1528

01:05:06,710 --> 01:05:04,319

understand it is that there are some

1529

01:05:08,809 --> 01:05:06,720

atoms moving around and occasionally

1530

01:05:11,210 --> 01:05:08,819

that is something we call information

1531

01:05:12,829 --> 01:05:11,220

processing that information processing

1532

01:05:14,990 --> 01:05:12,839

is much like there's a lamp right here

1533

01:05:17,569 --> 01:05:15,000

that is casting onto the wall that wall

1534

01:05:19,609 --> 01:05:17,579

is now the feeling of Consciousness that

1535

01:05:21,950 --> 01:05:19,619

is is the effect and something is

1536

01:05:24,349 --> 01:05:21,960

happening here now that wall doesn't

1537

01:05:26,150 --> 01:05:24,359

cause anything with this light the light

1538

01:05:27,530 --> 01:05:26,160

will move around right now it's

1539

01:05:30,289 --> 01:05:27,540

stationary but the light can change

1540

01:05:31,670 --> 01:05:30,299

colors it can get brighter it can get

1541

01:05:34,190 --> 01:05:31,680

smashed on the ground and that wall

1542

01:05:36,349 --> 01:05:34,200

would change but I wouldn't say that

1543

01:05:37,069 --> 01:05:36,359

that wall has any causal influence on

1544

01:05:41,750 --> 01:05:37,079

that

1545

01:05:43,430 --> 01:05:41,760

sounds like there is no free will in

1546

01:05:45,370 --> 01:05:43,440

what has just been outlined so please

1547

01:05:49,190 --> 01:05:45,380

correct my misunderstanding okay so

1548

01:05:51,710 --> 01:05:49,200

let's try to talk about Free Will so so

1549

01:05:54,950 --> 01:05:51,720

first of all

1550

01:05:56,569 --> 01:05:54,960

um so Baja my partner she's a science

1551

01:05:59,630 --> 01:05:56,579

journalist and who's written a lot about

1552

01:06:03,470 --> 01:05:59,640

these topics uh I encourage you to check

1553

01:06:07,069 --> 01:06:03,480

out her article in the Atlantic which uh

1554

01:06:11,510 --> 01:06:07,079

to do thanks thanks nonsense on the

1555

01:06:13,849 --> 01:06:11,520

topic um but but she she always

1556

01:06:15,650 --> 01:06:13,859

reminds me to think about these things

1557

01:06:18,890 --> 01:06:15,660

in the context of their historical

1558

01:06:21,410 --> 01:06:18,900

development so so pre-enlightenment

1559

01:06:24,650 --> 01:06:21,420

there was this idea that Free Will and

1560

01:06:28,190 --> 01:06:24,660

meaning and mind were

1561

01:06:30,349 --> 01:06:28,200

um inextricably attached to Notions like

1562

01:06:32,510 --> 01:06:30,359

God and the immortal soul

1563

01:06:34,309 --> 01:06:32,520

okay so when when those ideas started to

1564

01:06:38,089 --> 01:06:34,319

be questioned

1565

01:06:40,370 --> 01:06:38,099

was the same time that the materialist

1566

01:06:41,690 --> 01:06:40,380

Paradigm arose so the Newtonian world

1567

01:06:43,690 --> 01:06:41,700

view of

1568

01:06:46,069 --> 01:06:43,700

you know

1569

01:06:48,289 --> 01:06:46,079

atoms is bouncing around in the void

1570

01:06:49,849 --> 01:06:48,299

perfectly predictable clock work so at

1571

01:06:52,010 --> 01:06:49,859

the same time that we discarded or

1572

01:06:56,809 --> 01:06:52,020

started to discard the spiritual

1573

01:07:01,130 --> 01:06:56,819

and in that Gap we inserted this sort of

1574

01:07:03,890 --> 01:07:01,140

very first and and and and perhaps naive

1575

01:07:07,510 --> 01:07:03,900

um mechanistic determinism

1576

01:07:10,010 --> 01:07:07,520

uh Notions like Free Will which were

1577

01:07:12,109 --> 01:07:10,020

conjoined with God and the Soul got

1578

01:07:15,470 --> 01:07:12,119

thrown out with the bath water and were

1579

01:07:19,309 --> 01:07:15,480

replaced by the idea that that these

1580

01:07:22,309 --> 01:07:19,319

things are Epi phenomena of over you

1581

01:07:26,150 --> 01:07:22,319

know called mechanistic Universe

1582

01:07:33,170 --> 01:07:29,270

so that that's one crime what is is it's

1583

01:07:38,329 --> 01:07:33,180

a it's a a gripe with the what I think

1584

01:07:41,029 --> 01:07:38,339

is an over simplification of the

1585

01:07:42,589 --> 01:07:41,039

um approach to to thinking about

1586

01:07:44,990 --> 01:07:42,599

free will but but all other things

1587

01:07:47,150 --> 01:07:45,000

related to the mind also

1588

01:07:51,670 --> 01:07:47,160

um so so let me

1589

01:07:55,130 --> 01:07:51,680

explain why my view does and

1590

01:07:57,289 --> 01:07:55,140

uh suggest that Free Will is an illusion

1591

01:07:59,870 --> 01:07:57,299

um and so what does it mean it means

1592

01:08:01,910 --> 01:07:59,880

Free Will is means that you make your

1593

01:08:03,829 --> 01:08:01,920

your choices are your own they're not

1594

01:08:05,210 --> 01:08:03,839

forced On You by something else

1595

01:08:07,549 --> 01:08:05,220

uh

1596

01:08:09,770 --> 01:08:07,559

and and for any choice you make you

1597

01:08:11,630 --> 01:08:09,780

could have chosen otherwise

1598

01:08:12,890 --> 01:08:11,640

and you know the standard argument is

1599

01:08:18,950 --> 01:08:12,900

that

1600

01:08:20,749 --> 01:08:18,960

you're made of okay you couldn't have

1601

01:08:23,450 --> 01:08:20,759

done it before is

1602

01:08:25,789 --> 01:08:23,460

so this is this this is the the argument

1603

01:08:26,689 --> 01:08:25,799

that you hear uh I won't mention any

1604

01:08:28,370 --> 01:08:26,699

names

1605

01:08:29,990 --> 01:08:28,380

um because

1606

01:08:32,090 --> 01:08:30,000

you know you so you couldn't have chosen

1607

01:08:33,470 --> 01:08:32,100

otherwise because the whatever the exact

1608

01:08:37,430 --> 01:08:33,480

position and velocity of all of your

1609

01:08:39,729 --> 01:08:37,440

subatomic particles uh set and how to

1610

01:08:42,050 --> 01:08:39,739

evolve according to the laws of physics

1611

01:08:43,610 --> 01:08:42,060

or that

1612

01:08:45,349 --> 01:08:43,620

you know if that

1613

01:08:46,910 --> 01:08:45,359

you know if those particles have some

1614

01:08:49,309 --> 01:08:46,920

fundamental Randomness then the

1615

01:08:52,669 --> 01:08:49,319

randomness is still not free will

1616

01:08:55,729 --> 01:08:52,679

okay so that's the this argument

1617

01:08:58,249 --> 01:08:55,739

um and first of all let me say that that

1618

01:09:02,570 --> 01:08:58,259

you know that picture of physics is you

1619

01:09:05,390 --> 01:09:02,580

know it's right in a sense okay so I I

1620

01:09:07,550 --> 01:09:05,400

believe that that

1621

01:09:09,289 --> 01:09:07,560

subatomic particles evolve according to

1622

01:09:12,289 --> 01:09:09,299

The Showdown equation

1623

01:09:15,229 --> 01:09:12,299

Etc uh and the subatomic particles have

1624

01:09:16,610 --> 01:09:15,239

no idea that they're in a brain or that

1625

01:09:18,169 --> 01:09:16,620

they're part of a choice or they

1626

01:09:22,669 --> 01:09:18,179

represent a data structure that's part

1627

01:09:24,050 --> 01:09:22,679

of that that data structure feels uh as

1628

01:09:24,709 --> 01:09:24,060

part of a choice

1629

01:09:28,669 --> 01:09:24,719

um

1630

01:09:31,789 --> 01:09:28,679

but the problem with this reductionist

1631

01:09:35,570 --> 01:09:31,799

argument is that it's

1632

01:09:38,990 --> 01:09:35,580

it's messing up its definitions and in

1633

01:09:41,809 --> 01:09:39,000

particular it's definitions of causality

1634

01:09:43,010 --> 01:09:41,819

so if we think about

1635

01:09:45,470 --> 01:09:43,020

um

1636

01:09:47,030 --> 01:09:45,480

the world is having these kind of layers

1637

01:09:49,450 --> 01:09:47,040

of complexity

1638

01:09:53,510 --> 01:09:49,460

okay you have

1639

01:09:55,669 --> 01:09:53,520

physics driving the atoms and chemistry

1640

01:09:58,010 --> 01:09:55,679

driving the molecules in biology driving

1641

01:10:00,290 --> 01:09:58,020

the cells then you could you could say

1642

01:10:01,030 --> 01:10:00,300

something like so if you want to talk

1643

01:10:03,470 --> 01:10:01,040

about

1644

01:10:07,010 --> 01:10:03,480

causality here in terms of the

1645

01:10:09,470 --> 01:10:07,020

hierarchies of of emergence then you

1646

01:10:12,890 --> 01:10:09,480

could say that that quarks and electrons

1647

01:10:15,470 --> 01:10:12,900

cause atoms atoms cause molecules core

1648

01:10:18,290 --> 01:10:15,480

cells cells cause apples and brains and

1649

01:10:21,290 --> 01:10:18,300

brains cause Minds right

1650

01:10:23,570 --> 01:10:21,300

um but this is a type of causation and

1651

01:10:25,130 --> 01:10:23,580

it's it's like this cross hierarchical

1652

01:10:28,130 --> 01:10:25,140

causation

1653

01:10:30,830 --> 01:10:28,140

but I would argue that there's a real

1654

01:10:33,830 --> 01:10:30,840

fundamental difference between that type

1655

01:10:37,070 --> 01:10:33,840

of causation to what you might call an

1656

01:10:39,410 --> 01:10:37,080

an intra-hierarchical causation that

1657

01:10:41,330 --> 01:10:39,420

defines the Dynamics within a given

1658

01:10:42,649 --> 01:10:41,340

layout can you give me an example all

1659

01:10:45,610 --> 01:10:42,659

right so

1660

01:10:52,370 --> 01:10:45,620

you can say that you know there's this

1661

01:10:55,189 --> 01:10:52,380

causal power whereby a cell is or say a

1662

01:10:56,689 --> 01:10:55,199

neuron is caused by the molecules that

1663

01:10:59,270 --> 01:10:56,699

it's formed of

1664

01:11:02,390 --> 01:10:59,280

um it is an Epi phenomenon of those

1665

01:11:05,330 --> 01:11:02,400

molecules which in turn are Epi

1666

01:11:09,290 --> 01:11:05,340

phenomena of their atoms Etc but it's

1667

01:11:12,350 --> 01:11:09,300

also entirely meaningful to say that

1668

01:11:16,910 --> 01:11:12,360

an action potential in a neuron

1669

01:11:19,310 --> 01:11:16,920

causes a downstream neuron to fire

1670

01:11:21,770 --> 01:11:19,320

right so that's that's a reasonable

1671

01:11:24,169 --> 01:11:21,780

statement okay and you're on Fires one

1672

01:11:26,750 --> 01:11:24,179

that's attached to fires and you can you

1673

01:11:29,270 --> 01:11:26,760

can and and it and it makes total sense

1674

01:11:31,430 --> 01:11:29,280

and and in a real sense it's true to say

1675

01:11:33,169 --> 01:11:31,440

that the first neuron caused the firing

1676

01:11:34,930 --> 01:11:33,179
of the second

1677

01:11:38,930 --> 01:11:34,940
um it's

1678

01:11:41,810 --> 01:11:38,940
less useful to say that like

1679

01:11:44,570 --> 01:11:41,820
the wiggle of a Quantum string

1680

01:11:47,630 --> 01:11:44,580
on the Planck scale caused a downstream

1681

01:11:50,689 --> 01:11:47,640
neuron to fire even if the

1682

01:11:52,430 --> 01:11:50,699
even if the quantum string is the let's

1683

01:11:53,450 --> 01:11:52,440
call it the hierarchical cause of one of

1684

01:11:56,270 --> 01:11:53,460
the electrons in the first action

1685

01:11:59,090 --> 01:11:56,280
potential that's like a a roundabout and

1686

01:12:01,130 --> 01:11:59,100
relatively inane approach to talking

1687

01:12:05,270 --> 01:12:01,140
about causation so there's this this

1688

01:12:08,870 --> 01:12:05,280

kind of bottom-up causation in which

1689

01:12:12,709 --> 01:12:08,880

different levels in in

1690

01:12:16,810 --> 01:12:12,719

the scale of uh you know uh

1691

01:12:20,630 --> 01:12:16,820

physical scale or complexity scale are

1692

01:12:23,090 --> 01:12:20,640

generated by the the lower layers but

1693

01:12:26,330 --> 01:12:23,100

there's a different type of causation

1694

01:12:29,870 --> 01:12:26,340

within the layer okay so

1695

01:12:32,510 --> 01:12:29,880

um and and and within each of these

1696

01:12:36,470 --> 01:12:32,520

hierarchical layers you have

1697

01:12:38,810 --> 01:12:36,480

a a dynamics that is in a sense

1698

01:12:41,630 --> 01:12:38,820

independent of

1699

01:12:43,669 --> 01:12:41,640

the the layer below that generated it

1700

01:12:45,770 --> 01:12:43,679

okay so you can

1701

01:12:48,470 --> 01:12:45,780

um you know I mentioned Bernoulli's

1702

01:12:51,530 --> 01:12:48,480

equation and fluid flow so you you have

1703

01:12:53,810 --> 01:12:51,540

this whole field of hydrodynamics which

1704

