



**KARL**  
**FRISTON**  
**PART TWO**

**DON'T BE DECEIVED**  
**BY GURUS,**  
**OR YOURSELF**



1  
00:00:04,630 --> 00:00:02,710  
push to not feel fear slash not feel the

2  
00:00:06,869 --> 00:00:04,640  
ego quote unquote

3  
00:00:08,629 --> 00:00:06,879  
etc can be dangerous not because the

4  
00:00:10,310 --> 00:00:08,639  
lesson is false though it may be but

5  
00:00:11,830 --> 00:00:10,320  
because of the social pressure around

6  
00:00:13,669 --> 00:00:11,840  
those words in fact there's a

7  
00:00:15,910 --> 00:00:13,679  
universally frowned upon quality called

8  
00:00:18,310 --> 00:00:15,920  
being egotistical ego is embedded in it

9  
00:00:20,470 --> 00:00:18,320  
and also to be seen as retreating is the

10  
00:00:22,390 --> 00:00:20,480  
same as being seen as being defensive

11  
00:00:24,630 --> 00:00:22,400  
which is the same as being fearful which

12  
00:00:26,470 --> 00:00:24,640  
is seen as being lower on the spiritual

13  
00:00:28,470 --> 00:00:26,480

hierarchy perhaps it's true that you

14

00:00:29,990 --> 00:00:28,480

should feel less disquieted about

15

00:00:32,310 --> 00:00:30,000

certain facts though perhaps your

16

00:00:35,590 --> 00:00:32,320

disqualitute is justified for where you

17

00:00:38,069 --> 00:00:35,600

are now and that's okay it's 100

18

00:00:39,830 --> 00:00:38,079

okay it took me about one year to

19

00:00:41,990 --> 00:00:39,840

realize that in fact perhaps more than

20

00:00:43,990 --> 00:00:42,000

one year took me over one year to

21

00:00:45,910 --> 00:00:44,000

realize that these spiritual lessons

22

00:00:47,750 --> 00:00:45,920

tend to not have the physics notion of

23

00:00:49,830 --> 00:00:47,760

path dependence perhaps you shouldn't

24

00:00:52,470 --> 00:00:49,840

uncritically adopt an eastern practice

25

00:00:54,310 --> 00:00:52,480

in a western world and vice versa or

26  
00:00:56,069 --> 00:00:54,320  
perhaps certain truths are dependent on

27  
00:00:57,590 --> 00:00:56,079  
the path that is where you are now

28  
00:00:59,510 --> 00:00:57,600  
rather than being independent of

29  
00:01:01,910 --> 00:00:59,520  
anything frankly it's embarrassing to

30  
00:01:04,710 --> 00:01:01,920  
reveal myself as so

31  
00:01:05,910 --> 00:01:04,720  
selfish and malicious and

32  
00:01:08,550 --> 00:01:05,920  
cowardly

33  
00:01:11,109 --> 00:01:08,560  
and to do so so unguardedly to carl

34  
00:01:12,710 --> 00:01:11,119  
fristen and even to you

35  
00:01:18,310 --> 00:01:12,720  
as i'm a

36  
00:01:20,630 --> 00:01:18,320  
at least currently i am but hopefully in

37  
00:01:21,990 --> 00:01:20,640  
the end it's a net benefit the dangers

38  
00:01:24,390 --> 00:01:22,000

of going on to journeys of

39

00:01:26,710 --> 00:01:24,400

investigations into consciousness the

40

00:01:29,350 --> 00:01:26,720

self computational reality and even the

41

00:01:31,830 --> 00:01:29,360

phenomenon as it can lead to a spiral

42

00:01:34,550 --> 00:01:31,840

down some viciously dark paths that are

43

00:01:36,630 --> 00:01:34,560

at least ostensibly irrevocable while

44

00:01:39,030 --> 00:01:36,640

having certainty that your new founded

45

00:01:40,710 --> 00:01:39,040

conception of reality is indeed truthful

46

00:01:43,109 --> 00:01:40,720

while i don't like to state personal

47

00:01:45,270 --> 00:01:43,119

opinions because i generally don't have

48

00:01:47,510 --> 00:01:45,280

many strong views and the views that i

49

00:01:49,510 --> 00:01:47,520

do have are fickle changing week by week

50

00:01:51,830 --> 00:01:49,520

sometimes my current conclusion is that

51

00:01:53,670 --> 00:01:51,840

if it's not life affirming if it's not

52

00:01:55,350 --> 00:01:53,680

loving if it's not something you can

53

00:01:57,910 --> 00:01:55,360

tell others without others being

54

00:01:59,429 --> 00:01:57,920

horrified and frightened for you then

55

00:02:01,030 --> 00:01:59,439

use that as a sign that what you're

56

00:02:03,910 --> 00:02:01,040

experiencing or what you're feeling or

57

00:02:07,030 --> 00:02:03,920

what you think is not truthful please

58

00:02:09,350 --> 00:02:07,040

seek help don't suffer alone you're not

59

00:02:12,070 --> 00:02:09,360

alone and you can verify that simply by

60

00:02:13,750 --> 00:02:12,080

talking to as many people as you can if

61

00:02:15,270 --> 00:02:13,760

you're listening to this podcast then

62

00:02:17,990 --> 00:02:15,280

it's likely because you at least have

63

00:02:20,470 --> 00:02:18,000

some trust in it so trust that statement

64

00:02:22,630 --> 00:02:20,480

or at least test that statement out now

65

00:02:24,949 --> 00:02:22,640

on to the guest carl fristen is a

66

00:02:26,949 --> 00:02:24,959

professor of neuroscience at university

67

00:02:29,350 --> 00:02:26,959

college london and is one of the most

68

00:02:31,350 --> 00:02:29,360

cited individuals in his field he's also

69

00:02:32,790 --> 00:02:31,360

the inventor of the free energy

70

00:02:34,470 --> 00:02:32,800

principle and is someone who's made

71

00:02:36,550 --> 00:02:34,480

advances in the field of active

72

00:02:38,949 --> 00:02:36,560

inference that's matched almost by no

73

00:02:40,869 --> 00:02:38,959

one he may be one of the most insightful

74

00:02:42,390 --> 00:02:40,879

and brilliant people on the planet i've

75

00:02:45,110 --> 00:02:42,400

been lucky enough to speak to carl

76  
00:02:46,949 --> 00:02:45,120  
before in a substantive 4-hour podcast

77  
00:02:49,190 --> 00:02:46,959  
linked below which is best watched at

78  
00:02:51,350 --> 00:02:49,200  
least twice to properly understand this

79  
00:02:52,790 --> 00:02:51,360  
episode is an outlier in the toe channel

80  
00:02:55,030 --> 00:02:52,800  
because this will serve as an

81  
00:02:56,470 --> 00:02:55,040  
introduction to that episode as many

82  
00:02:58,229 --> 00:02:56,480  
after watching that we're still unclear

83  
00:03:00,550 --> 00:02:58,239  
as to what the free energy principle is

84  
00:03:02,710 --> 00:03:00,560  
if you feel like you're lost that's okay

85  
00:03:04,390 --> 00:03:02,720  
let that be a theme understanding is

86  
00:03:06,149 --> 00:03:04,400  
less like a light switch and more like a

87  
00:03:07,589 --> 00:03:06,159  
stove top that is it's not like all of a

88  
00:03:09,110 --> 00:03:07,599

sudden you have an insight and then you

89  
00:03:10,710 --> 00:03:09,120  
understand some phenomenon you went from

90  
00:03:13,030 --> 00:03:10,720  
zero to one it's more like you get a

91  
00:03:15,030 --> 00:03:13,040  
gradual increase in understanding where

92  
00:03:17,350 --> 00:03:15,040  
a modicum here makes more sense and then

93  
00:03:19,350 --> 00:03:17,360  
a smidge in here as wheeler says and i

94  
00:03:21,509 --> 00:03:19,360  
like to quote the point isn't to drink

95  
00:03:23,910 --> 00:03:21,519  
from the fire hose but instead to get

96  
00:03:25,750 --> 00:03:23,920  
wet trusting that your conscious

97  
00:03:28,070 --> 00:03:25,760  
befuddlement is part of the process and

98  
00:03:29,190 --> 00:03:28,080  
unconsciously more is becoming clear

99  
00:03:30,710 --> 00:03:29,200  
click on the timestamp in the

100  
00:03:33,190 --> 00:03:30,720  
description if you'd like to skip this

101

00:03:35,509 --> 00:03:33,200

intro my name is kirchey mungle i'm a

102

00:03:37,990 --> 00:03:35,519

torontonian filmmaker with a background

103

00:03:40,470 --> 00:03:38,000

in mathematical physics dedicated to the

104

00:03:42,229 --> 00:03:40,480

explication of the variegated terrain of

105

00:03:44,149 --> 00:03:42,239

theories of everything from a

106

00:03:46,149 --> 00:03:44,159

theoretical physics perspective but as

107

00:03:47,910 --> 00:03:46,159

well as analyzing consciousness and

108

00:03:50,070 --> 00:03:47,920

seeing its potential connection to

109

00:03:51,990 --> 00:03:50,080

fundamental reality whatever that is

110

00:03:54,550 --> 00:03:52,000

essentially this channel is dedicated to

111

00:03:56,630 --> 00:03:54,560

exploring the under nature of reality

112

00:03:58,229 --> 00:03:56,640

the constitutional laws that govern it

113

00:04:00,550 --> 00:03:58,239

provided those laws exist at all and are

114

00:04:02,470 --> 00:04:00,560

even noble to us if you enjoy witnessing

115

00:04:05,270 --> 00:04:02,480

and engaging with others on the topics

116

00:04:07,509 --> 00:04:05,280

of psychology consciousness physics etc

117

00:04:09,110 --> 00:04:07,519

the channels themes then do consider

118

00:04:11,030 --> 00:04:09,120

going to the discord and the subreddit

119

00:04:12,869 --> 00:04:11,040

which are linked in the description

120

00:04:15,509 --> 00:04:12,879

there's also a link to the patreon that

121

00:04:17,430 --> 00:04:15,519

is patreon.com slash kirchheim uncle if

122

00:04:19,349 --> 00:04:17,440

you'd like to support this podcast as

123

00:04:21,270 --> 00:04:19,359

the patrons and the sponsors are the

124

00:04:23,590 --> 00:04:21,280

only reasons that i'm able to have

125

00:04:25,590 --> 00:04:23,600

podcasts of this quality and this depth

126

00:04:27,030 --> 00:04:25,600

given that i can do this now full time

127

00:04:29,189 --> 00:04:27,040

thanks to both the patrons and the

128

00:04:31,110 --> 00:04:29,199

sponsors support speaking of sponsors

129

00:04:32,870 --> 00:04:31,120

there are two the first sponsor is

130

00:04:34,310 --> 00:04:32,880

brilliant during the winter break i

131

00:04:36,150 --> 00:04:34,320

decided to brush up on some of the

132

00:04:38,310 --> 00:04:36,160

fundamentals of physics particularly

133

00:04:40,230 --> 00:04:38,320

with regard to information theory as i'd

134

00:04:41,909 --> 00:04:40,240

like to interview chiara marletto on

135

00:04:43,510 --> 00:04:41,919

constructor theory which is heavily

136

00:04:45,189 --> 00:04:43,520

based in information theory now

137

00:04:46,550 --> 00:04:45,199

information theory is predicated on

138

00:04:48,950 --> 00:04:46,560

entropy at least there's a fundamental

139

00:04:50,629 --> 00:04:48,960

formula for entropy so i ended up taking

140

00:04:52,710 --> 00:04:50,639

the brilliant course i challenged myself

141

00:04:54,710 --> 00:04:52,720

to do one lesson per day and i took the

142

00:04:55,909 --> 00:04:54,720

course's random variable distributions

143

00:04:58,230 --> 00:04:55,919

and knowledge

144

00:04:59,909 --> 00:04:58,240

uncertainty what i loved is that despite

145

00:05:01,510 --> 00:04:59,919

knowing the formula for entropy which is

146

00:05:03,430 --> 00:05:01,520

essentially hammered into you as an

147

00:05:05,749 --> 00:05:03,440

undergraduate it seems like it comes

148

00:05:07,510 --> 00:05:05,759

down from the sky arbitrarily and with

149

00:05:09,270 --> 00:05:07,520

brilliance for the first time i was able

150

00:05:10,710 --> 00:05:09,280

to see how the formula for entropy which

151

00:05:12,950 --> 00:05:10,720

you're seeing right now is actually

152

00:05:14,710 --> 00:05:12,960

extremely natural and it'd be strange to

153

00:05:16,550 --> 00:05:14,720

define it in any other manner there are

154

00:05:18,150 --> 00:05:16,560

plenty of courses and you can even learn

155

00:05:19,270 --> 00:05:18,160

group theory which is what's being

156

00:05:21,510 --> 00:05:19,280

referenced when you hear that the

157

00:05:23,830 --> 00:05:21,520

standard model is predicated on  $u_1$  cross

158

00:05:25,189 --> 00:05:23,840

$su_2$  cross  $su_3$  those are league groups

159

00:05:26,629 --> 00:05:25,199

continuous lead groups visit

160

00:05:29,350 --> 00:05:26,639

brilliant.org

161

00:05:31,029 --> 00:05:29,360

tow t-o-e to get 20 off an annual

162

00:05:33,189 --> 00:05:31,039

subscription and i recommend that you

163

00:05:34,950 --> 00:05:33,199

don't stop before four lessons i think

164

00:05:36,710 --> 00:05:34,960

you'll be greatly surprised at the ease

165

00:05:38,629 --> 00:05:36,720

at which you can now comprehend subjects

166

00:05:41,350 --> 00:05:38,639

you previously had a difficult time

167

00:05:43,430 --> 00:05:41,360

grokking the second sponsor is algo now

168

00:05:45,430 --> 00:05:43,440

algo is an end-to-end supply chain

169

00:05:47,510 --> 00:05:45,440

optimization software company with

170

00:05:49,510 --> 00:05:47,520

software that helps business users

171

00:05:51,670 --> 00:05:49,520

optimize sales and operations planning

172

00:05:53,590 --> 00:05:51,680

to avoid stockouts reduce return and

173

00:05:55,990 --> 00:05:53,600

inventory write-downs while reducing

174

00:05:59,189 --> 00:05:56,000

inventory investment it's a supply chain

175

00:06:01,270 --> 00:05:59,199

ai that drives smart roi headed by amjad

176  
00:06:03,670 --> 00:06:01,280  
hussein who's been a huge supporter of

177  
00:06:06,710 --> 00:06:03,680  
this podcast since near its inception in

178  
00:06:08,550 --> 00:06:06,720  
fact amjad has his own podcast on ai and

179  
00:06:10,469 --> 00:06:08,560  
consciousness and business growth and if

180  
00:06:12,390 --> 00:06:10,479  
you'd like to support the toe podcast

181  
00:06:14,070 --> 00:06:12,400  
then visit the link in the description

182  
00:06:16,070 --> 00:06:14,080  
to see amjad's podcast because

183  
00:06:18,550 --> 00:06:16,080  
subscribing to him or at least visiting

184  
00:06:20,469 --> 00:06:18,560  
supports the toe podcast indirectly

185  
00:06:22,070 --> 00:06:20,479  
thank you and enjoy let's do an

186  
00:06:23,990 --> 00:06:22,080  
introduction once more so what is the

187  
00:06:25,909 --> 00:06:24,000  
free energy principle specifically

188  
00:06:27,350 --> 00:06:25,919

specifically its relationship to a

189

00:06:29,029 --> 00:06:27,360

theory of everything as that's what this

190

00:06:31,510 --> 00:06:29,039

channel is about

191

00:06:32,390 --> 00:06:31,520

right um

192

00:06:34,150 --> 00:06:32,400

so

193

00:06:36,870 --> 00:06:34,160

my usual response here is do you want

194

00:06:38,070 --> 00:06:36,880

the the high road or the lo or or the

195

00:06:40,950 --> 00:06:38,080

low road

196

00:06:42,469 --> 00:06:40,960

um let's take the high road uh given

197

00:06:44,070 --> 00:06:42,479

that we're talking about theories of

198

00:06:45,110 --> 00:06:44,080

everything um

199

00:06:48,070 --> 00:06:45,120

so

200

00:06:49,749 --> 00:06:48,080

the free energy principle is a principle

201  
00:06:53,029 --> 00:06:49,759  
of least action

202  
00:06:56,390 --> 00:06:53,039  
so it's a method really it's put most

203  
00:06:59,510 --> 00:06:56,400  
simply a method that allows you to

204  
00:07:03,270 --> 00:06:59,520  
identify the most likely dynamics the

205  
00:07:04,629 --> 00:07:03,280  
most likely way a process will unfold

206  
00:07:05,990 --> 00:07:04,639  
what is the process that we're talking

207  
00:07:07,670 --> 00:07:06,000  
about here

208  
00:07:09,909 --> 00:07:07,680  
but we're talking about

209  
00:07:11,589 --> 00:07:09,919  
things like you and me particles or

210  
00:07:13,990 --> 00:07:11,599  
people

211  
00:07:15,430 --> 00:07:14,000  
so the first thing to note is that you

212  
00:07:16,710 --> 00:07:15,440  
can

213  
00:07:18,629 --> 00:07:16,720

apply

214

00:07:20,790 --> 00:07:18,639

standard variational principles of least

215

00:07:22,790 --> 00:07:20,800

action to any system specifically a

216

00:07:25,110 --> 00:07:22,800

random dynamical system of the kind that

217

00:07:26,629 --> 00:07:25,120

could be described by say a launchvan

218

00:07:27,990 --> 00:07:26,639

equation that underwrites most of the

219

00:07:30,150 --> 00:07:28,000

physics we know

220

00:07:31,589 --> 00:07:30,160

but the special thing about the free

221

00:07:33,510 --> 00:07:31,599

energy principle

222

00:07:36,390 --> 00:07:33,520

is it tries to understand the

223

00:07:39,430 --> 00:07:36,400

relationship of something

224

00:07:41,909 --> 00:07:39,440

in relation to everything else

225

00:07:43,350 --> 00:07:41,919

so you're starting from the premise that

226  
00:07:44,550 --> 00:07:43,360  
something exists and then you have to

227  
00:07:46,469 --> 00:07:44,560  
think carefully

228  
00:07:48,950 --> 00:07:46,479  
your what is a thing and how do i

229  
00:07:50,309 --> 00:07:48,960  
distinguish it from something else so

230  
00:07:52,230 --> 00:07:50,319  
immediately you start you have to

231  
00:07:55,749 --> 00:07:52,240  
introduce a partition

232  
00:07:58,070 --> 00:07:55,759  
between the states of things

233  
00:08:00,790 --> 00:07:58,080  
that comprise states that are internal

234  
00:08:02,550 --> 00:08:00,800  
to the thing and states that are outside

235  
00:08:03,589 --> 00:08:02,560  
the thing and

236  
00:08:05,990 --> 00:08:03,599  
thereby

237  
00:08:07,990 --> 00:08:06,000  
in think carefully about how those

238  
00:08:10,309 --> 00:08:08,000

states are coupled and what happens is

239

00:08:13,029 --> 00:08:10,319

that you have to introduce a further set

240

00:08:16,230 --> 00:08:13,039

of states known as blanket states

241

00:08:18,550 --> 00:08:16,240

that constitute a markov blanket that

242

00:08:20,309 --> 00:08:18,560

mediate a bi-directional exchange

243

00:08:23,270 --> 00:08:20,319

between the internal states and the

244

00:08:26,390 --> 00:08:23,280

external states so you've got this

245

00:08:27,510 --> 00:08:26,400

notion now of taking the states of any

246

00:08:29,270 --> 00:08:27,520

universe

247

00:08:30,469 --> 00:08:29,280

any system that you want to try and

248

00:08:33,029 --> 00:08:30,479

understand

249

00:08:36,469 --> 00:08:33,039

and partitioning it or carving it into

250

00:08:38,230 --> 00:08:36,479

four subsets internal external and then

251  
00:08:40,630 --> 00:08:38,240  
sensory active states that constitute

252  
00:08:42,230 --> 00:08:40,640  
the blanket states where the active

253  
00:08:44,790 --> 00:08:42,240  
states mediate the effects of the

254  
00:08:46,150 --> 00:08:44,800  
internal on the external on the inside

255  
00:08:48,310 --> 00:08:46,160  
on the outside

256  
00:08:51,509 --> 00:08:48,320  
and the sensory states conversely

257  
00:08:53,190 --> 00:08:51,519  
mediate the influences of the external

258  
00:08:55,829 --> 00:08:53,200  
on the internal

259  
00:08:57,590 --> 00:08:55,839  
so with this particular partition which

260  
00:08:59,670 --> 00:08:57,600  
you wouldn't need if you wanted to now

261  
00:09:00,870 --> 00:08:59,680  
just move on and develop

262  
00:09:05,190 --> 00:09:00,880  
um

263  
00:09:08,710 --> 00:09:05,200

mechanics or lagrangian classical

264

00:09:10,470 --> 00:09:08,720

mechanics we're now in the special case

265

00:09:14,310 --> 00:09:10,480

of dealing with a system that has this

266

00:09:16,470 --> 00:09:14,320

partition and in this special case

267

00:09:19,269 --> 00:09:16,480

those conventional variational

268

00:09:24,230 --> 00:09:19,279

principles of least action

269

00:09:26,389 --> 00:09:24,240

translate into or can be used to

270

00:09:28,870 --> 00:09:26,399

associate the paths of least action the

271

00:09:31,829 --> 00:09:28,880

most likely paths that the system will

272

00:09:33,509 --> 00:09:31,839

take particularly the states of the

273

00:09:35,509 --> 00:09:33,519

particle or person that we're talking

274

00:09:37,269 --> 00:09:35,519

about

275

00:09:40,710 --> 00:09:37,279

that we can associate those paths at

276

00:09:43,590 --> 00:09:40,720

least action with paths that minimize

277

00:09:45,269 --> 00:09:43,600

something called variational free energy

278

00:09:47,269 --> 00:09:45,279

so that's basically it and then the

279

00:09:50,550 --> 00:09:47,279

story as well what's what's variation

280

00:09:54,470 --> 00:09:50,560

free energy well variational free energy

281

00:09:58,150 --> 00:09:54,480

uh is as with all actions in physics

282

00:09:59,190 --> 00:09:58,160

it's just a um a path integral or a time

283

00:10:03,829 --> 00:09:59,200

integral

284

00:10:06,470 --> 00:10:03,839

uh a sum an accumulation of a functional

285

00:10:09,670 --> 00:10:06,480

usually known as a lagrangian

286

00:10:11,829 --> 00:10:09,680

where in this instance the func the

287

00:10:13,829 --> 00:10:11,839

functional in question this variational

288

00:10:16,310 --> 00:10:13,839

free energy

289

00:10:20,710 --> 00:10:16,320

can be read as exactly the same quantity

290

00:10:25,030 --> 00:10:22,230

psychologists

291

00:10:27,269 --> 00:10:25,040

people trying to understand data

292

00:10:29,190 --> 00:10:27,279

would treat as

293

00:10:31,990 --> 00:10:29,200

a proxy for

294

00:10:33,590 --> 00:10:32,000

the evidence for some model of the world

295

00:10:35,430 --> 00:10:33,600

so this is known as bayesian model

296

00:10:37,750 --> 00:10:35,440

evidence

297

00:10:40,630 --> 00:10:37,760

statistically it's also known as a

298

00:10:41,509 --> 00:10:40,640

marginal likelihood the likelihood of

299

00:10:43,910 --> 00:10:41,519

these

300

00:10:46,710 --> 00:10:43,920

sensory data the sensory the path

301  
00:10:48,389 --> 00:10:46,720  
through the sensory states under a

302  
00:10:50,550 --> 00:10:48,399  
particular model

303  
00:10:54,150 --> 00:10:50,560  
that would try to explain

304  
00:10:55,110 --> 00:10:54,160  
those data

305  
00:10:57,910 --> 00:10:55,120  
so

306  
00:11:00,470 --> 00:10:57,920  
you've got this interpretation or

307  
00:11:01,430 --> 00:11:00,480  
certainly the fact that the functional

308  
00:11:03,750 --> 00:11:01,440  
form

309  
00:11:05,590 --> 00:11:03,760  
of this variation free energy that is

310  
00:11:07,910 --> 00:11:05,600  
being minimized by the paths of least

311  
00:11:09,910 --> 00:11:07,920  
action of the autonomous the active and

312  
00:11:11,750 --> 00:11:09,920  
the internal states of something a

313  
00:11:14,710 --> 00:11:11,760

particle or a person

314

00:11:17,190 --> 00:11:14,720

now looks as if it is trying to minimize

315

00:11:19,670 --> 00:11:17,200

a quantity which provides an

316

00:11:21,190 --> 00:11:19,680

approximation or a negative

317

00:11:22,150 --> 00:11:21,200

approximation

318

00:11:24,630 --> 00:11:22,160

to

319

00:11:26,630 --> 00:11:24,640

marginal likelihood or moral evidencing

320

00:11:29,670 --> 00:11:26,640

so in other words it looks as if the

321

00:11:31,430 --> 00:11:29,680

most likely paths are trying to maximize

322

00:11:32,630 --> 00:11:31,440

model evidence

323

00:11:34,470 --> 00:11:32,640

so

324

00:11:36,150 --> 00:11:34,480

one can read that in many different ways

325

00:11:37,190 --> 00:11:36,160

one can read that

326

00:11:40,150 --> 00:11:37,200

and

327

00:11:43,829 --> 00:11:40,160

as jakob howie has read it

328

00:11:46,310 --> 00:11:43,839

a philosopher you're a scientist who

329

00:11:48,069 --> 00:11:46,320

has a commitment and understanding to

330

00:11:51,030 --> 00:11:48,079

this kind of formulation

331

00:11:52,949 --> 00:11:51,040

as self evidencing literally

332

00:11:54,230 --> 00:11:52,959

interacting with your

333

00:11:56,870 --> 00:11:54,240

environment

334

00:11:59,509 --> 00:11:56,880

actively inferring engaging with your

335

00:12:01,590 --> 00:11:59,519

experienced world your eco niche

336

00:12:03,190 --> 00:12:01,600

in a way that looks as if you're trying

337

00:12:05,030 --> 00:12:03,200

to solicit

338

00:12:07,670 --> 00:12:05,040

the most evidence

339

00:12:09,910 --> 00:12:07,680