01:12:56,330 --> 01:12:53,820

is beautiful and in a sense it's

1705

01:12:59,450 --> 01:12:56,340

causally closed Like You can predict

1706

01:13:03,350 --> 01:12:59,460

anything about the behavior of fluids

1707

01:13:06,410 --> 01:13:03,360

using these rules and

1708

01:13:08,689 --> 01:13:06,420

it it does matter what the properties of

1709

01:13:09,950 --> 01:13:08,699

the the particles in that layer are and

1710

01:13:12,350 --> 01:13:09,960

those properties are the properties of

1711

01:13:14,090 --> 01:13:12,360

those particles are generated by the

1712

01:13:15,470 --> 01:13:14,100

layer below but once you know the

1713

01:13:19,130 --> 01:13:15,480

properties of those particles you don't

1714

01:13:21,950 --> 01:13:19,140

care about the the the detailed physics

1715

01:13:24,050 --> 01:13:21,960

of the the level below you you are you

1716

01:13:26,570 --> 01:13:24,060

are in that layer and the rules of that

1717

01:13:29,930 --> 01:13:26,580

layer are in a sense closed and

1718

01:13:32,030 --> 01:13:29,940

independent Okay so

1719

01:13:35,149 --> 01:13:32,040

so brains

1720

01:13:38,689 --> 01:13:35,159

have a dynamics of neural activity okay

1721

01:13:41,090 --> 01:13:38,699

it's a physical system they behave

1722

01:13:43,250 --> 01:13:41,100

like some type of neural network we can

1723

01:13:45,649 --> 01:13:43,260

we can even simulate it okay current

1724

01:13:49,010 --> 01:13:45,659

neural networks miss an awful lot but in

1725

01:13:54,950 --> 01:13:52,970

run the the Dynamics of the brain with a

1726

01:13:56,930 --> 01:13:54,960

different substrate we can run them we

1727

01:14:00,890 --> 01:13:56,940

could run we one day probably will be

1728

01:14:04,550 --> 01:14:00,900

able to run these in silico and it and

1729

01:14:07,310 --> 01:14:04,560

that dynamical system the system of of

1730

01:14:09,050 --> 01:14:07,320

neural activity will be independent of

1731

01:14:13,610 --> 01:14:09,060

the substrate once we figure out what

1732

01:14:14,930 --> 01:14:13,620

that Dynamics is man Matt you oh the I

1733

01:14:17,570 --> 01:14:14,940

don't know if you realize we've seen

1734

01:14:19,610 --> 01:14:17,580

such controversial statements at at

1735

01:14:21,590 --> 01:14:19,620

saying in principle so for instance you

1736

01:14:25,010 --> 01:14:21,600

see in principle we could simulate the

1737

01:14:26,270 --> 01:14:25,020

brain substrate Independence who knows I

1738

01:14:28,550 --> 01:14:26,280

mean well that's like a huge offer well

1739

01:14:29,750 --> 01:14:28,560

I'm I'm gonna understand I'm going to

1740

01:14:31,850 --> 01:14:29,760

crap all over the expression in

1741

01:14:34,370 --> 01:14:31,860

principle I think because

1742

01:14:36,590 --> 01:14:34,380

um so yeah who cares we're just talking

1743

01:14:38,209 --> 01:14:36,600

at people who are listening just realize

1744

01:14:40,490 --> 01:14:38,219

that none of us have the correct words

1745

01:14:42,169 --> 01:14:40,500

and in order for us to just in order for

1746

01:14:43,790 --> 01:14:42,179

us to convey anything that's non-trivial

1747

01:14:45,649 --> 01:14:43,800

we're going to have to flummox a

1748

01:14:46,910 --> 01:14:45,659

flounder okay well I'm happy I'm happy

1749

01:14:48,470 --> 01:14:46,920

to put myself out there I think we will

1750

01:14:51,950 --> 01:14:48,480

be able to simulate the brain but it

1751
01:14:54,470 --> 01:14:51,960
might be a really long time away because

1752
01:14:56,570 --> 01:14:54,480
there's so much

1753
01:14:58,370 --> 01:14:56,580
and and the point is that once we once

1754
01:15:01,490 --> 01:14:58,380
we figure out those Dynamics it'll be

1755
01:15:04,790 --> 01:15:01,500
independent of the substrate silicon or

1756
01:15:08,390 --> 01:15:04,800
meat in the case all right so

1757
01:15:11,149 --> 01:15:08,400
maybe we can agree that that the

1758
01:15:13,669 --> 01:15:11,159
Dynamics within a layer are their own

1759
01:15:15,709 --> 01:15:13,679
thing they're they're in a it and and

1760
01:15:17,090 --> 01:15:15,719
the idea of cause within one of those

1761
01:15:20,209 --> 01:15:17,100
layers like

1762
01:15:22,430 --> 01:15:20,219
is different to the cause that generates

1763
01:15:24,770 --> 01:15:22,440

one layer from the layer below it okay

1764

01:15:26,770 --> 01:15:24,780

uh I see what you're saying okay okay so

1765

01:15:30,410 --> 01:15:26,780

you have you have you have this

1766

01:15:33,530 --> 01:15:30,420

dynamics of cause and effect

1767

01:15:38,209 --> 01:15:33,540

in you know in biology or in an

1768

01:15:40,370 --> 01:15:38,219

ecological system okay it's true that

1769

01:15:41,990 --> 01:15:40,380

reintroducing wolves to the Yellowstone

1770

01:15:43,910 --> 01:15:42,000

National Park

1771

01:15:45,890 --> 01:15:43,920

caused

1772

01:15:47,810 --> 01:15:45,900

the deer population to be come under

1773

01:15:49,970 --> 01:15:47,820

control okay that's that's a totally

1774

01:15:52,790 --> 01:15:49,980

meaningful statement and it would serve

1775

01:15:56,090 --> 01:15:52,800

to try to do the same thing with quarks

1776

01:15:59,570 --> 01:15:56,100

okay yes yes like Studios right so so

1777

01:16:02,450 --> 01:15:59,580

you have these these dynamical systems

1778

01:16:04,790 --> 01:16:02,460

where where and and the cause in that

1779

01:16:07,070 --> 01:16:04,800

sense is it is like we should have a

1780

01:16:08,750 --> 01:16:07,080

different word for it but

1781

01:16:11,209 --> 01:16:08,760

um so we're mixing our definitions of

1782

01:16:14,390 --> 01:16:11,219

the interest system versus the

1783

01:16:16,010 --> 01:16:14,400

inter-system causation

1784

01:16:17,810 --> 01:16:16,020

so we're still not we're still not at

1785

01:16:20,270 --> 01:16:17,820

Free Will yet so

1786

01:16:22,250 --> 01:16:20,280

um our conscious experience

1787

01:16:25,490 --> 01:16:22,260

may be emergent from the actions of our

1788

01:16:26,030 --> 01:16:25,500

neurons it probably is in some sense

1789

01:16:27,229 --> 01:16:26,040

um

1790

01:16:30,410 --> 01:16:27,239

but

1791

01:16:33,970 --> 01:16:30,420

in another sense it is dual to our the

1792

01:16:36,290 --> 01:16:33,980

actions of our neurons Okay so

1793

01:16:38,110 --> 01:16:36,300

the the

1794

01:16:42,290 --> 01:16:38,120

L

1795

01:16:44,870 --> 01:16:42,300

neurons have a Dynamics which you know

1796

01:16:45,950 --> 01:16:44,880

you can at some level explain their

1797

01:16:50,510 --> 01:16:45,960

behavior

1798

01:16:52,669 --> 01:16:50,520

but the uh

1799

01:16:55,130 --> 01:16:52,679

that and they generate this pattern of

1800

01:16:58,790 --> 01:16:55,140

information that's you know it tells a

1801

01:17:01,370 --> 01:16:58,800

story about itself Etc and and so

1802

01:17:05,030 --> 01:17:01,380

um in a way

1803

01:17:06,770 --> 01:17:05,040

our minds or or you know the description

1804

01:17:08,770 --> 01:17:06,780

of our minds is just another way of

1805

01:17:12,410 --> 01:17:08,780

casting

1806

01:17:14,510 --> 01:17:12,420

that it's that that is a you know it's

1807

01:17:18,649 --> 01:17:14,520

essentially a duality it is a dual to

1808

01:17:22,070 --> 01:17:18,659

that system but in a way you could argue

1809

01:17:26,149 --> 01:17:22,080

that it's more fundamental right so

1810

01:17:28,370 --> 01:17:26,159

if in the broader sense our minds are

1811

01:17:31,370 --> 01:17:28,380

the result of a computation then then

1812

01:17:34,130 --> 01:17:31,380

our minds are also a dynamical system

1813

01:17:35,990 --> 01:17:34,140

independent of the substrate

1814

01:17:40,910 --> 01:17:36,000

um so a set of elements in this case

1815

01:17:43,729 --> 01:17:40,920

thoughts linked by a set of rules uh and

1816

01:17:45,830 --> 01:17:43,739

you know and and thoughts a symbolic

1817

01:17:49,910 --> 01:17:45,840

representations and so you can come up

1818

01:17:51,770 --> 01:17:49,920

with a a language that that

1819

01:17:53,390 --> 01:17:51,780

that manipulates these symbolic

1820

01:17:56,330 --> 01:17:53,400

representations and tells stories with

1821

01:17:59,930 --> 01:17:56,340

them okay that's you know in

1822

01:18:02,750 --> 01:17:59,940

uh sense kind of what what a mind is

1823

01:18:04,610 --> 01:18:02,760

um and a bunch of other stuff okay so in

1824

01:18:06,290 --> 01:18:04,620

a Sense Psychology is the science of

1825

01:18:09,410 --> 01:18:06,300

understanding the Dynamics of that

1826

01:18:12,410 --> 01:18:09,420

system and it's to some extent mappable

1827

01:18:15,110 --> 01:18:12,420

maybe never completely

1828

01:18:16,870 --> 01:18:15,120

um but it you know you but you you could

1829

01:18:20,030 --> 01:18:16,880

write down the Dynamics of the mind

1830

01:18:21,709 --> 01:18:20,040

without referencing neurons

1831

01:18:22,790 --> 01:18:21,719

okay just as you could write down the

1832

01:18:24,649 --> 01:18:22,800

Dynamics of the neurons without

1833

01:18:28,189 --> 01:18:24,659

referencing electrons but and the reason

1834

01:18:29,470 --> 01:18:28,199

I said that that in a sense the the

1835

01:18:32,270 --> 01:18:29,480

uh

1836

01:18:33,709 --> 01:18:32,280

the way of looking at neurodynamics

1837

01:18:35,169 --> 01:18:33,719

which is the

1838

01:18:37,790 --> 01:18:35,179

the the The

1839

01:18:40,910 --> 01:18:37,800

Duel of it which is the subjective

1840

01:18:43,130 --> 01:18:40,920

experience is more predictively powerful

1841

01:18:44,810 --> 01:18:43,140

than the neurodynamics themselves in in

1842

01:18:47,090 --> 01:18:44,820

you know some way of looking at it

1843

01:18:48,770 --> 01:18:47,100

that's more fundamental

1844

01:18:52,910 --> 01:18:48,780

um there are things you can predict

1845

01:18:54,649 --> 01:18:52,920

about what a brain will do and and what

1846

01:18:59,209 --> 01:18:54,659

what an organism how an organism will

1847

01:19:03,709 --> 01:18:59,219

behave that you could only get by

1848

01:19:05,450 --> 01:19:03,719

looking at the uh the the thought

1849

01:19:08,149 --> 01:19:05,460

Dynamics like the mental Dynamics and

1850

01:19:10,070 --> 01:19:08,159

you could never get by trying to look at

1851

01:19:12,290 --> 01:19:10,080

a few neurons and and guess what they're

1852

01:19:14,810 --> 01:19:12,300

going to do okay so is this not a

1853

01:19:16,310 --> 01:19:14,820

difference between what we can do and

1854

01:19:18,050 --> 01:19:16,320

what is

1855

01:19:18,950 --> 01:19:18,060

I don't think so

1856

01:19:23,390 --> 01:19:18,960

um

1857

01:19:30,410 --> 01:19:25,189

all right so

1858

01:19:32,510 --> 01:19:30,420

so we so first of all mate let's uh

1859

01:19:35,810 --> 01:19:32,520

you know

1860

01:19:37,010 --> 01:19:35,820

put a pin in the idea that the mind is

1861

01:19:39,350 --> 01:19:37,020

this

1862

01:19:43,310 --> 01:19:39,360

its own dynamical system potentially

1863

01:19:45,290 --> 01:19:43,320

independent a bit substrate uh

1864

01:19:51,110 --> 01:19:45,300

and

1865

01:19:55,250 --> 01:19:51,120

Dynamics of neurons for for many many

1866

01:20:01,729 --> 01:19:59,390

does it mean does that mean uh that yeah

1867

01:20:04,610 --> 01:20:01,739

like you said it is the mind

1868

01:20:07,850 --> 01:20:04,620

is this just our impression that you

1869

01:20:09,290 --> 01:20:07,860

know it's we can't do this we we can't

1870

01:20:13,250 --> 01:20:09,300

for example

1871

01:20:15,649 --> 01:20:13,260

predict someone else's detailed Behavior

1872

01:20:19,550 --> 01:20:15,659

you know uh their

1873

01:20:25,790 --> 01:20:23,209

fall in love with you know particular

1874

01:20:27,350 --> 01:20:25,800

Types of People based on looking at

1875

01:20:29,510 --> 01:20:27,360

their looking at their neurons or

1876

01:20:31,850 --> 01:20:29,520

looking at their quarks okay but but

1877

01:20:35,450 --> 01:20:31,860

okay so now we get to this idea of in

1878

01:20:38,570 --> 01:20:35,460

principle yeah okay is it

1879

01:20:40,910 --> 01:20:38,580

that's the title of the podcast

1880

01:20:44,450 --> 01:20:40,920

uh is it even

1881