for your model of that world

340

00:12:11,910 --> 00:12:09,920

this quantity is also found in machine

341

00:12:15,269 --> 00:12:11,920

learning it's known as an evidence lower

342

00:12:17,990 --> 00:12:15,279

bound i should um qualify or just

343

00:12:20,710 --> 00:12:18,000

clarify that in machine learning this

344

00:12:22,790 --> 00:12:20,720

free energy is the reverse of the free

345

00:12:24,870 --> 00:12:22,800

energy used in physics so in machine

346

00:12:28,389 --> 00:12:24,880

learning they try to maximize the

347

00:12:31,509 --> 00:12:28,399

negative free energy um aka an evidence

348

00:12:33,509 --> 00:12:31,519

lower bound or elbow um while in physics

349

00:12:35,430 --> 00:12:33,519

you're you're always articulating in

350

00:12:37,829 --> 00:12:35,440

terms of minimizing a potential energy

351

00:12:39,670 --> 00:12:37,839

or minimizing in this instance of

352

00:12:42,470 --> 00:12:39,680

variation free energy

353

00:12:44,470 --> 00:12:42,480

so you'll find that exactly

354

00:12:46,230 --> 00:12:44,480

the same functional the same quantity

355

00:12:47,269 --> 00:12:46,240

the same measure

356

00:12:55,590 --> 00:12:47,279

of

357

00:13:00,629 --> 00:12:55,600

sensorium was generated

358

00:13:02,470 --> 00:13:00,639

um in terms of um the the this um

359

00:13:06,629 --> 00:13:02,480

variational free energy

360

00:13:09,269 --> 00:13:06,639

that leads you to an interpretation of

361

00:13:10,710 --> 00:13:09,279

people particle persons

362

00:13:13,190 --> 00:13:10,720

inferring

363

00:13:14,949 --> 00:13:13,200

accumulating evidence making inferences

364

00:13:18,150 --> 00:13:14,959

about the states of the world that are

365

00:13:20,870 --> 00:13:18,160

generating their sensations so that in a

366

00:13:24,310 --> 00:13:20,880

nutshell or perhaps not on our channel

367

00:13:26,710 --> 00:13:24,320

is is a formal explanation of the free

368

00:13:27,670 --> 00:13:26,720

energy principle i did so slipping in

369

00:13:29,990 --> 00:13:27,680

the beginning

370

00:13:31,750 --> 00:13:30,000

very much like um

371

00:13:34,310 --> 00:13:31,760

things which you you know you may be

372

00:13:36,389 --> 00:13:34,320

familiar with when you were at school

373

00:13:37,670 --> 00:13:36,399

say hamilton's principle of station

374

00:13:39,110 --> 00:13:37,680

reaction

375

00:13:41,350 --> 00:13:39,120

um

376

00:13:44,949 --> 00:13:41,360

it is

377

00:13:47,670 --> 00:13:44,959

just a method you know it allows you

378

00:13:49,750 --> 00:13:47,680

to identify predict

379

00:13:52,870 --> 00:13:49,760

simulate engineer

380

00:13:54,310 --> 00:13:52,880

those trajectories as paths as dynamics

381

00:13:58,069 --> 00:13:54,320

those processes

382

00:13:58,870 --> 00:13:58,079

um that will um minimize

383

00:14:05,030 --> 00:13:58,880

the

384

00:14:07,269 --> 00:14:05,040

so what that means is that

385

00:14:09,030 --> 00:14:07,279

if you now understand

386

00:14:11,829 --> 00:14:09,040

or have at hand

387

00:14:12,949 --> 00:14:11,839

the functional form of your variation

388

00:14:15,670 --> 00:14:12,959

free energy

389

00:14:18,389 --> 00:14:15,680

that depends upon

390

00:14:19,990 --> 00:14:18,399

posterior beliefs or beliefs about the

391

00:14:22,150 --> 00:14:20,000

outside world

392

00:14:24,790 --> 00:14:22,160

under a generative model quite simply a

393

00:14:27,990 --> 00:14:24,800

probability density over

394

00:14:31,430 --> 00:14:28,000

the external causes of the

395

00:14:34,389 --> 00:14:31,440

consequences that are the sensory states

396

00:14:37,269 --> 00:14:34,399

and then you can use that methodology

397

00:14:41,430 --> 00:14:37,279

use that principle to start to simulate

398

00:14:44,550 --> 00:14:41,440

to build sentient artifacts that behave

399

00:14:47,189 --> 00:14:44,560

in the way that we assume under the free

400

00:14:48,629 --> 00:14:47,199

energy principle that you and i are

401  
00:14:50,629 --> 00:14:48,639  
behaving let's see if i can make a

402  
00:14:52,629 --> 00:14:50,639  
nutshell of the nutshell for some people

403  
00:14:54,230 --> 00:14:52,639  
who are more familiar with physics so

404  
00:14:55,750 --> 00:14:54,240  
let's say you have a ball you want to

405  
00:14:57,509 --> 00:14:55,760  
know the dynamics of the ball you can

406  
00:14:59,030 --> 00:14:57,519  
understand this with newtonian force and

407  
00:15:00,790 --> 00:14:59,040  
that's useful for certain calculations

408  
00:15:02,150 --> 00:15:00,800  
or you can think of it as minimizing a

409  
00:15:05,189 --> 00:15:02,160  
lagrangian and then that actually

410  
00:15:06,870 --> 00:15:05,199  
provides a more useful for most cases

411  
00:15:08,389 --> 00:15:06,880  
way of calculating the trajectory of the

412  
00:15:09,829 --> 00:15:08,399  
ball so then

413  
00:15:12,230 --> 00:15:09,839

right there when i said ball we've

414

00:15:13,990 --> 00:15:12,240

identified the ball now here you're not

415

00:15:15,350 --> 00:15:14,000

just limiting yourself to balls you're

416

00:15:16,710 --> 00:15:15,360

saying let's say cells instead of

417

00:15:18,550 --> 00:15:16,720

talking about people because we can

418

00:15:20,150 --> 00:15:18,560

break it down simply at least for me for

419

00:15:21,990 --> 00:15:20,160

myself i find it much more easy to think

420

00:15:23,590 --> 00:15:22,000

of a cell okay so then we want to know

421

00:15:26,550 --> 00:15:23,600

what are the dynamics of the cell how is

422

00:15:28,870 --> 00:15:26,560

the cell a single cell going to act

423

00:15:30,790 --> 00:15:28,880

okay firstly the first step would be

424

00:15:31,509 --> 00:15:30,800

identifying that cell

425

00:15:33,829 --> 00:15:31,519

and

426

00:15:35,829 --> 00:15:33,839

when you mention the word markov blanket

427

00:15:37,829 --> 00:15:35,839

that's a way of identifying what this

428

00:15:39,829 --> 00:15:37,839

object is because in order to identify

429

00:15:41,509 --> 00:15:39,839

what an object is it's often useful to

430

00:15:43,269 --> 00:15:41,519

identify what it isn't at the same time

431

00:15:45,750 --> 00:15:43,279

what it is and isn't so that markov

432

00:15:48,550 --> 00:15:45,760

blanket delimits the cell now is that

433

00:15:49,829 --> 00:15:48,560

correct so far absolutely yeah so you

434

00:15:52,230 --> 00:15:49,839

know i think the cell is a perfect

435

00:15:55,749 --> 00:15:52,240

example here you've got you know

436

00:15:57,670 --> 00:15:55,759

a cell is just defined by the boundary

437

00:15:58,949 --> 00:15:57,680

which would be the surface of the cell

438

00:16:00,710 --> 00:15:58,959

and that would essentially be the

439

00:16:01,670 --> 00:16:00,720

sensory states that i was talking about

440

00:16:04,389 --> 00:16:01,680

before

441

00:16:06,230 --> 00:16:04,399

the insides the intracellular states

442

00:16:08,629 --> 00:16:06,240

would be the internal states and then

443

00:16:10,550 --> 00:16:08,639

the milieu in which that cell lives

444

00:16:13,030 --> 00:16:10,560

which is usually in

445

00:16:15,749 --> 00:16:13,040

a bunch or a family of other cells uh

446

00:16:16,629 --> 00:16:15,759

will constitute all the external states

447

00:16:18,150 --> 00:16:16,639

so

448

00:16:20,470 --> 00:16:18,160

you've made the very first step just

449

00:16:22,550 --> 00:16:20,480

talking about a cell a thing

450

00:16:26,550 --> 00:16:22,560

you've defined it in terms of this

451  
00:16:29,749 --> 00:16:26,560  
partition into internal external and the

452  
00:16:31,990 --> 00:16:29,759  
uh the sensory states that bound and

453  
00:16:33,509 --> 00:16:32,000  
separate the inside from the outside you

454  
00:16:36,150 --> 00:16:33,519  
may be asking well where the active

455  
00:16:38,069 --> 00:16:36,160  
states come first cell i usually like to

456  
00:16:40,230 --> 00:16:38,079  
associate those with something called

457  
00:16:43,269 --> 00:16:40,240  
actin filaments that just lie underneath

458  
00:16:46,310 --> 00:16:43,279  
the surface the sensory states and

459  
00:16:48,470 --> 00:16:46,320  
actively push the cell surface say oh

460  
00:16:51,350 --> 00:16:48,480  
the philia and

461  
00:16:54,870 --> 00:16:51,360  
the um

462  
00:16:57,749 --> 00:16:54,880  
the the mechanisms that cause motion of

463  
00:16:58,470 --> 00:16:57,759

the cell should it move around

464

00:17:00,230 --> 00:16:58,480

so

465

00:17:02,150 --> 00:17:00,240

those parts those states that are

466

00:17:03,990 --> 00:17:02,160

responsible for cellular motility so if

467

00:17:06,230 --> 00:17:04,000

we're now thinking about a moving cell

468

00:17:07,669 --> 00:17:06,240

or a swimming cell for example

469

00:17:09,750 --> 00:17:07,679

then you need to supplement that

470

00:17:12,309 --> 00:17:09,760

partition with with active states so

471

00:17:14,549 --> 00:17:12,319

that's absolutely the first step um and

472

00:17:17,189 --> 00:17:14,559

then you're going to go on and now

473

00:17:19,429 --> 00:17:17,199

translate the ball what's the ball in

474

00:17:20,630 --> 00:17:19,439

this in this metaphor

475

00:17:22,870 --> 00:17:20,640

you also mentioned the word

476

00:17:24,870 --> 00:17:22,880

bi-directional earlier and when i was

477

00:17:26,949 --> 00:17:24,880

learning about this the way that i like

478

00:17:28,549 --> 00:17:26,959

to understand this was that in computer

479

00:17:30,710 --> 00:17:28,559

science generally computer scientists

480

00:17:32,070 --> 00:17:30,720

think and can only think in terms of you

481

00:17:33,270 --> 00:17:32,080

have an input then there's a black box

482

00:17:34,630 --> 00:17:33,280

and you have an output and that's

483

00:17:36,150 --> 00:17:34,640

essentially computer science in a

484

00:17:37,430 --> 00:17:36,160

nutshell it's a bit more complicated

485

00:17:38,710 --> 00:17:37,440

than that but it's in a nutshell it's do

486

00:17:40,630 --> 00:17:38,720

you have an input you perform some

487

00:17:43,029 --> 00:17:40,640

calculation and you get an output the

488

00:17:45,110 --> 00:17:43,039

reason why you said bi-directional at

489

00:17:47,510 --> 00:17:45,120

least the way that i understand it so

490

00:17:49,350 --> 00:17:47,520

please correct this is it's because of

491

00:17:52,070 --> 00:17:49,360

actions in that model where there's

492

00:17:53,430 --> 00:17:52,080

input black box output that's generally

493

00:17:55,430 --> 00:17:53,440

if we want to use the term embody

494

00:17:57,669 --> 00:17:55,440

cognition more on the cognition side so

495

00:17:59,590 --> 00:17:57,679

you're just this black box where you're

496

00:18:01,430 --> 00:17:59,600

impressed with sensory information the

497

00:18:03,270 --> 00:18:01,440

input is your senses you're sensing all

498

00:18:04,630 --> 00:18:03,280

of what's happening and then this output

499

00:18:06,950 --> 00:18:04,640

now

500

00:18:09,029 --> 00:18:06,960

is the actions that generally a computer

501  
00:18:10,390 --> 00:18:09,039  
sits there but we're creatures in this

502  
00:18:12,150 --> 00:18:10,400  
world at least we think we're creatures

503  
00:18:15,590 --> 00:18:12,160  
in a physical world the black box has a

504  
00:18:17,990 --> 00:18:15,600  
model and then one way of maximizing or

505  
00:18:20,549 --> 00:18:18,000  
showing that your model is correct is by

506  
00:18:22,549 --> 00:18:20,559  
updating your model or it's by changing

507  
00:18:24,390 --> 00:18:22,559  
what you've sensed in order to match the

508  
00:18:27,029 --> 00:18:24,400  
model now to change what you've sensed

509  
00:18:28,950 --> 00:18:27,039  
is to act so it's useful to think of two

510  
00:18:30,549 --> 00:18:28,960  
black boxes so there's one that's

511  
00:18:31,909 --> 00:18:30,559  
inputting to the other and then the

512  
00:18:33,590 --> 00:18:31,919  
output goes into the other which is

513  
00:18:35,990 --> 00:18:33,600

external this is the internal this is

514

00:18:37,510 --> 00:18:36,000

the cell it senses and then it acts upon

515

00:18:39,190 --> 00:18:37,520

the world and then that changes the

516

00:18:40,830 --> 00:18:39,200

world which then changes what you sent

517

00:18:43,270 --> 00:18:40,840

so is that the reason that you said

518

00:18:45,750 --> 00:18:43,280

bi-directional yeah no no i think that's

519

00:18:48,950 --> 00:18:45,760

a really important observation yeah

520

00:18:51,270 --> 00:18:48,960

so you know before we were talking about

521

00:18:53,510 --> 00:18:51,280

these states that separate the inside

522

00:18:55,510 --> 00:18:53,520

from the outside and i made a big thing

523

00:18:57,430 --> 00:18:55,520

that they comprise sensory and active

524

00:19:00,070 --> 00:18:57,440

states and that there is a

525

00:19:02,470 --> 00:19:00,080

a two-way traffic here and that two-way

526  
00:19:03,830 --> 00:19:02,480  
traffic instantiates exactly what you're

527  
00:19:05,190 --> 00:19:03,840  
talking about which is a circular

528  
00:19:06,990 --> 00:19:05,200  
causality

529  
00:19:11,669 --> 00:19:07,000  
so you know i use the word

530  
00:19:13,430 --> 00:19:11,679  
self-evidencing and described it as

531  
00:19:14,230 --> 00:19:13,440  
soliciting evidence

532  
00:19:15,909 --> 00:19:14,240  
for

533  
00:19:18,310 --> 00:19:15,919  
sensory data

534  
00:19:20,789 --> 00:19:18,320  
that it provides evidence for your model

535  
00:19:23,110 --> 00:19:20,799  
of what's going on but in soliciting

536  
00:19:24,390 --> 00:19:23,120  
this is something that a computer would

537  
00:19:26,789 --> 00:19:24,400  
not normally do

538  
00:19:29,510 --> 00:19:26,799

a passive or a sessile artifact like a

539

00:19:32,070 --> 00:19:29,520

computer it would not be in charge of

540

00:19:35,190 --> 00:19:32,080

nor would it terribly worry or indeed be

541

00:19:37,350 --> 00:19:35,200

equipped with the capacity to select the

542

00:19:38,390 --> 00:19:37,360

inputs to select the data say had to

543

00:19:40,870 --> 00:19:38,400

analyze

544

00:19:43,350 --> 00:19:40,880

so just having a statistical package you

545

00:19:45,590 --> 00:19:43,360

give it some data and it produces an

546

00:19:47,430 --> 00:19:45,600

outcome say a p value or some kind of

547

00:19:50,070 --> 00:19:47,440

inference um

548

00:19:52,390 --> 00:19:50,080

so a lot of computing and a lot of

549

00:19:53,830 --> 00:19:52,400

machine learning you give it data and it

550

00:19:55,350 --> 00:19:53,840

provides a prediction or a

551

00:19:57,590 --> 00:19:55,360

classification

552

00:19:59,270 --> 00:19:57,600

that's not the kind of computational

553

00:20:01,830 --> 00:19:59,280

process that is implied by the free

554

00:20:05,710 --> 00:20:01,840

energy principle it's much more as you

555

00:20:08,710 --> 00:20:05,720

put it um inactive it has you know the

556

00:20:11,110 --> 00:20:08,720

aspirations to provide a mathematical

557

00:20:12,630 --> 00:20:11,120

image of the action perception cycle

558

00:20:16,950 --> 00:20:12,640

where crucially

559

00:20:21,350 --> 00:20:16,960

you have to go and decide what data

560

00:20:23,590 --> 00:20:21,360

to base your inferences on by

561

00:20:24,390 --> 00:20:23,600

acting upon the world

562

00:20:29,909 --> 00:20:24,400

so

563

00:20:31,830 --> 00:20:29,919

the thing that distinguishes this kind

564

00:20:33,750 --> 00:20:31,840

of formalism this calculus is bayesian

565

00:20:36,789 --> 00:20:33,760

calculus which is quintessentially

566

00:20:39,669 --> 00:20:36,799

inactive you know it's not just a

567

00:20:41,430 --> 00:20:39,679

um you know a good computer it can be

568

00:20:45,270 --> 00:20:41,440

made a good computer just by removing

569

00:20:47,350 --> 00:20:45,280

active states if you want to um but that

570

00:20:49,909 --> 00:20:47,360

you know that would be a limiting and a

571

00:20:51,909 --> 00:20:49,919

a rather um

572

00:20:55,750 --> 00:20:51,919

biophysically unrealizable and

573

00:20:58,950 --> 00:20:55,760

unsustainable kind of artifact

574

00:21:01,669 --> 00:20:58,960

the whole point here is that there is a

575

00:21:03,510 --> 00:21:01,679

reciprocal exchange with the world so

576  
00:21:04,870 --> 00:21:03,520  
your notion of having two black boxes

577  
00:21:07,029 --> 00:21:04,880  
talking to each other i think is a

578  
00:21:08,230 --> 00:21:07,039  
really nice notion um

579  
00:21:09,909 --> 00:21:08,240  
and indeed

580  
00:21:11,350 --> 00:21:09,919  
when

581  
00:21:13,029 --> 00:21:11,360  
applying

582  
00:21:14,470 --> 00:21:13,039  
this principle of least action the free

583  
00:21:18,950 --> 00:21:14,480  
energy principle

584  
00:21:21,830 --> 00:21:18,960  
to interesting scenarios um one ends up

585  
00:21:25,350 --> 00:21:21,840  
very often um putting two

586  
00:21:27,669 --> 00:21:25,360  
um sets of uh internal states each

587  
00:21:29,990 --> 00:21:27,679  
equipped with markov blankets talking to

588  
00:21:33,430 --> 00:21:30,000

each other so the active states of one

589

00:21:35,990 --> 00:21:33,440

blanket or one particle or one person

590

00:21:39,190 --> 00:21:36,000

now constitute the sensory states of the

591

00:21:41,830 --> 00:21:39,200

other and vice versa so you've got now

592

00:21:46,230 --> 00:21:41,840

two systems trying to model each other

593

00:21:47,430 --> 00:21:46,240

and if their game is to effectively um

594

00:21:50,950 --> 00:21:47,440

provide

595

00:21:53,430 --> 00:21:50,960

or solicit the most evidence

596

00:21:55,350 --> 00:21:53,440

for their model of the rest of the world

597

00:21:57,669 --> 00:21:55,360

which is just another

598

00:21:59,669 --> 00:21:57,679

artifact very much like you who's doing

599

00:22:01,830 --> 00:21:59,679

trying to do exactly the same thing

600

00:22:03,029 --> 00:22:01,840

what you are you what will inevitably

601  
00:22:05,750 --> 00:22:03,039  
emerge

602  
00:22:08,870 --> 00:22:05,760  
from that joint minimization of free

603  
00:22:11,510 --> 00:22:08,880  
energy or the maximization of marginal

604  
00:22:14,630 --> 00:22:11,520  
likelihood is the kind of active

605  
00:22:16,950 --> 00:22:14,640  
engagement that renders say you and me

606  
00:22:19,350 --> 00:22:16,960  
as the two black boxes renders us

607  
00:22:21,270 --> 00:22:19,360  
mutually predictable so what we will do

608  
00:22:23,990 --> 00:22:21,280  
is we will come to share the same

609  
00:22:25,909 --> 00:22:24,000  
generative model the same narrative so

610  
00:22:27,430 --> 00:22:25,919  
that i can predict exactly what you're

611  
00:22:29,350 --> 00:22:27,440  
going to say next

612  
00:22:31,270 --> 00:22:29,360  
given that's the kind of thing that i

613  
00:22:33,029 --> 00:22:31,280

would say because that's the sort of

614

00:22:35,590 --> 00:22:33,039

world that i'm trying to model

615

00:22:36,870 --> 00:22:35,600

so immediately you have this

616

00:22:37,669 --> 00:22:36,880

picture

617

00:22:44,950 --> 00:22:37,679

of

618

00:22:47,430 --> 00:22:44,960

variational free energy or the um

619

00:22:50,390 --> 00:22:47,440

the maximization of the joint marginal

620

00:22:52,830 --> 00:22:50,400

likelihood for shared models and one

621

00:22:55,110 --> 00:22:52,840

gets from that sort of quite compelling

622

00:22:57,430 --> 00:22:55,120

interesting um

623

00:22:59,029 --> 00:22:57,440

formulations of multi-agent games

624

00:23:03,190 --> 00:22:59,039

communication

625

00:23:05,590 --> 00:23:03,200

synchronization between uh con specifics

626

00:23:08,230 --> 00:23:05,600

that all rest upon

627

00:23:10,710 --> 00:23:08,240

trying to resolve uncertainty

628

00:23:13,190 --> 00:23:10,720

in the service of securing actively

629

00:23:15,270 --> 00:23:13,200

eliciting asking questions of the other

630

00:23:17,430 --> 00:23:15,280

black box you asking me questions me

631

00:23:19,590 --> 00:23:17,440

asking you questions

632

00:23:21,510 --> 00:23:19,600

just so i can understand what's going on

633

00:23:23,669 --> 00:23:21,520

out there where you are going on out

634

00:23:25,830 --> 00:23:23,679

there

635

00:23:28,230 --> 00:23:25,840

can any system let's say it's more than

636

00:23:29,510 --> 00:23:28,240

two so in the example that i gave and

637

00:23:31,270 --> 00:23:29,520

that we were talking about there's one

638

00:23:33,029 --> 00:23:31,280

cell and then the external world but

639

00:23:34,549 --> 00:23:33,039

obviously the world is much more complex

640

00:23:35,830 --> 00:23:34,559

than that and let's just imagine

641

00:23:38,149 --> 00:23:35,840

slightly more complicated there's two

642

00:23:40,230 --> 00:23:38,159

cells and then an external world

643

00:23:42,390 --> 00:23:40,240

is it always the case that

644

00:23:43,750 --> 00:23:42,400

from the perspective of one cell you may

645

00:23:45,270 --> 00:23:43,760

as well just

646

00:23:47,430 --> 00:23:45,280

treat the external world even though it

647

00:23:49,590 --> 00:23:47,440

comprises an external world plus another

648

00:23:52,230 --> 00:23:49,600

cell out there can you always treat that

649

00:23:54,310 --> 00:23:52,240

as its own singular black box such that

650

00:23:56,070 --> 00:23:54,320

we can always understand the dynamics as

651  
00:23:58,070 --> 00:23:56,080  
two black boxes or is there ever a need

652  
00:24:00,230 --> 00:23:58,080  
for a third a fourth a fifth

653  
00:24:02,870 --> 00:24:00,240  
i i think i think there probably would

654  
00:24:05,110 --> 00:24:02,880  
be a need to go if out there if the

655  
00:24:07,110 --> 00:24:05,120  
external states

656  
00:24:10,549 --> 00:24:07,120  
are themselves

657  
00:24:12,710 --> 00:24:10,559  
um partitioned into things so if my if

658  
00:24:13,990 --> 00:24:12,720  
my universe

659  
00:24:17,269 --> 00:24:14,000  
is

660  
00:24:21,110 --> 00:24:17,279  
composed of external states that can

661  
00:24:24,470 --> 00:24:21,120  
themselves be carved into natural kinds

662  
00:24:27,029 --> 00:24:24,480  
like other artifacts and objects and air

663  
00:24:29,590 --> 00:24:27,039

planets liquids

664

00:24:31,990 --> 00:24:29,600

natural kinds as soon as you talk about

665

00:24:33,909 --> 00:24:32,000

a natural kind you're talking about a

666

00:24:35,510 --> 00:24:33,919

kind of thing as soon as there is a

667

00:24:37,750 --> 00:24:35,520

thing that's in play there's a mark of

668

00:24:39,830 --> 00:24:37,760

blankets so what that tells you is in

669

00:24:42,070 --> 00:24:39,840

principle it was possible to take

670

00:24:43,430 --> 00:24:42,080

all the states that constitute say an

671

00:24:44,789 --> 00:24:43,440

eco niche

672

00:24:46,390 --> 00:24:44,799

and this

673

00:24:49,269 --> 00:24:46,400

find identify

674

00:24:51,510 --> 00:24:49,279

the thing of interest say say me

675

00:24:52,230 --> 00:24:51,520

and my internal states and so and then i

676  
00:24:53,990 --> 00:24:52,240  
would

677  
00:24:55,830 --> 00:24:54,000  
identify my blanket states and then i

678  
00:24:57,909 --> 00:24:55,840  
got the rest of the states but now i can

679  
00:25:00,549 --> 00:24:57,919  
start again i can find another set of

680  
00:25:02,390 --> 00:25:00,559  
internal states and identify its blanket

681  
00:25:04,710 --> 00:25:02,400  
states and then take those states off

682  
00:25:08,230 --> 00:25:04,720  
the table and then start again and