01:20:49,430 --> 01:20:44,460

in principle possible to do so

1882

01:20:52,310 --> 01:20:49,440

um and I would argue they are also no

1883

01:20:54,890 --> 01:20:52,320

um it's in principle possible to predict

1884

01:20:58,189 --> 01:20:54,900

some human behavior by

1885

01:20:59,950 --> 01:20:58,199

trying to model the physical aspects of

1886

01:21:04,250 --> 01:20:59,960

the brain

1887

01:21:06,350 --> 01:21:04,260

but I don't think it's possible to uh

1888

01:21:08,870 --> 01:21:06,360

so so here things get a little bit messy

1889

01:21:10,850 --> 01:21:08,880

so so you could predict someone's

1890

01:21:12,410 --> 01:21:10,860

Behavior just by knowing them well

1891

01:21:13,970 --> 01:21:12,420

does that mean they have no free will

1892

01:21:15,229 --> 01:21:13,980

that they couldn't potentially do

1893

01:21:16,490 --> 01:21:15,239

otherwise

1894

01:21:17,930 --> 01:21:16,500

uh

1895

01:21:19,930 --> 01:21:17,940

you could

1896

01:21:22,550 --> 01:21:19,940

predict someone's

1897

01:21:27,130 --> 01:21:22,560

inclination to certain types of behavior

1898

01:21:28,970 --> 01:21:27,140

by knowing you know about any

1899

01:21:32,870 --> 01:21:28,980

neuropathologies that they might have

1900

01:21:34,610 --> 01:21:32,880

okay so so for sure we aren't

1901

01:21:37,010 --> 01:21:34,620

uh

1902

01:21:39,770 --> 01:21:37,020

you know the epitome is a free will we

1903

01:21:41,390 --> 01:21:39,780

we often fail to exercise free will or

1904

01:21:44,090 --> 01:21:41,400

we are predictable

1905

01:21:48,350 --> 01:21:44,100

but the idea that

1906

01:21:50,630 --> 01:21:48,360

Free Will is an illusion because brains

1907

01:21:53,930 --> 01:21:50,640

are mechanistic I think is a little

1908

01:21:58,370 --> 01:21:53,940

fallacious and

1909

01:22:03,470 --> 01:22:01,370

so if a brain

1910

01:22:06,050 --> 01:22:03,480

because of that dual notion

1911

01:22:08,750 --> 01:22:06,060

well not not even I think we can go to

1912

01:22:13,669 --> 01:22:08,760

to physical here like there are physical

1913

01:22:16,910 --> 01:22:13,679

ish reasons here so so the brain

1914

01:22:18,770 --> 01:22:16,920

the idea is that that your actions are

1915

01:22:22,610 --> 01:22:18,780

predetermined and predictable because

1916

01:22:24,590 --> 01:22:22,620

the they're entirely determined by the

1917

01:22:27,350 --> 01:22:24,600

configuration of physical

1918

01:22:28,250 --> 01:22:27,360

matter and and so on

1919

01:22:31,790 --> 01:22:28,260

um

1920

01:22:34,850 --> 01:22:31,800

but but then you know I want to ask

1921

01:22:38,390 --> 01:22:34,860

to whom is the brain predictable and

1922

01:22:39,890 --> 01:22:38,400

predetermined okay to what observer in

1923

01:22:41,990 --> 01:22:39,900

what reference frame

1924

01:22:47,750 --> 01:22:42,000

uh so if you have any sufficiently

1925

01:22:49,630 --> 01:22:47,760

complex system like the brain uh you the

1926

01:22:53,149 --> 01:22:49,640

Dynamics

1927

01:22:57,110 --> 01:22:53,159

are coupled across multiple physical

1928

01:22:58,550 --> 01:22:57,120

scales like so so

1929

01:23:02,810 --> 01:22:58,560

um

1930

01:23:03,890 --> 01:23:02,820

so for example uh a an important part of

1931

01:23:08,630 --> 01:23:03,900

the

1932

01:23:10,790 --> 01:23:08,640

so-called bryshark potential which is

1933

01:23:14,630 --> 01:23:10,800

just the the way the brain

1934

01:23:16,970 --> 01:23:14,640

uh it it's uh

1935

01:23:19,490 --> 01:23:16,980

basically the the correlated noise and

1936

01:23:21,709 --> 01:23:19,500

brain signal that the that the brain

1937

01:23:24,350 --> 01:23:21,719

actually uses to as a sort of a

1938

01:23:26,149 --> 01:23:24,360

tiebreaker in decision making

1939

01:23:28,070 --> 01:23:26,159

um and it and it partially drives the

1940

01:23:29,870 --> 01:23:28,080

Dynamics in ways that we don't very well

1941

01:23:31,550 --> 01:23:29,880

understand that all because it's super

1942

01:23:33,189 --> 01:23:31,560

new that we figured out but can you

1943

01:23:35,689 --> 01:23:33,199

repeat the name of the potential

1944

01:23:40,070 --> 01:23:35,699

it's the bryshark potential it's also

1945

01:23:43,070 --> 01:23:40,080

called the Readiness potential okay yeah

1946

01:23:43,910 --> 01:23:43,080

uh and you you want to look at

1947

01:23:48,110 --> 01:23:43,920

um

1948

01:23:48,910 --> 01:23:48,120

Aaron Sugar's work uh and uh and

1949

01:23:51,830 --> 01:23:48,920

actually

1950

01:23:52,669 --> 01:23:51,840

Baja wrote an article on this I'm just

1951

01:23:54,470 --> 01:23:52,679

mentioning that because I'm super

1952

01:23:59,229 --> 01:23:54,480

familiar with it now but it's just one

1953

01:24:03,649 --> 01:23:59,239

example of uh how uh that you have

1954

01:24:06,110 --> 01:24:03,659

Dynamics influence in complex and even

1955

01:24:09,290 --> 01:24:06,120

pseudo chaotic systems you have these

1956

01:24:12,770 --> 01:24:09,300

Dynamics linked across you know multiple

1957

01:24:16,970 --> 01:24:12,780

scales of these hierarchies and

1958

01:24:19,630 --> 01:24:16,980

and in that case

1959

01:24:22,550 --> 01:24:19,640

it it becomes

1960

01:24:27,530 --> 01:24:22,560

essentially impossible to predict

1961

01:24:29,570 --> 01:24:27,540

Behavior based on the uh you know the

1962

01:24:31,910 --> 01:24:29,580

smallest piece that like the smallest

1963

01:24:33,950 --> 01:24:31,920

elements of the substrate whatever the

1964

01:24:35,689 --> 01:24:33,960

the the atoms

1965

01:24:38,450 --> 01:24:35,699

um and

1966

01:24:40,310 --> 01:24:38,460

okay so you have this you know system

1967

01:24:43,430 --> 01:24:40,320

that that is in

1968

01:24:44,870 --> 01:24:43,440

you're partially chaotic uh and it's

1969

01:24:46,090 --> 01:24:44,880

well known that these things can't be

1970

01:24:47,770 --> 01:24:46,100

predicted by

1971

01:24:50,390 --> 01:24:47,780

without without

1972

01:24:52,610 --> 01:24:50,400

infinite computation okay I think I

1973

01:24:55,430 --> 01:24:52,620

think this is a manifestation of this

1974

01:24:57,530 --> 01:24:55,440

computational irreducibility also

1975

01:24:59,030 --> 01:24:57,540

um Okay so

1976

01:25:01,250 --> 01:24:59,040

Okay so

1977

01:25:04,669 --> 01:25:01,260

so my question is

1978

01:25:08,570 --> 01:25:04,679

what Observer or what reference frame

1979

01:25:09,709 --> 01:25:08,580

could predict your actions perfectly by

1980

01:25:12,290 --> 01:25:09,719

knowing

1981

01:25:14,209 --> 01:25:12,300

the exact state of all the quantum

1982

01:25:18,770 --> 01:25:14,219

fields in your brain

1983

01:25:20,530 --> 01:25:18,780

um so so you could you could imagine you

1984

01:25:24,050 --> 01:25:20,540

know some

1985

01:25:25,790 --> 01:25:24,060

uh super Advanced alien that could

1986

01:25:27,709 --> 01:25:25,800

somehow perfectly scan your brain and

1987

01:25:30,770 --> 01:25:27,719

get that and then run a simulation of

1988

01:25:34,250 --> 01:25:30,780

your brain at the same time but but even

1989

01:25:36,410 --> 01:25:34,260

that I think here like the very nature

1990

01:25:39,050 --> 01:25:36,420

of quantum mechanics makes that

1991

01:25:41,510 --> 01:25:39,060

challenging Okay so

1992

01:25:43,790 --> 01:25:41,520

so you literally need to track every bit

1993

01:25:45,709 --> 01:25:43,800

of quantum information in

1994

01:25:47,390 --> 01:25:45,719

the most complex systems to make a

1995

01:25:49,790 --> 01:25:47,400

perfect prediction okay so maybe you can

1996

01:25:53,510 --> 01:25:49,800

make some predictions but it's not even

1997

01:25:56,330 --> 01:25:53,520

practically impossible it's in it's

1998

01:25:58,370 --> 01:25:56,340

probably even in principle impossible

1999

01:26:02,149 --> 01:25:58,380

okay so you you have things like the no

2000

01:26:03,770 --> 01:26:02,159

cloning theorem which forbids you from

2001

01:26:05,209 --> 01:26:03,780

making a perfect copy of quantum

2002

01:26:07,010 --> 01:26:05,219

information

2003

01:26:09,050 --> 01:26:07,020

um which is what you would need to do to

2004

01:26:10,850 --> 01:26:09,060

make a perfect prediction so

2005

01:26:14,090 --> 01:26:10,860

so

2006

01:26:20,990 --> 01:26:17,090

I think in a meaningful way it's

2007

01:26:25,310 --> 01:26:21,000

in principle not possible for any

2008

01:26:29,209 --> 01:26:25,320

possible Observer to perfectly predict

2009

01:26:32,270 --> 01:26:29,219

your choice okay it is possible for

2010

01:26:34,970 --> 01:26:32,280

impossible observers like laplace's

2011

01:26:36,410 --> 01:26:34,980

demon who knows the exact position and

2012

01:26:37,310 --> 01:26:36,420

velocity of every particle in the

2013

01:26:40,669 --> 01:26:37,320

universe

2014

01:26:42,649 --> 01:26:40,679

uh so from the perspective of laplace's

2015

01:26:46,310 --> 01:26:42,659

demon you have no free will but

2016

01:26:48,590 --> 01:26:46,320

laplace's demon is a mythical entity

2017

01:26:56,450 --> 01:26:48,600

and

2018

01:26:58,910 --> 01:26:56,460

I don't think we should rate something

2019

01:27:02,209 --> 01:26:58,920

an illusion because a mythical entity

2020

01:27:04,550 --> 01:27:02,219

could in principle predict your

2021

01:27:06,050 --> 01:27:04,560

um your behavior so there's this guy

2022

01:27:07,970 --> 01:27:06,060

named David walpart I don't know if you

2023

01:27:09,649 --> 01:27:07,980

know him but he's in Santa Barbara I

2024

01:27:11,270 --> 01:27:09,659

believe and he has the limits on

2025

01:27:13,490 --> 01:27:11,280

inference machines which says that even

2026

01:27:15,890 --> 01:27:13,500

lap class is demon in Newtonian

2027

01:27:17,810 --> 01:27:15,900

mechanics can't exist

2028

01:27:21,010 --> 01:27:17,820

I agree that laplace's demon cannot

2029

01:27:23,090 --> 01:27:21,020

exist I think even relativity forbids

2030

01:27:25,790 --> 01:27:23,100

laplace's demon because there's an

2031

01:27:27,290 --> 01:27:25,800

infant there's a there's a limit to how

2032

01:27:31,570 --> 01:27:27,300

quickly

2033

01:27:34,189 --> 01:27:31,580

it could anyway like this yeah yeah yeah

2034

01:27:37,010 --> 01:27:34,199

okay so you know so so you know long

2035

01:27:40,250 --> 01:27:37,020

story short I think Free Will is

2036

01:27:42,290 --> 01:27:40,260

real in a meaningful sense okay we're

2037

01:27:45,169 --> 01:27:42,300

like going down the definition of real

2038

01:27:47,810 --> 01:27:45,179

is like a whole other podcast but free

2039

01:27:52,490 --> 01:27:47,820

was real in a meaningful sense because

2040

01:27:53,870 --> 01:27:52,500

choice is a fundamental dynamical

2041

01:27:56,450 --> 01:27:53,880

component

2042

01:27:59,330 --> 01:27:56,460

in a particular dynamical system whose

2043

01:28:01,729 --> 01:27:59,340

behavior is independent of its substrate

2044

01:28:04,550 --> 01:28:01,739

and whose behavior is not

2045

01:28:07,430 --> 01:28:04,560

fully predictable in the context of its

2046

01:28:09,890 --> 01:28:07,440

substrates by by

2047

01:28:11,930 --> 01:28:09,900

mapping its substrates

2048

01:28:14,209 --> 01:28:11,940

um you know you know

2049

01:28:19,250 --> 01:28:14,219

in a way that is possible for any entity

2050

01:28:22,610 --> 01:28:21,169

but if you choose to not believe in free

2051

01:28:24,950 --> 01:28:22,620

will then

2052

01:28:28,129 --> 01:28:24,960

at least you have that choice

2053

01:28:30,050 --> 01:28:28,139

yeah okay great well man there's so much

2054

01:28:31,970 --> 01:28:30,060

that we can talk about okay how about

2055

01:28:33,649 --> 01:28:31,980

instead of delving more deeply into I'll

2056

01:28:34,850 --> 01:28:33,659

just tell you the one thought I'll just

2057

01:28:37,790 --> 01:28:34,860

tell you one of the thoughts why is this

2058

01:28:40,850 --> 01:28:37,800

notion of to who imported for instance

2059

01:28:43,070 --> 01:28:40,860

we can say there is a computer here

2060

01:28:44,689 --> 01:28:43,080

when we consider that to be an objective

2061

01:28:47,750 --> 01:28:44,699

fact we don't say this computer is here