683  
00:25:11,750 --> 00:25:08,240  
recursively tile all the external states

684  
00:25:14,149 --> 00:25:11,760  
so that now i've eliminated effectively

685  
00:25:16,230 --> 00:25:14,159  
external states and replaced them by the

686  
00:25:17,510 --> 00:25:16,240  
internal and the blanket states of all

687  
00:25:19,350 --> 00:25:17,520  
other things

688  
00:25:21,990 --> 00:25:19,360

and in on that view

689

00:25:23,029 --> 00:25:22,000

what happens is that because

690

00:25:24,310 --> 00:25:23,039

there's a

691

00:25:25,830 --> 00:25:24,320

um

692

00:25:29,510 --> 00:25:25,840

a statistical

693

00:25:31,350 --> 00:25:29,520

insulation or separation of internal and

694

00:25:33,269 --> 00:25:31,360

external states by the blanket states

695

00:25:35,269 --> 00:25:33,279

that means i can never see your internal

696

00:25:36,870 --> 00:25:35,279

states i don't need to know your

697

00:25:39,110 --> 00:25:36,880

internal states

698

00:25:41,510 --> 00:25:39,120

because everything that is

699

00:25:43,830 --> 00:25:41,520

knowable about your internal states is

700

00:25:46,149 --> 00:25:43,840

on the surface on your blanket states

701  
00:25:50,149 --> 00:25:46,159  
what so now the picture that emerges is

702  
00:25:50,950 --> 00:25:50,159  
an ensemble of things natural kinds

703  
00:25:53,909 --> 00:25:50,960  
um

704  
00:25:56,630 --> 00:25:53,919  
that are coupled to each other

705  
00:26:00,230 --> 00:25:56,640  
via their blanket states

706  
00:26:01,269 --> 00:26:00,240  
no no no individual particle or person

707  
00:26:02,149 --> 00:26:01,279  
or thing

708  
00:26:04,789 --> 00:26:02,159  
um

709  
00:26:06,710 --> 00:26:04,799  
will ever be have access to the internal

710  
00:26:08,870 --> 00:26:06,720  
states of anything else

711  
00:26:11,269 --> 00:26:08,880  
but there will be

712  
00:26:13,750 --> 00:26:11,279  
coupling and influences and mediated by

713  
00:26:15,029 --> 00:26:13,760

the blanket states the active states um

714

00:26:16,310 --> 00:26:15,039

and possibly the sensory states

715

00:26:18,549 --> 00:26:16,320

mathematically you can actually have the

716

00:26:20,549 --> 00:26:18,559

sensory states also influencing the

717

00:26:22,870 --> 00:26:20,559

outside but for simplicity let's let's

718

00:26:25,669 --> 00:26:22,880

assume that sensory states do not

719

00:26:27,350 --> 00:26:25,679

influence external states uh it is just

720

00:26:29,269 --> 00:26:27,360

the role of active states to actually

721

00:26:30,710 --> 00:26:29,279

couple back to the outside you mentioned

722

00:26:31,990 --> 00:26:30,720

something extremely interesting and i

723

00:26:34,390 --> 00:26:32,000

want to pick up on this you said that

724

00:26:36,149 --> 00:26:34,400

the sensory states can influence the

725

00:26:37,669 --> 00:26:36,159

external states at least that's not how

726

00:26:39,990 --> 00:26:37,679

i understand it so how can a sensory

727

00:26:42,870 --> 00:26:40,000

state influence an external state so i

728

00:26:46,310 --> 00:26:42,880

said that um mathematically it is that

729

00:26:48,310 --> 00:26:46,320

is possible um so if you if you think

730

00:26:51,510 --> 00:26:48,320

about um

731

00:26:53,669 --> 00:26:51,520

your from a pure from the point of view

732

00:26:56,950 --> 00:26:53,679

of um

733

00:26:58,950 --> 00:26:56,960

somebody who's trying to understand the

734

00:27:00,310 --> 00:26:58,960

statistical behavior the probabilistic

735

00:27:03,909 --> 00:27:00,320

behavior

736

00:27:07,110 --> 00:27:03,919

of a set of dynamics described as

737

00:27:09,190 --> 00:27:07,120

differential equations or your coupled

738

00:27:12,230 --> 00:27:09,200

systems

739

00:27:13,110 --> 00:27:12,240

then the name of the game really is to

740

00:27:16,390 --> 00:27:13,120

ask

741

00:27:19,590 --> 00:27:16,400

your what statistical dependencies that

742

00:27:22,390 --> 00:27:19,600

define a markov blanket specifically

743

00:27:24,070 --> 00:27:22,400

a markov blanket renders the internal

744

00:27:26,789 --> 00:27:24,080

states conditionally independent of the

745

00:27:29,190 --> 00:27:26,799

external states given the markov blanket

746

00:27:31,190 --> 00:27:29,200

so that's their role that's what that's

747

00:27:33,830 --> 00:27:31,200

what is implied

748

00:27:36,310 --> 00:27:33,840

by a separation of the inside from the

749

00:27:37,990 --> 00:27:36,320

outside that all you need to know

750

00:27:39,830 --> 00:27:38,000

is the blanket states because given the

751

00:27:42,549 --> 00:27:39,840

blanket states the inside and the

752

00:27:45,350 --> 00:27:42,559

outside are condition independent

753

00:27:49,029 --> 00:27:45,360

um so the question now is what kind of

754

00:27:49,990 --> 00:27:49,039

sparse coupling among all the states at

755

00:27:51,750 --> 00:27:50,000

hand

756

00:27:54,470 --> 00:27:51,760

give rise to

757

00:27:56,710 --> 00:27:54,480

that conditional independence that

758

00:27:57,909 --> 00:27:56,720

definitively specifies the markov

759

00:28:00,789 --> 00:27:57,919

blanket

760

00:28:03,669 --> 00:28:00,799

it so happens that all you need is the

761

00:28:06,710 --> 00:28:03,679

following rule

762

00:28:10,230 --> 00:28:06,720

internal states can only influence

763

00:28:12,710 --> 00:28:10,240

themselves and active states

764

00:28:15,909 --> 00:28:12,720

external states can only influence

765

00:28:18,870 --> 00:28:15,919

themselves and sensory states that's all

766

00:28:21,990 --> 00:28:18,880

you need so with that

767

00:28:24,710 --> 00:28:22,000

condition in place you now immediately

768

00:28:25,830 --> 00:28:24,720

have a markov blanket or a particular

769

00:28:27,510 --> 00:28:25,840

partition

770

00:28:29,430 --> 00:28:27,520

from that follows the conditional

771

00:28:31,669 --> 00:28:29,440

independence and therefore the

772

00:28:34,789 --> 00:28:31,679

interpretation of the

773

00:28:36,870 --> 00:28:34,799

um autonomous dynamics which is

774

00:28:38,630 --> 00:28:36,880

a description of the trajectories or the

775

00:28:41,029 --> 00:28:38,640

paths of the processes

776

00:28:42,549 --> 00:28:41,039

taken by the active and the internal

777

00:28:45,909 --> 00:28:42,559

states of a particular

778

00:28:47,350 --> 00:28:45,919

of a particle um

779

00:28:49,909 --> 00:28:47,360

so

780

00:28:51,990 --> 00:28:49,919

that means that it is actually

781

00:28:54,230 --> 00:28:52,000

mathematically allowable

782

00:28:56,230 --> 00:28:54,240

in the sense that you don't you do not

783

00:28:58,789 --> 00:28:56,240

destroy that

784

00:29:00,710 --> 00:28:58,799

that markov blanket or the statistical

785

00:29:02,549 --> 00:29:00,720

properties of that markov blanket it is

786

00:29:04,549 --> 00:29:02,559

allowable for the sensory states to

787

00:29:06,789 --> 00:29:04,559

influence uh active states and you may

788

00:29:08,470 --> 00:29:06,799

be thinking mom that's a bit silly you

789

00:29:12,230 --> 00:29:08,480

know there's no way in which my

790

00:29:15,190 --> 00:29:12,240

photoreceptors or my uh you know my the

791

00:29:16,310 --> 00:29:15,200

cochlear implant materially affect the

792

00:29:18,230 --> 00:29:16,320

outside

793

00:29:19,909 --> 00:29:18,240

i think that's absolutely true so for

794

00:29:20,789 --> 00:29:19,919

things like you and me

795

00:29:24,149 --> 00:29:20,799

um

796

00:29:26,710 --> 00:29:24,159

then you would not normally expect the

797

00:29:27,669 --> 00:29:26,720

sensory states to influence the external

798

00:29:29,990 --> 00:29:27,679

states

799

00:29:31,590 --> 00:29:30,000

but that's not the case for much simpler

800

00:29:32,630 --> 00:29:31,600

things

801  
00:29:36,470 --> 00:29:32,640  
when

802  
00:29:39,669 --> 00:29:36,480  
where

803  
00:29:41,350 --> 00:29:39,679  
most of the dynamical influences the

804  
00:29:42,789 --> 00:29:41,360  
coupling that we're talking about you'd

805  
00:29:45,110 --> 00:29:42,799  
write down in terms of the differential

806  
00:29:46,070 --> 00:29:45,120  
equations the launch of an equation

807  
00:29:48,870 --> 00:29:46,080  
um

808  
00:29:50,470 --> 00:29:48,880  
most of those influences are basically

809  
00:29:53,590 --> 00:29:50,480  
short range

810  
00:29:55,669 --> 00:29:53,600  
so you know we can preclude action at a

811  
00:29:56,549 --> 00:29:55,679  
distance for example if you're a single

812  
00:29:58,870 --> 00:29:56,559  
cell

813  
00:30:01,269 --> 00:29:58,880

you know unless you're next to me i

814

00:30:03,190 --> 00:30:01,279

don't really know what you're up to

815

00:30:04,870 --> 00:30:03,200

i'm having to exclude here all sorts of

816

00:30:07,269 --> 00:30:04,880

interesting things about long-range

817

00:30:08,870 --> 00:30:07,279

electrochemical communication and

818

00:30:12,710 --> 00:30:08,880

electrical gradients and the like but

819

00:30:15,830 --> 00:30:12,720

let's just take um a bag of cells um

820

00:30:16,870 --> 00:30:15,840

that um that just diffuse stuff locally

821

00:30:18,310 --> 00:30:16,880

they just

822

00:30:20,230 --> 00:30:18,320

they touch each other and that's the

823

00:30:22,549 --> 00:30:20,240

only way that they can that they can

824

00:30:25,350 --> 00:30:22,559

influence each other is by being

825

00:30:27,590 --> 00:30:25,360

proximate in some euclidean space so

826

00:30:29,990 --> 00:30:27,600

everything short range now in this

827

00:30:32,950 --> 00:30:30,000

situation you have a very different kind

828

00:30:35,590 --> 00:30:32,960

of structure so here the cell the

829

00:30:37,669 --> 00:30:35,600

sensory states are the cell surface and

830

00:30:39,750 --> 00:30:37,679

when these active states that lie

831

00:30:41,990 --> 00:30:39,760

underneath the cell surface

832

00:30:43,990 --> 00:30:42,000

change the environment they do so by

833

00:30:46,789 --> 00:30:44,000

pushing the cell surface

834

00:30:49,669 --> 00:30:46,799

into the external milieu and cause

835

00:30:51,669 --> 00:30:49,679

changes in the sensory states the

836

00:30:52,389 --> 00:30:51,679

surface states of other cells

837

00:30:55,510 --> 00:30:52,399

so

838

00:30:57,510 --> 00:30:55,520

being a cell is probably a good example

839

00:30:59,269 --> 00:30:57,520

of where your sensory states which just

840

00:31:01,990 --> 00:30:59,279

are your surface states

841

00:31:04,950 --> 00:31:02,000

um actually do all the heavy lifting in

842

00:31:06,230 --> 00:31:04,960

terms of changing the outside the

843

00:31:10,310 --> 00:31:06,240

spatial

844

00:31:11,909 --> 00:31:10,320

cells that you're co-inhabiting a

845

00:31:13,269 --> 00:31:11,919

particular organ

846

00:31:14,310 --> 00:31:13,279

for example

847

00:31:15,350 --> 00:31:14,320

so

848

00:31:17,590 --> 00:31:15,360

you know it's a little bit

849

00:31:20,950 --> 00:31:17,600

counter-intuitive um but i think a

850

00:31:23,350 --> 00:31:20,960

really interesting um sort of you know

851  
00:31:25,669 --> 00:31:23,360  
thought experiment um and actually a

852  
00:31:26,630 --> 00:31:25,679  
practical uh consideration when it comes

853  
00:31:29,990 --> 00:31:26,640  
to

854  
00:31:32,870 --> 00:31:30,000  
looking at the different ways in which

855  
00:31:36,389 --> 00:31:32,880  
insides couple to outsides and the

856  
00:31:37,830 --> 00:31:36,399  
nature of interactions between the

857  
00:31:40,310 --> 00:31:37,840  
internal states of something in the

858  
00:31:41,990 --> 00:31:40,320  
external states of something um and we

859  
00:31:44,230 --> 00:31:42,000  
sort of take it for granted that we can

860  
00:31:47,110 --> 00:31:44,240  
do action at a distance you know uh

861  
00:31:49,269 --> 00:31:47,120  
literally i can talk to you in in canada

862  
00:31:50,950 --> 00:31:49,279  
while you're talking while i'm in london

863  
00:31:53,350 --> 00:31:50,960

um you know that

864

00:31:55,350 --> 00:31:53,360

that that is that is a beautiful example

865

00:31:58,149 --> 00:31:55,360

of this action to distance

866

00:32:00,470 --> 00:31:58,159

um that means that you know we have

867

00:32:02,950 --> 00:32:00,480

quite a special

868

00:32:05,990 --> 00:32:02,960

kind of coupling between our sensory

869

00:32:07,669 --> 00:32:06,000

states and our active states that is not

870

00:32:09,029 --> 00:32:07,679

um

871

00:32:11,830 --> 00:32:09,039

a gift

872

00:32:14,710 --> 00:32:11,840

of very simple um cellular-like

873

00:32:18,310 --> 00:32:14,720

structures or automata that can't

874

00:32:20,789 --> 00:32:18,320

interpret signals um or be subject to or

875

00:32:23,830 --> 00:32:20,799

be sensitive to

876

00:32:26,070 --> 00:32:23,840

influences uh at a distance just so you

877

00:32:28,070 --> 00:32:26,080

know or for people who are listening and

878

00:32:29,909 --> 00:32:28,080

if this wasn't obvious enough the free

879

00:32:32,070 --> 00:32:29,919

energy principle is famous for or

880

00:32:33,990 --> 00:32:32,080

perhaps infamous for being somewhat

881

00:32:35,830 --> 00:32:34,000

inscrutable for people who have a

882

00:32:38,230 --> 00:32:35,840

physics background or math background

883

00:32:39,990 --> 00:32:38,240

what would be the minimum prerequisites

884

00:32:41,750 --> 00:32:40,000

this is how i like to conceptualize the

885

00:32:43,430 --> 00:32:41,760

podcast before i interview someone i

886

00:32:44,710 --> 00:32:43,440

think about okay what are all the pieces

887

00:32:46,789 --> 00:32:44,720

of knowledge i need to know prior to

888

00:32:48,310 --> 00:32:46,799

interviewing them so obvious example is

889

00:32:49,830 --> 00:32:48,320

let's say qft you need to understand

890

00:32:51,750 --> 00:32:49,840

classical mechanics or invariants

891

00:32:52,950 --> 00:32:51,760

quantum mechanics perhaps bundle theory

892

00:32:55,590 --> 00:32:52,960

if you want to understand young mills

893

00:32:57,990 --> 00:32:55,600

and so on properly so what would be the

894

00:32:59,750 --> 00:32:58,000

prerequisites for someone to properly

895

00:33:01,590 --> 00:32:59,760

understand the free energy principle

896

00:33:03,269 --> 00:33:01,600

let's say if they have a math or physics

897

00:33:04,630 --> 00:33:03,279

background

898

00:33:07,110 --> 00:33:04,640

it wouldn't be

899

00:33:10,149 --> 00:33:07,120

it would be probably much less than

900

00:33:12,549 --> 00:33:10,159

you'd expect to encounter um a

901  
00:33:13,350 --> 00:33:12,559  
university i think you certainly need to

902  
00:33:18,230 --> 00:33:13,360  
know

903  
00:33:19,509 --> 00:33:18,240  
the basics of variational calculus and

904  
00:33:22,310 --> 00:33:19,519  
it would be really nice if you

905  
00:33:23,590 --> 00:33:22,320  
understood where a lagrangian com came

906  
00:33:24,710 --> 00:33:23,600  
from

907  
00:33:30,070 --> 00:33:24,720  
and

908  
00:33:32,070 --> 00:33:30,080  
you know basically you know exactly

909  
00:33:34,710 --> 00:33:32,080  
hamilton's principle of least action and

910  
00:33:36,950 --> 00:33:34,720  
how that inherits from path integrals of

911  
00:33:39,909 --> 00:33:36,960  
lagrangians and

912  
00:33:41,990 --> 00:33:39,919  
how that arises from um

913  
00:33:45,190 --> 00:33:42,000

dynamical systems theory of a very

914

00:33:47,430 --> 00:33:45,200

simple sort where you can write down any

915

00:33:49,269 --> 00:33:47,440

random dynamical system as you know a

916

00:33:51,269 --> 00:33:49,279

stochastic differential equation or a

917

00:33:52,710 --> 00:33:51,279

large van equation

918

00:33:54,710 --> 00:33:52,720

i think

919

00:33:56,470 --> 00:33:54,720

that's probably quite sufficient you

920

00:33:59,190 --> 00:33:56,480

know what um

921

00:34:00,389 --> 00:33:59,200

what you would need i think um

922

00:34:03,590 --> 00:34:00,399

to

923

00:34:07,750 --> 00:34:03,600

appreciate all the interpretational

924

00:34:10,149 --> 00:34:07,760

richness afforded by what happens to

925

00:34:12,550 --> 00:34:10,159

the paths of least action when you have

926  
00:34:14,069 --> 00:34:12,560  
a mark off blanket you need to know a

927  
00:34:15,510 --> 00:34:14,079  
little bit of probability theory you

928  
00:34:18,230 --> 00:34:15,520  
need to know what a conditional

929  
00:34:20,470 --> 00:34:18,240  
distribution is you need to know uh the

930  
00:34:23,270 --> 00:34:20,480  
important you know what uh have an

931  
00:34:25,349 --> 00:34:23,280  
intuition as to what is meant by

932  
00:34:27,190 --> 00:34:25,359  
model evidence for example or marginal

933  
00:34:28,790 --> 00:34:27,200  
likelihood so

934  
00:34:32,149 --> 00:34:28,800  
you know whether

935  
00:34:34,069 --> 00:34:32,159  
i would imagine you know a week's um

936  
00:34:36,550 --> 00:34:34,079  
foraging on uh wikipedia you could

937  
00:34:39,109 --> 00:34:36,560  
probably acquire that if you know if you

938  
00:34:40,470 --> 00:34:39,119

felt flu if you were fluent already and

939

00:34:42,950 --> 00:34:40,480

sort of um

940

00:34:45,349 --> 00:34:42,960

uh in path integral like formulations of

941

00:34:47,669 --> 00:34:45,359

the kind you can find on wikipedia so

942

00:34:49,589 --> 00:34:47,679

that you certainly wouldn't need

943

00:34:51,030 --> 00:34:49,599

you know what sort of bundles were you

944

00:34:52,149 --> 00:34:51,040

wouldn't need category theory you

945

00:34:54,149 --> 00:34:52,159

wouldn't need to know anything about

946

00:34:55,669 --> 00:34:54,159

gauge theories um

947

00:34:56,550 --> 00:34:55,679

you you know you wouldn't even you

948

00:34:57,990 --> 00:34:56,560

wouldn't even

949

00:35:01,430 --> 00:34:58,000

you need to know about lagrange

950

00:35:02,390 --> 00:35:01,440

multipliers yeah but you need to know um

951  
00:35:05,510 --> 00:35:02,400  
you know

952  
00:35:08,790 --> 00:35:05,520  
the basics of how to uh

953  
00:35:10,950 --> 00:35:08,800  
how how to understand um differential

954  
00:35:12,870 --> 00:35:10,960  
equations with you know with random

955  
00:35:15,589 --> 00:35:12,880  
fluctuations with a probabilistic or

956  
00:35:18,230 --> 00:35:15,599  
stochastic aspect to them and how you

957  
00:35:20,470 --> 00:35:18,240  
can understand paths of least action uh

958  
00:35:22,150 --> 00:35:20,480  
in these kinds of systems your example

959  
00:35:24,790 --> 00:35:22,160  
of wikipedia is

960  
00:35:26,630 --> 00:35:24,800  
is on point because the way that i

961  
00:35:28,630 --> 00:35:26,640  
conceptualized this interview this

962  
00:35:31,829 --> 00:35:28,640  
podcast and the way that we spoke about

963  
00:35:33,589 --> 00:35:31,839

it prior to going on air via emails is

964

00:35:36,470 --> 00:35:33,599

it's going to be tendril-like or

965

00:35:37,829 --> 00:35:36,480

gossamer-like where you have these words

966

00:35:39,349 --> 00:35:37,839

i'm imagining what you're saying is like

967

00:35:41,670 --> 00:35:39,359

a wikipedia page and you say certain

968

00:35:43,910 --> 00:35:41,680

keywords which would be if you were a

969

00:35:45,589 --> 00:35:43,920

wikipedia page underlined in blue and

970

00:35:47,270 --> 00:35:45,599

worthy of their own investigation in and

971

00:35:50,390 --> 00:35:47,280

of themselves so some of these i'm going

972

00:35:51,990 --> 00:35:50,400

to pick out and interrupt you

973

00:35:53,270 --> 00:35:52,000

sometimes and i apologize for that like

974

00:35:55,750 --> 00:35:53,280

i did earlier

975

00:36:00,069 --> 00:35:55,760

in order to

976  
00:36:02,230 --> 00:36:00,079  
prerequisites because we had a four hour

977  
00:36:03,510 --> 00:36:02,240  
behemoth before and that was meant to

978  
00:36:05,430 --> 00:36:03,520  
serve as an introduction to the free

979  
00:36:07,910 --> 00:36:05,440  
energy principle however there were some

980  
00:36:09,430 --> 00:36:07,920  
people who were still uncertain as to

981  
00:36:11,589 --> 00:36:09,440  
exactly what the free energy principle

982  
00:36:13,270 --> 00:36:11,599  
is so this will serve as an introduction

983  
00:36:15,030 --> 00:36:13,280  
to that introduction

984  
00:36:17,109 --> 00:36:15,040  
okay

985  
00:36:19,430 --> 00:36:17,119  
you mentioned marginal likelihood slash

986  
00:36:21,270 --> 00:36:19,440  
model evidencing and i believe you see

987  
00:36:23,030 --> 00:36:21,280  
those two as the same and i'm unclear as

988  
00:36:24,470 --> 00:36:23,040

to what any of those two are so can you

989

00:36:27,829 --> 00:36:24,480

give an explanation what is model

990

00:36:30,230 --> 00:36:27,839

evidencing marginal likelihood

991

00:36:33,109 --> 00:36:30,240

excellent question so this is where your

992

00:36:34,470 --> 00:36:33,119

you would need to be slightly fluent um

993

00:36:35,990 --> 00:36:34,480

in the

994

00:36:37,510 --> 00:36:36,000

the concepts and constructs that

995

00:36:39,030 --> 00:36:37,520

statisticians

996

00:36:41,670 --> 00:36:39,040

would bring to the table

997

00:36:45,190 --> 00:36:41,680

so um

998

00:36:46,230 --> 00:36:45,200

if i now um want to use probability

999

00:36:49,990 --> 00:36:46,240

theory

1000

00:36:52,790 --> 00:36:50,000

um to articulate the

1001

00:36:55,190 --> 00:36:52,800

the job of a statistician

1002

00:36:57,990 --> 00:36:55,200

trying to make sense of data

1003

00:36:59,750 --> 00:36:58,000

um and just know that that sense making

1004

00:37:01,990 --> 00:36:59,760

is basically the interpretation we're

1005

00:37:06,829 --> 00:37:02,000

putting on these paths of least action

1006

00:37:10,790 --> 00:37:06,839

um then you you you'd start off by by

1007

00:37:12,310 --> 00:37:10,800

um understanding the problem in terms of

1008

00:37:15,109 --> 00:37:12,320

um

1009

00:37:18,630 --> 00:37:15,119

estimating under uncertainty sort of

1010

00:37:21,270 --> 00:37:18,640

assimilating data whilst

1011

00:37:24,710 --> 00:37:21,280

quantifying and accommodating

1012

00:37:27,270 --> 00:37:24,720

uncertainty due to random effects so you

1013

00:37:28,150 --> 00:37:27,280

know the random effects here can be read

1014

00:37:30,790 --> 00:37:28,160

as

1015

00:37:32,870 --> 00:37:30,800

um the random fluctuations of the vena

1016

00:37:34,550 --> 00:37:32,880

fluctuations or the innovations in some

1017

00:37:36,310 --> 00:37:34,560

stochastic process from the point of

1018

00:37:38,950 --> 00:37:36,320

view of the physicist from the point of

1019

00:37:42,790 --> 00:37:38,960

view of statistician

1020

00:37:45,270 --> 00:37:42,800

those that randomness um is inherited as

1021

00:37:47,270 --> 00:37:45,280

random effects observation noise for

1022

00:37:50,390 --> 00:37:47,280

example would be one if you were dealing

1023

00:37:52,390 --> 00:37:50,400

with a state space model which is really

1024

00:37:54,790 --> 00:37:52,400

a model of a dynamical process as the

1025

00:37:57,589 --> 00:37:54,800

statistician might use to do data

1026  
00:37:59,990 --> 00:37:57,599  
simulation given some given some time

1027  
00:38:04,230 --> 00:38:00,000  
serious data there may be a distinction

1028  
00:38:07,510 --> 00:38:04,240  
between observation noise or

1029  
00:38:10,069 --> 00:38:07,520  
sensor noise and the noise or the random

1030  
00:38:11,910 --> 00:38:10,079  
fluctuations on the states that can't be

1031  
00:38:15,109 --> 00:38:11,920  
directly observed that would be known as

1032  
00:38:16,870 --> 00:38:15,119  
state noise or system noise for example

1033  
00:38:18,230 --> 00:38:16,880  
they both you're

1034  
00:38:19,910 --> 00:38:18,240  
describing the same thing but from the

1035  
00:38:22,390 --> 00:38:19,920  
point of view of the statistician these

1036  
00:38:25,190 --> 00:38:22,400  
these this is becomes noise or

1037  
00:38:26,390 --> 00:38:25,200  
uncertainty or random effects

1038  
00:38:29,349 --> 00:38:26,400

so how do you deal with this but

1039

00:38:30,550 --> 00:38:29,359

basically um you're confronted with the

1040

00:38:34,069 --> 00:38:30,560

problem of

1041

00:38:35,109 --> 00:38:34,079

some data and you have a hypothesis or a

1042

00:38:38,550 --> 00:38:35,119

model

1043

00:38:41,109 --> 00:38:38,560

about how those data were generated

1044

00:38:43,589 --> 00:38:41,119

by some latent states

1045

00:38:47,510 --> 00:38:43,599

sometimes known as hidden states

1046

00:38:49,270 --> 00:38:47,520

and hidden um here i think uh

1047

00:38:51,190 --> 00:38:49,280

just as to try and connect it to the

1048

00:38:53,270 --> 00:38:51,200

markov blanket they're hidden behind the

1049

00:38:54,550 --> 00:38:53,280

mark of blankets so the statistician can

1050

00:38:57,030 --> 00:38:54,560

if you think of that being in the

1051  
00:38:59,270 --> 00:38:57,040  
internal states they're surrounded

1052  
00:39:02,390 --> 00:38:59,280  
they're enshrouded by a markov blanket

1053  
00:39:03,829 --> 00:39:02,400  
the data is impressing themselves on the

1054  
00:39:05,990 --> 00:39:03,839  
sensory veil

1055  
00:39:07,510 --> 00:39:06,000  
there's something on the outside that

1056  
00:39:10,550 --> 00:39:07,520  
are latent in the sense that they're

1057  
00:39:12,150 --> 00:39:10,560  
hidden behind this uh this veil so they

1058  
00:39:13,270 --> 00:39:12,160  
only have access to the data they don't

1059  
00:39:16,230 --> 00:39:13,280  
know how

1060  
00:39:18,390 --> 00:39:16,240  
the data were caused so for example they

1061  
00:39:20,150 --> 00:39:18,400  
might have a hypothesis that this drug

1062  
00:39:23,030 --> 00:39:20,160  
treatment

1063  
00:39:23,870 --> 00:39:23,040

materially affected

1064

00:39:25,510 --> 00:39:23,880

some

1065

00:39:27,990 --> 00:39:25,520

pathophysiology

1066

00:39:30,950 --> 00:39:28,000

that reduced the symptoms that were

1067

00:39:33,270 --> 00:39:30,960

measurable or recordable by the doctor

1068

00:39:35,750 --> 00:39:33,280

but it's only the observable data that

1069

00:39:38,230 --> 00:39:35,760

the doctor can get from the patients

1070

00:39:40,790 --> 00:39:38,240

that the statistician has at hand now

1071

00:39:43,190 --> 00:39:40,800

the statistician now has to infer was

1072

00:39:44,630 --> 00:39:43,200

there a drug effect and what she will do

1073

00:39:47,190 --> 00:39:44,640

she will create

1074

00:39:49,270 --> 00:39:47,200

a generative model that

1075

00:39:52,550 --> 00:39:49,280

if there was a drug effect of a certain

1076  
00:39:54,230 --> 00:39:52,560  
size then i'd expect a separation of the

1077  
00:39:57,109 --> 00:39:54,240  
data for example

1078  
00:39:59,589 --> 00:39:57,119  
now that generative model

1079  
00:40:01,829 --> 00:39:59,599  
at the end of the day can always be

1080  
00:40:03,109 --> 00:40:01,839  
written down as a joint probability

1081  
00:40:06,069 --> 00:40:03,119  
density

1082  
00:40:08,870 --> 00:40:06,079  
um over the causes and consequences

1083  
00:40:11,190 --> 00:40:08,880  
where the causes are the latent or the

1084  
00:40:13,589 --> 00:40:11,200  
hidden states that you are trying to

1085  
00:40:16,390 --> 00:40:13,599  
estimate and the consequences of the

1086  
00:40:18,710 --> 00:40:16,400  
observable data that you have at hand

1087  
00:40:21,589 --> 00:40:18,720  
given that generative model

1088  
00:40:23,190 --> 00:40:21,599

you can now estimate um

1089

00:40:25,349 --> 00:40:23,200

given some data

1090

00:40:27,670 --> 00:40:25,359

the most likely

1091

00:40:29,750 --> 00:40:27,680

hidden or latent states or causes of

1092

00:40:31,829 --> 00:40:29,760

that data basically the treatment effect

1093

00:40:33,670 --> 00:40:31,839

that you were hypothesized

1094

00:40:35,750 --> 00:40:33,680

so that's the posterior distribution

1095

00:40:38,470 --> 00:40:35,760

that's the probability

1096

00:40:40,950 --> 00:40:38,480

of some hidden state say the external

1097

00:40:44,790 --> 00:40:40,960

states the markov blanket given

1098

00:40:48,630 --> 00:40:44,800

conditioned upon the data

1099

00:40:50,870 --> 00:40:48,640

so that's the holy grail usually of um a

1100

00:40:51,670 --> 00:40:50,880

statistical analysis and you know what

1101

00:40:54,470 --> 00:40:51,680

your

1102

00:40:58,230 --> 00:40:54,480

most classical uh inference for example

1103

00:41:00,630 --> 00:40:58,240

those based on t-tests or f-tests um uh

1104

00:41:03,910 --> 00:41:00,640

right through to more sophisticated and

1105

00:41:04,950 --> 00:41:03,920

informed uh log-odd ratios such as base

1106

00:41:07,589 --> 00:41:04,960

factors

1107

00:41:09,510 --> 00:41:07,599

these are just scoring

1108

00:41:12,630 --> 00:41:09,520

the evidence

1109

00:41:15,349 --> 00:41:12,640

for an effective interest expressed in

1110

00:41:18,710 --> 00:41:15,359

this latent state space

1111

00:41:20,470 --> 00:41:18,720

in terms of the probability of one model

1112

00:41:23,510 --> 00:41:20,480

relative to another model

1113

00:41:25,270 --> 00:41:23,520

and usually in science that would be the

1114

00:41:27,910 --> 00:41:25,280

alternate hypothesis versus the null

1115

00:41:28,630 --> 00:41:27,920

hypothesis and then you can look at the

1116

00:41:44,630 --> 00:41:28,640

the

1117

00:41:45,510 --> 00:41:44,640

so to come to our example our example of

1118

00:41:48,230 --> 00:41:45,520

um

1119

00:41:51,190 --> 00:41:48,240

you know the statistician trying to

1120

00:41:53,750 --> 00:41:51,200

infer whether the drug has had a

1121

00:41:57,589 --> 00:41:53,760

remedial effect or not what she would do

1122

00:41:58,710 --> 00:41:57,599

is compute the probability of her data

1123

00:42:00,630 --> 00:41:58,720

with

1124

00:42:03,190 --> 00:42:00,640

an effect and then compute the

1125

00:42:05,589 --> 00:42:03,200

probability of her data if there was no

1126

00:42:07,510 --> 00:42:05,599

effect of the drug so the you know the

1127

00:42:09,829 --> 00:42:07,520

data sets from the treatment and the

1128

00:42:12,230 --> 00:42:09,839

non-treatment group were treated as from

1129

00:42:14,550 --> 00:42:12,240

a single group and then she would use

1130

00:42:16,950 --> 00:42:14,560

that to make an inference that there was

1131

00:42:18,630 --> 00:42:16,960

indeed an effect so

1132

00:42:19,829 --> 00:42:18,640

that probability the probability of the

1133

00:42:22,550 --> 00:42:19,839

data

1134

00:42:24,550 --> 00:42:22,560

given a particular model a specific

1135

00:42:26,870 --> 00:42:24,560

model be it the ultimate hypothesis on

1136

00:42:28,630 --> 00:42:26,880

the null hypothesis that's the marginal

1137

00:42:31,109 --> 00:42:28,640

likelihood so why is it called a

1138

00:42:32,870 --> 00:42:31,119

marginal likelihood well what you've

1139

00:42:34,870 --> 00:42:32,880

done is

1140

00:42:35,910 --> 00:42:34,880

you've estimated given your generative

1141

00:42:39,190 --> 00:42:35,920

model

1142

00:42:43,270 --> 00:42:39,200

the probability of the data

1143

00:42:45,190 --> 00:42:43,280

having marginalized or averaged away

1144

00:42:48,950 --> 00:42:45,200

the thing that you don't know which is

1145

00:42:49,829 --> 00:42:48,960

the effect size the treatment effect

1146

00:42:52,150 --> 00:42:49,839

so

1147

00:42:53,910 --> 00:42:52,160

the probability of the data

1148

00:42:57,829 --> 00:42:53,920

given a model

1149

00:43:00,870 --> 00:42:57,839

is the average probability of the data

1150

00:43:03,910 --> 00:43:00,880

given that model and the effect size

1151  
00:43:05,430 --> 00:43:03,920  
averaged under your beliefs about the

1152  
00:43:08,069 --> 00:43:05,440  
effect size

1153  
00:43:09,829 --> 00:43:08,079  
so it that's why it's called a marginal

1154  
00:43:10,710 --> 00:43:09,839  
a marginal likelihood

1155  
00:43:13,349 --> 00:43:10,720  
and

1156  
00:43:16,069 --> 00:43:13,359  
that's a great question because um

1157  
00:43:18,550 --> 00:43:16,079  
you know it actually um

1158  
00:43:20,950 --> 00:43:18,560  
leads one to um

1159  
00:43:23,589 --> 00:43:20,960  
the genesis of variational free energy

1160  
00:43:25,430 --> 00:43:23,599  
on one reading by uh in the context of

1161  
00:43:27,670 --> 00:43:25,440  
richard feynman's pathetic formulation

1162  
00:43:31,190 --> 00:43:27,680  
of quantum electrodynamics

1163  
00:43:33,109 --> 00:43:31,200

he he had this marginalization problem

1164

00:43:36,550 --> 00:43:33,119

um so

1165

00:43:39,750 --> 00:43:36,560

he wanted to or one could read the

1166

00:43:43,030 --> 00:43:39,760

history as him wanting

1167

00:43:46,069 --> 00:43:43,040

to evaluate the marginal likelihood

1168

00:43:46,079 --> 00:43:50,950

paths of say small particles

1169

00:43:54,870 --> 00:43:53,109

which would necessarily necessarily

1170

00:43:57,829 --> 00:43:54,880

involve

1171

00:43:59,589 --> 00:43:57,839

computing or marginalizing

1172

00:44:00,870 --> 00:43:59,599

integrating of extremely high

1173

00:44:03,109 --> 00:44:00,880

dimensional

1174

00:44:04,950 --> 00:44:03,119

probability distributions

1175

00:44:07,829 --> 00:44:04,960

which is intractable

1176  
00:44:10,230 --> 00:44:07,839  
so in order to solve the marginalization

1177  
00:44:12,150 --> 00:44:10,240  
or the integration problem to ensure

1178  
00:44:14,230 --> 00:44:12,160  
everything sells to one effectively to

1179  
00:44:16,309 --> 00:44:14,240  
get your partition function

1180  
00:44:18,150 --> 00:44:16,319  
he introduced

1181  
00:44:19,910 --> 00:44:18,160  
the variation free energy

1182  
00:44:22,790 --> 00:44:19,920  
and that was a really clever move

1183  
00:44:24,150 --> 00:44:22,800  
because he converted what was an

1184  
00:44:27,230 --> 00:44:24,160  
intractable

1185  
00:44:29,030 --> 00:44:27,240  
and non-realizable and incomputable

1186  
00:44:32,710 --> 00:44:29,040  
marginalization

1187  
00:44:34,950 --> 00:44:32,720  
or integration problem into a tractable

1188  
00:44:37,430 --> 00:44:34,960

optimization problem simply by

1189

00:44:40,150 --> 00:44:37,440

introducing this variational free energy

1190

00:44:41,829 --> 00:44:40,160

which was a band on the marginal

1191

00:44:44,230 --> 00:44:41,839

likelihood

1192

00:44:46,550 --> 00:44:44,240

so that's why it's called an elbow or an

1193

00:44:49,349 --> 00:44:46,560

evidence lower bound simply because it

1194

00:44:51,670 --> 00:44:49,359

now becomes a computable object or

1195

00:44:53,750 --> 00:44:51,680

mathematical functional

1196

00:44:56,470 --> 00:44:53,760

that you can evaluate given some data

1197

00:45:00,069 --> 00:44:56,480

and a generative model that is always in

1198

00:45:02,390 --> 00:45:00,079

machine learning lower than the log of

1199

00:45:04,390 --> 00:45:02,400

the marginal likelihood

1200

00:45:05,510 --> 00:45:04,400

in my world the physics world is the

1201

00:45:08,069 --> 00:45:05,520

other way around but let's stick with

1202

00:45:10,150 --> 00:45:08,079

the machine learning world so the

1203

00:45:11,990 --> 00:45:10,160

negative uh variational free energy of

1204

00:45:14,710 --> 00:45:12,000

the physicist is

1205

00:45:16,710 --> 00:45:14,720

always smaller than the thing you want

1206

00:45:19,750 --> 00:45:16,720

to actually evaluate so if you just

1207

00:45:21,829 --> 00:45:19,760

optimize by pushing up the elbow or the

1208

00:45:23,990 --> 00:45:21,839

variation free energy until you can't

1209

00:45:26,630 --> 00:45:24,000

make it any larger

1210

00:45:28,309 --> 00:45:26,640

and under the assumption that the band

1211

00:45:30,550 --> 00:45:28,319

the tightness of the bound is high

1212

00:45:31,829 --> 00:45:30,560

you've now got a good approximation to

1213

00:45:33,990 --> 00:45:31,839

what you were chasing which is the

1214

00:45:36,069 --> 00:45:34,000

marginal likelihood and once the

1215

00:45:38,069 --> 00:45:36,079

statistician has that marginal

1216

00:45:39,510 --> 00:45:38,079

likelihood she can repeat the process

1217

00:45:41,829 --> 00:45:39,520

for another model say the null

1218

00:45:44,790 --> 00:45:41,839

hypothesis with no treatment effect and

1219

00:45:46,790 --> 00:45:44,800

then she can take the ratio of the free

1220

00:45:48,870 --> 00:45:46,800

energies the variation free energies and

1221

00:45:50,790 --> 00:45:48,880

start to compare the models using base

1222

00:45:54,390 --> 00:45:50,800

factors and then go back to the doctors

1223

00:45:56,470 --> 00:45:54,400

say look um i am

1224

00:45:58,630 --> 00:45:56,480

pretty confident that that drug really

1225

00:46:00,950 --> 00:45:58,640

did have an effect and i can say that

1226

00:46:03,750 --> 00:46:00,960

because the evidence in your data

1227

00:46:06,950 --> 00:46:03,760

suggests that the marginal likelihood of

1228

00:46:08,790 --> 00:46:06,960

a hypothesis or a model that included an

1229

00:46:09,630 --> 00:46:08,800

effective drug

1230

00:46:12,230 --> 00:46:09,640

was

1231

00:46:14,309 --> 00:46:12,240

52.6 times greater than the marginal

1232

00:46:15,829 --> 00:46:14,319

likelihood if i assume there had been no

1233

00:46:17,430 --> 00:46:15,839

uh no change

1234

00:46:20,630 --> 00:46:17,440

so that's where the notion of a marginal

1235

00:46:22,950 --> 00:46:20,640

likelihood comes from um so the marginal

1236

00:46:24,710 --> 00:46:22,960

marginal likelihood just is the evidence

1237

00:46:29,750 --> 00:46:24,720

for a model it just is

1238

00:46:31,750 --> 00:46:29,760

um the um the probability of some data

1239

00:46:33,750 --> 00:46:31,760

you know in the present context you know

1240

00:46:36,470 --> 00:46:33,760

sensory or from the quality of the free

1241

00:46:38,309 --> 00:46:36,480

energy principle the sensory states uh

1242

00:46:39,270 --> 00:46:38,319

or the sensory trajectory of say time

1243

00:46:40,630 --> 00:46:39,280

series

1244

00:46:43,270 --> 00:46:40,640

um

1245

00:46:45,670 --> 00:46:43,280

given a particular model marginalizing

1246

00:46:47,270 --> 00:46:45,680

away all your beliefs about the

1247

00:46:51,349 --> 00:46:47,280

particulars effect size and the

1248

00:46:53,589 --> 00:46:51,359

parameters and all all the um quantities

1249

00:46:57,829 --> 00:46:53,599

that were responsible for generating

1250

00:47:01,190 --> 00:47:00,069

under the structure afforded by by the

1251  
00:47:03,430 --> 00:47:01,200  
model

1252  
00:47:05,670 --> 00:47:03,440  
is that is that clear i mean you know

1253  
00:47:07,510 --> 00:47:05,680  
these are the fundamentals of um

1254  
00:47:10,390 --> 00:47:07,520  
you know machine learning data

1255  
00:47:11,349 --> 00:47:10,400  
simulations system identification

1256  
00:47:12,630 --> 00:47:11,359  
and

1257  
00:47:16,470 --> 00:47:12,640  
you know

1258  
00:47:17,270 --> 00:47:16,480  
you could actually argue this is one way

1259  
00:47:20,309 --> 00:47:17,280  
of

1260  
00:47:22,829 --> 00:47:20,319  
nuancing the scientific um process not

1261  
00:47:25,510 --> 00:47:22,839  
quite in using the rhetoric

1262  
00:47:28,630 --> 00:47:25,520  
of um karl popper but certainly has this

1263  
00:47:29,589 --> 00:47:28,640

poparian aspect to him that

1264

00:47:32,790 --> 00:47:29,599

every

1265

00:47:35,349 --> 00:47:32,800

bit of scientific inquiry

1266

00:47:38,470 --> 00:47:35,359

including the way we live our lives is

1267

00:47:40,470 --> 00:47:38,480

just about hypothesis testing

1268

00:47:42,790 --> 00:47:40,480

and we just generate

1269

00:47:45,109 --> 00:47:42,800

alternative explanations for the

1270

00:47:46,470 --> 00:47:45,119

evidence at hand and then we try to

1271

00:47:49,589 --> 00:47:46,480

evaluate the evidence for this

1272

00:47:51,270 --> 00:47:49,599

hypothesis relative that hypothesis

1273

00:47:53,589 --> 00:47:51,280

evaluate the marginal likelihood of the

1274

00:47:55,670 --> 00:47:53,599

data at hand for this hypothesis versus

1275

00:47:58,069 --> 00:47:55,680

that hypothesis this model versus that

1276

00:47:59,910 --> 00:47:58,079

model and then we usually commit to the

1277

00:48:03,349 --> 00:47:59,920

model with the greatest evidence this

1278

00:48:06,550 --> 00:48:03,359

just is evidence-based scientific uh

1279

00:48:08,790 --> 00:48:06,560

progress uh um you're having

1280

00:48:10,550 --> 00:48:08,800

committed to or selected

1281

00:48:13,670 --> 00:48:10,560

technically known as bayesian model

1282

00:48:16,150 --> 00:48:13,680

selection uh this hypothesis you then

1283

00:48:17,670 --> 00:48:16,160

think about okay what's the next space

1284

00:48:20,630 --> 00:48:17,680

of hypotheses or what's the next

1285

00:48:22,870 --> 00:48:20,640

portfolio of ideas or models

1286

00:48:24,870 --> 00:48:22,880

that i want to now go and gather

1287

00:48:26,710 --> 00:48:24,880

evidence for

1288

00:48:29,589 --> 00:48:26,720

i think this analogy is quite nice i'm

1289

00:48:33,030 --> 00:48:29,599

glad you've let me down this explanation

1290

00:48:35,030 --> 00:48:33,040

because because a good scientist then

1291

00:48:38,069 --> 00:48:35,040

the good one will generate new

1292

00:48:40,470 --> 00:48:38,079

hypotheses and then the problem

1293

00:48:42,230 --> 00:48:40,480

contending the scientist

1294

00:48:44,630 --> 00:48:42,240

who's been who's just chasing these

1295

00:48:47,670 --> 00:48:44,640

marginal likelihoods or um model

1296

00:48:50,710 --> 00:48:47,680

evidences for her models of of her

1297

00:48:53,270 --> 00:48:50,720

fielding uh of inquiry

1298

00:48:56,549 --> 00:48:53,280

is to design a good experiment

1299

00:48:58,870 --> 00:48:56,559

so here we we we come back to the you

1300

00:48:59,589 --> 00:48:58,880

know the other side of the coin

1301

00:49:01,670 --> 00:48:59,599

that

1302

00:49:04,150 --> 00:49:01,680

takes us um

1303

00:49:05,990 --> 00:49:04,160

beyond machine learning as a black box

1304

00:49:08,390 --> 00:49:06,000

sort of you know give it some inputs

1305

00:49:10,309 --> 00:49:08,400

give it an output we now come back to

1306

00:49:12,790 --> 00:49:10,319

the design of our experiments how we

1307

00:49:16,630 --> 00:49:12,800

actively secure and solicit

1308

00:49:19,030 --> 00:49:16,640

the evidence that will best disambiguate

1309

00:49:20,950 --> 00:49:19,040

among our hypotheses and i repeat

1310

00:49:23,109 --> 00:49:20,960

usually when you're writing scientific

1311

00:49:25,030 --> 00:49:23,119

papers it's a null hypothesis there's an

1312

00:49:27,430 --> 00:49:25,040

alternate hypothesis but in real life

1313

00:49:29,829 --> 00:49:27,440

and in real scientific thinking people

1314

00:49:32,549 --> 00:49:29,839

you normally have eight hypotheses or a

1315

00:49:35,750 --> 00:49:32,559

hundred hypotheses um

1316

00:49:38,870 --> 00:49:35,760

and they're scoring all of them um

1317

00:49:41,349 --> 00:49:38,880

by evaluating the marginal likelihood of

1318

00:49:43,030 --> 00:49:41,359

the data that they have carefully

1319

00:49:45,910 --> 00:49:43,040

solicited by

1320

00:49:48,870 --> 00:49:45,920

bayes optimal experimental design to

1321

00:49:49,990 --> 00:49:48,880

maximally disambiguate in terms of the

1322

00:49:53,109 --> 00:49:50,000

marginal likelihood of the model

1323

00:49:53,910 --> 00:49:53,119

evidence between all of their hypotheses

1324

00:49:55,510 --> 00:49:53,920

so

1325

00:49:59,270 --> 00:49:55,520

that um

1326

00:50:01,670 --> 00:49:59,280

that sort of brings another aspect of

1327

00:50:03,990 --> 00:50:01,680

probability theory to the table

1328

00:50:05,190 --> 00:50:04,000

um which would be an important

1329

00:50:07,510 --> 00:50:05,200

complement

1330

00:50:09,349 --> 00:50:07,520

for somebody wanting to understand

1331

00:50:12,230 --> 00:50:09,359

bayesian statistics

1332

00:50:14,069 --> 00:50:12,240

the bayes aspect of course is is that as

1333

00:50:16,390 --> 00:50:14,079

soon as you start to talk about

1334

00:50:18,470 --> 00:50:16,400

conditional distributions of the kind

1335

00:50:19,910 --> 00:50:18,480

that are marginal likelihood so it's

1336

00:50:22,390 --> 00:50:19,920

conditional in the sense that it's a

1337

00:50:25,030 --> 00:50:22,400

probability of some data conditioned

1338

00:50:27,750 --> 00:50:25,040

upon a model or given a model having

1339

00:50:29,030 --> 00:50:27,760

marginalized away all the parameters of

1340

00:50:31,990 --> 00:50:29,040

of that model

1341

00:50:34,549 --> 00:50:32,000

um and you know building a post area the

1342

00:50:36,069 --> 00:50:34,559

probability of my

1343

00:50:38,309 --> 00:50:36,079

hidden states

1344

00:50:41,190 --> 00:50:38,319

the parameters of my model

1345

00:50:42,470 --> 00:50:41,200

given the data falls out of bayes rule

1346

00:50:44,630 --> 00:50:42,480

so we're talking about

1347

00:50:47,109 --> 00:50:44,640

bayesian inference here and just

1348

00:50:49,670 --> 00:50:47,119

straightforward probability theory uh

1349

00:50:51,670 --> 00:50:49,680

that can be articulated in terms in

1350

00:50:54,470 --> 00:50:51,680

terms of bayes rule but there's another

1351  
00:50:56,150 --> 00:50:54,480  
really important application of bayes

1352  
00:50:58,230 --> 00:50:56,160  
rule

1353  
00:50:59,589 --> 00:50:58,240  
which speaks to this sort of inactive

1354  
00:51:02,790 --> 00:50:59,599  
situated

1355  
00:51:05,430 --> 00:51:02,800  
statistician where statistician now

1356  
00:51:08,390 --> 00:51:05,440  
is not simply in the service of the

1357  
00:51:11,510 --> 00:51:08,400  
doctor supplying her with data and

1358  
00:51:14,390 --> 00:51:11,520  
asking a particular question

1359  
00:51:16,710 --> 00:51:14,400  
now the statistician is in charge of

1360  
00:51:18,950 --> 00:51:16,720  
designing the perfect experiment that

1361  
00:51:20,710 --> 00:51:18,960  
gives her the data that allows her to

1362  
00:51:23,750 --> 00:51:20,720  
make the most efficient

1363  
00:51:25,349 --> 00:51:23,760

and statistically powerful

1364

00:51:27,750 --> 00:51:25,359

inference about whether there was a

1365

00:51:29,670 --> 00:51:27,760

treatment effect and that's the

1366

00:51:31,829 --> 00:51:29,680

that's the problem of optimal uh

1367

00:51:34,870 --> 00:51:31,839

experimental design there is an answer

1368

00:51:37,750 --> 00:51:34,880

to that it's called the principle of

1369

00:51:40,150 --> 00:51:37,760

basal bays optimal design uh first

1370

00:51:41,589 --> 00:51:40,160

articulated by people like um uh

1371

00:51:45,030 --> 00:51:41,599

lindelin the

1372

00:51:47,589 --> 00:51:45,040

in the 1950s and then re-articulated by

1373

00:51:49,190 --> 00:51:47,599

people like david mckay in active

1374

00:51:51,510 --> 00:51:49,200

learning

1375

00:51:53,270 --> 00:51:51,520

and it is if you like the other side of

1376  
00:51:55,990 --> 00:51:53,280  
the bayesian coin

1377  
00:51:57,990 --> 00:51:56,000  
when it comes to um

1378  
00:52:00,390 --> 00:51:58,000  
um

1379  
00:52:04,309 --> 00:52:00,400  