2062

01:28:49,910 --> 01:28:47,760

to who unless you are someone who

2063

01:28:51,110 --> 01:28:49,920

believes that the Observer creates the

2064

01:28:53,870 --> 01:28:51,120

reality

2065

01:28:56,030 --> 01:28:53,880

so let's disregard that interpretation

2066

01:28:58,430 --> 01:28:56,040

say there's an objective reality so why

2067

01:29:00,590 --> 01:28:58,440

is it that we're saying Free Will exists

2068

01:29:03,649 --> 01:29:00,600

to who why can't we just say Free Will

2069

01:29:07,970 --> 01:29:03,659

exists in the same way that this

2070

01:29:13,430 --> 01:29:10,490

yeah I mean we live in a we live in a

2071

01:29:18,709 --> 01:29:13,440

relative Universe particles

2072

01:29:20,810 --> 01:29:18,719

have a relative existence you know uh uh

2073

01:29:22,970 --> 01:29:20,820

Hawking radiation

2074

01:29:24,709 --> 01:29:22,980

only exists

2075

01:29:27,229 --> 01:29:24,719

if you're a certain distance away from a

2076

01:29:28,729 --> 01:29:27,239

black hole unreal radiation only exists

2077

01:29:33,770 --> 01:29:28,739

if you're

2078

01:29:37,250 --> 01:29:33,780

uh accelerating uh so so there I mean

2079

01:29:40,430 --> 01:29:37,260

there is a sense in which

2080

01:29:42,590 --> 01:29:40,440

um the frame of reference is is is

2081

01:29:45,770 --> 01:29:42,600

critical

2082

01:29:48,229 --> 01:29:45,780

um and for like non-noisy

2083

01:29:50,870 --> 01:29:48,239

so there's something noisy about the the

2084

01:29:52,370 --> 01:29:50,880

radiation and the unra radiation so the

2085

01:29:55,430 --> 01:29:52,380

Hawking radiation and that one yeah well

2086

01:29:56,930 --> 01:29:55,440

I think I think so maybe I I do I don't

2087

01:30:01,129 --> 01:29:56,940

know but there's there is something

2088

01:30:06,770 --> 01:30:01,139

non-trivial about the relativity of

2089

01:30:11,390 --> 01:30:09,050

um and

2090

01:30:13,550 --> 01:30:11,400

so I mean this is this is something I

2091

01:30:16,430 --> 01:30:13,560

don't think we've properly wrapped our

2092

01:30:18,290 --> 01:30:16,440

heads around you know maybe it's as

2093

01:30:19,729 --> 01:30:18,300

confusing as the measurement problem the

2094

01:30:21,290 --> 01:30:19,739

idea that

2095

01:30:23,510 --> 01:30:21,300

the universe

2096

01:30:25,669 --> 01:30:23,520

can look Canon does look radically

2097

01:30:27,290 --> 01:30:25,679

different depending on your frame of

2098

01:30:27,890 --> 01:30:27,300

reference

2099

01:30:32,390 --> 01:30:27,900

um

2100

01:30:34,910 --> 01:30:32,400

and the only thing that is consistent

2101
01:30:38,270 --> 01:30:34,920
is the self-consistency of the universe

2102
01:30:42,050 --> 01:30:38,280
itself it like no matter

2103
01:30:43,729 --> 01:30:42,060
what changes you know based on your

2104
01:30:46,669 --> 01:30:43,739
frame of reference

2105
01:30:50,270 --> 01:30:46,679
how you choose to make measurements

2106
01:30:52,970 --> 01:30:50,280
for example in you know things like a a

2107
01:30:55,310 --> 01:30:52,980
bell test

2108
01:30:57,470 --> 01:30:55,320
these these things radically can

2109
01:30:59,390 --> 01:30:57,480
radically change what the unit what

2110
01:31:01,729 --> 01:30:59,400
Universe you see

2111
01:31:04,850 --> 01:31:01,739
the the one thing that never change

2112
01:31:06,950 --> 01:31:04,860
changes is that

2113
01:31:09,169 --> 01:31:06,960

the universe remains self-consistent for

2114

01:31:11,330 --> 01:31:09,179

all Observers

2115

01:31:12,890 --> 01:31:11,340

okay can you explain what that means and

2116

01:31:16,310 --> 01:31:12,900

it's that different than the statement

2117

01:31:17,689 --> 01:31:16,320

that the laws of physics are the same

2118

01:31:22,430 --> 01:31:17,699

um

2119

01:31:27,709 --> 01:31:24,649

well I mean the simple case of of

2120

01:31:33,410 --> 01:31:27,719

Relativity yeah like let's take the

2121

01:31:35,750 --> 01:31:33,420

simple case of the twin paradox where uh

2122

01:31:38,090 --> 01:31:35,760

so this is this for an experiment in

2123

01:31:42,530 --> 01:31:38,100

relativity where a pair of twins one

2124

01:31:44,450 --> 01:31:42,540

jumps in a spacecraft and Zips off at a

2125

01:31:45,530 --> 01:31:44,460

large fraction of the speed of light and

2126
01:31:48,350 --> 01:31:45,540
you know

2127
01:31:50,149 --> 01:31:48,360
hangs comes back several years later

2128
01:31:52,490 --> 01:31:50,159
from the perspective of between on at

2129
01:31:56,090 --> 01:31:52,500
home and

2130
01:31:58,850 --> 01:31:56,100
um the the twin at home has aged and the

2131
01:32:01,610 --> 01:31:58,860
twin who travel is much younger because

2132
01:32:02,870 --> 01:32:01,620
time ticked slower for the twin who was

2133
01:32:05,510 --> 01:32:02,880
traveling

2134
01:32:08,689 --> 01:32:05,520
um because of their relative speed

2135
01:32:12,229 --> 01:32:08,699
okay so from the point of view of the

2136
01:32:14,810 --> 01:32:12,239
the traveling twin they didn't think

2137
01:32:17,450 --> 01:32:14,820
that their clock was tickets

2138
01:32:19,850 --> 01:32:17,460

okay uh they you know they were looking

2139

01:32:22,250 --> 01:32:19,860

back home and they thought that at home

2140

01:32:24,470 --> 01:32:22,260

the Clock Was ticking fast and

2141

01:32:28,370 --> 01:32:24,480

um and from

2142

01:32:34,790 --> 01:32:31,550

no I should know this stuff

2143

01:32:36,649 --> 01:32:34,800

um so the the the so so so this is a

2144

01:32:40,310 --> 01:32:36,659

this is a

2145

01:32:41,709 --> 01:32:40,320

you should watch this PBS space time

2146

01:32:45,770 --> 01:32:41,719

yeah yeah

2147

01:32:48,410 --> 01:32:45,780

the the way it works is that that that

2148

01:32:50,270 --> 01:32:48,420

When You observe a clock that's

2149

01:32:52,729 --> 01:32:50,280

traveling at some speed that clock

2150

01:32:55,550 --> 01:32:52,739

appears to tick slow all right so so

2151
01:33:00,350 --> 01:32:55,560
fast moving objects the time slows down

2152
01:33:02,689 --> 01:33:00,360
so so both twins see each other's clock

2153
01:33:04,910 --> 01:33:02,699
as ticking slow all right because the

2154
01:33:07,610 --> 01:33:04,920
spaceship is moving fast but then for

2155
01:33:10,010 --> 01:33:07,620
the for the astronaut twin earth appears

2156
01:33:11,330 --> 01:33:10,020
to be moving backwards quickly because

2157
01:33:13,850 --> 01:33:11,340
you know

2158
01:33:15,950 --> 01:33:13,860
velocity speed is relative

2159
01:33:18,530 --> 01:33:15,960
there's no preferred inertial frame of

2160
01:33:21,470 --> 01:33:18,540
reference so if it races away that twins

2161
01:33:24,530 --> 01:33:21,480
clock seems to slow down and yet when

2162
01:33:26,090 --> 01:33:24,540
the twin gets back home after that long

2163
01:33:28,970 --> 01:33:26,100

trip

2164

01:33:30,470 --> 01:33:28,980

the the twin who stayed at her so it has

2165

01:33:32,750 --> 01:33:30,480

to end up being consistent which one

2166

01:33:35,030 --> 01:33:32,760

aged more than the other and the answer

2167

01:33:37,129 --> 01:33:35,040

is that there is an answer that there is

2168

01:33:39,110 --> 01:33:37,139

a self-consistent answer when they get

2169

01:33:41,810 --> 01:33:39,120

home both of them agree that the twin

2170

01:33:44,930 --> 01:33:41,820

who stayed home aged more

2171

01:33:46,550 --> 01:33:44,940

but how can that work if both of them

2172

01:33:49,070 --> 01:33:46,560

saw the same change in each other's

2173

01:33:51,169 --> 01:33:49,080

clock and

2174

01:33:52,910 --> 01:33:51,179

they both of the twins have an answer

2175

01:33:55,550 --> 01:33:52,920

for that

2176
01:33:58,430 --> 01:33:55,560
and their answers are different but they

2177
01:34:00,490 --> 01:33:58,440
lead to the same conclusion okay the

2178
01:34:02,030 --> 01:34:00,500
twins at home

2179
01:34:05,149 --> 01:34:02,040
sees

2180
01:34:07,070 --> 01:34:05,159
the traveling twins clock tick slower

2181
01:34:10,729 --> 01:34:07,080
and so that the traveling between ages

2182
01:34:13,310 --> 01:34:10,739
less okay and and gets home meanwhile

2183
01:34:15,649 --> 01:34:13,320
the one at home is waiting and and

2184
01:34:18,470 --> 01:34:15,659
getting older and his twin comes back

2185
01:34:21,129 --> 01:34:18,480
much younger okay because the less time

2186
01:34:24,729 --> 01:34:21,139
passed but for the traveling twin

2187
01:34:28,729 --> 01:34:24,739
they watch the the the the twin at home

2188
01:34:31,790 --> 01:34:28,739

uh and and they watch the the twin at

2189

01:34:33,470 --> 01:34:31,800

home's clock tick slower so in fact the

2190

01:34:36,410 --> 01:34:33,480

traveling twin feels themselves aging

2191

01:34:39,470 --> 01:34:36,420

Lassa aging faster

2192

01:34:41,689 --> 01:34:39,480

until the moment that they turn around

2193

01:34:44,750 --> 01:34:41,699

okay so in order to turn around and come

2194

01:34:48,169 --> 01:34:44,760

home they have to accelerate

2195

01:34:50,450 --> 01:34:48,179

and the other thing that Einstein's

2196

01:34:53,330 --> 01:34:50,460

relativity tells us is that if you are

2197

01:34:54,770 --> 01:34:53,340

deep in a gravitational field your clock

2198

01:34:59,030 --> 01:34:54,780

ticks slower

2199

01:35:01,850 --> 01:34:59,040

okay so the amount that that twin has to

2200

01:35:05,990 --> 01:35:01,860

accelerate in order to return home

2201
01:35:08,750 --> 01:35:06,000
causes their clock to slow down enough

2202
01:35:11,209 --> 01:35:08,760
that that from their perspective

2203
01:35:13,729 --> 01:35:11,219
between who is at home

2204
01:35:16,250 --> 01:35:13,739
not only caught up to them but aged a

2205
01:35:18,590 --> 01:35:16,260
lot more okay yeah they both have

2206
01:35:19,669 --> 01:35:18,600
different stories about why

2207
01:35:23,570 --> 01:35:19,679
um

2208
01:35:25,669 --> 01:35:23,580
why they both agree that the traveling

2209
01:35:27,590 --> 01:35:25,679
twin is younger than the the

2210
01:35:32,030 --> 01:35:27,600
stay-at-home twin

2211
01:35:37,790 --> 01:35:34,910
Kurt how did we get to this so this was

2212
01:35:40,550 --> 01:35:37,800
in service of a point

2213
01:35:42,350 --> 01:35:40,560

okay so firstly I was asking about what

2214

01:35:44,570 --> 01:35:42,360

does it mean to be self-consistent oh

2215

01:35:47,090 --> 01:35:44,580

yeah yeah so that so the universe will

2216

01:35:49,090 --> 01:35:47,100

always conspire to be self-consistent

2217

01:35:51,890 --> 01:35:49,100

and and and that

2218

01:35:54,169 --> 01:35:51,900

uh observers will

2219

01:35:58,310 --> 01:35:54,179

you know ultimately agree

2220

01:36:01,910 --> 01:36:00,229

I have so many questions here that's

2221

01:36:03,770 --> 01:36:01,920

even the case that's even the kids with

2222

01:36:05,629 --> 01:36:03,780

particles like uh if you if you see

2223

01:36:07,669 --> 01:36:05,639

unreal radiation I don't know what the

2224

01:36:08,870 --> 01:36:07,679

solution to this one is

2225

01:36:10,970 --> 01:36:08,880

um

2226

01:36:12,830 --> 01:36:10,980

someone else doesn't see under radiation

2227

01:36:14,990 --> 01:36:12,840

but they see

2228

01:36:18,010 --> 01:36:15,000

yeah it's like if you if you accelerate

2229

01:36:20,390 --> 01:36:18,020

fast enough then you'll you'll be

2230

01:36:23,090 --> 01:36:20,400

incinerated by what what's the

2231

01:36:24,470 --> 01:36:23,100

equivalent of Hawking Recreation it's a

2232

01:36:25,310 --> 01:36:24,480

type of horizon radiation you'll be in

2233

01:36:31,010 --> 01:36:25,320

but

2234

01:36:34,189 --> 01:36:31,020

someone who is not accelerating

2235

01:36:38,149 --> 01:36:34,199

doesn't see your unrew particles

2236

01:36:41,090 --> 01:36:38,159

and yet does see you incinerated

2237

01:36:43,490 --> 01:36:41,100

so why does the the person who's not

2238

01:36:45,470 --> 01:36:43,500

accelerating CU incinerated I think the

2239

01:36:48,709 --> 01:36:45,480

answer is

2240

01:36:50,270 --> 01:36:48,719

you they see you being incinerated by

2241

01:36:52,070 --> 01:36:50,280

something else like the drag on the

2242

01:36:54,530 --> 01:36:52,080

quantum fields or something I

2243

01:36:56,629 --> 01:36:54,540

I I don't recall but but there was a

2244

01:36:58,010 --> 01:36:56,639

there's a neat answer to it like the

2245

01:37:01,070 --> 01:36:58,020

universe keeps conspiring to give us

2246

01:37:04,010 --> 01:37:01,080

these neat answers that everyone

2247

01:37:06,430 --> 01:37:04,020

ultimately is going to agree even if the

2248

01:37:08,750 --> 01:37:06,440

universe that they

2249

01:37:10,250 --> 01:37:08,760

think they live in looks wildly

2250

01:37:14,149 --> 01:37:10,260

different to the universe of the next

2251

01:37:16,790 --> 01:37:14,159

person the the consist the consistency

2252

01:37:18,110 --> 01:37:16,800

conspires to always be there

2253

01:37:20,570 --> 01:37:18,120

um and I think there's a mystery there

2254

01:37:23,149 --> 01:37:20,580

and I don't know what okay so Matt

2255

01:37:25,729 --> 01:37:23,159

a couple questions occurred to me so one

2256

01:37:27,410 --> 01:37:25,739

when we use the word self-consistent to

2257

01:37:29,030 --> 01:37:27,420

apply to the universe I mean why can't

2258

01:37:30,830 --> 01:37:29,040

we just remove the word itself and say

2259

01:37:33,470 --> 01:37:30,840

the universe is consistent so that's

2260

01:37:34,850 --> 01:37:33,480

number one and then number two what

2261

01:37:37,550 --> 01:37:34,860

would it look like if there was

2262

01:37:38,990 --> 01:37:37,560

inconsistency does it mean that there'd

2263

01:37:40,669 --> 01:37:39,000

be disagreement between us because there

2264

01:37:41,750 --> 01:37:40,679

already is disagreement and then if

2265

01:37:44,750 --> 01:37:41,760

we're saying it's no scientific

2266

01:37:46,669 --> 01:37:44,760

inconsistency well then science bites

2267

01:37:48,050 --> 01:37:46,679

Nature's intersubjective agreement which

2268

01:37:50,030 --> 01:37:48,060

means we've had disagreements we've

2269

01:37:51,950 --> 01:37:50,040

pushed on the side and so it's like

2270

01:37:54,709 --> 01:37:51,960

saying we agree because I've removed the

2271

01:37:57,050 --> 01:37:54,719

disagreements so why do we use the word

2272

01:37:59,330 --> 01:37:57,060

self-consistent secondly

2273

01:38:01,010 --> 01:37:59,340

we what the heck would it ever look like

2274

01:38:03,709 --> 01:38:01,020

to be inconsistent

2275

01:38:05,570 --> 01:38:03,719

right so by self-consistent I mean

2276

01:38:08,510 --> 01:38:05,580

internally consistent

2277

01:38:10,850 --> 01:38:08,520

um which means that I mean you you can

2278

01:38:12,649 --> 01:38:10,860

imagine consistency is in consistent

2279

01:38:14,330 --> 01:38:12,659

with someone's beliefs about what the

2280

01:38:15,590 --> 01:38:14,340

universe should be but that's not the

2281

01:38:19,790 --> 01:38:15,600

case

2282

01:38:23,390 --> 01:38:19,800

um and the universe when you know to for

2283

01:38:25,610 --> 01:38:23,400

carefully made measurements and and it

2284

01:38:27,950 --> 01:38:25,620

is always

2285

01:38:29,990 --> 01:38:27,960

but always obeys its own rules

2286

01:38:33,229 --> 01:38:30,000

but the the particular rule that it

2287

01:38:35,450 --> 01:38:33,239

seems to be obeying may be different for

2288

01:38:37,250 --> 01:38:35,460

one Observer or another but but all

2289

01:38:40,189 --> 01:38:37,260

observers will obey

2290

01:38:43,189 --> 01:38:40,199

we'll all see that the universe

2291

01:38:44,149 --> 01:38:43,199

obeys its rules its own rules

2292

01:38:49,490 --> 01:38:44,159

um

2293

01:38:51,350 --> 01:38:49,500

so in the example of the twin paradox

2294

01:39:08,270 --> 01:38:51,360

the

2295

01:39:10,010 --> 01:39:08,280

dilation due to you know acceleration by

2296

01:39:13,070 --> 01:39:10,020

the equivalence principle General

2297

01:39:16,250 --> 01:39:13,080

activity at least in one's way of

2298

01:39:19,629 --> 01:39:16,260

framing that Paradox um in in the case

2299

01:39:23,229 --> 01:39:19,639

of the unru radiation uh they everyone

2300

01:39:27,050 --> 01:39:23,239

everyone sees the accelerating person ex

2301
01:39:28,669 --> 01:39:27,060
incinerate okay and so it's not like one

2302
01:39:34,010 --> 01:39:28,679
person

2303
01:39:36,229 --> 01:39:34,020
sees them and then accelerate it okay so

2304
01:39:39,709 --> 01:39:36,239
which would lead to a paradox okay so

2305
01:39:41,390 --> 01:39:39,719
the universe never generates paradoxes

2306
01:39:44,689 --> 01:39:41,400
it

2307
01:39:46,729 --> 01:39:44,699
always you you will always find that

2308
01:39:48,290 --> 01:39:46,739
that it has

2309
01:39:51,470 --> 01:39:48,300
obeyed

2310
01:39:55,610 --> 01:39:51,480
its own you know it's its laws of nature

2311
01:39:57,350 --> 01:39:55,620
uh if it doesn't then it it's us who

2312
01:40:00,290 --> 01:39:57,360
haven't figured out the right laws of

2313
01:40:01,250 --> 01:40:00,300

nature but but the thing is to observers

2314

01:40:03,229 --> 01:40:01,260

me

2315

01:40:05,510 --> 01:40:03,239

see it doing that in different ways and

2316

01:40:09,169 --> 01:40:05,520

the the original example of this is is

2317

01:40:10,189 --> 01:40:09,179

good old electromagnetism where

2318

01:40:13,070 --> 01:40:10,199

um

2319

01:40:15,290 --> 01:40:13,080

you know a a moving electric charge

2320

01:40:16,910 --> 01:40:15,300

generates a magnetic field

2321

01:40:19,669 --> 01:40:16,920

um but we know that motion is relative

2322

01:40:21,470 --> 01:40:19,679

so if you're if you're moving with the

2323

01:40:24,169 --> 01:40:21,480

electric charge

2324

01:40:26,870 --> 01:40:24,179

you should see no magnetic field but

2325

01:40:30,050 --> 01:40:26,880

that magnetic field has an effect okay

2326

01:40:30,950 --> 01:40:30,060

if it causes other charged particles to

2327

01:40:33,590 --> 01:40:30,960

move

2328

01:40:36,830 --> 01:40:33,600

um and and so that it would be

2329

01:40:38,510 --> 01:40:36,840

inconsistent if one person saw a moving

2330

01:40:40,970 --> 01:40:38,520

charge particle generate a magnetic

2331

01:40:44,629 --> 01:40:40,980

field and the effect of that magnetic

2332

01:40:46,430 --> 01:40:44,639

field you know resulting in the motion

2333

01:40:48,470 --> 01:40:46,440

of yet more particles

2334

01:40:51,649 --> 01:40:48,480

and person traveling with the magnetic

2335

01:40:54,110 --> 01:40:51,659

field sees that sees no such thing that

2336

01:40:55,370 --> 01:40:54,120

would be an inconsistency and a paradox

2337

01:40:56,930 --> 01:40:55,380

in a sense

2338

01:40:58,550 --> 01:40:56,940

um because

2339

01:40:59,870 --> 01:40:58,560

there would be an irreconcilable

2340

01:41:01,250 --> 01:40:59,880

disagreement

2341

01:41:04,850 --> 01:41:01,260

um about their observations but there

2342

01:41:07,209 --> 01:41:04,860

are but the reality is that

2343

01:41:11,510 --> 01:41:07,219

um the person traveling with the charge

2344

01:41:14,770 --> 01:41:11,520

does see a force on the uh surrounding

2345

01:41:17,510 --> 01:41:14,780

particles but to them they they would

2346

01:41:20,930 --> 01:41:17,520

argue that the force was from the

2347

01:41:23,390 --> 01:41:20,940

electrostatic build which is the force

2348

01:41:26,149 --> 01:41:23,400

that that you know the the

2349

01:41:29,450 --> 01:41:26,159

right so so the so that's an example but

2350

01:41:31,310 --> 01:41:29,460

that but nonetheless the universe has

2351

01:41:33,950 --> 01:41:31,320

obeyed its own rules

2352

01:41:36,290 --> 01:41:33,960

it's just the different observers would

2353

01:41:37,430 --> 01:41:36,300

disagree on which rule which rules did

2354

01:41:40,310 --> 01:41:37,440

obeyed

2355

01:41:42,229 --> 01:41:40,320

um and and no Paradox is interesting so

2356

01:41:44,689 --> 01:41:42,239

that's what I mean by that

2357

01:41:47,030 --> 01:41:44,699

um what was the what would it look like

2358

01:41:50,209 --> 01:41:47,040

to be inconsistent and then also when I

2359

01:41:51,830 --> 01:41:50,219

when we say that the world is consistent

2360

01:41:53,390 --> 01:41:51,840

like I mentioned we do have

2361

01:41:55,790 --> 01:41:53,400

disagreements and there is such a thing

2362

01:41:57,890 --> 01:41:55,800

as someone seeing something that you did

2363

01:42:00,169 --> 01:41:57,900

not see and we generally consider those

2364

01:42:02,209 --> 01:42:00,179

to be mental illnesses but I'm sure

2365

01:42:04,129 --> 01:42:02,219

there exists other cases that are not so

2366

01:42:06,770 --> 01:42:04,139

extreme though I can't though none come

2367

01:42:08,629 --> 01:42:06,780

to mind and in which case would that be

2368

01:42:10,310 --> 01:42:08,639

in like science we'd say well

2369

01:42:12,530 --> 01:42:10,320

scientifically and so on like I

2370

01:42:14,090 --> 01:42:12,540

mentioned you just remove the qualities

2371

01:42:15,950 --> 01:42:14,100

that we dislike and we say they have no

2372

01:42:21,109 --> 01:42:15,960

qualities we dislike

2373

01:42:23,510 --> 01:42:21,119

yeah I mean ultimately to to test uh to

2374

01:42:26,810 --> 01:42:23,520

test consistency

2375

01:42:29,510 --> 01:42:26,820

the the result from both observers has

2376

01:42:31,669 --> 01:42:29,520

to come back to one Observer so so so

2377

01:42:34,010 --> 01:42:31,679

you one Observer needs to test the

2378

01:42:35,750 --> 01:42:34,020

consistency and

2379

01:42:39,830 --> 01:42:35,760

um that

2380

01:42:41,510 --> 01:42:39,840

consistency check would be that

2381

01:42:44,090 --> 01:42:41,520

ultimately all of the incoming

2382

01:42:46,250 --> 01:42:44,100

information agrees

2383

01:42:50,570 --> 01:42:46,260

um like

2384

01:42:54,109 --> 01:42:50,580

uh so in the twin paradox both of them

2385

01:42:56,090 --> 01:42:54,119

agree that the stay-at-home twin aged

2386

01:42:58,129 --> 01:42:56,100

and the asteroid twin

2387

01:42:59,330 --> 01:42:58,139

uh stayed Young

2388

01:43:01,250 --> 01:42:59,340

but

2389

01:43:03,169 --> 01:43:01,260

you know they they won't know that until

2390

01:43:06,709 --> 01:43:03,179

they talk to each other about it and and

2391

01:43:08,270 --> 01:43:06,719

then each of them independently

2392

01:43:11,570 --> 01:43:08,280

has

2393

01:43:14,890 --> 01:43:11,580

a self-consistent model of the world oh

2394

01:43:20,030 --> 01:43:14,900

my brother returned

2395

01:43:23,330 --> 01:43:20,040

and is younger to my vision

2396

01:43:25,970 --> 01:43:23,340

and also tells me that

2397

01:43:30,709 --> 01:43:25,980

they agree with that assessment okay so

2398

01:43:33,050 --> 01:43:30,719

so if your your brother came back and

2399

01:43:35,870 --> 01:43:33,060

told you that

2400

01:43:37,850 --> 01:43:35,880

wait no I

2401
01:43:39,350 --> 01:43:37,860
feel myself as being old and you look

2402
01:43:42,830 --> 01:43:39,360
young then that would be an

2403
01:43:45,649 --> 01:43:42,840
inconsistency okay so the data

2404
01:43:47,270 --> 01:43:45,659
that that's coming into your your head

2405
01:43:51,770 --> 01:43:47,280
has to

2406
01:43:55,790 --> 01:43:51,780
and it should line up and maybe this is

2407
01:43:56,330 --> 01:43:55,800
just an axiom of of science that that

2408
01:43:59,209 --> 01:43:56,340
um

2409
01:44:01,490 --> 01:43:59,219
that the universe is internally

2410
01:44:03,530 --> 01:44:01,500
consistent or self-consistent and I

2411
01:44:08,330 --> 01:44:03,540
think it you know it's reasonable to say

2412
01:44:12,709 --> 01:44:08,340
that it is one of the axioms that we

2413
01:44:14,689 --> 01:44:12,719

just have to start with but it it is

2414

01:44:17,689 --> 01:44:14,699

stunning how

2415

01:44:21,470 --> 01:44:17,699

the the range of circumstances where it

2416

01:44:23,810 --> 01:44:21,480

demonstrates itself to be correct in

2417

01:44:26,209 --> 01:44:23,820

ways that you know the number of

2418

01:44:30,290 --> 01:44:26,219

paradoxes seeming paradoxes that have

2419

01:44:35,030 --> 01:44:30,300

Arisen and have not had a clear solution

2420

01:44:36,770 --> 01:44:35,040

but in fallibly a solution appears

2421

01:44:38,870 --> 01:44:36,780

okay speaking of consistency does

2422

01:44:42,050 --> 01:44:38,880