bayesian assimilation of statistical

1380  
00:52:06,470 --> 00:52:04,319  
assimilation of data and inference um

1381  
00:52:08,150 --> 00:52:06,480  
and one could also argue it's the other

1382  
00:52:09,910 --> 00:52:08,160  
side of the coin when it comes to things

1383  
00:52:12,870 --> 00:52:09,920  
like basic decisions theory as well but

1384  
00:52:14,870 --> 00:52:12,880  
that that's a slight distraction uh i

1385  
00:52:19,109 --> 00:52:14,880  
think we just stick with the big idea

1386  
00:52:20,790 --> 00:52:19,119  
here that you know there are good

1387  
00:52:22,470 --> 00:52:20,800  
let's look at it like this if it is the

1388  
00:52:25,190 --> 00:52:22,480

case that the marginal likelihood is

1389

00:52:26,790 --> 00:52:25,200

just the probability of some data

1390

00:52:28,390 --> 00:52:26,800

given a model

1391

00:52:30,870 --> 00:52:28,400

and your job

1392

00:52:34,390 --> 00:52:30,880

is to evaluate

1393

00:52:37,589 --> 00:52:34,400

that quantity and usually optimize the

1394

00:52:39,990 --> 00:52:37,599

um optimize the uh the marginal

1395

00:52:42,069 --> 00:52:40,000

likelihood or maximize the um the

1396

00:52:43,910 --> 00:52:42,079

evidence for your model you can either

1397

00:52:45,270 --> 00:52:43,920

change the model or you can change the

1398

00:52:47,270 --> 00:52:45,280

data

1399

00:52:50,150 --> 00:52:47,280

and that means that you've got sort of

1400

00:52:51,910 --> 00:52:50,160

two uh two problems to solve as it were

1401  
00:52:54,950 --> 00:52:51,920  
if you cast this as an optimality

1402  
00:52:56,470 --> 00:52:54,960  
problem as a maximization of an evidence

1403  
00:52:58,230 --> 00:52:56,480  
lower bound

1404  
00:53:00,309 --> 00:52:58,240  
or a minimization of variation free

1405  
00:53:01,589 --> 00:53:00,319  
energy from a from a feminist point of

1406  
00:53:03,430 --> 00:53:01,599  
view

1407  
00:53:06,549 --> 00:53:03,440  
and that's i think comes back to your

1408  
00:53:09,190 --> 00:53:06,559  
your original uh point about this of two

1409  
00:53:10,150 --> 00:53:09,200  
black boxes two computers inferring each

1410  
00:53:11,510 --> 00:53:10,160  
other

1411  
00:53:12,950 --> 00:53:11,520  
um

1412  
00:53:15,990 --> 00:53:12,960  
you know where

1413  
00:53:17,349 --> 00:53:16,000

there are uh i can either change my mind

1414

00:53:19,510 --> 00:53:17,359

about you

1415

00:53:21,349 --> 00:53:19,520

uh or i can try and change you by

1416

00:53:23,750 --> 00:53:21,359

queering you asking a question

1417

00:53:25,990 --> 00:53:23,760

performing an experiment upon you to get

1418

00:53:28,549 --> 00:53:26,000

some better um

1419

00:53:30,549 --> 00:53:28,559

better data from you that resolves my

1420

00:53:32,549 --> 00:53:30,559

uncertainty about you

1421

00:53:34,150 --> 00:53:32,559

is there a relationship between changing

1422

00:53:37,349 --> 00:53:34,160

your evidence versus changing your model

1423

00:53:39,589 --> 00:53:37,359

and the psychoanalytic repression so

1424

00:53:42,390 --> 00:53:39,599

repression would be saying you know what

1425

00:53:44,150 --> 00:53:42,400

that data doesn't exist let me ignore it

1426  
00:53:46,069 --> 00:53:44,160  
versus the

1427  
00:53:48,230 --> 00:53:46,079  
perhaps a cognitive behavioral therapy

1428  
00:53:50,230 --> 00:53:48,240  
technique would be to say no go out and

1429  
00:53:51,829 --> 00:53:50,240  
perhaps update your model of it view it

1430  
00:53:53,750 --> 00:53:51,839  
differently view the maybe it's our

1431  
00:53:56,230 --> 00:53:53,760  
arachnophobia for example i think it's a

1432  
00:53:58,470 --> 00:53:56,240  
beautiful analogy and you know not

1433  
00:54:01,910 --> 00:53:58,480  
probably beyond an analogy there are

1434  
00:54:06,549 --> 00:54:01,920  
people in computational psychiatry who

1435  
00:54:08,950 --> 00:54:06,559  
think exactly like that um and you know

1436  
00:54:11,109 --> 00:54:08,960  
you can find articles trends in

1437  
00:54:12,710 --> 00:54:11,119  
cognitive science reviews of the car you

1438  
00:54:14,470 --> 00:54:12,720

know something to deal with you know how

1439

00:54:16,710 --> 00:54:14,480

do you how do you resolve cognitive

1440

00:54:20,470 --> 00:54:16,720

dissonance how do you understand wishful

1441

00:54:23,030 --> 00:54:20,480

thinking um so examples

1442

00:54:27,190 --> 00:54:23,040

i think that's a perfect example of

1443

00:54:29,510 --> 00:54:27,200

this way of maximizing the evidence for

1444

00:54:31,190 --> 00:54:29,520

your models of the world in that case it

1445

00:54:32,710 --> 00:54:31,200

sounds like at least the colloquial

1446

00:54:34,710 --> 00:54:32,720

understanding maybe in the west or maybe

1447

00:54:35,910 --> 00:54:34,720

throughout the world i'm unsure is that

1448

00:54:37,190 --> 00:54:35,920

you should update your model you

1449

00:54:38,470 --> 00:54:37,200

shouldn't try to change the evidence to

1450

00:54:40,230 --> 00:54:38,480

match your model you should update your

1451  
00:54:41,990 --> 00:54:40,240  
model and in fact there are some

1452  
00:54:43,510 --> 00:54:42,000  
political implications i'm sure people

1453  
00:54:46,230 --> 00:54:43,520  
shout that on the streets across various

1454  
00:54:48,390 --> 00:54:46,240  
political divides so is this an argument

1455  
00:54:50,309 --> 00:54:48,400  
to say that updating the model is

1456  
00:54:51,910 --> 00:54:50,319  
actually the one that should be primary

1457  
00:54:53,510 --> 00:54:51,920  
because the way that i understand from

1458  
00:54:55,510 --> 00:54:53,520  
how you've explained it is that both are

1459  
00:54:57,030 --> 00:54:55,520  
equally valid however when i look across

1460  
00:54:58,549 --> 00:54:57,040  
the world and i look at how we think

1461  
00:55:00,230 --> 00:54:58,559  
just in terms of common sense

1462  
00:55:01,589 --> 00:55:00,240  
psychological advice at least to us in

1463  
00:55:04,230 --> 00:55:01,599

the 21st century it sounds like you

1464

00:55:06,309 --> 00:55:04,240

should update your model um well but i

1465

00:55:07,990 --> 00:55:06,319

think you're right to say that you know

1466

00:55:10,309 --> 00:55:08,000

it would be um

1467

00:55:12,309 --> 00:55:10,319

disingenuous from a mathematical point

1468

00:55:14,150 --> 00:55:12,319

of view to privilege the model versus

1469

00:55:16,790 --> 00:55:14,160

the data and

1470

00:55:20,790 --> 00:55:18,470

so how does one choose between those

1471

00:55:22,630 --> 00:55:20,800

mathematically how does one i don't i i

1472

00:55:25,109 --> 00:55:22,640

i don't think you can in the sense you

1473

00:55:27,910 --> 00:55:25,119

know you you can't you can't spit a coin

1474

00:55:32,549 --> 00:55:27,920

a coin has two two sides to it i mean

1475

00:55:35,030 --> 00:55:32,559

um the whole point of this inactivist um

1476

00:55:38,790 --> 00:55:35,040

take on sense-making

1477

00:55:41,190 --> 00:55:38,800

um is the it you know you you have to

1478

00:55:43,109 --> 00:55:41,200

optimally go and listen to the right

1479

00:55:46,309 --> 00:55:43,119

kind of news talk to the right kind of

1480

00:55:48,390 --> 00:55:46,319

people um in order to solicit the right

1481

00:55:50,069 --> 00:55:48,400

kind of data that's going to maximize

1482

00:55:51,750 --> 00:55:50,079

the evidence for your model whilst at

1483

00:55:54,150 --> 00:55:51,760

the same time you are updating your

1484

00:55:56,549 --> 00:55:54,160

model um sometimes known as basically

1485

00:55:58,470 --> 00:55:56,559

palpitating um

1486

00:56:00,630 --> 00:55:58,480

or certain bayesian model selection for

1487

00:56:02,870 --> 00:56:00,640

example so the two things go hand in

1488

00:56:05,829 --> 00:56:02,880

hand i think one way of resolving or

1489

00:56:08,390 --> 00:56:05,839

answering your question is just to

1490

00:56:12,549 --> 00:56:08,400

say in a political um

1491

00:56:18,230 --> 00:56:14,789

perhaps even sort of

1492

00:56:19,430 --> 00:56:18,240

communication science uh sense or uh or

1493

00:56:22,390 --> 00:56:19,440

at least

1494

00:56:25,349 --> 00:56:22,400

the social aspects of it um what you're

1495

00:56:27,270 --> 00:56:25,359

what you're saying is that um

1496

00:56:30,230 --> 00:56:27,280

there is now

1497

00:56:32,470 --> 00:56:30,240

once you acknowledge that you also are

1498

00:56:33,349 --> 00:56:32,480

in charge of getting the data

1499

00:56:34,630 --> 00:56:33,359

um

1500

00:56:39,910 --> 00:56:34,640

then

1501  
00:56:42,789 --> 00:56:39,920  
problems of how much weight you afford

1502  
00:56:44,470 --> 00:56:42,799  
to that data versus that data and where

1503  
00:56:47,349 --> 00:56:44,480  
you get your data from which news

1504  
00:56:49,349 --> 00:56:47,359  
channels do you uh do um

1505  
00:56:52,150 --> 00:56:49,359  
forage

1506  
00:56:53,990 --> 00:56:52,160  
who do you listen to who do you trust

1507  
00:56:55,190 --> 00:56:54,000  
who do you ignore

1508  
00:56:57,190 --> 00:56:55,200  
um

1509  
00:57:00,309 --> 00:56:57,200  
and we do this all the time we do this

1510  
00:57:02,470 --> 00:57:00,319  
in a very skillful way so personally

1511  
00:57:04,150 --> 00:57:02,480  
in terms of deploying

1512  
00:57:06,549 --> 00:57:04,160  
our attention

1513  
00:57:09,829 --> 00:57:06,559

so if you're an engineer

1514

00:57:11,990 --> 00:57:09,839

and you are thinking about

1515

00:57:14,309 --> 00:57:12,000

assimilating visual information using a

1516

00:57:17,430 --> 00:57:14,319

kalman filter for example

1517

00:57:20,230 --> 00:57:17,440

then one of the most artful challenges

1518

00:57:22,230 --> 00:57:20,240

or art for resolutions that the cameron

1519

00:57:25,270 --> 00:57:22,240

filter brings to the table is to get the

1520

00:57:26,549 --> 00:57:25,280

kalman gain right how much weight do you

1521

00:57:28,710 --> 00:57:26,559

afford

1522

00:57:33,030 --> 00:57:28,720

the prediction errors that supply the up

1523

00:57:35,430 --> 00:57:33,040

to term of a basin or a kalman filter

1524

00:57:38,870 --> 00:57:35,440

and we we do that on the fly all the

1525

00:57:40,630 --> 00:57:38,880

time right down to the level of

1526

00:57:43,109 --> 00:57:40,640

turning on and off

1527

00:57:44,069 --> 00:57:43,119

the attention or the precision or the

1528

00:57:45,750 --> 00:57:44,079

gain

1529

00:57:48,309 --> 00:57:45,760

um afforded

1530

00:57:52,150 --> 00:57:48,319

visual information so my favorite

1531

00:57:54,789 --> 00:57:52,160

example is um psychotic eye movements um

1532

00:57:57,030 --> 00:57:54,799

so just to demonstrate that you know

1533

00:57:59,349 --> 00:57:57,040

we could you know one can

1534

00:58:02,710 --> 00:57:59,359

do this experiment at home you can just

1535

00:58:05,430 --> 00:58:02,720

look um from one side of your visual

1536

00:58:07,750 --> 00:58:05,440

scene to the other side and back and

1537

00:58:09,670 --> 00:58:07,760

forth and back and forth with psychotic

1538

00:58:11,829 --> 00:58:09,680

eye movements

1539

00:58:13,670 --> 00:58:11,839

and you will not perceive the world

1540

00:58:16,309 --> 00:58:13,680

jumping around

1541

00:58:18,789 --> 00:58:16,319

however if you reproduce the same visual

1542

00:58:21,109 --> 00:58:18,799

impressions just by palpating your eye

1543

00:58:22,710 --> 00:58:21,119

in the spirit of hellholes

1544

00:58:23,430 --> 00:58:22,720

what's that palpating what does that

1545

00:58:24,870 --> 00:58:23,440

mean

1546

00:58:26,309 --> 00:58:24,880

yeah if you well you can literally do

1547

00:58:29,750 --> 00:58:26,319

this now if you just take your finger

1548

00:58:32,150 --> 00:58:29,760

and place it gently on the outer

1549

00:58:34,950 --> 00:58:32,160

aspect of your eyeball and just gently

1550

00:58:36,789 --> 00:58:34,960

press in until you see the world shift

1551  
00:58:37,510 --> 00:58:36,799  
around and move around

1552  
00:58:40,230 --> 00:58:37,520  
so

1553  
00:58:43,349 --> 00:58:40,240  
you can see visual motion

1554  
00:58:45,030 --> 00:58:43,359  
that is a consequence of optic flow in

1555  
00:58:47,270 --> 00:58:45,040  
introduced in this instance by you

1556  
00:58:49,829 --> 00:58:47,280  
pushing your retina

1557  
00:58:50,870 --> 00:58:49,839  
translating your retina with the input

1558  
00:58:53,270 --> 00:58:50,880  
fixed

1559  
00:58:54,470 --> 00:58:53,280  
um and that is basically exactly the

1560  
00:58:57,510 --> 00:58:54,480  
same from the point of view of the

1561  
00:59:00,309 --> 00:58:57,520  
retina the back of your eyeball as

1562  
00:59:01,990 --> 00:59:00,319  
moving the iso

1563  
00:59:07,270 --> 00:59:02,000

with the

1564

00:59:08,870 --> 00:59:07,280

you only saw

1565

00:59:11,750 --> 00:59:08,880

motion of the world

1566

00:59:14,309 --> 00:59:11,760

when you were moving your eyeball

1567

00:59:17,270 --> 00:59:14,319

when you move your eyes in the normal

1568

00:59:20,069 --> 00:59:17,280

way you don't see that motion

1569

00:59:21,349 --> 00:59:20,079

and the reason is that your brain

1570

00:59:22,789 --> 00:59:21,359

ignores

1571

00:59:25,109 --> 00:59:22,799

visual input

1572

00:59:27,270 --> 00:59:25,119

during eye movement and that's called

1573

00:59:29,349 --> 00:59:27,280

psychotic suppression so i think it's a

1574

00:59:30,390 --> 00:59:29,359

beautiful example of the fact that every

1575

00:59:33,109 --> 00:59:30,400

moment

1576

00:59:35,510 --> 00:59:33,119

we are selectively ignoring

1577

00:59:36,710 --> 00:59:35,520

information that is not newsworthy we

1578

00:59:38,870 --> 00:59:36,720

are selecting it we don't know we're

1579

00:59:42,150 --> 00:59:38,880

doing it but we do it all the time of

1580

00:59:44,870 --> 00:59:42,160

course you know at a much more abstract

1581

00:59:47,670 --> 00:59:44,880

and epistemic level exactly the same

1582

00:59:49,750 --> 00:59:47,680

principles apply when we choose you know

1583

00:59:52,549 --> 00:59:49,760

which newspapers which blog which

1584

00:59:54,549 --> 00:59:52,559

twitter accounts to follow um yeah which

1585

00:59:56,710 --> 00:59:54,559

friends to talk to which universes to go

1586

01:00:00,069 --> 00:59:56,720

to um is it going to be a scholarpedia

1587

01:00:02,630 --> 01:00:00,079

or a wikipedia no all of these decisions

1588

01:00:05,270 --> 01:00:02,640

you know that we make in terms of

1589

01:00:08,870 --> 01:00:05,280

securing the right kind of informative

1590

01:00:11,270 --> 01:00:08,880

precise data that will um literally have

1591

01:00:13,190 --> 01:00:11,280

a salience in the sense that it complies

1592

01:00:16,630 --> 01:00:13,200

with the principles of optimum bayesian

1593

01:00:19,270 --> 01:00:16,640

design in the sense that it will resolve

1594

01:00:20,549 --> 01:00:19,280

the most uncertainty about what i don't

1595

01:00:25,030 --> 01:00:20,559

know

1596

01:00:27,750 --> 01:00:25,040

this sort of um

1597

01:00:29,270 --> 01:00:27,760

being in charge of the data

1598

01:00:32,630 --> 01:00:29,280

even before thinking about the

1599

01:00:35,430 --> 01:00:32,640

consequences of your belief updating and

1600

01:00:37,030 --> 01:00:35,440

you know you're getting uh just knowing

1601  
01:00:39,829 --> 01:00:37,040  
that you have to write that and of

1602  
01:00:41,990 --> 01:00:39,839  
course the you know the um

1603  
01:00:44,150 --> 01:00:42,000  
from the from a socio-political point of

1604  
01:00:46,150 --> 01:00:44,160  
view what we're talking about now is how

1605  
01:00:46,870 --> 01:00:46,160  
to disambiguate between fake news and

1606  
01:00:49,109 --> 01:00:46,880  
true

1607  
01:00:50,549 --> 01:00:49,119  
news how to

1608  
01:00:57,270 --> 01:00:50,559  
um

1609  
01:01:01,109 --> 01:00:57,280  
us being isolationist or precludes as

1610  
01:01:03,910 --> 01:01:01,119  
succumbing to um cult like

1611  
01:01:06,630 --> 01:01:03,920  
ideologies um you know precludes

1612  
01:01:08,630 --> 01:01:06,640  
fundamentalism of a dysfunctional sort

1613  
01:01:11,030 --> 01:01:08,640

or why is it dysfunctional well usually

1614

01:01:12,470 --> 01:01:11,040

because that kind of fundamentalism does

1615

01:01:15,589 --> 01:01:12,480

not speak to

1616

01:01:17,430 --> 01:01:15,599

and does not um minimize that joint

1617

01:01:20,069 --> 01:01:17,440

predictability of that joint free energy

1618

01:01:21,589 --> 01:01:20,079

that we were talking about um

1619

01:01:24,710 --> 01:01:21,599

several minutes ago

1620

01:01:26,230 --> 01:01:24,720

so what what you will find is that

1621

01:01:28,870 --> 01:01:26,240

[Music]

1622

01:01:32,069 --> 01:01:28,880

that dialectic between changing your

1623

01:01:34,870 --> 01:01:32,079

mind on the basis of some evidence and

1624

01:01:37,670 --> 01:01:34,880

changing the evidence by uh changing

1625

01:01:39,910 --> 01:01:37,680

where you look for that evidence that

1626

01:01:41,109 --> 01:01:39,920

that balance is at the heart of action

1627

01:01:43,430 --> 01:01:41,119

and perception

1628

01:01:44,950 --> 01:01:43,440

and indeed you you could argue the all

1629

01:01:47,990 --> 01:01:44,960

of action

1630

01:01:50,470 --> 01:01:48,000

is simply in the service of gathering

1631

01:01:52,950 --> 01:01:50,480

better data what do you mean by better

1632

01:01:55,910 --> 01:01:52,960

those data that was that minimize your

1633

01:01:58,150 --> 01:01:55,920

surprise minimize your expected surprise

1634

01:02:00,549 --> 01:01:58,160

or your uncertainty resolving

1635

01:02:03,109 --> 01:02:00,559

uncertainty about the way you think the

1636

01:02:05,750 --> 01:02:03,119

world works and more particularly how

1637

01:02:07,190 --> 01:02:05,760

you work in that in that world this

1638

01:02:09,030 --> 01:02:07,200

sounds like a deeper issue than just a

1639

01:02:12,549 --> 01:02:09,040

political problem it sounds like an

1640

01:02:14,950 --> 01:02:12,559

issue for the process of suggesting that

1641

01:02:16,789 --> 01:02:14,960

the conclusions that one has come to was

1642

01:02:19,109 --> 01:02:16,799

from a dispassionate assessment of the

1643

01:02:20,630 --> 01:02:19,119

evidence so you hear people say this

1644

01:02:22,309 --> 01:02:20,640

generally people who like to think of

1645

01:02:24,309 --> 01:02:22,319

themselves as extremely rational people

1646

01:02:26,710 --> 01:02:24,319

who've come to their conclusions because

1647

01:02:29,030 --> 01:02:26,720

they have objectively analyzed some

1648

01:02:30,710 --> 01:02:29,040

situation it sounds like that is a

1649

01:02:32,069 --> 01:02:30,720

doomed project because we're all

1650

01:02:34,710 --> 01:02:32,079

sampling different data without

1651

01:02:36,390 --> 01:02:34,720

realizing it now is that the case or no

1652

01:02:38,789 --> 01:02:36,400

yes no i think that's absolutely right

1653

01:02:40,789 --> 01:02:38,799

um and i don't think there's anything

1654

01:02:42,470 --> 01:02:40,799

bad about it i mean that's just the way

1655

01:02:44,069 --> 01:02:42,480

things are so how does one overcome that

1656

01:02:47,430 --> 01:02:44,079

what what do we do how is it this the

1657

01:02:51,190 --> 01:02:47,440

scientific process seems to work

1658

01:02:53,510 --> 01:02:51,200

um well it works because um uh

1659

01:02:56,470 --> 01:02:53,520

the the operational definition of

1660

01:02:58,870 --> 01:02:56,480

working simply is maximizing the

1661

01:03:00,549 --> 01:02:58,880

marginal likelihood so your liberty to

1662

01:03:03,030 --> 01:03:00,559

actually maximize the margin likely by

1663

01:03:06,710 --> 01:03:03,040

either changing the data or changing to

1664

01:03:08,549 --> 01:03:06,720

changing the model um so notice that in

1665

01:03:10,230 --> 01:03:08,559

this instance

1666

01:03:11,510 --> 01:03:10,240

you're not going to make any false

1667

01:03:14,150 --> 01:03:11,520

inferences

1668

01:03:16,789 --> 01:03:14,160

you know provided that all the data you

1669

01:03:18,630 --> 01:03:16,799

solicit is always very consistent with

1670

01:03:21,270 --> 01:03:18,640

your model you you won't need to change

1671

01:03:23,029 --> 01:03:21,280

your mind um if you've got the wrong

1672

01:03:25,029 --> 01:03:23,039

model the data will provide this

1673

01:03:27,190 --> 01:03:25,039

confirmatory evidence and and you may

1674

01:03:28,630 --> 01:03:27,200

well to try and get data from another

1675

01:03:30,390 --> 01:03:28,640

source and if you can do that and

1676

01:03:32,630 --> 01:03:30,400

continue engaging until your model is

1677

01:03:35,270 --> 01:03:32,640

fit for purpose what you have basically

1678

01:03:37,510 --> 01:03:35,280

done is find a niche for yourself where

1679

01:03:39,109 --> 01:03:37,520

your ideology your conceptions your

1680

01:03:41,670 --> 01:03:39,119

understanding of the world the world the

1681

01:03:43,670 --> 01:03:41,680

way the world work is perfectly fine so

1682

01:03:46,390 --> 01:03:43,680

you've found a culturally

1683

01:03:49,510 --> 01:03:46,400

or possibly a physiological eco niche or

1684

01:03:50,950 --> 01:03:49,520

an information eco niche that suits you

1685

01:03:53,430 --> 01:03:50,960

and you will have a high adaptive

1686

01:03:54,789 --> 01:03:53,440

fitness and survive and persist in that

1687

01:03:56,789 --> 01:03:54,799

eco niche

1688

01:04:01,670 --> 01:03:56,799

if you can't you move to another one and

1689

01:04:04,230 --> 01:04:01,680

so now we have a model of speciation um

1690

01:04:07,589 --> 01:04:04,240

we have a model of

1691

01:04:10,069 --> 01:04:07,599

shared narratives shared convictions

1692

01:04:11,990 --> 01:04:10,079

that can be communicated so supply and

1693

01:04:12,950 --> 01:04:12,000

teach each other

1694

01:04:15,029 --> 01:04:12,960

that

1695

01:04:17,430 --> 01:04:15,039

is self-assembling

1696

01:04:19,190 --> 01:04:17,440

and um

1697

01:04:20,710 --> 01:04:19,200

self-constructing

1698

01:04:24,230 --> 01:04:20,720

co-created

1699

01:04:25,589 --> 01:04:24,240

simply because you are looking for

1700

01:04:27,109 --> 01:04:25,599

at the same time you're looking for

1701

01:04:29,670 --> 01:04:27,119

information that resolves the

1702

01:04:31,589 --> 01:04:29,680

uncertainty about your models of how the

1703

01:04:34,069 --> 01:04:31,599

world works

1704

01:04:36,950 --> 01:04:34,079

which makes it look as if from the

1705

01:04:40,710 --> 01:04:36,960

outside you're basically changing the

1706

01:04:43,589 --> 01:04:40,720

world to make your hypotheses come true

1707

01:04:46,150 --> 01:04:43,599

and that of course is just another way

1708

01:04:47,589 --> 01:04:46,160

of describing action so if we come away

1709

01:04:49,750 --> 01:04:47,599

from the sort of

1710

01:04:51,910 --> 01:04:49,760

the exchange of information as a

1711

01:04:54,230 --> 01:04:51,920

scientist or somebody who reads the news

1712

01:04:55,270 --> 01:04:54,240

or somebody who's trying to do a phd or

1713

01:04:57,589 --> 01:04:55,280

um

1714

01:05:00,309 --> 01:04:57,599

indeed just you know make sense of uh

1715

01:05:02,230 --> 01:05:00,319

recent political events uh if we can

1716

01:05:06,630 --> 01:05:02,240

bring it back down to

1717

01:05:09,430 --> 01:05:06,640

simple things like um moving your eyes

1718

01:05:12,950 --> 01:05:11,660

in a sense that is you

1719

01:05:17,510 --> 01:05:12,960

[Music]