girdle's incompleteness theorem have

2423

01:44:44,870 --> 01:44:42,060

anything to say about physics or the POS

2424

01:44:48,050 --> 01:44:44,880

the existence of a toe yeah it sure

2425

01:44:50,270 --> 01:44:48,060

feels like it should doesn't it you know

2426

01:44:55,970 --> 01:44:53,689

How does it go again no

2427

01:44:58,129 --> 01:44:55,980

system of axioms either no

2428

01:44:59,570 --> 01:44:58,139

self-consistent system of axioms no

2429

01:45:00,950 --> 01:44:59,580

formal language

2430

01:45:06,050 --> 01:45:00,960

uh

2431

01:45:09,290 --> 01:45:06,060

and prove all of the truths

2432

01:45:11,510 --> 01:45:09,300

that it can represent yeah there always

2433

01:45:13,310 --> 01:45:11,520

exist at least one truth that's

2434

01:45:15,050 --> 01:45:13,320

unprovable from the set of axioms if

2435

01:45:18,050 --> 01:45:15,060

it's consistent and it's strong enough

2436

01:45:20,090 --> 01:45:18,060

to encode the the basic arithmetic that

2437

01:45:24,470 --> 01:45:20,100

we take for granted

2438

01:45:28,010 --> 01:45:26,390

I I would say

2439

01:45:29,030 --> 01:45:28,020

maybe

2440

01:45:35,209 --> 01:45:29,040

um

2441

01:45:36,649 --> 01:45:35,219

there is a ground truth to reality that

2442

01:45:37,390 --> 01:45:36,659

there is a

2443

01:45:42,590 --> 01:45:37,400

a

2444

01:45:44,870 --> 01:45:42,600

um

2445

01:45:46,250 --> 01:45:44,880

explains

2446

01:45:50,149 --> 01:45:46,260

why there's something rather than

2447

01:45:51,590 --> 01:45:50,159

nothing why it behaves the way it does

2448

01:45:58,669 --> 01:45:51,600

etc etc

2449

01:46:03,830 --> 01:46:01,910

in in any formal language that we can

2450

01:46:06,050 --> 01:46:03,840

come up with including math

2451

01:46:07,669 --> 01:46:06,060

there's no guarantee that

2452

01:46:12,530 --> 01:46:07,679

that

2453

01:46:14,270 --> 01:46:12,540

is provable because there are always

2454

01:46:16,010 --> 01:46:14,280

some that are not

2455

01:46:18,729 --> 01:46:16,020

um

2456

01:46:21,649 --> 01:46:18,739

but yeah I don't see it as a reason to

2457

01:46:22,370 --> 01:46:21,659

be too despondent

2458

01:46:26,390 --> 01:46:22,380

um

2459

01:46:28,250 --> 01:46:26,400

because if a uh

2460

01:46:31,189 --> 01:46:28,260

a truth is not provable in one formal

2461

01:46:33,050 --> 01:46:31,199

system then it may be in others

2462

01:46:34,729 --> 01:46:33,060

um

2463

01:46:38,689 --> 01:46:34,739

and

2464

01:46:42,350 --> 01:46:38,699

yeah yeah so I I'd say I'd say the the

2465

01:46:44,450 --> 01:46:42,360

the the risk more is that

2466

01:46:46,870 --> 01:46:44,460

um we

2467

01:46:50,390 --> 01:46:46,880

either that

2468

01:46:54,709 --> 01:46:50,400

singular ground truth doesn't exist okay

2469

01:46:55,990 --> 01:46:54,719

so it it may really be that that there's

2470

01:47:00,350 --> 01:46:56,000

this sort of

2471

01:47:03,770 --> 01:47:00,360

relativity of Frameworks and there's no

2472

01:47:07,430 --> 01:47:03,780

singular framework in which we can

2473

01:47:10,609 --> 01:47:07,440

Express the the sort of what people have

2474

01:47:13,330 --> 01:47:10,619

you know wanted to find this the idea of

2475

01:47:17,870 --> 01:47:13,340

this final theory that

2476

01:47:20,030 --> 01:47:17,880

that there's you know in a sense no

2477

01:47:21,530 --> 01:47:20,040

ultimate theoretical ground beneath our

2478

01:47:22,250 --> 01:47:21,540

feet

2479

01:47:24,050 --> 01:47:22,260

um

2480

01:47:25,609 --> 01:47:24,060

which is

2481

01:47:27,350 --> 01:47:25,619

to me

2482

01:47:29,270 --> 01:47:27,360

both

2483

01:47:31,490 --> 01:47:29,280

a bit terrifying it gives me vertigo to

2484

01:47:33,890 --> 01:47:31,500

think about it yeah yeah I just had some

2485

01:47:36,470 --> 01:47:33,900

of that as well but it's also cool man

2486

01:47:38,090 --> 01:47:36,480

because

2487

01:47:40,729 --> 01:47:38,100

then when you when you think about what

2488

01:47:44,570 --> 01:47:40,739

we are in such a universe you know where

2489

01:47:46,810 --> 01:47:44,580

it's like where the where where this

2490

01:47:49,450 --> 01:47:46,820

layer of emergent complexity that's

2491

01:47:54,770 --> 01:47:49,460

bootstrapped up from nothing

2492

01:47:57,770 --> 01:47:54,780

and you know it's it's now to us to

2493

01:48:00,609 --> 01:47:57,780

explore this uh this this crazy

2494

01:48:04,250 --> 01:48:00,619

phenomenon of reality and and try to

2495

01:48:07,790 --> 01:48:04,260

characterize it as best we can

2496

01:48:11,629 --> 01:48:09,229

um

2497

01:48:15,350 --> 01:48:11,639

you know like the idea there's no ground

2498

01:48:18,530 --> 01:48:15,360

truth there's certainly no fundamental

2499

01:48:20,330 --> 01:48:18,540

meaning uh in that picture there's

2500

01:48:21,770 --> 01:48:20,340

there's only the meaning that we impose

2501

01:48:24,310 --> 01:48:21,780

on it

2502

01:48:29,149 --> 01:48:24,320

um that if you think about

2503

01:48:31,609 --> 01:48:29,159

humans as explorers you know we uh have

2504

01:48:34,609 --> 01:48:31,619

broken free from our bounds

2505

01:48:36,350 --> 01:48:34,619

um on on so many levels and and you know

2506

01:48:38,330 --> 01:48:36,360

for most of our history it was the it

2507

01:48:41,570 --> 01:48:38,340

was physical bounds you know we we

2508

01:48:44,810 --> 01:48:41,580

explored the world okay then we left the

2509

01:48:46,310 --> 01:48:44,820

world and and went to other worlds well

2510

01:48:49,490 --> 01:48:46,320

the moon

2511

01:48:51,470 --> 01:48:49,500

um but with our science we've explored

2512

01:48:54,109 --> 01:48:51,480

the physical Universe to its boundaries

2513

01:48:56,330 --> 01:48:54,119

but there's also there's other type of

2514

01:48:59,510 --> 01:48:56,340

exploration that that you don't think

2515

01:49:01,250 --> 01:48:59,520

about so we we kind of live in these

2516

01:49:03,530 --> 01:49:01,260

day-to-day subjective worlds which are

2517

01:49:06,229 --> 01:49:03,540

these like these mini games that I sort

2518

01:49:08,149 --> 01:49:06,239

of talked about the the idea we just try

2519

01:49:10,669 --> 01:49:08,159

to find the regularities that are

2520

01:49:12,950 --> 01:49:10,679

convenient enough and and those are

2521

01:49:15,109 --> 01:49:12,960

imposed on us by Evolution too like

2522

01:49:17,990 --> 01:49:15,119

where where we

2523

01:49:19,850 --> 01:49:18,000

believe in a world mate where there's

2524

01:49:21,770 --> 01:49:19,860

space and time and hierarchies of

2525

01:49:23,990 --> 01:49:21,780

objects and there are relationships

2526

01:49:25,850 --> 01:49:24,000

between these things forces Etc which is

2527

01:49:29,570 --> 01:49:25,860

just one

2528

01:49:32,270 --> 01:49:29,580

very selective way of casting reality

2529

01:49:34,550 --> 01:49:32,280

but uh but it's also a very natural and

2530

01:49:38,689 --> 01:49:34,560

it's the one that we were born into in

2531

01:49:41,629 --> 01:49:38,699

the same way we're born in a country but

2532

01:49:44,450 --> 01:49:41,639

we have broken free from that bound too

2533

01:49:48,050 --> 01:49:44,460

and we're capable of

2534

01:49:50,990 --> 01:49:48,060

like literally arbitrary abstraction and

2535

01:49:53,209 --> 01:49:51,000

exploring all of the ways to to frame

2536

01:49:55,669 --> 01:49:53,219

reality and and none of them are better

2537

01:50:00,890 --> 01:49:55,679

than any other in terms of more

2538

01:50:03,470 --> 01:50:00,900

fundamental so we're we're we are adrift

2539

01:50:05,510 --> 01:50:03,480

um but which is and and you mentioned

2540

01:50:07,070 --> 01:50:05,520

this earlier but it's a it's really a

2541

01:50:09,669 --> 01:50:07,080

terrifying thing

2542

01:50:12,290 --> 01:50:09,679

you know how how do you

2543

01:50:14,750 --> 01:50:12,300

choose a world view how do you anchor

2544

01:50:16,430 --> 01:50:14,760

yourself down and say right this is my

2545

01:50:19,570 --> 01:50:16,440

world view this is how I'm going to

2546

01:50:24,290 --> 01:50:19,580

interpret everything and and

2547

01:50:26,629 --> 01:50:24,300

choose my actions yeah I would say that

2548

01:50:29,090 --> 01:50:26,639

double down on

2549

01:50:32,149 --> 01:50:29,100

the power of this relativity on the

2550

01:50:33,649 --> 01:50:32,159

power that you have of having cut

2551
01:50:37,669 --> 01:50:33,659
yourself loose

2552
01:50:39,169 --> 01:50:37,679
from these you know these the bonds of

2553
01:50:42,050 --> 01:50:39,179
the framework that you were born into

2554
01:50:43,310 --> 01:50:42,060
your your you know your

2555
01:50:45,950 --> 01:50:43,320
uh

2556
01:50:49,910 --> 01:50:45,960
Surfer impossibility space

2557
01:50:53,330 --> 01:50:49,920
um to me that's actually

2558
01:50:55,129 --> 01:50:53,340
uh something you can

2559
01:50:57,410 --> 01:50:55,139
put an anchor in

2560
01:51:03,890 --> 01:50:59,510
explain that well you can put an anchor

2561
01:51:06,169 --> 01:51:03,900
in the fact that you are in the in

2562
01:51:10,129 --> 01:51:06,179
the the so

2563
01:51:11,510 --> 01:51:10,139

in your in I mean you can take pride in

2564

01:51:13,490 --> 01:51:11,520

your knowledge

2565

01:51:16,129 --> 01:51:13,500

in your ability to

2566

01:51:17,990 --> 01:51:16,139

you know have this meta awareness that

2567

01:51:20,510 --> 01:51:18,000

that

2568

01:51:25,729 --> 01:51:20,520

um a world view

2569

01:51:32,290 --> 01:51:28,010

and and you can see that there are many

2570

01:51:35,149 --> 01:51:32,300

possible World Views and you you know so

2571

01:51:38,330 --> 01:51:35,159

I'm not saying that that I can do this

2572

01:51:41,330 --> 01:51:38,340

but it but I can see that it that this

2573

01:51:41,870 --> 01:51:41,340

could be an admirable

2574

01:51:46,629 --> 01:51:41,880

um

2575

01:51:49,490 --> 01:51:46,639

type of existence is to to see these

2576

01:51:51,530 --> 01:51:49,500

uh these different you know local Minima

2577

01:51:53,870 --> 01:51:51,540

in the landscape each one A different

2578

01:51:56,030 --> 01:51:53,880

belief system and and

2579

01:51:58,490 --> 01:51:56,040

world view and

2580

01:52:00,950 --> 01:51:58,500

idea about what reality is

2581

01:52:03,770 --> 01:52:00,960

um but but knowing the Landscapes there

2582

01:52:05,270 --> 01:52:03,780

and even at some level being free to

2583

01:52:08,390 --> 01:52:05,280

move

2584

01:52:12,890 --> 01:52:10,790

um it's just it's just damn cool man I I

2585

01:52:14,810 --> 01:52:12,900

think it's an increase

2586

01:52:17,030 --> 01:52:14,820

foreign

2587

01:52:20,629 --> 01:52:17,040

it's a unique

2588

01:52:22,070 --> 01:52:20,639

um quality of human beings it's what

2589

01:52:25,209 --> 01:52:22,080

makes us

2590

01:52:27,649 --> 01:52:25,219

I think true General intelligences

2591

01:52:31,729 --> 01:52:27,659

although we have we have deep

2592

01:52:33,470 --> 01:52:31,739

constraints and we we have to

2593

01:52:36,770 --> 01:52:33,480

you know fight a lot of our inclinations

2594

01:52:38,870 --> 01:52:36,780

to to do one thing over another in many

2595

01:52:43,129 --> 01:52:38,880

cases we

2596

01:52:44,930 --> 01:52:43,139

uh we still have the capability to to

2597

01:52:46,970 --> 01:52:44,940

uh

2598

01:52:48,649 --> 01:52:46,980

to see all this stock to see all the to

2599

01:52:50,750 --> 01:52:48,659

see all of the different

2600

01:52:56,450 --> 01:52:50,760

Frameworks in which the universe can be

2601
01:53:00,530 --> 01:52:56,460
seen and to in some way explore them

2602
01:53:02,450 --> 01:53:00,540
to Define ourselves and

2603
01:53:04,910 --> 01:53:02,460
um

2604
01:53:06,890 --> 01:53:04,920
yeah I feel like just that that fact it

2605
01:53:18,350 --> 01:53:06,900
is

2606
01:53:19,970 --> 01:53:18,360
called inventing reality so imagine that

2607
01:53:22,310 --> 01:53:19,980
several of the themes we talked about

2608
01:53:24,410 --> 01:53:22,320
will be covered in the film exactly what

2609
01:53:26,810 --> 01:53:24,420
was the impetus behind the film

2610
01:53:28,550 --> 01:53:26,820