1720

01:05:18,789 --> 01:05:17,520

changing the data to match your model

1721

01:05:19,910 --> 01:05:18,799

so

1722

01:05:21,670 --> 01:05:19,920

if you

1723

01:05:23,510 --> 01:05:21,680

so this falls out of the free energy

1724

01:05:26,069 --> 01:05:23,520

principle because you know if it's the

1725

01:05:30,309 --> 01:05:26,079

case that the autonomous paths the

1726

01:05:32,470 --> 01:05:30,319

dynamics that we um um that um

1727

01:05:35,270 --> 01:05:32,480

that constitute are

1728

01:05:37,430 --> 01:05:35,280

our active engagement with the world if

1729

01:05:39,670 --> 01:05:37,440

they're trying to minimize free energy

1730

01:05:42,630 --> 01:05:39,680

and we in this instance minimize free

1731

01:05:45,670 --> 01:05:42,640

energy as a prediction error or surprise

1732

01:05:47,430 --> 01:05:45,680

um remembering that it's the negative of

1733

01:05:48,870 --> 01:05:47,440

the marginal likelihood

1734

01:05:49,670 --> 01:05:48,880

it's something

1735

01:05:52,309 --> 01:05:49,680

if

1736

01:05:53,990 --> 01:05:52,319

the probability of these data

1737

01:05:55,750 --> 01:05:54,000

given my understanding of my

1738

01:05:57,029 --> 01:05:55,760

construction of the world at this point

1739

01:05:59,510 --> 01:05:57,039

in time

1740

01:06:01,910 --> 01:05:59,520

is very very low

1741

01:06:04,230 --> 01:06:01,920

then it will have a very very small

1742

01:06:06,470 --> 01:06:04,240

marginal likelihood or have a very very

1743

01:06:08,390 --> 01:06:06,480

high free energy and therefore it will

1744

01:06:09,270 --> 01:06:08,400

be surprising given my model of the

1745

01:06:12,230 --> 01:06:09,280

world

1746

01:06:14,470 --> 01:06:12,240

some people like to articulate the other

1747

01:06:16,950 --> 01:06:14,480

that surprise in terms of a prediction

1748

01:06:19,109 --> 01:06:16,960

what i predicted was going to happen

1749

01:06:20,950 --> 01:06:19,119

is nothing like what i actually sense

1750

01:06:22,710 --> 01:06:20,960

the data i actually got

1751  
01:06:23,750 --> 01:06:22,720  
so

1752  
01:06:25,109 --> 01:06:23,760  
imagine

1753  
01:06:26,470 --> 01:06:25,119  
how um

1754  
01:06:27,270 --> 01:06:26,480  
imagine now

1755  
01:06:32,069 --> 01:06:27,280  
you

1756  
01:06:35,349 --> 01:06:32,079  
the autonomous states that include the

1757  
01:06:37,349 --> 01:06:35,359  
active states are just in the service of

1758  
01:06:39,270 --> 01:06:37,359  
minimizing prediction error

1759  
01:06:41,990 --> 01:06:39,280  
how we would you understand that in

1760  
01:06:43,750 --> 01:06:42,000  
terms of elemental movement and behavior

1761  
01:06:47,109 --> 01:06:43,760  
and one way of understanding that is

1762  
01:06:49,190 --> 01:06:47,119  
that basically your models of say how

1763  
01:06:51,750 --> 01:06:49,200

you're going to move are actually

1764

01:06:54,230 --> 01:06:51,760

realized by creating data that is

1765

01:06:56,950 --> 01:06:54,240

consistent with your predictions

1766

01:06:58,829 --> 01:06:56,960

so i have in my head

1767

01:07:01,829 --> 01:06:58,839

a model a

1768

01:07:03,750 --> 01:07:01,839

hypothesis the notion that i'm going to

1769

01:07:04,470 --> 01:07:03,760

raise my arm

1770

01:07:07,750 --> 01:07:04,480

and

1771

01:07:09,990 --> 01:07:07,760

all that's happening in that

1772

01:07:11,510 --> 01:07:10,000

notion is that that's my belief about

1773

01:07:14,309 --> 01:07:11,520

state in the world

1774

01:07:17,589 --> 01:07:14,319

and i'm telling my spinal cord and my

1775

01:07:19,829 --> 01:07:17,599

musculature and my muscles

1776

01:07:22,630 --> 01:07:19,839

that's how i expect the world to be and

1777

01:07:24,230 --> 01:07:22,640

then my reflexes are driven by the

1778

01:07:25,270 --> 01:07:24,240

prediction errors

1779

01:07:27,029 --> 01:07:25,280

driven

1780

01:07:29,349 --> 01:07:27,039

by the free energy gradients literally

1781

01:07:32,789 --> 01:07:29,359

like the ball rolling down the hill

1782

01:07:34,789 --> 01:07:32,799

um to realize to change the world so it

1783

01:07:36,069 --> 01:07:34,799

supplies the kind of data that i

1784

01:07:39,349 --> 01:07:36,079

predicted

1785

01:07:40,789 --> 01:07:39,359

i just wanted to mention that um

1786

01:07:43,589 --> 01:07:40,799

that notion

1787

01:07:46,710 --> 01:07:43,599

of movement

1788

01:07:49,109 --> 01:07:46,720

as simply a realization

1789

01:07:51,510 --> 01:07:49,119

of predicted

1790

01:07:54,069 --> 01:07:51,520

endpoints

1791

01:07:54,829 --> 01:07:54,079

intentions to move

1792

01:07:58,069 --> 01:07:54,839

is

1793

01:08:00,470 --> 01:07:58,079

physiologically um fully licensed by

1794

01:08:02,789 --> 01:08:00,480

things like equilibrium point hypothesis

1795

01:08:06,549 --> 01:08:02,799

in motor control and motor physiology

1796

01:08:08,630 --> 01:08:06,559

but it's it goes back even further to um

1797

01:08:12,150 --> 01:08:08,640

ideomotor theory so this was in the

1798

01:08:13,990 --> 01:08:12,160

victorian age how people understood

1799

01:08:17,189 --> 01:08:14,000

movement that basically it was a

1800

01:08:19,749 --> 01:08:17,199

physical manifestation of beliefs about

1801

01:08:21,590 --> 01:08:19,759

the way my body should be posed or what

1802

01:08:24,789 --> 01:08:21,600

my body should be doing

1803

01:08:27,349 --> 01:08:24,799

so to me that is if you like an

1804

01:08:28,390 --> 01:08:27,359

elemental and quite fundamental example

1805

01:08:31,829 --> 01:08:28,400

of

1806

01:08:34,470 --> 01:08:31,839

the model

1807

01:08:38,390 --> 01:08:34,480

so if you changed your model in the

1808

01:08:41,189 --> 01:08:38,400

context of i'm going to stand up now

1809

01:08:43,110 --> 01:08:41,199

and you looked at the data and nothing

1810

01:08:45,269 --> 01:08:43,120

is happening you would immediately

1811

01:08:46,950 --> 01:08:45,279

change your mind and say oh i'm not

1812

01:08:48,630 --> 01:08:46,960

standing up

1813

01:08:50,789 --> 01:08:48,640

what would that look like that would

1814

01:08:53,269 --> 01:08:50,799

look like parkinson's disease

1815

01:08:55,110 --> 01:08:53,279

that would be a failure to properly

1816

01:08:57,590 --> 01:08:55,120

attenuate the evidence that i'm not

1817

01:09:00,149 --> 01:08:57,600

moving when i strongly believe that i am

1818

01:09:02,709 --> 01:09:00,159

about to move

1819

01:09:03,430 --> 01:09:02,719

and of course you can understand now

1820

01:09:08,149 --> 01:09:03,440

the

1821

01:09:12,630 --> 01:09:09,749

disease

1822

01:09:14,070 --> 01:09:12,640

that's due to a failure of

1823

01:09:15,749 --> 01:09:14,080

neuronal message passing and

1824

01:09:18,470 --> 01:09:15,759

particularly the weight or the gain

1825

01:09:20,309 --> 01:09:18,480

afforded proprioceptive information in

1826

01:09:21,910 --> 01:09:20,319

that light it's a failure of active

1827

01:09:23,110 --> 01:09:21,920

influences a failure of the active

1828

01:09:27,990 --> 01:09:23,120

states

1829

01:09:28,870 --> 01:09:28,000

to um probably uh respond to

1830

01:09:34,630 --> 01:09:28,880

um

1831

01:09:37,510 --> 01:09:34,640

evidence at hand

1832

01:09:38,950 --> 01:09:37,520

so this is a lovely example of ignoring

1833

01:09:41,990 --> 01:09:38,960

selectively ignoring just like the

1834

01:09:43,990 --> 01:09:42,000

satanic suppression with the eyes

1835

01:09:45,829 --> 01:09:44,000

that enables movement if you didn't do

1836

01:09:48,390 --> 01:09:45,839

that we couldn't move so what i'm trying

1837

01:09:50,070 --> 01:09:48,400

to say is that you know right from the

1838

01:09:52,709 --> 01:09:50,080

the inception of these kinds of this

1839

01:09:55,910 --> 01:09:52,719

kind of thinking in the inactive domain

1840

01:09:58,550 --> 01:09:55,920

uh in terms of ideomotive theory

1841

01:10:01,669 --> 01:09:58,560

the uh there is a there is i think a

1842

01:10:02,390 --> 01:10:01,679

fundamental importance of um

1843

01:10:03,430 --> 01:10:02,400

your

1844

01:10:05,270 --> 01:10:03,440

um

1845

01:10:07,430 --> 01:10:05,280

of the other side of the coin from

1846

01:10:10,709 --> 01:10:07,440

changing your mind which is basically

1847

01:10:13,910 --> 01:10:10,719

changing the data uh upon which you make

1848

01:10:18,390 --> 01:10:15,830

which causes you to change your mind

1849

01:10:19,590 --> 01:10:18,400

through through sense-making

1850

01:10:21,910 --> 01:10:19,600

and without that we wouldn't have

1851

01:10:24,709 --> 01:10:21,920

actions so you can almost say that

1852

01:10:26,870 --> 01:10:24,719

action and perception are the two sides

1853

01:10:29,110 --> 01:10:26,880

of the same coin the perception is

1854

01:10:31,430 --> 01:10:29,120

changing your mind by changing your

1855

01:10:33,830 --> 01:10:31,440

model to maximize the marginal

1856

01:10:36,470 --> 01:10:33,840

likelihood given a particular model

1857

01:10:38,870 --> 01:10:36,480

action just is changing the data by

1858

01:10:41,110 --> 01:10:38,880

acting upon the world to maximize the

1859

01:10:42,790 --> 01:10:41,120

marginal likelihood basically maximizing

1860

01:10:45,830 --> 01:10:42,800

changing the data so the probability of

1861

01:10:47,830 --> 01:10:45,840

the data given the model is so

1862

01:10:49,669 --> 01:10:47,840

active inference or that coupling of

1863

01:10:51,189 --> 01:10:49,679

action perception

1864

01:10:54,390 --> 01:10:51,199

is essentially

1865

01:10:57,830 --> 01:10:54,400

trying to realize your beliefs about or

1866

01:10:59,270 --> 01:10:57,840

your models of your lived world and if

1867

01:11:01,910 --> 01:10:59,280

you're successful in doing that you've

1868

01:11:04,310 --> 01:11:01,920

got the right eco niche you will have a

1869

01:11:05,910 --> 01:11:04,320

high marginal likelihood you know from

1870

01:11:07,270 --> 01:11:05,920

an evolutionary perspective you will

1871

01:11:08,630 --> 01:11:07,280

have um

1872

01:11:12,390 --> 01:11:08,640

a

1873

01:11:13,590 --> 01:11:12,400

perspective you will be uh people will

1874

01:11:15,669 --> 01:11:13,600

listen to you

1875

01:11:19,189 --> 01:11:15,679

and teach you your job into these

1876

01:11:22,310 --> 01:11:19,199

podcasts suggesting you you do indeed

1877

01:11:25,270 --> 01:11:22,320

solicit that kind of information uh that

1878

01:11:28,630 --> 01:11:25,280

causes people to you know to go to your

1879

01:11:30,310 --> 01:11:28,640

channel to attend to your stuff um

1880

01:11:31,510 --> 01:11:30,320

simply because they they think they're

1881

01:11:34,149 --> 01:11:31,520

gonna get good stuff and they're gonna

1882

01:11:37,270 --> 01:11:34,159

get uncertainty resolving stuff um so

1883

01:11:39,350 --> 01:11:37,280

this this this i think is is is uh puts

1884

01:11:41,590 --> 01:11:39,360

the balance back on the uh on getting

1885

01:11:42,550 --> 01:11:41,600

the data right or the data data foraging

1886

01:11:44,149 --> 01:11:42,560

right

1887

01:11:46,470 --> 01:11:44,159

okay well perhaps let me undermine my

1888

01:11:47,270 --> 01:11:46,480

own credibility here

1889

01:11:49,590 --> 01:11:47,280

so

1890

01:11:51,830 --> 01:11:49,600

a few weeks ago and i think about a year

1891

01:11:54,229 --> 01:11:51,840

ago or so we talked and i had some

1892

01:11:55,990 --> 01:11:54,239

experience about and i was worried and

1893

01:11:57,270 --> 01:11:56,000

you said kurt don't be worried don't i

1894

01:11:59,510 --> 01:11:57,280

had some experience where i thought i

1895

01:12:01,189 --> 01:11:59,520

heard a voice it was at a in a

1896

01:12:03,270 --> 01:12:01,199

hypnagogic state so i was just about to

1897

01:12:05,030 --> 01:12:03,280

fall asleep when

1898

01:12:06,149 --> 01:12:05,040

many people

1899

01:12:08,310 --> 01:12:06,159

that shouldn't be a state that i

1900

01:12:10,070 --> 01:12:08,320

attribute much credence to but i

1901

01:12:12,310 --> 01:12:10,080

remember being afraid because i heard my

1902

01:12:14,149 --> 01:12:12,320

wife either say okay or just some one

1903

01:12:16,070 --> 01:12:14,159

syllable word and then i was so worried

1904

01:12:17,910 --> 01:12:16,080

and i worked myself up into anxiety

1905

01:12:18,709 --> 01:12:17,920

thinking do i have schizophrenia oh my

1906

01:12:21,110 --> 01:12:18,719

gosh

1907

01:12:23,430 --> 01:12:21,120

there was no other voices since then but

1908

01:12:24,630 --> 01:12:23,440

i was extremely anxious

1909

01:12:26,070 --> 01:12:24,640

and then you told me don't worry and

1910

01:12:28,470 --> 01:12:26,080

even kurt even if there is there's

1911

01:12:30,630 --> 01:12:28,480

medication and many people go through

1912

01:12:31,510 --> 01:12:30,640

psychosis and or psychotic breaks and so

1913

01:12:33,430 --> 01:12:31,520

on

1914

01:12:35,669 --> 01:12:33,440

but luckily i didn't luckily there was

1915

01:12:37,990 --> 01:12:35,679

nothing wrong with me and your words did

1916

01:12:39,590 --> 01:12:38,000

calm me so thank you for that however

1917

01:12:41,510 --> 01:12:39,600

and coincidentally

1918

01:12:43,510 --> 01:12:41,520

perhaps not but coincidentally a few

1919

01:12:45,350 --> 01:12:43,520

weeks ago

1920

01:12:46,950 --> 01:12:45,360

i had a strange experience carl and i

1921

01:12:48,790 --> 01:12:46,960

wasn't sure if i was gonna bring this up

1922

01:12:49,990 --> 01:12:48,800

on the podcast for one reason because i

1923

01:12:51,030 --> 01:12:50,000

don't want you to think that i'm someone

1924

01:12:53,270 --> 01:12:51,040

who's

1925

01:12:55,830 --> 01:12:53,280

beset with psychological issues but on

1926

01:12:57,830 --> 01:12:55,840

the other side i am driven by a

1927

01:12:59,830 --> 01:12:57,840

filmmaking adage which says that the

1928

01:13:01,830 --> 01:12:59,840

more personal the pain the more widely

1929

01:13:03,669 --> 01:13:01,840

applicable it is and the opposite is

1930

01:13:05,590 --> 01:13:03,679

also false the opposite is false so if

1931

01:13:07,990 --> 01:13:05,600

you try to speak generally you end up

1932

01:13:10,390 --> 01:13:08,000

speaking to no one

1933

01:13:12,070 --> 01:13:10,400

what happened a couple weeks ago

1934

01:13:13,990 --> 01:13:12,080

was i had this

1935

01:13:16,070 --> 01:13:14,000

sense and it was so and even to talk

1936

01:13:19,350 --> 01:13:16,080

about it now is a bit frightening i had

1937

01:13:22,310 --> 01:13:19,360

this sense that i was like oh shoot

1938

01:13:24,709 --> 01:13:22,320

solipsism is everything in my head just

1939

01:13:26,550 --> 01:13:24,719

that thought and i've because i'm on

1940

01:13:29,430 --> 01:13:26,560

this podcast and i've entertained many

1941

01:13:31,189 --> 01:13:29,440

ideas it's extremely taxing to do so

1942

01:13:32,470 --> 01:13:31,199

because i try to take different people's

1943

01:13:33,910 --> 01:13:32,480

points of views

1944

01:13:35,830 --> 01:13:33,920

seriously

1945

01:13:37,270 --> 01:13:35,840

and perhaps i shouldn't but i feel like

1946

01:13:39,750 --> 01:13:37,280

in order to give them a fair shake i

1947

01:13:43,189 --> 01:13:39,760

need to embody them in some way shape or

1948

01:13:45,110 --> 01:13:43,199

form so if they say well all is mind for

1949

01:13:46,950 --> 01:13:45,120

example that's the idealists

1950

01:13:48,550 --> 01:13:46,960

i'm trying to imagine what would that be

1951

01:13:50,070 --> 01:13:48,560

like and if someone's a materialist well

1952

01:13:51,350 --> 01:13:50,080

what does it mean that this was dead and

1953

01:13:53,270 --> 01:13:51,360

it somehow emerged that we have

1954

01:13:55,270 --> 01:13:53,280

consciousness either way the point of

1955

01:13:57,030 --> 01:13:55,280

that is to say i've been feeling like

1956

01:13:59,189 --> 01:13:57,040

for almost a year and a half now just in

1957

01:14:01,270 --> 01:13:59,199

a void not sure what is true and what's

1958

01:14:04,630 --> 01:14:01,280

not true that's fine i can deal with

1959

01:14:06,950 --> 01:14:04,640

that except that that led me to this

1960

01:14:08,470 --> 01:14:06,960

spiraling of such

1961

01:14:10,790 --> 01:14:08,480

it was probably the most terrifying

1962

01:14:11,990 --> 01:14:10,800

experience i've ever had in my life

1963

01:14:13,590 --> 01:14:12,000

and it took me weeks and i'm still

1964

01:14:14,630 --> 01:14:13,600

recovering from it where i felt like

1965

01:14:17,189 --> 01:14:14,640

shoot

1966

01:14:19,590 --> 01:14:17,199

am i all that exists and then just that

1967

01:14:21,669 --> 01:14:19,600

thought alone i'm like i don't want to

1968

01:14:22,870 --> 01:14:21,679

believe that that could be the case and

1969

01:14:25,830 --> 01:14:22,880

i remember looking at my wife and

1970

01:14:28,070 --> 01:14:25,840

thinking is my wife even real how

1971

01:14:30,390 --> 01:14:28,080

much of an imbecile and how ungrateful

1972

01:14:32,310 --> 01:14:30,400

and how foolish is it and how

1973

01:14:34,390 --> 01:14:32,320

that i would even think that i feel bad

1974

01:14:36,470 --> 01:14:34,400

that i would even entertain that thought

1975

01:14:37,830 --> 01:14:36,480

oh my gosh i'm scared i don't want to go

1976

01:14:40,149 --> 01:14:37,840

to the

1977

01:14:42,229 --> 01:14:40,159

hospital because i felt like if i was to

1978

01:14:44,870 --> 01:14:42,239

truly accept that thought i could i was

1979

01:14:46,950 --> 01:14:44,880

on the brink of just losing it into an

1980

01:14:49,830 --> 01:14:46,960

insensitive spiral

1981

01:14:51,830 --> 01:14:49,840

i became extremely scared of myself and

1982

01:14:53,430 --> 01:14:51,840

i think that

1983

01:14:54,630 --> 01:14:53,440

i'm the type of person i am an anxious

1984

01:14:55,510 --> 01:14:54,640

person

1985

01:14:57,430 --> 01:14:55,520

and i

1986

01:15:00,149 --> 01:14:57,440

am the type of person that tends to

1987

01:15:02,630 --> 01:15:00,159

obsess over thoughts

1988

01:15:05,189 --> 01:15:02,640

so then i started to obsess over this

1989

01:15:09,430 --> 01:15:05,199

and for the past couple weeks i was so

1990

01:15:11,750 --> 01:15:09,440

scared so scared of my own mind so

1991

01:15:13,350 --> 01:15:11,760

almost like a hypochondriac for mental

1992

01:15:15,030 --> 01:15:13,360

disorders where i didn't want to even

1993

01:15:16,950 --> 01:15:15,040

look up what's the definition of

1994

01:15:18,709 --> 01:15:16,960

schizophrenia or psychosis was because i

1995

01:15:20,070 --> 01:15:18,719

was afraid that i would see the signs

1996

01:15:21,430 --> 01:15:20,080

everywhere

1997

01:15:24,070 --> 01:15:21,440

for example

1998

01:15:25,830 --> 01:15:24,080

a few days ago or about a week ago i

1999

01:15:28,149 --> 01:15:25,840

remember generally we all speak to

2000

01:15:30,310 --> 01:15:28,159

ourselves in our own heads and sometimes

2001

01:15:32,470 --> 01:15:30,320

i use the phrase so i don't like that or

2002

01:15:33,669 --> 01:15:32,480

i like that i use the word i in my own

2003

01:15:35,030 --> 01:15:33,679

internal monologue but sometimes the

2004

01:15:36,630 --> 01:15:35,040

word yeah you can do this you can do

2005

01:15:38,470 --> 01:15:36,640

this so sometimes you use i and

2006

01:15:40,149 --> 01:15:38,480

sometimes they use you

2007

01:15:42,870 --> 01:15:40,159

and i imagine we all do that it's

2008

01:15:45,669 --> 01:15:42,880

colloquially okay to exchange those two

2009

01:15:47,590 --> 01:15:45,679

however then i thought oh shoot

2010

01:15:49,510 --> 01:15:47,600

what if i felt distance from my thought

2011

01:15:50,870 --> 01:15:49,520

what if the one that's saying you is a

2012

01:15:53,910 --> 01:15:50,880

thought speaking to me like a

2013

01:15:55,590 --> 01:15:53,920

schizophrenic may hear oh my gosh oh my

2014

01:15:58,149 --> 01:15:55,600

gosh i don't want to hear this and i was

2015

01:15:59,830 --> 01:15:58,159

so afraid and i felt derealized and

2016

01:16:01,830 --> 01:15:59,840

depersonalized when you mentioned

2017

01:16:04,550 --> 01:16:01,840

parkinson's earlier that the difference

2018

01:16:06,709 --> 01:16:04,560

between the model and then the data it

2019

01:16:08,070 --> 01:16:06,719

that didn't strike me as a

2020

01:16:09,830 --> 01:16:08,080

symptom of parkinson's the way you were

2021

01:16:11,990 --> 01:16:09,840

describing it struck me as a symptom of

2022

01:16:13,430 --> 01:16:12,000

derealization

2023

01:16:15,510 --> 01:16:13,440

anyway i'm bringing this all up and i

2024

01:16:17,270 --> 01:16:15,520

actually feel

2025

01:16:18,870 --> 01:16:17,280

good about speaking about it it somehow

2026

01:16:23,030 --> 01:16:18,880

feels

2027

01:16:24,390 --> 01:16:23,040

curative to even voice these concerns

2028

01:16:53,830 --> 01:16:24,400

i

2029

01:16:55,830 --> 01:16:53,840

that some people who

2030

01:16:57,669 --> 01:16:55,840

view yosha box ideas that this all an

2031

01:16:58,950 --> 01:16:57,679

illusion or this all simulated

2032

01:17:01,430 --> 01:16:58,960

consciousness some people become

2033

01:17:03,110 --> 01:17:01,440

suicidal that's actually extremely

2034

01:17:04,790 --> 01:17:03,120

terrifying luckily i'm not suicidal

2035

01:17:06,630 --> 01:17:04,800

though i'm scared that i

2036

01:17:08,790 --> 01:17:06,640

could because i've heard that other

2037

01:17:09,910 --> 01:17:08,800

people could i'm not sure if my problem

2038

01:17:11,990 --> 01:17:09,920

is just

2039

01:17:13,669 --> 01:17:12,000

obsessive thoughts

2040

01:17:16,229 --> 01:17:13,679

or if it was indicative of something

2041

01:17:18,950 --> 01:17:16,239

else and i was so afraid and it's it's

2042

01:17:19,669 --> 01:17:18,960

such a scary feeling carl to be afraid

2043

01:17:22,870 --> 01:17:19,679

of

2044

01:17:24,630 --> 01:17:22,880

one's self to not even be able to sleep

2045

01:17:27,430 --> 01:17:24,640

at night because you're afraid of your

2046

01:17:29,430 --> 01:17:27,440

own thoughts and what that may lead to

2047

01:17:30,950 --> 01:17:29,440

so does any of that make sense and i

2048

01:17:34,149 --> 01:17:30,960

know that sounds like it's completely

2049

01:17:37,669 --> 01:17:34,159

off field perhaps it's not no

2050

01:17:39,590 --> 01:17:37,679

no no i think i think it follows on

2051  
01:17:41,590 --> 01:17:39,600  
very gracefully but but you've taken it

2052  
01:17:43,750 --> 01:17:41,600  
right now to um

2053  
01:17:46,070 --> 01:17:43,760  
some of the most important aspects of

2054  
01:17:47,669 --> 01:17:46,080  
modeling um which we all contend with

2055  
01:17:50,070 --> 01:17:47,679  
which of course is is

2056  
01:17:51,030 --> 01:17:50,080  
um i mean i mentioned before your

2057  
01:17:54,070 --> 01:17:51,040  
getting

2058  
01:17:55,910 --> 01:17:54,080  
models for our um

2059  
01:17:57,510 --> 01:17:55,920  
our lived worlds but of course the most

2060  
01:17:59,910 --> 01:17:57,520  
important part

2061  
01:18:01,669 --> 01:17:59,920  
when we're a baby of the world is our

2062  
01:18:02,790 --> 01:18:01,679  
body so the first thing we have to do is

2063  
01:18:07,189 --> 01:18:02,800

to build

2064

01:18:10,070 --> 01:18:07,199

a model uh of our body and um work out

2065

01:18:12,790 --> 01:18:10,080

you know what things that we are able to

2066

01:18:15,350 --> 01:18:12,800

move um you know hence motor babbling

2067

01:18:18,550 --> 01:18:17,270

rattling um

2068

01:18:21,430 --> 01:18:18,560

probably more important than that of

2069

01:18:22,870 --> 01:18:21,440

course is um exchanges with the mother

2070

01:18:25,030 --> 01:18:22,880

um and

2071

01:18:27,910 --> 01:18:25,040

developing a sense that

2072

01:18:29,990 --> 01:18:27,920

mother is an object and crucially an

2073

01:18:32,149 --> 01:18:30,000

object that is separate from me

2074

01:18:34,950 --> 01:18:32,159

and that's quite a skillful move and it

2075

01:18:37,350 --> 01:18:34,960

takes a lot of my belief updating and

2076

01:18:39,750 --> 01:18:37,360

changing your models and building

2077

01:18:42,310 --> 01:18:39,760

a coherent um

2078

01:18:44,390 --> 01:18:42,320

explanation for all your sensations both

2079

01:18:45,990 --> 01:18:44,400

the political touch or the

2080

01:18:48,470 --> 01:18:46,000

and the physiological interceptic

2081

01:18:50,229 --> 01:18:48,480

consequences of being subtle for example

2082

01:18:51,350 --> 01:18:50,239

and being cared for

2083

01:18:54,229 --> 01:18:51,360

um

2084

01:18:57,189 --> 01:18:54,239

and i'm taking this route to the key

2085

01:18:59,110 --> 01:18:57,199

thing which is basically models of self

2086

01:19:01,030 --> 01:18:59,120

and selfhood

2087

01:19:03,510 --> 01:19:01,040

so

2088

01:19:05,830 --> 01:19:03,520

if if we are

2089

01:19:08,630 --> 01:19:05,840

coming back to this picture of

2090

01:19:12,430 --> 01:19:08,640

some mathematical universe that i've now

2091

01:19:15,030 --> 01:19:12,440

tilled with multiple markov blankets

2092

01:19:16,630 --> 01:19:15,040

encapsulating or defining lots of

2093

01:19:18,630 --> 01:19:16,640

particles

2094

01:19:21,990 --> 01:19:18,640

and basically we

2095

01:19:25,430 --> 01:19:22,000

inhabit a universe that is constituted

2096

01:19:27,189 --> 01:19:25,440

by things like us and in initially uh

2097

01:19:29,590 --> 01:19:27,199

you know mum and dad and brothers and

2098

01:19:31,430 --> 01:19:29,600

sisters and then you know

2099

01:19:35,270 --> 01:19:31,440

peers at school

2100

01:19:37,189 --> 01:19:35,280

that means that our models of our lived

2101  
01:19:40,070 --> 01:19:37,199  
or experienced world

2102  
01:19:42,070 --> 01:19:40,080  
have to have models of other in it which

2103  
01:19:43,669 --> 01:19:42,080  
means you need to be able to

2104  
01:19:47,270 --> 01:19:43,679  
disambiguate

2105  
01:19:49,590 --> 01:19:47,280  
between sensations caused by others and

2106  
01:19:51,110 --> 01:19:49,600  
sensations that you caused as a

2107  
01:19:51,990 --> 01:19:51,120  
fundamental

2108  
01:19:54,470 --> 01:19:52,000  
um

2109  
01:19:56,470 --> 01:19:54,480  
structural aspect of the models you're

2110  
01:19:57,830 --> 01:19:56,480  
going to bring to the table just to live

2111  
01:19:59,910 --> 01:19:57,840  