so the

2611
01:53:32,750 --> 01:53:28,560
so

2612
01:53:34,010 --> 01:53:32,760
Bahar and I were planning to make a show

2613
01:53:37,250 --> 01:53:34,020

together

2614

01:53:39,830 --> 01:53:37,260

um so she's a science journalist and

2615

01:53:41,510 --> 01:53:39,840

and you know I I'm

2616

01:53:44,030 --> 01:53:41,520

I'm an emerging

2617

01:53:47,689 --> 01:53:44,040

science Communicator

2618

01:53:49,310 --> 01:53:47,699

um and two million subscribers and is

2619

01:53:52,250 --> 01:53:49,320

emerging geez

2620

01:53:55,250 --> 01:53:52,260

well in terms of my skills maybe

2621

01:53:56,810 --> 01:53:55,260

um and so we were planning to make a

2622

01:53:59,149 --> 01:53:56,820

show it was going to be called the

2623

01:54:01,970 --> 01:53:59,159

reality show and it was going to be a

2624

01:54:04,490 --> 01:54:01,980

you know a riff on reality reality TV

2625

01:54:06,830 --> 01:54:04,500

but really oh interesting interesting

2626

01:54:08,870 --> 01:54:06,840

yeah it was going to be a fun way to

2627

01:54:11,390 --> 01:54:08,880

look at how people are exploring the

2628

01:54:13,790 --> 01:54:11,400

nature of reality and this was this was

2629

01:54:15,830 --> 01:54:13,800

like five years ago so when you say you

2630

01:54:18,590 --> 01:54:15,840

were working on a show you mean a show

2631

01:54:21,770 --> 01:54:18,600

like on TV or Netflix or we we you know

2632

01:54:23,930 --> 01:54:21,780

it was we were friends showing many

2633

01:54:25,970 --> 01:54:23,940

things it was maybe going to be a

2634

01:54:27,129 --> 01:54:25,980

YouTube show because that's what I knew

2635

01:54:29,750 --> 01:54:27,139

um

2636

01:54:32,990 --> 01:54:29,760

whatever stuck uh and then we got

2637

01:54:36,169 --> 01:54:33,000

distracted you know I got I got

2638

01:54:37,609 --> 01:54:36,179

um distracted by my research program

2639

01:54:40,189 --> 01:54:37,619

possible to

2640

01:54:41,810 --> 01:54:40,199

to do that and space-time which we can

2641

01:54:43,310 --> 01:54:41,820

talk about next time when we speak which

2642

01:54:45,050 --> 01:54:43,320

is the crisis in cosmology because

2643

01:54:46,490 --> 01:54:45,060

there's so much that I would love to

2644

01:54:48,350 --> 01:54:46,500

know about that

2645

01:54:49,370 --> 01:54:48,360

absolutely

2646

01:54:54,050 --> 01:54:49,380

um

2647

01:54:56,570 --> 01:54:54,060

and uh so so it's it's just that was

2648

01:54:58,930 --> 01:54:56,580

something that we have been talking

2649

01:55:01,970 --> 01:54:58,940

about for a long time and

2650

01:55:06,649 --> 01:55:01,980

and you know also talking about these

2651
01:55:08,990 --> 01:55:06,659
questions and and uh peeking into these

2652
01:55:10,669 --> 01:55:09,000
together but but also on the other side

2653
01:55:13,970 --> 01:55:10,679
with

2654
01:55:16,490 --> 01:55:13,980
um uh Andrew cornhaber and Eric Brown

2655
01:55:18,729 --> 01:55:16,500
who were the producers of space-time

2656
01:55:22,010 --> 01:55:18,739
we've been talking for a long time about

2657
01:55:23,390 --> 01:55:22,020
doing something big

2658
01:55:25,550 --> 01:55:23,400
um in terms of

2659
01:55:29,750 --> 01:55:25,560
reaching

2660
01:55:31,070 --> 01:55:29,760
um a bigger audience and uh you know

2661
01:55:32,270 --> 01:55:31,080
what we would want to say it would be

2662
01:55:34,910 --> 01:55:32,280
your audience

2663
01:55:37,790 --> 01:55:34,920

um and how we can

2664

01:55:41,870 --> 01:55:37,800

just do something

2665

01:55:45,050 --> 01:55:41,880

you know really cool with what what we

2666

01:55:48,770 --> 01:55:45,060

thought was this in this affordance we'd

2667

01:55:50,450 --> 01:55:48,780

we uncovered which is the appetite

2668

01:55:51,410 --> 01:55:50,460

for

2669

01:55:53,689 --> 01:55:51,420

um

2670

01:55:55,250 --> 01:55:53,699

good depth and you know some level of

2671

01:55:58,870 --> 01:55:55,260

authenticity

2672

01:56:03,109 --> 01:55:58,880

um so so these two

2673

01:56:04,250 --> 01:56:03,119

projects merged into this film inventing

2674

01:56:06,410 --> 01:56:04,260

reality

2675

01:56:07,850 --> 01:56:06,420

um and we

2676

01:56:12,290 --> 01:56:07,860

uh

2677

01:56:13,070 --> 01:56:12,300

we were very lucky to have a

2678

01:56:15,530 --> 01:56:13,080

um

2679

01:56:16,550 --> 01:56:15,540

well I guess a a fan of the show but now

2680

01:56:20,030 --> 01:56:16,560

a friend

2681

01:56:21,470 --> 01:56:20,040

um offered to match funds

2682

01:56:25,070 --> 01:56:21,480

um up to four hundred thousand dollars

2683

01:56:26,030 --> 01:56:25,080

actually so we wow great all right time

2684

01:56:36,290 --> 01:56:26,040

to

2685

01:56:40,870 --> 01:56:36,300

um I mean it you know PBS is awesome but

2686

01:56:42,530 --> 01:56:40,880

this this kind of had to be something

2687

01:56:43,330 --> 01:56:42,540

independent

2688

01:56:46,970 --> 01:56:43,340

um

2689

01:56:49,850 --> 01:56:46,980

because we want we wanted absolute

2690

01:56:51,709 --> 01:56:49,860

absolute creative freedom

2691

01:56:53,570 --> 01:56:51,719

they're a great partner for space time

2692

01:56:55,390 --> 01:56:53,580

but we wanted this one it had to be

2693

01:56:59,390 --> 01:56:55,400

absolute creative freedom and we also

2694

01:57:02,810 --> 01:56:59,400

realized that uh that that the appetite

2695

01:57:03,649 --> 01:57:02,820

for this could actually let us fund it

2696

01:57:05,990 --> 01:57:03,659

um

2697

01:57:07,430 --> 01:57:06,000

uh so so that's what we're doing so

2698

01:57:11,390 --> 01:57:07,440

what's the website

2699

01:57:13,669 --> 01:57:11,400

so it's in we're we have a Indiegogo

2700

01:57:16,010 --> 01:57:13,679

crowdfunding Indiegogo if I was to

2701
01:57:18,910 --> 01:57:16,020
search inventing reality it would come

2702
01:57:24,890 --> 01:57:18,920
up sure hope so

2703
01:57:31,129 --> 01:57:28,490
yeah okay I see it I see it I'm not I'm

2704
01:57:32,330 --> 01:57:31,139
going to be donating to this oh good

2705
01:57:34,550 --> 01:57:32,340
thank you

2706
01:57:36,050 --> 01:57:34,560
well I want to see this made

2707
01:57:38,510 --> 01:57:36,060
so

2708
01:57:40,189 --> 01:57:38,520
um we're gonna do our best we're one day

2709
01:57:41,570 --> 01:57:40,199
into the campaign by the time I guess

2710
01:57:43,250 --> 01:57:41,580
this video is out will be a little more

2711
01:57:44,750 --> 01:57:43,260
than that let me read some of this if

2712
01:57:47,030 --> 01:57:44,760
you don't mind because this is

2713
01:57:49,370 --> 01:57:47,040

interesting to the listeners our

2714

01:57:50,810 --> 01:57:49,380

space-time and particles even real hey

2715

01:57:53,629 --> 01:57:50,820

if you thought Donald Hoffman was

2716

01:57:55,850 --> 01:57:53,639

allowing your mind to be untrammelled in

2717

01:57:58,070 --> 01:57:55,860

a positive or negative sense then

2718

01:58:00,109 --> 01:57:58,080

he's uh he's adding particles to this

2719

01:58:02,390 --> 01:58:00,119

makes matter designing particles well

2720

01:58:05,089 --> 01:58:02,400

particles are definitely not real good I

2721

01:58:07,510 --> 01:58:05,099

could tell you that now I gotta I gotta

2722

01:58:10,370 --> 01:58:07,520

drive home and function so

2723

01:58:12,589 --> 01:58:10,380

is reductionism a dead end

2724

01:58:15,589 --> 01:58:12,599

can physics ever hope to find ground

2725

01:58:18,109 --> 01:58:15,599

truth interesting interesting

2726

01:58:20,089 --> 01:58:18,119

so it seems to me like

2727

01:58:22,070 --> 01:58:20,099

even in this conversation of there are

2728

01:58:24,169 --> 01:58:22,080

there may not be ground truths even that

2729

01:58:27,169 --> 01:58:24,179

statement alone maybe a ground truth of

2730

01:58:28,790 --> 01:58:27,179

sorts so it's a it's a such a tricky

2731

01:58:30,290 --> 01:58:28,800

statement to make that there are none

2732

01:58:31,790 --> 01:58:30,300

and that we can say that there are none

2733

01:58:35,510 --> 01:58:31,800

of a certain class so that's why I like

2734

01:58:37,609 --> 01:58:35,520

this yeah yeah there are physics ever

2735

01:58:39,709 --> 01:58:37,619

help to find crowd truth final terms

2736

01:58:41,209 --> 01:58:39,719

also and for people who are fans of the

2737

01:58:43,850 --> 01:58:41,219

toe podcast something I talk about

2738

01:58:46,070 --> 01:58:43,860

frequently is abijnasis which means how

2739

01:58:48,050 --> 01:58:46,080

do you combine basically science has

2740

01:58:50,149 --> 01:58:48,060

evolved it's not it's not the same that

2741

01:58:52,250 --> 01:58:50,159

it was 300 years ago so then the

2742

01:58:54,890 --> 01:58:52,260

question is what is it evolving to and

2743

01:58:57,109 --> 01:58:54,900

can other modes of knowing quote-unquote

2744

01:58:58,850 --> 01:58:57,119

knowing be integrated with science and

2745

01:58:59,830 --> 01:58:58,860

so I call that in a tongue-in-cheek

2746

01:59:02,209 --> 01:58:59,840

manner

2747

01:59:03,350 --> 01:59:02,219

abiginosis which is gnosis of the

2748

01:59:06,290 --> 01:59:03,360

western average

2749

01:59:07,970 --> 01:59:06,300

I forget the root word of the East but

2750

01:59:09,830 --> 01:59:07,980

it's not as if that that's the only two

2751
01:59:12,109 --> 01:59:09,840
maybe there's maybe there's four maybe

2752
01:59:13,490 --> 01:59:12,119
there's five different ways of

2753
01:59:14,930 --> 01:59:13,500
integrating knowledge anyway so if

2754
01:59:16,070 --> 01:59:14,940
you're interested in that can physics

2755
01:59:17,870 --> 01:59:16,080
ever hope to find the ground truth

2756
01:59:19,910 --> 01:59:17,880
that'd be interesting to you what is the

2757
01:59:21,169 --> 01:59:19,920
role of the of the observer in quantum

2758
01:59:22,910 --> 01:59:21,179
mechanics okay that's like a central

2759
01:59:24,890 --> 01:59:22,920
thing this is uh did you what did you do

2760
01:59:27,350 --> 01:59:24,900
man did you just copy all the did you go

2761
01:59:29,270 --> 01:59:27,360
to the toe description and create the

2762
01:59:31,729 --> 01:59:29,280
the ideal movie

2763
01:59:33,589 --> 01:59:31,739

no man we did we just have the same

2764

01:59:35,649 --> 01:59:33,599

Curiosities because

2765

01:59:37,970 --> 01:59:35,659

I know I'm just kidding around man

2766

01:59:40,129 --> 01:59:37,980

yeah yeah exactly these are the

2767

01:59:41,750 --> 01:59:40,139

questions I have a personal question for

2768

01:59:43,490 --> 01:59:41,760

you as you start to investigate this

2769

01:59:46,550 --> 01:59:43,500

further and further do you find that

2770

01:59:47,870 --> 01:59:46,560

you're questioning you've at first we're

2771

01:59:49,729 --> 01:59:47,880

thinking how do I unify quantum

2772

01:59:51,229 --> 01:59:49,739

mechanics or Quantum field Theory with

2773

01:59:52,370 --> 01:59:51,239

gravity it's like okay that's the most

2774

01:59:54,169 --> 01:59:52,380

fundamental question then you get to

2775

01:59:57,050 --> 01:59:54,179

ideas of what the heck does it mean to

2776

01:59:59,570 --> 01:59:57,060

cause what does it mean to be real

2777

02:00:01,490 --> 01:59:59,580

what does it mean to mean do you find

2778

02:00:04,609 --> 02:00:01,500

that that's the case for you it's

2779

02:00:06,770 --> 02:00:04,619

paralyzing but I guess you have to power

2780

02:00:08,750 --> 02:00:06,780

through of course yeah and I think it's

2781

02:00:11,870 --> 02:00:08,760

important

2782

02:00:14,930 --> 02:00:11,880

um I mean the key is once you do that

2783

02:00:18,290 --> 02:00:14,940

staying on track you know you can't

2784

02:00:20,629 --> 02:00:18,300

follow one line of reasoning and

2785

02:00:22,370 --> 02:00:20,639

and well you can follow unloaded

2786

02:00:23,689 --> 02:00:22,380

reasoning and be diverted at every

2787

02:00:24,770 --> 02:00:23,699

definition

2788

02:00:26,450 --> 02:00:24,780

um and

2789

02:00:28,430 --> 02:00:26,460

you know this is what makes Smart people

2790

02:00:31,010 --> 02:00:28,440

smart is they're able to construct these

2791

02:00:35,270 --> 02:00:31,020

These Chains of reasoning and

2792

02:00:38,530 --> 02:00:35,280

you know flag their potential

2793

02:00:41,930 --> 02:00:38,540

you know uncertainties biases

2794

02:00:44,450 --> 02:00:41,940

definitional uh uncertainties along the

2795

02:00:47,330 --> 02:00:44,460

way and then come back and build build

2796

02:00:50,089 --> 02:00:47,340

the the edifice of their understanding

2797

02:00:53,450 --> 02:00:50,099

but it's it's

2798

02:00:56,209 --> 02:00:53,460

it can be really paralyzing for sure

2799

02:00:59,270 --> 02:00:56,219

um what does mean even mean

2800

02:01:01,010 --> 02:00:59,280

I thought that one but now I will here's

2801

02:01:02,810 --> 02:01:01,020

something that I asked Noam Chomsky it's

2802

02:01:04,189 --> 02:01:02,820

a similar question that I asked you is

2803

02:01:05,450 --> 02:01:04,199

that in order to know what something

2804

02:01:07,189 --> 02:01:05,460

means do you have to know what it not

2805

02:01:08,570 --> 02:01:07,199

what it doesn't mean so in order for you

2806

02:01:10,010 --> 02:01:08,580

to understand what a cat is does that

2807

02:01:12,950 --> 02:01:10,020

mean you have to point out instances of

2808

02:01:14,510 --> 02:01:12,960

non-cats he said yes but then to me this

2809

02:01:17,689 --> 02:01:14,520

there's something defeating about that

2810

02:01:19,430 --> 02:01:17,699

and it's defeating in in a in the sense

2811

02:01:20,930 --> 02:01:19,440

that he says we don't have a definition

2812

02:01:22,750 --> 02:01:20,940

of meaning so how are we supposed to

2813

02:01:24,410 --> 02:01:22,760

know if something is meaningless without

2814

02:01:25,430 --> 02:01:24,420

presupposing that you know what meaning

2815

02:01:28,970 --> 02:01:25,440

is

2816

02:01:30,890 --> 02:01:28,980

uh I mean maybe yeah right I mean

2817

02:01:33,709 --> 02:01:30,900

meeting is about

2818

02:01:36,890 --> 02:01:33,719

a correlation between

2819

02:01:40,010 --> 02:01:36,900

two things and in particular between

2820

02:01:48,290 --> 02:01:43,129

you know informational representation

2821

02:01:49,129 --> 02:01:48,300

and the thing itself I suppose

2822

02:01:52,390 --> 02:01:49,139

um

2823

02:01:55,550 --> 02:01:52,400

in in a simple sense you know

2824

02:01:56,330 --> 02:01:55,560

this word means this animal and both of

2825

02:01:57,890 --> 02:01:56,340

them

2826

02:02:00,709 --> 02:01:57,900

have

2827

02:02:03,109 --> 02:02:00,719

some informational correlate in your

2828

02:02:06,770 --> 02:02:03,119

brain uh and so it's the pointers

2829

02:02:08,470 --> 02:02:06,780

between these interesting things right

2830

02:02:10,669 --> 02:02:08,480

um but but I I

2831

02:02:12,770 --> 02:02:10,679

am sure

2832

02:02:14,209 --> 02:02:12,780

that Noam Chomsky has thought all

2833

02:02:16,010 --> 02:02:14,219

through this in a lot of detail and

2834

02:02:18,109 --> 02:02:16,020

means something deeper when he says we

2835

02:02:19,189 --> 02:02:18,119

don't know what meaning means I think

2836

02:02:20,870 --> 02:02:19,199

that's I think it's the case that

2837

02:02:22,370 --> 02:02:20,880

nonchovsky's

2838

02:02:23,390 --> 02:02:22,380

whatever people think about him

2839

02:02:25,490 --> 02:02:23,400

politically

2840

02:02:29,750 --> 02:02:25,500

I think it's absolutely

2841

02:02:33,229 --> 02:02:29,760

sharp like a sharp as a thumbtack at 92.

2842

02:02:36,589 --> 02:02:33,239

sharper than most people are at their

2843

02:02:38,589 --> 02:02:36,599

Prime and he's 92 or 93. I was even

2844

02:02:42,770 --> 02:02:38,599

talking to Terence

2845

02:02:45,229 --> 02:02:42,780

like genius said no no question yeah so

2846

02:02:48,109 --> 02:02:45,239

just as an ending as an ending statement

2847

02:02:49,189 --> 02:02:48,119

there's the hard problem of meaning at

2848

02:02:50,450 --> 02:02:49,199

least this is what I call it there's

2849

02:02:52,010 --> 02:02:50,460

something called the symbol grounding

2850

02:02:53,870 --> 02:02:52,020

problem so you can look this up it's

2851
02:02:55,729 --> 02:02:53,880
sent it means how is it that when we say

2852
02:02:57,589 --> 02:02:55,739
the word pen we mean pen how is that

2853
02:02:59,570 --> 02:02:57,599
word ever how does that word point to a

2854
02:03:02,750 --> 02:02:59,580
pen what does the pointing mean

2855
02:03:05,750 --> 02:03:02,760
that's something that yeah I get much

2856
02:03:08,990 --> 02:03:05,760
attention my feeling is so ultimately it

2857
02:03:11,089 --> 02:03:09,000
has to be to something in your

2858
02:03:13,609 --> 02:03:11,099
you know in your brain or in your

2859
02:03:15,950 --> 02:03:13,619
conscious experience and it's really

2860
02:03:18,229 --> 02:03:15,960
hard to pin down because

2861
02:03:20,330 --> 02:03:18,239
you know what you have a single neuron

2862
02:03:22,669 --> 02:03:20,340
who's firing means you've thought of pen

2863
02:03:24,169 --> 02:03:22,679

that's that itself is not very

2864

02:03:26,510 --> 02:03:24,179

meaningful

2865

02:03:28,390 --> 02:03:26,520

um because the neuron is

2866

02:03:32,270 --> 02:03:28,400

you know

2867

02:03:36,410 --> 02:03:32,280

uh tentacally lipid layer uh structure

2868

02:03:40,430 --> 02:03:36,420

it doesn't mean pen so so the meaning

2869

02:03:41,510 --> 02:03:40,440

has to arise in a different way and I

2870

02:03:43,910 --> 02:03:41,520

think

2871

02:03:44,990 --> 02:03:43,920

the only way to me that makes sense is

2872

02:03:46,810 --> 02:03:45,000

that

2873

02:03:49,669 --> 02:03:46,820

the the

2874

02:03:50,990 --> 02:03:49,679

representation of Penn in in your head

2875

02:03:54,050 --> 02:03:51,000

comes

2876

02:03:57,890 --> 02:03:54,060

has its entire existence in

2877

02:04:02,930 --> 02:03:57,900

the connection of all of the things that

2878

02:04:04,250 --> 02:04:02,940

you relate to penis and and

2879

02:04:06,830 --> 02:04:04,260

um

2880

02:04:09,070 --> 02:04:06,840

you know it's it's function its shape

2881

02:04:11,689 --> 02:04:09,080

and and all of these have have

2882

02:04:15,770 --> 02:04:11,699

representations elsewhere in your head

2883

02:04:19,129 --> 02:04:15,780

and and it's in the combination of these

2884

02:04:20,870 --> 02:04:19,139

that you get the notion of the pen but

2885

02:04:23,390 --> 02:04:20,880

then you ask for each of those other

2886

02:04:25,609 --> 02:04:23,400

things like okay you need you need to

2887

02:04:27,950 --> 02:04:25,619

connect Inc what about ink how does ink

2888

02:04:30,530 --> 02:04:27,960

does income know that itself is also

2889

02:04:33,290 --> 02:04:30,540

this connection of representation so

2890

02:04:36,709 --> 02:04:33,300

once you strip away

2891

02:04:41,570 --> 02:04:36,719

all of those uh representations the pen

2892

02:04:43,689 --> 02:04:41,580

vanishes there isn't even you know a

2893

02:04:47,209 --> 02:04:43,699

a single neuron left where

2894

02:04:50,089 --> 02:04:47,219

that that meant Penn now has no

2895

02:04:52,970 --> 02:04:50,099

qualities that there's nothing and so

2896

02:04:55,669 --> 02:04:52,980

um that's what that's what it feels like

2897

02:04:58,010 --> 02:04:55,679

um which is again uh

2898

02:05:01,970 --> 02:04:58,020

an ungrounding notion

2899

02:05:04,010 --> 02:05:01,980

um that that meaning only exists in the

2900

02:05:07,550 --> 02:05:04,020

relationship between

2901

02:05:09,649 --> 02:05:07,560

the properties that that

2902

02:05:13,910 --> 02:05:09,659

um you know

2903

02:05:15,890 --> 02:05:13,920

yeah so so that's uh my now that word

2904

02:05:17,870 --> 02:05:15,900

ungrounding did you you use that

2905

02:05:19,310 --> 02:05:17,880

purposefully because I called I mean

2906

02:05:21,290 --> 02:05:19,320

because I referenced the symbol

2907

02:05:22,490 --> 02:05:21,300

grounding problem or did you just use

2908

02:05:24,950 --> 02:05:22,500

that word

2909

02:05:27,350 --> 02:05:24,960

uh I didn't mean to copy you but no no

2910

02:05:30,229 --> 02:05:27,360

it's not copying me it's actually the

2911

02:05:31,910 --> 02:05:30,239

word that is appropriate and and but

2912

02:05:34,070 --> 02:05:31,920

it's there's also a technical meaning of

2913

02:05:35,209 --> 02:05:34,080

that word and the conversation with

2914

02:05:37,310 --> 02:05:35,219

Terence Deacon which is actually

2915

02:05:39,890 --> 02:05:37,320

premiering in about an hour or so talk

2916

02:05:42,709 --> 02:05:39,900

specifically about that it's difficult

2917

02:05:45,050 --> 02:05:42,719

to say what grounding is but he and does

2918

02:05:46,729 --> 02:05:45,060

it mean in that context grounding to

2919

02:05:50,030 --> 02:05:46,739

some kind of

2920

02:05:52,310 --> 02:05:50,040

your neurostructure or a neurocarily

2921

02:05:54,589 --> 02:05:52,320

as far as I understand

2922

02:05:57,830 --> 02:05:54,599

grounding is

2923

02:06:00,290 --> 02:05:57,840

something physical and so what's meant

2924

02:06:01,729 --> 02:06:00,300

by the word pen is ungrounded is that

2925

02:06:04,250 --> 02:06:01,739

there's nothing that you can see from

2926
02:06:06,589 --> 02:06:04,260
the symbols of the word pen that grounds

2927
02:06:08,209 --> 02:06:06,599
it to the word pen but it has something

2928
02:06:11,149 --> 02:06:08,219
to do with it being grounded in

2929
02:06:14,030 --> 02:06:11,159
something physical Matt

2930
02:06:16,870 --> 02:06:14,040
thank you thank you so much man listen

2931
02:06:20,089 --> 02:06:16,880
because it was an absolute pleasure and

2932
02:06:22,609 --> 02:06:20,099
based on who you've had on this podcast

2933
02:06:24,890 --> 02:06:22,619
and and the brilliant conversations

2934
02:06:27,709 --> 02:06:24,900
you've managed to get out of them also

2935
02:06:28,790 --> 02:06:27,719
which is no mean feat um it's an honor

2936
02:06:31,189 --> 02:06:28,800
so

2937
02:06:33,109 --> 02:06:31,199
an honors mine then like I but I've been

2938
02:06:35,770 --> 02:06:33,119

watching you for years I I watch you

2939

02:06:40,310 --> 02:06:35,780

guys I go to sleep that sounds creepy

2940

02:06:41,870 --> 02:06:40,320

I'll watch it before yeah and and so

2941

02:06:44,450 --> 02:06:41,880

it's and I've been doing that for years

2942

02:06:46,669 --> 02:06:44,460

and and I learned from you and several

2943

02:06:48,770 --> 02:06:46,679

met perhaps the majority of the audience

2944

02:06:51,649 --> 02:06:48,780

has plenty to credit to you in terms of

2945

02:06:54,830 --> 02:06:51,659

their knowledge so thank you

2946

02:06:58,129 --> 02:06:54,840

well I I was just communicating it so

2947

02:07:00,109 --> 02:06:58,139

glad I got some across the podcast is

2948

02:07:01,550 --> 02:07:00,119

now concluded thank you for watching if

2949

02:07:03,229 --> 02:07:01,560

you haven't subscribed or clicked on

2950

02:07:06,290 --> 02:07:03,239

that like button now would be a great

2951
02:07:08,570 --> 02:07:06,300
time to do so as each subscribe and like

2952
02:07:10,669 --> 02:07:08,580
helps YouTube push this content to more

2953
02:07:12,830 --> 02:07:10,679
people also I recently found out that

2954
02:07:14,810 --> 02:07:12,840
external links count plenty toward the

2955
02:07:17,629 --> 02:07:14,820
algorithm which means that when you

2956
02:07:19,790 --> 02:07:17,639
share on Twitter on Facebook on Reddit

2957
02:07:21,649 --> 02:07:19,800
Etc it shows YouTube that people are

2958
02:07:23,689 --> 02:07:21,659
talking about this outside of YouTube

2959
02:07:25,550 --> 02:07:23,699
which in turn greatly AIDS the

2960
02:07:27,229 --> 02:07:25,560
Distribution on YouTube as well if you'd

2961
02:07:29,530 --> 02:07:27,239
like to support more conversations like

2962
02:07:31,609 --> 02:07:29,540
this then do consider visiting

2963
02:07:33,830 --> 02:07:31,619

theoriesofeverything.org again it's

2964

02:07:36,290 --> 02:07:33,840

support from the sponsors and you that

2965

02:07:37,970 --> 02:07:36,300

allow me to work on toe full time you

2966

02:07:40,070 --> 02:07:37,980

get early access to ad-free audio

2967

02:07:42,169 --> 02:07:40,080

episodes there as well every dollar

2968

02:07:44,209 --> 02:07:42,179

helps far more than you may think either