in a world

2112  
01:20:01,830 --> 01:19:59,920  
which is constituted by creatures like

2113  
01:20:08,149 --> 01:20:01,840

you

2114

01:20:10,149 --> 01:20:08,159

something quite special um

2115

01:20:11,110 --> 01:20:10,159

which

2116

01:20:14,870 --> 01:20:11,120

is

2117

01:20:17,510 --> 01:20:14,880

a model that encompasses selfhood

2118

01:20:18,630 --> 01:20:17,520

so you wouldn't need this if you

2119

01:20:21,830 --> 01:20:18,640

um

2120

01:20:24,709 --> 01:20:21,840

lived in a world that did not involve an

2121

01:20:27,270 --> 01:20:24,719

exchange with other con specifics

2122

01:20:29,510 --> 01:20:27,280

but because we do live your our world is

2123

01:20:31,270 --> 01:20:29,520

constituted by other things like us

2124

01:20:33,750 --> 01:20:31,280

we need to be able to contextualize and

2125

01:20:36,229 --> 01:20:33,760

make the inference i did that or you did

2126

01:20:38,630 --> 01:20:36,239

that or it's my turn or it's your turn

2127

01:20:40,470 --> 01:20:38,640

or you've got that intentional stance

2128

01:20:41,669 --> 01:20:40,480

and you know i've got this intentional

2129

01:20:43,990 --> 01:20:41,679

stance

2130

01:20:46,229 --> 01:20:44,000

so just having as part of the generative

2131

01:20:50,070 --> 01:20:46,239

model of the hypothesis your the

2132

01:20:53,030 --> 01:20:50,080

hypothesis that i am me and you and you

2133

01:20:56,470 --> 01:20:53,040

is something which characterizes um one

2134

01:20:59,189 --> 01:20:56,480

would imagine very high life forms

2135

01:21:01,910 --> 01:20:59,199

now we go even higher

2136

01:21:03,270 --> 01:21:01,920

um basically philosophers and people

2137

01:21:06,229 --> 01:21:03,280

like you

2138

01:21:09,910 --> 01:21:06,239

so if you've got if you have

2139

01:21:11,590 --> 01:21:09,920

if you spend your life worrying about um

2140

01:21:12,950 --> 01:21:11,600

what is the self does the self even

2141

01:21:15,270 --> 01:21:12,960

exist

2142

01:21:17,590 --> 01:21:15,280

most precisely yeah well i mean that

2143

01:21:20,870 --> 01:21:17,600

that's that that seems to be the the

2144

01:21:24,550 --> 01:21:20,880

essence of your existential angst and

2145

01:21:28,229 --> 01:21:24,560

all its attendant um intrceptive and

2146

01:21:29,830 --> 01:21:28,239

emotional um consequences uh you know do

2147

01:21:31,830 --> 01:21:29,840

i exist

2148

01:21:33,950 --> 01:21:31,840

and i think really usefully you brought

2149

01:21:36,709 --> 01:21:33,960

to uh the table the notions of

2150

01:21:38,790 --> 01:21:36,719

depersonalization and derealization if

2151  
01:21:40,229 --> 01:21:38,800  
this is for physicists then can you

2152  
01:21:41,669 --> 01:21:40,239  
explain to your audience what those

2153  
01:21:43,270 --> 01:21:41,679  
things are because i think that it would

2154  
01:21:45,750 --> 01:21:43,280  
be really useful for people that do not

2155  
01:21:48,229 --> 01:21:45,760  
know what periodically well to be quite

2156  
01:21:50,550 --> 01:21:48,239  
frank carl i didn't want to look up this

2157  
01:21:52,790 --> 01:21:50,560  
exact definition because i know that i'm

2158  
01:21:55,430 --> 01:21:52,800  
a valid tutenarian and i would just

2159  
01:21:57,510 --> 01:21:55,440  
obsess over myself having these issues

2160  
01:21:58,870 --> 01:21:57,520  
so i can give an explanation of my

2161  
01:22:01,270 --> 01:21:58,880  
experience and then perhaps you can

2162  
01:22:03,030 --> 01:22:01,280  
delineate what the psychopathology is

2163  
01:22:04,870 --> 01:22:03,040

okay i'll make an aside first some

2164

01:22:06,790 --> 01:22:04,880

people say that what we need to do is

2165

01:22:08,870 --> 01:22:06,800

realize that the self is an illusion you

2166

01:22:11,110 --> 01:22:08,880

can hear this in the more eastern end

2167

01:22:13,270 --> 01:22:11,120

and i know that many people who watch

2168

01:22:14,790 --> 01:22:13,280

this channel also feel like they take

2169

01:22:16,310 --> 01:22:14,800

these people seriously like i took them

2170

01:22:17,830 --> 01:22:16,320

seriously and i don't know if that's

2171

01:22:19,510 --> 01:22:17,840

exactly true

2172

01:22:21,430 --> 01:22:19,520

not whether or not the truth of the self

2173

01:22:23,669 --> 01:22:21,440

being an illusion is true but whether or

2174

01:22:25,750 --> 01:22:23,679

not that is indeed useful for everyone

2175

01:22:27,910 --> 01:22:25,760

it may not be it may be at least for me

2176  
01:22:30,070 --> 01:22:27,920  
it was extremely harmful and perhaps

2177  
01:22:31,910 --> 01:22:30,080  
still is and it may be dependent upon

2178  
01:22:33,990 --> 01:22:31,920  
where you are and psychological

2179  
01:22:36,149 --> 01:22:34,000  
development spiritual development and

2180  
01:22:39,430 --> 01:22:36,159  
sometimes these lessons that are told to

2181  
01:22:41,350 --> 01:22:39,440  
us by philosophers or spiritual gurus or

2182  
01:22:43,910 --> 01:22:41,360  
people who seem like spiritual gurus

2183  
01:22:45,910 --> 01:22:43,920  
perhaps they should be taken with such a

2184  
01:22:47,669 --> 01:22:45,920  
grain of salt and i've come to the

2185  
01:22:49,669 --> 01:22:47,679  
conclusion that if it's not life

2186  
01:22:52,070 --> 01:22:49,679  
affirming then perhaps don't follow that

2187  
01:22:54,790 --> 01:22:52,080  
perhaps use that as a clue that that's a

2188  
01:22:57,110 --> 01:22:54,800

pathological path and don't do anything

2189

01:22:58,310 --> 01:22:57,120

that can be drastic don't give up

2190

01:22:59,510 --> 01:22:58,320

because i felt like i was in a state

2191

01:23:01,270 --> 01:22:59,520

where i could

2192

01:23:03,350 --> 01:23:01,280

snap and feel like well this is all a

2193

01:23:05,830 --> 01:23:03,360

dream i remember feeling looking at my

2194

01:23:07,270 --> 01:23:05,840

arms and feeling like am i even behind

2195

01:23:08,870 --> 01:23:07,280

like right now i'm feeling great and

2196

01:23:11,030 --> 01:23:08,880

sorry i don't mean i seem like it but

2197

01:23:12,470 --> 01:23:11,040

i'm speaking with you i feel safe i love

2198

01:23:14,950 --> 01:23:12,480

my wife i've actually whatever i'm

2199

01:23:16,790 --> 01:23:14,960

feeling happy right now and i feel like

2200

01:23:18,830 --> 01:23:16,800

i would a month ago which is i'm behind

2201

01:23:21,110 --> 01:23:18,840

my eyes and this is a person

2202

01:23:23,990 --> 01:23:21,120

speaking a week two weeks ago three

2203

01:23:25,350 --> 01:23:24,000

weeks ago i was feeling like

2204

01:23:26,870 --> 01:23:25,360

all of that could be a model i could

2205

01:23:29,030 --> 01:23:26,880

emulate anyone else's head i could be

2206

01:23:30,350 --> 01:23:29,040

anyone else this could all be in my head

2207

01:23:33,030 --> 01:23:30,360

so

2208

01:23:35,110 --> 01:23:33,040

debilitating destabilizing

2209

01:23:37,189 --> 01:23:35,120

walking around feeling like is this a

2210

01:23:38,470 --> 01:23:37,199

dream constantly checking my fingers

2211

01:23:39,990 --> 01:23:38,480

because that's one of the signs you can

2212

01:23:41,350 --> 01:23:40,000

check your for lucid dreaming how many

2213

01:23:43,030 --> 01:23:41,360

fingers do you have and then also

2214

01:23:45,110 --> 01:23:43,040

feeling bad like why the heck am i

2215

01:23:46,070 --> 01:23:45,120

thinking this is a dream shoot what if

2216

01:23:47,350 --> 01:23:46,080

it is

2217

01:23:48,470 --> 01:23:47,360

just

2218

01:23:54,390 --> 01:23:48,480

spiraling

2219

01:23:56,310 --> 01:23:54,400

okay that's what i had slash still have

2220

01:23:57,910 --> 01:23:56,320

to some degree though not right now i

2221

01:23:59,430 --> 01:23:57,920

wouldn't say that i'm over it because it

2222

01:24:01,350 --> 01:23:59,440

was such a recent experience i'm not

2223

01:24:03,830 --> 01:24:01,360

going to say that i've solved it i feel

2224

01:24:05,590 --> 01:24:03,840

like it's tapering off luckily anyway

2225

01:24:07,270 --> 01:24:05,600

that's what i had i would characterize

2226

01:24:08,950 --> 01:24:07,280

that as derealization in the sense that

2227

01:24:10,629 --> 01:24:08,960

i didn't feel like it was real i don't

2228

01:24:11,750 --> 01:24:10,639

know if it's depersonalization because i

2229

01:24:13,669 --> 01:24:11,760

don't know the difference between those

2230

01:24:15,590 --> 01:24:13,679

two nor dissociative identity disorders

2231

01:24:16,470 --> 01:24:15,600

so i don't know the differences between

2232

01:24:18,709 --> 01:24:16,480

those

2233

01:24:20,629 --> 01:24:18,719

well it's good it's nice you bring all

2234

01:24:22,470 --> 01:24:20,639

those three

2235

01:24:24,229 --> 01:24:22,480

their phenomenology is very very closely

2236

01:24:25,510 --> 01:24:24,239

related but you know

2237

01:24:29,510 --> 01:24:25,520

the way it described that that was

2238

01:24:35,669 --> 01:24:33,350

either um a de-realization um

2239

01:24:38,950 --> 01:24:35,679

which people normally described uh

2240

01:24:41,669 --> 01:24:38,960

describe as they're looking um they are

2241

01:24:44,070 --> 01:24:41,679

sensing um something that doesn't quite

2242

01:24:46,310 --> 01:24:44,080

seem real that you know the outside

2243

01:24:48,950 --> 01:24:46,320

world seems like it's a movie it's not

2244

01:24:51,910 --> 01:24:48,960

it's not it's lost that tangibility

2245

01:24:53,189 --> 01:24:51,920

there's no um there's no grip that can

2246

01:24:55,510 --> 01:24:53,199

be attained

2247

01:24:57,510 --> 01:24:55,520

that reassures you that stuff is

2248

01:25:00,149 --> 01:24:57,520

actually out there the other the

2249

01:25:03,110 --> 01:25:00,159

converse of course is i'm um i'm no

2250

01:25:04,870 --> 01:25:03,120

longer a person um and that could i

2251

01:25:07,669 --> 01:25:04,880

think he'd be even more frightening and

2252

01:25:11,510 --> 01:25:07,679

both of these i think speak to um

2253

01:25:14,470 --> 01:25:11,520

speak to um this dissociation that comes

2254

01:25:17,510 --> 01:25:14,480

with a dissolution of selfhood or at

2255

01:25:23,430 --> 01:25:20,149

construction of explanations for the

2256

01:25:25,590 --> 01:25:23,440

self in a lived world

2257

01:25:28,390 --> 01:25:25,600

you used a phrase which

2258

01:25:30,149 --> 01:25:28,400

i i think was was quite uh pertinent

2259

01:25:32,229 --> 01:25:30,159

here which is you know

2260

01:25:34,950 --> 01:25:32,239

one should not pursue this kind of

2261

01:25:38,149 --> 01:25:34,960

thinking and self-exploration and

2262

01:25:41,510 --> 01:25:38,159

introspection unless it is um

2263

01:25:44,070 --> 01:25:41,520

affirmatory and and self-affirmatory and

2264

01:25:46,310 --> 01:25:44,080

in a sense that's exactly from the sort

2265

01:25:48,550 --> 01:25:46,320

of mathematical and dry perspective of

2266

01:25:50,390 --> 01:25:48,560

the free energy principle that just is

2267

01:25:53,189 --> 01:25:50,400

maximizing model evidence this is

2268

01:25:55,110 --> 01:25:53,199

self-evidencing it is you know if you

2269

01:25:56,870 --> 01:25:55,120

can affirm

2270

01:25:59,189 --> 01:25:56,880

through all the right kind of

2271

01:26:01,110 --> 01:25:59,199

interactions be the emotional social

2272

01:26:04,310 --> 01:26:01,120

sexual um

2273

01:26:06,550 --> 01:26:04,320

intellectual um the the this you've got

2274

01:26:08,709 --> 01:26:06,560

the right kind of model of your world

2275

01:26:10,709 --> 01:26:08,719

which is constituted by people like your

2276  
01:26:13,270 --> 01:26:10,719  
interviewees and your wife and all your

2277  
01:26:17,110 --> 01:26:13,280  
colleagues and then

2278  
01:26:20,950 --> 01:26:17,120  
affirming that model simply is securing

2279  
01:26:24,709 --> 01:26:20,960  
um evidence for that good model of your

2280  
01:26:26,550 --> 01:26:24,719  
rich and uncultured world that just is

2281  
01:26:28,310 --> 01:26:26,560  
that's that

2282  
01:26:31,189 --> 01:26:28,320  
that sort of um

2283  
01:26:32,149 --> 01:26:31,199  
affirmatory uh process

2284  
01:26:33,750 --> 01:26:32,159  
however

2285  
01:26:36,070 --> 01:26:33,760  
there are dangers

2286  
01:26:38,149 --> 01:26:36,080  
that you um that lurk in the shadows

2287  
01:26:39,669 --> 01:26:38,159  
which you've clearly contended with to

2288  
01:26:42,310 --> 01:26:39,679

do that properly

2289

01:26:44,550 --> 01:26:42,320

to be able to secure the right kind of

2290

01:26:48,830 --> 01:26:44,560

evidence that you are

2291

01:26:51,270 --> 01:26:48,840

living in a world of positive

2292

01:26:52,709 --> 01:26:51,280

um constructive

2293

01:26:53,830 --> 01:26:52,719

nourishing

2294

01:26:56,149 --> 01:26:53,840

enabling

2295

01:26:56,950 --> 01:26:56,159

human beings others other things like

2296

01:27:04,310 --> 01:26:56,960

you

2297

01:27:05,189 --> 01:27:04,320

entertain the idea

2298

01:27:09,750 --> 01:27:05,199

that

2299

01:27:11,750 --> 01:27:09,760

there is there is self and other um and

2300

01:27:14,149 --> 01:27:11,760

simply uh you know to engage in turn

2301

01:27:17,590 --> 01:27:14,159

taking you need to have this um this

2302

01:27:21,189 --> 01:27:17,600

explicit part of your charity model um

2303

01:27:27,189 --> 01:27:25,270

in so doing you will also have um

2304

01:27:29,270 --> 01:27:27,199

contextualize as part of your junior

2305

01:27:31,669 --> 01:27:29,280

model itself in a number of different

2306

01:27:33,590 --> 01:27:31,679

states uh and you need to have remember

2307

01:27:36,310 --> 01:27:33,600

before we talk about the good scientists

2308

01:27:38,709 --> 01:27:36,320

um having a portfolio of hypotheses

2309

01:27:40,470 --> 01:27:38,719

we're generating a new set of hypotheses

2310

01:27:43,350 --> 01:27:40,480

so that we can now gather evidence of

2311

01:27:45,270 --> 01:27:43,360

these hypotheses so that's part of uh

2312

01:27:47,750 --> 01:27:45,280

what you are doing i mean you're you

2313

01:27:48,629 --> 01:27:47,760

know in in doing these podcasts you are

2314

01:27:49,830 --> 01:27:48,639

on

2315

01:27:52,629 --> 01:27:49,840

a journey

2316

01:27:54,870 --> 01:27:52,639

of um developing different hypotheses

2317

01:27:57,030 --> 01:27:54,880

about ways of being

2318

01:27:59,270 --> 01:27:57,040

the the danger though when it comes to

2319

01:28:01,110 --> 01:27:59,280

different ways of

2320

01:28:02,390 --> 01:28:01,120

me as a self

2321

01:28:05,189 --> 01:28:02,400

existing

2322

01:28:06,149 --> 01:28:05,199

is that you can sometimes

2323

01:28:08,709 --> 01:28:06,159

lose

2324

01:28:10,950 --> 01:28:08,719

entertain the null hypothesis that i am

2325

01:28:13,910 --> 01:28:10,960

not a self or i do not exist in a

2326

01:28:15,910 --> 01:28:13,920

sentient fashion in a in the fashion of

2327

01:28:18,310 --> 01:28:15,920

having particular kinds of qualitative

2328

01:28:20,149 --> 01:28:18,320

experiences this is a perfectly viable

2329

01:28:22,390 --> 01:28:20,159

hypothesis it can be had in a

2330

01:28:23,990 --> 01:28:22,400

non-emotional context when you meet

2331

01:28:25,590 --> 01:28:24,000

people like philosophers entertain

2332

01:28:27,910 --> 01:28:25,600

things like the you know the zombie

2333

01:28:29,910 --> 01:28:27,920

hypothesis or brain avatar thought

2334

01:28:32,790 --> 01:28:29,920

experiments these are all really

2335

01:28:35,430 --> 01:28:32,800

interesting interesting instances

2336

01:28:37,669 --> 01:28:35,440

of a very high order life form

2337

01:28:40,229 --> 01:28:37,679

thinking about what would have been like

2338

01:28:42,310 --> 01:28:40,239

if i was maybe without me hood if i was

2339

01:28:44,790 --> 01:28:42,320

a zombie what would it be like if it

2340

01:28:46,790 --> 01:28:44,800

wasn't actually me talking

2341

01:28:49,110 --> 01:28:46,800

what would it be like if there was no

2342

01:28:51,189 --> 01:28:49,120

reality it was all just me all of these

2343

01:28:54,790 --> 01:28:51,199

alternative ways of being

2344

01:28:56,790 --> 01:28:54,800

that speak to selfhood or it's negation

2345

01:28:58,629 --> 01:28:56,800

or it's nihilism

2346

01:29:00,790 --> 01:28:58,639

now become plausible hypotheses for

2347

01:29:03,590 --> 01:29:00,800

which you have to search for evidence

2348

01:29:04,950 --> 01:29:03,600

and of course if you are just doing this

2349

01:29:06,229 --> 01:29:04,960

in your head and ruminating and

2350

01:29:08,709 --> 01:29:06,239

introspecting there's going to be very

2351

01:29:11,669 --> 01:29:08,719

little evidence available to you

2352

01:29:14,870 --> 01:29:11,679

to disaffirm

2353

01:29:16,709 --> 01:29:14,880

your hypothesis perhaps i'm not me um if

2354

01:29:18,390 --> 01:29:16,719

you don't actually engage with somebody

2355

01:29:19,669 --> 01:29:18,400

else there is no evidence

2356

01:29:22,149 --> 01:29:19,679

at hand

2357

01:29:25,990 --> 01:29:22,159

for to refute their hypothesis

2358

01:29:28,310 --> 01:29:26,000

so on the one hand that is a remarkable

2359

01:29:31,430 --> 01:29:28,320

capacity the very fact you can have this

2360

01:29:33,430 --> 01:29:31,440

hypothesis in your head i am not me uh

2361

01:29:35,430 --> 01:29:33,440

or it is not me having these thoughts it

2362

01:29:36,870 --> 01:29:35,440

is not me having these quantitative

2363

01:29:38,790 --> 01:29:36,880

experiences

2364

01:29:41,510 --> 01:29:38,800

it's quite remarkable it's a very very

2365

01:29:44,149 --> 01:29:41,520

high level um ability which which i

2366

01:29:47,910 --> 01:29:44,159

would imagine where you you and i are

2367

01:29:49,669 --> 01:29:47,920

the only kinds of um sentient artifacts

2368

01:29:51,990 --> 01:29:49,679

in the universe that can entertain that

2369

01:29:54,709 --> 01:29:52,000

kind of counterfactual hypothesis which

2370

01:29:56,310 --> 01:29:54,719

is necessary to explore different models

2371

01:29:58,790 --> 01:29:56,320

it's necessary indeed to actually just

2372

01:30:00,390 --> 01:29:58,800

behave and have plans you have to have

2373

01:30:03,030 --> 01:30:00,400

counterfactual hypothesis about the

2374

01:30:06,870 --> 01:30:03,040

future and different ways of being

2375

01:30:07,910 --> 01:30:06,880

because it comes with um it comes with a

2376

01:30:10,709 --> 01:30:07,920

price

2377

01:30:12,950 --> 01:30:10,719

if sometimes you

2378

01:30:15,990 --> 01:30:12,960

entertain a hypothesis for which there

2379

01:30:18,709 --> 01:30:16,000

is no evidence on hand that could

2380

01:30:21,189 --> 01:30:18,719

possibly refute it

2381

01:30:23,350 --> 01:30:21,199

and certainly if you adopt a particular

2382

01:30:25,669 --> 01:30:23,360

behavioral strategy or engagement with

2383

01:30:27,590 --> 01:30:25,679

the world that precludes

2384

01:30:30,310 --> 01:30:27,600

soliciting evidence against the

2385

01:30:34,790 --> 01:30:30,320

hypothesis that you are say you

2386

01:30:36,470 --> 01:30:34,800

um so examples of that would be

2387

01:30:39,590 --> 01:30:36,480

things like obsessional compulsive

2388

01:30:42,070 --> 01:30:39,600

disorder or agrophobia or

2389

01:30:45,669 --> 01:30:42,080

your rumination disorders

2390

01:30:47,430 --> 01:30:45,679

where you physically um or possibly even

2391

01:30:49,510 --> 01:30:47,440

prosocially

2392

01:30:51,030 --> 01:30:49,520

prevent yourself from acquiring any

2393

01:30:52,470 --> 01:30:51,040

further information that would allow you

2394

01:30:54,390 --> 01:30:52,480

to change your mind

2395

01:30:55,830 --> 01:30:54,400

and of course once you realize that's a

2396

01:30:57,510 --> 01:30:55,840

possibility

2397

01:31:00,709 --> 01:30:57,520

you um

2398

01:31:02,550 --> 01:31:00,719

you can always or you can also get into

2399

01:31:05,110 --> 01:31:02,560

the negatively balanced emotional

2400

01:31:08,870 --> 01:31:05,120

aspects of entertaining these hypotheses

2401

01:31:11,350 --> 01:31:08,880

so if i've got schizophrenia

2402

01:31:13,430 --> 01:31:11,360

that now offers a very plausible

2403

01:31:14,950 --> 01:31:13,440

hypothesis for these dissociative

2404

01:31:16,870 --> 01:31:14,960

experiences

2405

01:31:19,189 --> 01:31:16,880

why am i having these dissociative

2406

01:31:21,430 --> 01:31:19,199

experiences well one very plausible

2407

01:31:23,750 --> 01:31:21,440

hypothesis i am having i have a

2408

01:31:25,750 --> 01:31:23,760

dissociative order or i have a

2409

01:31:27,990 --> 01:31:25,760

disorganized thought disorder that

2410

01:31:30,629 --> 01:31:28,000

characterizes schizophrenia so this now

2411

01:31:32,629 --> 01:31:30,639

becomes a very plausible hypothesis

2412

01:31:34,950 --> 01:31:32,639

how would you go secure evidence against

2413

01:31:37,430 --> 01:31:34,960

that um well it becomes very difficult

2414

01:31:38,390 --> 01:31:37,440

because the whole prop point of having

2415

01:31:40,310 --> 01:31:38,400

these

2416

01:31:43,590 --> 01:31:40,320

very high order counter factual

2417

01:31:45,910 --> 01:31:43,600

hypotheses or models at hand to explain

2418

01:31:48,550 --> 01:31:45,920

your experienced world

2419

01:31:49,669 --> 01:31:48,560

um is that the the

2420

01:31:54,070 --> 01:31:49,679

they're very

2421

01:31:55,990 --> 01:31:54,080

and it's very difficult um uh if you

2422

01:31:57,669 --> 01:31:56,000

have got schizophrenia you're not going

2423

01:31:58,870 --> 01:31:57,679

to be able to trust any information

2424

01:32:01,669 --> 01:31:58,880

anywhere because they're correct

2425

01:32:04,310 --> 01:32:01,679

illusion hallucinatory so it's one of

2426

01:32:07,430 --> 01:32:04,320

these wonderful um self-fulfilling

2427

01:32:10,310 --> 01:32:07,440

hypotheses that are very difficult to uh

2428

01:32:12,149 --> 01:32:10,320

to dismantle um and you see the same

2429

01:32:14,550 --> 01:32:12,159

phenomenology

2430

01:32:17,110 --> 01:32:14,560

in in many instances

2431

01:32:19,590 --> 01:32:17,120

you mentioned behavior therapy before

2432

01:32:22,070 --> 01:32:19,600

and um in a way that doesn't have this

2433

01:32:24,229 --> 01:32:22,080

quite the same horrible existential

2434

01:32:27,510 --> 01:32:24,239

angst that you clearly experienced you

2435

01:32:29,189 --> 01:32:27,520

can actually construe um many phobias

2436

01:32:31,750 --> 01:32:29,199

for example

2437

01:32:34,149 --> 01:32:31,760

of the same kind in the sense that if

2438

01:32:35,990 --> 01:32:34,159

you are very frightened of spiders

2439

01:32:38,950 --> 01:32:36,000

you're very unlikely

2440

01:32:40,709 --> 01:32:38,960

to actually go and solicit the evidence

2441

01:32:44,229 --> 01:32:40,719

that would

2442

01:32:46,149 --> 01:32:44,239

hypothesis that spiders are not

2443

01:32:48,790 --> 01:32:46,159

frightening because you just don't go

2444

01:32:51,669 --> 01:32:48,800

near spiders so this is the kind of

2445

01:32:54,550 --> 01:32:51,679

hypothesis that maintains itself because

2446

01:32:56,870 --> 01:32:54,560

it's undermined the way that you acted

2447

01:33:00,390 --> 01:32:56,880

this list of evidence for your beliefs

2448

01:33:01,669 --> 01:33:00,400

but for you of course you you know

2449

01:33:03,750 --> 01:33:01,679

you know it's not a question of being

2450

01:33:06,310 --> 01:33:03,760

frightened of spiders it's a much more

2451

01:33:07,910 --> 01:33:06,320

existentially deep and worrisome notion

2452

01:33:10,310 --> 01:33:07,920

that in fact you're not you or you're

2453

01:33:13,270 --> 01:33:10,320

not even yourself um and you're not even

2454

01:33:16,470 --> 01:33:13,280

perceiving reality and these kinds of

2455

01:33:19,189 --> 01:33:16,480

hypotheses that come along qualified by

2456

01:33:23,830 --> 01:33:19,199

or associated with um plausible

2457

01:33:25,350 --> 01:33:23,840

explanations i'm going mad um um

2458

01:33:27,990 --> 01:33:25,360

are very difficult to refute in the

2459

01:33:30,870 --> 01:33:28,000

moment especially if you if you ruminate

2460

01:33:32,629 --> 01:33:30,880

on them um they will go away as soon as

2461

01:33:33,990 --> 01:33:32,639

you start re-engaging with with other

2462

01:33:36,310 --> 01:33:34,000

people

2463

01:33:37,590 --> 01:33:36,320

that's what i found to be the case carl

2464

01:33:38,950 --> 01:33:37,600

is that the more i talk about it the

2465

01:33:41,669 --> 01:33:38,960

more i'm speaking with you than just

2466

01:33:43,910 --> 01:33:41,679

speaking with people and not being so in

2467

01:33:46,310 --> 01:33:43,920

my head almost instantaneously it starts

2468

01:33:47,750 --> 01:33:46,320

to dissipate and also just so you know

2469

01:33:50,390 --> 01:33:47,760

there's a danger for the people who

2470

01:33:53,910 --> 01:33:50,400

watch this channel that it's seen as a

2471

01:33:56,950 --> 01:33:53,920

spiritual triumphant state to be egoless

2472

01:33:58,709 --> 01:33:56,960

to have ego death so then just so you

2473

01:34:01,030 --> 01:33:58,719

know when i was feeling that i was then

2474

01:34:03,110 --> 01:34:01,040

telling myself but am i supposed to have

2475

01:34:05,110 --> 01:34:03,120

ego death is this what ego death is like

2476  
01:34:06,790 --> 01:34:05,120  
and now i feel bad am i just not strong

2477  
01:34:08,390 --> 01:34:06,800  
enough as a person which then i feel

2478  
01:34:10,390 --> 01:34:08,400  
like i'm less on the social hierarchy

2479  
01:34:12,390 --> 01:34:10,400  
because i'm just a coward who cannot

2480  
01:34:14,149 --> 01:34:12,400  
deal with

2481  
01:34:15,750 --> 01:34:14,159  
who isn't psychologically strong enough

2482  
01:34:17,750 --> 01:34:15,760  
to deal with potential ego death if that

2483  
01:34:19,270 --> 01:34:17,760  
was even ego death

2484  
01:34:21,030 --> 01:34:19,280  
so that those are there's so many

2485  
01:34:22,790 --> 01:34:21,040  
dangers in this and i didn't realize

2486  
01:34:25,669 --> 01:34:22,800  
this i had this insight was in that

2487  
01:34:27,910 --> 01:34:25,679  
episode or experience that kurt kurkert

2488  
01:34:29,430 --> 01:34:27,920

kurt something was like i was talking to

2489

01:34:31,510 --> 01:34:29,440

myself or something was talking to me

2490

01:34:33,830 --> 01:34:31,520

and telling me kurt you've been thinking

2491

01:34:35,350 --> 01:34:33,840

way too much this is you're extremely

2492

01:34:36,870 --> 01:34:35,360

analytical i never would have thought of

2493

01:34:39,510 --> 01:34:36,880

myself as someone who's too analytical

2494

01:34:41,750 --> 01:34:39,520

before it was clear to me that i was too

2495

01:34:42,790 --> 01:34:41,760

analytical and there's nothing wrong

2496

01:34:43,990 --> 01:34:42,800

with being analytical there's nothing

2497

01:34:46,629 --> 01:34:44,000

wrong with thinking but you've been

2498

01:34:49,189 --> 01:34:46,639

thinking a bit too much feel more just

2499

01:34:51,270 --> 01:34:49,199

ground yourself here engage in this

2500

01:34:53,189 --> 01:34:51,280

world more

2501  
01:34:55,030 --> 01:34:53,199  
and and there is also this feeling that

2502  
01:34:57,030 --> 01:34:55,040  
i don't love myself which is a strange

2503  
01:34:59,270 --> 01:34:57,040  
feeling carl that i don't have that i'm

2504  
01:35:00,709 --> 01:34:59,280  
a bit hard on myself and i would have

2505  
01:35:02,470 --> 01:35:00,719  
never said that before i would have

2506  
01:35:04,229 --> 01:35:02,480  
thought i'm not hard enough i need to

2507  
01:35:06,070 --> 01:35:04,239  
study harder i need to prepare for these

2508  
01:35:09,189 --> 01:35:06,080  
podcasts harder i need to release more i

2509  
01:35:10,950 --> 01:35:09,199  
need to learn more push push push push

2510  
01:35:13,350 --> 01:35:10,960  
it was only then that i felt like kurt

2511  
01:35:14,390 --> 01:35:13,360  
that's been dangerous man like just

2512  
01:35:16,870 --> 01:35:14,400  
relax

2513  
01:35:18,229 --> 01:35:16,880

and and don't worry too much and feeling

2514

01:35:20,790 --> 01:35:18,239

keep talking about this somewhat

2515

01:35:22,149 --> 01:35:20,800

publicly is a bit embarrassing because i

2516

01:35:23,510 --> 01:35:22,159

do feel like

2517

01:35:24,870 --> 01:35:23,520

by saying this like there's still that

2518

01:35:26,229 --> 01:35:24,880

part of me that feels like am i saying

2519

01:35:28,070 --> 01:35:26,239

this to give my way out because i'm

2520

01:35:29,669 --> 01:35:28,080

truly lazy and i want to say this so i

2521

01:35:31,910 --> 01:35:29,679

get the sympathy of for example you

2522

01:35:33,910 --> 01:35:31,920

maybe the audience to say kurt no no

2523

01:35:36,149 --> 01:35:33,920

you're doing great so then i can get i

2524

01:35:39,270 --> 01:35:36,159

can feel there's so much self analyzing

2525

01:35:41,430 --> 01:35:39,280

that's going on right here carl

2526

01:35:44,709 --> 01:35:41,440

anyway i felt like kurt you were

2527

01:35:47,750 --> 01:35:44,719

thinking too much just relax perhaps

2528

01:35:49,910 --> 01:35:47,760

don't engage as deeply as you have been

2529

01:35:51,910 --> 01:35:49,920

with these ideas don't entertain them as

2530

01:35:53,669 --> 01:35:51,920

much you maybe you're in a fragile state

2531

01:35:56,149 --> 01:35:53,679

right now you could do that later right

2532

01:35:57,830 --> 01:35:56,159

now take it back that's what came over

2533

01:35:59,750 --> 01:35:57,840

me and also this lesson that i don't

2534

01:36:01,189 --> 01:35:59,760

have enough self-love or self-acceptance

2535

01:36:02,629 --> 01:36:01,199

last night i looked up i was using a

2536

01:36:04,550 --> 01:36:02,639

rubber band for my thoughts like

2537

01:36:05,830 --> 01:36:04,560

self-administered aversive conditioning

2538

01:36:07,189 --> 01:36:05,840

when you snap yourself if you're

2539

01:36:08,470 --> 01:36:07,199

performing a bad habit so i thought

2540

01:36:10,149 --> 01:36:08,480

maybe i could do that with my thoughts

2541

01:36:11,990 --> 01:36:10,159

so anytime that i feel like that that

2542

01:36:14,070 --> 01:36:12,000

would encourage my mind to not feel like

2543

01:36:15,590 --> 01:36:14,080

that i looked it up and it said that

2544

01:36:17,990 --> 01:36:15,600

works for physical habits but not for

2545

01:36:21,510 --> 01:36:18,000

mental habits so stop that and what

2546

01:36:22,390 --> 01:36:21,520

works is act i believe acceptance

2547

01:36:24,709 --> 01:36:22,400

and

2548

01:36:27,430 --> 01:36:24,719

commitment therapy which is a cbt

2549

01:36:29,270 --> 01:36:27,440

technique so then last night i was

2550

01:36:31,189 --> 01:36:29,280

telling myself you know what try that

2551  
01:36:32,629 --> 01:36:31,199  
out accept these thoughts and i'm not

2552  
01:36:34,870 --> 01:36:32,639  
exactly sure what it means to accept

2553  
01:36:37,430 --> 01:36:34,880  
them i don't precisely think it means

2554  
01:36:39,830 --> 01:36:37,440  
entertain them but at least meet them

2555  
01:36:41,990 --> 01:36:39,840  
not with horror and dread and avoidance

2556  
01:36:43,350 --> 01:36:42,000  
but just say that's okay man you think

2557  
01:36:45,430 --> 01:36:43,360  
like that some people feel like that

2558  
01:36:47,189 --> 01:36:45,440  
sometimes so i started doing that and

2559  
01:36:49,109 --> 01:36:47,199  
last night was the first time in the

2560  
01:36:52,390 --> 01:36:49,119  
three weeks since i've had this that i

2561  
01:36:54,229 --> 01:36:52,400  
felt absolutely like my regular self

2562  
01:36:56,629 --> 01:36:54,239  
almost from five minutes of this quote

2563  
01:36:57,990 --> 01:36:56,639

unquote acceptance therapy

2564

01:36:59,910 --> 01:36:58,000

and then i woke up this morning felt

2565

01:37:02,550 --> 01:36:59,920

like my regular self like i'm behind my

2566

01:37:03,990 --> 01:37:02,560

eyes i have i'm in this world that was

2567

01:37:06,310 --> 01:37:04,000

fascinating

2568

01:37:07,510 --> 01:37:06,320

okay so i said quite a few statements

2569

01:37:09,189 --> 01:37:07,520

right there i'm sure there's plenty you

2570

01:37:11,030 --> 01:37:09,199

want to comment on what i'm also

2571

01:37:12,709 --> 01:37:11,040

interested in for you to put a pin in

2572

01:37:14,790 --> 01:37:12,719

your hat is what the heck does this

2573

01:37:16,390 --> 01:37:14,800

self-acceptance self-love if that seemed

2574

01:37:18,870 --> 01:37:16,400

the same mean in terms of the free

2575

01:37:22,229 --> 01:37:18,880

energy principle okay so i basically

2576

01:37:24,070 --> 01:37:22,239

just poured myself out there

2577

01:37:25,830 --> 01:37:24,080

there you go sorry carl for you to pick

2578

01:37:27,350 --> 01:37:25,840

up all those pieces i know it's a huge

2579

01:37:28,390 --> 01:37:27,360

responsibility i trust you you're

2580

01:37:30,470 --> 01:37:28,400

someone who studies this you're

2581

01:37:32,870 --> 01:37:30,480

extremely extremely bright and you have

2582

01:37:34,550 --> 01:37:32,880

such a wealth of knowledge and i do feel

2583

01:37:37,270 --> 01:37:34,560

like what i'm going through is not

2584

01:37:38,870 --> 01:37:37,280

something terribly unique i do feel like

2585

01:37:41,030 --> 01:37:38,880

this is something that many people who

2586

01:37:42,870 --> 01:37:41,040

are on this journey of understanding the

2587

01:37:45,350 --> 01:37:42,880

world and consciousness in their place

2588

01:37:47,270 --> 01:37:45,360

go through this perhaps at some point

2589

01:37:49,430 --> 01:37:47,280

i think i was trying to emphasize that

2590

01:37:51,189 --> 01:37:49,440

by saying that you know it is a gift

2591

01:37:54,390 --> 01:37:51,199

that you're able to have these

2592

01:37:56,709 --> 01:37:54,400

existential crises um your there are

2593

01:37:59,430 --> 01:37:56,719

dangers that lurk which you've clearly

2594

01:38:01,030 --> 01:37:59,440

encountered but at the end of the day

2595

01:38:03,270 --> 01:38:01,040

the very fact that you can entertain

2596

01:38:06,070 --> 01:38:03,280

these counterfactuals

2597

01:38:08,870 --> 01:38:06,080

is you know quite remarkable you know

2598

01:38:10,470 --> 01:38:08,880

to my mind it's it would be the highest

2599

01:38:13,510 --> 01:38:10,480

expression of the human condition just

2600

01:38:15,510 --> 01:38:13,520

to consider we are those alternative

2601  
01:38:18,070 --> 01:38:15,520  
hypotheses where bits of our humanity

2602  
01:38:20,390 --> 01:38:18,080  
are just not there anymore or have a a

2603  
01:38:22,709 --> 01:38:20,400  
different disposition or relationship to

2604  
01:38:24,229 --> 01:38:22,719  
reality or indeed other people but lots

2605  
01:38:25,270 --> 01:38:24,239  
of things you said it made a lot of

2606  
01:38:27,750 --> 01:38:25,280  
sense

2607  
01:38:29,990 --> 01:38:27,760  
from simple things like you know

2608  
01:38:32,310 --> 01:38:30,000  
soliciting reassurance from others that

2609  
01:38:35,109 --> 01:38:32,320  
you don't have to do

2610  
01:38:37,830 --> 01:38:35,119  
any more work in terms of preparing

2611  
01:38:41,270 --> 01:38:37,840  
yourself for being a good a good uh

2612  
01:38:44,550 --> 01:38:41,280  
expounder of ideas or or interviewer or

2613  
01:38:46,310 --> 01:38:44,560

book writer or or whatever and you know

2614

01:38:49,270 --> 01:38:46,320

that's exactly what you should be doing

2615

01:38:52,070 --> 01:38:49,280

that's that's exactly securing evidence

2616

01:38:53,109 --> 01:38:52,080

for yourself models of an affirmatory

2617

01:38:55,590 --> 01:38:53,119

sort

2618

01:38:57,510 --> 01:38:55,600

and the more you do that then the more

2619

01:38:59,750 --> 01:38:57,520

the more that model will

2620

01:39:02,310 --> 01:38:59,760

be fit for purpose and you will have the

2621

01:39:04,629 --> 01:39:02,320

right kind of marginal maximizing your

2622

01:39:06,070 --> 01:39:04,639

marginal likelihood but

2623

01:39:07,910 --> 01:39:06,080

you're in a difficult position because

2624

01:39:09,510 --> 01:39:07,920

your job is actually to explore other

2625

01:39:11,270 --> 01:39:09,520

ways of making sense of things and other

2626

01:39:13,750 --> 01:39:11,280

ways of thinking things like you're

2627

01:39:17,350 --> 01:39:13,760

compelled to explore alternative

2628

01:39:19,990 --> 01:39:17,360

hypotheses um and you know you you've

2629

01:39:21,830 --> 01:39:20,000

described um

2630

01:39:22,870 --> 01:39:21,840

the you know the potential

2631

01:39:30,629 --> 01:39:22,880

um

2632

01:39:32,310 --> 01:39:30,639

can't now remember my nightmares but i

2633

01:39:34,310 --> 01:39:32,320

imagine that all of us do go through

2634

01:39:35,990 --> 01:39:34,320

this and we have nightmares as children

2635

01:39:38,870 --> 01:39:36,000

i think you stop having true nightmares

2636

01:39:40,709 --> 01:39:38,880

in your 30s and 40s but uh you know

2637

01:39:43,189 --> 01:39:40,719

that sort of you know before you've

2638

01:39:43,990 --> 01:39:43,199

really got that grip and maintain that

2639

01:39:44,950 --> 01:39:44,000

grip

2640

01:39:46,870 --> 01:39:44,960

on

2641

01:39:50,070 --> 01:39:46,880

self-hood and

2642

01:39:52,709 --> 01:39:50,080

you in your in your lived uh in your

2643

01:39:54,550 --> 01:39:52,719

lived world as part of that and engage

2644

01:39:57,189 --> 01:39:54,560

with that world before you've got there

2645

01:39:57,990 --> 01:39:57,199

you know it must be absolutely awful and

2646

01:40:00,470 --> 01:39:58,000

you know

2647

01:40:02,149 --> 01:40:00,480

nihilistic to to occasionally lose that

2648

01:40:03,669 --> 01:40:02,159

and then you know worrying that you're

2649

01:40:06,070 --> 01:40:03,679

never going to get it back it does

2650

01:40:07,510 --> 01:40:06,080

remind me of certain um

2651

01:40:09,669 --> 01:40:07,520

some

2652

01:40:11,430 --> 01:40:09,679

drug-induced states you know i i can

2653

01:40:12,950 --> 01:40:11,440

imagine that you're the kind of person

2654

01:40:15,830 --> 01:40:12,960

who would be very afraid of having a

2655

01:40:17,510 --> 01:40:15,840

very bad trip um and i think very

2656

01:40:20,070 --> 01:40:17,520

frightened of having one

2657

01:40:22,310 --> 01:40:20,080

yeah yeah so that is correct and luckily

2658

01:40:23,510 --> 01:40:22,320

i wasn't well what i imagined what i was

2659

01:40:25,830 --> 01:40:23,520

going through would

2660

01:40:27,910 --> 01:40:25,840

feels like how someone would feel on a

2661

01:40:28,709 --> 01:40:27,920

on a terrible psychedelic trip

2662

01:40:30,149 --> 01:40:28,719

yes

2663

01:40:32,229 --> 01:40:30,159

um and it's interesting you bring up

2664

01:40:33,510 --> 01:40:32,239

psychedelics because of course you know

2665

01:40:35,830 --> 01:40:33,520

um

2666

01:40:38,149 --> 01:40:35,840

there is a move

2667

01:40:40,390 --> 01:40:38,159

in sort of pharmacologically assisted

2668

01:40:45,109 --> 01:40:40,400

talking therapists you know to to use

2669

01:40:47,189 --> 01:40:45,119

psychedelics simply um not to aspire to

2670

01:40:48,870 --> 01:40:47,199

i don't know what ego death means but i

2671

01:40:51,750 --> 01:40:48,880

i i can have a guess at it from the

2672

01:40:53,510 --> 01:40:51,760

point of view of meditation and

2673

01:40:54,709 --> 01:40:53,520

mindfulness

2674

01:40:57,109 --> 01:40:54,719

but there's a really interesting

2675

01:41:00,070 --> 01:40:57,119

connection between

2676

01:41:02,229 --> 01:41:00,080

the use of psychedelics

2677

01:41:03,109 --> 01:41:02,239

and the aspiration

2678

01:41:07,270 --> 01:41:03,119

of

2679

01:41:09,590 --> 01:41:07,280

many um meditation-like practices um

2680

01:41:13,030 --> 01:41:09,600

that would i think subsume the intent

2681

01:41:15,669 --> 01:41:13,040

internal attention states um of um of

2682

01:41:18,149 --> 01:41:15,679

meditation and you know current

2683

01:41:20,470 --> 01:41:18,159

practices of mindfulness which is really

2684

01:41:22,870 --> 01:41:20,480

to try and redirect your attention

2685

01:41:24,470 --> 01:41:22,880

to the sensorium and usually intercepted

2686

01:41:25,669 --> 01:41:24,480

parts of it so it's like breathing for

2687

01:41:27,430 --> 01:41:25,679

example

2688

01:41:31,430 --> 01:41:27,440

so this is the exact opposite of what

2689

01:41:34,149 --> 01:41:32,709

deploying

2690

01:41:36,950 --> 01:41:34,159

that attention

2691

01:41:38,790 --> 01:41:36,960

all that um um

2692

01:41:40,870 --> 01:41:38,800

game control we're talking about in

2693

01:41:43,350 --> 01:41:40,880

terms of selecting

2694

01:41:47,270 --> 01:41:43,360

what kind of information sensory

2695

01:41:48,790 --> 01:41:47,280

information sensory states to engage and

2696

01:41:51,669 --> 01:41:48,800

um

2697

01:41:53,990 --> 01:41:51,679

determine your belief updating

2698

01:41:56,550 --> 01:41:54,000

so putting it putting all that attention

2699

01:41:59,590 --> 01:41:56,560

out to the sensory side of your deep

2700

01:42:01,590 --> 01:41:59,600

hierarchical models your your constructs

2701  
01:42:03,590 --> 01:42:01,600  
uh what you're doing is the opposite you

2702  
01:42:06,709 --> 01:42:03,600  
you you've been actually wandering

2703  
01:42:10,390 --> 01:42:06,719  
around at the deeper the highest levels

2704  
01:42:12,629 --> 01:42:10,400  
of these hierarchical models

2705  
01:42:13,910 --> 01:42:12,639  
sorry so in back when we were initially

2706  
01:42:15,590 --> 01:42:13,920  
talking and it said there's a black box

2707  
01:42:17,669 --> 01:42:15,600  
the input output and then there are two

2708  
01:42:19,430 --> 01:42:17,679  
black boxes it's as if you're saying pay

2709  
01:42:20,709 --> 01:42:19,440  
attention to the sensory forget about

2710  
01:42:22,470 --> 01:42:20,719  
the action we haven't talked much about

2711  
01:42:24,709 --> 01:42:22,480  
the action though obviously as in body

2712  
01:42:26,070 --> 01:42:24,719  
creatures sensory in action are tight

2713  
01:42:28,070 --> 01:42:26,080

it's as if what i've been doing was

2714

01:42:29,590 --> 01:42:28,080

staying within the box and creating my

2715

01:42:31,590 --> 01:42:29,600

little sensations and actions within

2716

01:42:33,270 --> 01:42:31,600

there as little loops and you're saying

2717

01:42:34,310 --> 01:42:33,280

pay attention to the senses that come

2718

01:42:36,310 --> 01:42:34,320

from the outside is that what you're

2719

01:42:39,270 --> 01:42:36,320

saying or yes well no i'm not saying you

2720

01:42:40,709 --> 01:42:39,280

should do you you you will do

2721

01:42:42,470 --> 01:42:40,719

everything uh

2722

01:42:45,910 --> 01:42:42,480

in the right way and under the free

2723

01:42:47,750 --> 01:42:45,920

energy principle what i'm saying is that

2724

01:42:50,229 --> 01:42:47,760

what i'm just saying is that the

2725

01:42:51,669 --> 01:42:50,239

skilled practitioners of mindfulness and

2726  
01:42:54,070 --> 01:42:51,679  
meditation

2727  
01:42:55,189 --> 01:42:54,080  
i would imagine of the kind that would

2728  
01:42:57,109 --> 01:42:55,199  
lead to

2729  
01:42:59,510 --> 01:42:57,119  
ego death or

2730  
01:43:01,990 --> 01:42:59,520  
i'm not quite sure what that means um

2731  
01:43:06,950 --> 01:43:03,669  
would

2732  
01:43:08,790 --> 01:43:06,960  
employ exactly the same kind of

2733  
01:43:11,590 --> 01:43:08,800  
internally mediated and sometimes if

2734  
01:43:12,629 --> 01:43:11,600  
you're very skilled volitionally called

2735  
01:43:14,550 --> 01:43:12,639  
forth

2736  
01:43:16,790 --> 01:43:14,560  
mechanisms

2737  
01:43:20,240 --> 01:43:16,800  
that are actually um

2738  
01:43:21,750 --> 01:43:20,250

targeted by psychedelics

2739

01:43:23,109 --> 01:43:21,760

[Music]

2740

01:43:25,590 --> 01:43:23,119

require you

2741

01:43:28,709 --> 01:43:25,600

now to do all your belief updating and

2742

01:43:31,030 --> 01:43:28,719

evidence assimilation and sense making

2743

01:43:33,830 --> 01:43:31,040

at the much more the input level of of

2744

01:43:35,189 --> 01:43:33,840

the black box not at the if you like the

2745

01:43:37,109 --> 01:43:35,199

highest level which you could think of

2746

01:43:38,629 --> 01:43:37,119

as an output in terms of selecting the

2747

01:43:40,629 --> 01:43:38,639

plans and what am i going to do next and

2748

01:43:43,750 --> 01:43:40,639

what kind of person am i narratives that

2749

01:43:45,270 --> 01:43:43,760

we give ourselves that contextualize

2750

01:43:47,189 --> 01:43:45,280

the way that we behave and the other

2751

01:43:49,030 --> 01:43:47,199

things that we do

2752

01:43:50,470 --> 01:43:49,040

so you know i think there's

2753

01:43:52,950 --> 01:43:50,480

mechanistically a really interesting

2754

01:43:54,229 --> 01:43:52,960

connection between the notion of you

2755

01:43:56,310 --> 01:43:54,239

ruminating

2756

01:44:00,310 --> 01:43:56,320

going in circles around your head

2757

01:44:02,310 --> 01:44:00,320

exploring every darker and darker

2758

01:44:04,709 --> 01:44:02,320

corners of your mind and different

2759

01:44:06,709 --> 01:44:04,719

hypotheses for which there's very little

2760

01:44:08,629 --> 01:44:06,719

evidence available simply because you're

2761

01:44:10,950 --> 01:44:08,639

not attending to the censorium you're

2762

01:44:13,270 --> 01:44:10,960

not talking to anybody

2763

01:44:15,270 --> 01:44:13,280

you're not for example you're not you're

2764

01:44:17,109 --> 01:44:15,280

not focusing on your breathing

2765

01:44:29,109 --> 01:44:17,119

and indeed you try and supplement that

2766

01:44:34,709 --> 01:44:31,350

you probably are um skilled in

2767

01:44:36,149 --> 01:44:34,719

meditation um but that kind i think the

2768

01:44:38,149 --> 01:44:36,159

objective of

2769

01:44:40,550 --> 01:44:38,159

becoming a skilled practitioner of

2770

01:44:42,629 --> 01:44:40,560

mindfulness or meditation is simply to

2771

01:44:45,030 --> 01:44:42,639

get some volitional control over that

2772

01:44:47,350 --> 01:44:45,040

sort of attention

2773

01:44:50,310 --> 01:44:47,360

that is paid to these deeper

2774

01:44:53,270 --> 01:44:50,320

machinations versus attention that is

2775

01:44:57,270 --> 01:44:53,280

paid to the censorium that underwrites

2776

01:45:01,590 --> 01:44:57,280

the psychedelic aspect the um the

2777

01:45:03,590 --> 01:45:01,600

the allure of just sensory uh patterns

2778

01:45:05,189 --> 01:45:03,600

um

2779

01:45:07,350 --> 01:45:05,199

the sensations

2780

01:45:09,990 --> 01:45:07,360

um and textures that you get you know

2781

01:45:13,109 --> 01:45:10,000

when taking psychedelics so you know

2782

01:45:14,950 --> 01:45:13,119

getting control of the balance um

2783

01:45:16,229 --> 01:45:14,960

so it's not the fact you're attending to

2784

01:45:17,510 --> 01:45:16,239

your breathing which is important is the

2785

01:45:19,990 --> 01:45:17,520

fact that you could volitionally

2786

01:45:23,109 --> 01:45:20,000

redirect your attention away from

2787

01:45:26,550 --> 01:45:23,119

selfhood um

2788

01:45:29,109 --> 01:45:26,560

so but you seem to have got control um

2789

01:45:33,189 --> 01:45:29,119

by this acceptance and it strikes me

2790

01:45:36,470 --> 01:45:33,199

that you know in the absence of um

2791

01:45:38,790 --> 01:45:36,480

feelings of an emotional sort that were

2792

01:45:41,270 --> 01:45:38,800

articulated in your description in terms

2793

01:45:42,870 --> 01:45:41,280

of you know i'm an awful person i'm not

2794

01:45:53,750 --> 01:45:42,880

fit for purpose i i

2795

01:45:57,990 --> 01:45:56,629

but quite emotional constructs effective

2796

01:46:00,149 --> 01:45:58,000

valence

2797

01:46:02,629 --> 01:46:00,159

aspects they are also hypotheses they're

2798

01:46:04,550 --> 01:46:02,639

also explanations so the idea is that

2799

01:46:07,109 --> 01:46:04,560

you know anything that you can talk

2800

01:46:08,709 --> 01:46:07,119

about has to be part of an explanation

2801  
01:46:11,109 --> 01:46:08,719  
for particular ways of being that you

2802  
01:46:12,950 --> 01:46:11,119  
know i can be a worthless person or this

2803  
01:46:15,750 --> 01:46:12,960  
is i am a worthless person i'm not with

2804  
01:46:16,870 --> 01:46:15,760  
this person uh you know and you since uh

2805  
01:46:18,550 --> 01:46:16,880  
i am

2806  
01:46:20,870 --> 01:46:18,560  
in a state of anxiety i'm not in the

2807  
01:46:24,149 --> 01:46:20,880  
strength of anxiety we have to recognize

2808  
01:46:27,669 --> 01:46:24,159  
when we are anxious anxious is just a

2809  
01:46:29,830 --> 01:46:27,679  
state of being um which is necessarily

2810  
01:46:32,390 --> 01:46:29,840  
called for in certain situations that

2811  
01:46:33,669 --> 01:46:32,400  
rebalance this attention or precision

2812  
01:46:37,030 --> 01:46:33,679  
weighting in

2813  
01:46:39,750 --> 01:46:37,040

computational psychiatry um

2814

01:46:41,430 --> 01:46:39,760

to make your belief updating fit for

2815

01:46:44,229 --> 01:46:41,440

purpose in this particular in this

2816

01:46:45,510 --> 01:46:44,239

particular context and what i'm trying

2817

01:46:48,470 --> 01:46:45,520

to get to

2818

01:46:50,390 --> 01:46:48,480

is why acceptance might have worked

2819

01:46:53,109 --> 01:46:50,400

because i imagine that if you were

2820

01:46:56,070 --> 01:46:53,119

suddenly found yourself ruminating and

2821

01:46:58,870 --> 01:46:56,080

locked into those ruminations

2822

01:47:01,270 --> 01:46:58,880

then very much akin to someone on a bad

2823

01:47:03,669 --> 01:47:01,280

trip who thinks ah i am going to be

2824

01:47:06,470 --> 01:47:03,679

locked in this forever this is going to

2825

01:47:07,669 --> 01:47:06,480

be my uncertain state of being for

2826

01:47:09,350 --> 01:47:07,679

eternity

2827

01:47:12,070 --> 01:47:09,360

because there is no reality that's how

2828

01:47:14,950 --> 01:47:12,080

it feels sorry how i felt yep

2829

01:47:17,189 --> 01:47:14,960

that um that feeling

2830

01:47:18,790 --> 01:47:17,199

will well if that is true i must be

2831

01:47:20,229 --> 01:47:18,800

feeling anxious you are then going to

2832

01:47:25,669 --> 01:47:20,239

look for evidence that you're feeling

2833

01:47:27,750 --> 01:47:25,679

anxious uh and because you are anxious

2834

01:47:30,390 --> 01:47:27,760

you will experience

2835

01:47:33,510 --> 01:47:30,400

certain cardio acceleration certain uh

2836

01:47:34,870 --> 01:47:33,520

intraceptive um flight or flight like

2837

01:47:37,350 --> 01:47:34,880

responses

2838

01:47:38,629 --> 01:47:37,360

and that will supply evidence that you

2839

01:47:41,350 --> 01:47:38,639

are anxious

2840

01:47:45,109 --> 01:47:41,360

and then that becomes evidence yes i am

2841

01:47:47,430 --> 01:47:45,119

right i am now in a state of nihilism

2842

01:47:49,350 --> 01:47:47,440

i do not exist and i should be anxious

2843

01:47:52,709 --> 01:47:49,360

about that and yes i am anxious so you

2844

01:47:54,950 --> 01:47:52,719

get into a vicious circle so this is a

2845

01:47:57,669 --> 01:47:54,960

sort of uh good old-fashioned cognitive

2846

01:48:00,470 --> 01:47:57,679

behavioral explanation for things like

2847

01:48:03,910 --> 01:48:00,480

panic attacks that you know uh you quite

2848

01:48:06,229 --> 01:48:03,920

reasonably in an entirely basical way

2849

01:48:07,910 --> 01:48:06,239

make sense of intrceptive bodily gut

2850

01:48:09,669 --> 01:48:07,920

feelings literally

2851

01:48:12,950 --> 01:48:09,679

you make sense of that

2852

01:48:14,709 --> 01:48:12,960

with the hypothesis ah i must be in an

2853

01:48:16,070 --> 01:48:14,719

anxious state of being

2854

01:48:18,070 --> 01:48:16,080

and that

2855

01:48:20,070 --> 01:48:18,080

conclusion that hypothesis gen then

2856

01:48:22,149 --> 01:48:20,080

generates autonomic actions that are

2857

01:48:24,070 --> 01:48:22,159

realized reflexively in the way we

2858

01:48:26,709 --> 01:48:24,080

talked about when we're looking at the

2859

01:48:28,070 --> 01:48:26,719

parkinson's idea um and that will be

2860

01:48:31,750 --> 01:48:28,080

reflected in terms of cardiac

2861

01:48:33,669 --> 01:48:31,760

acceleration uh neuroendocrine releases

2862

01:48:35,750 --> 01:48:33,679

into your body and your body will change

2863

01:48:37,910 --> 01:48:35,760

and your body will supply signals

2864

01:48:40,229 --> 01:48:37,920

interceptive evidence yes i am anxious

2865

01:48:42,790 --> 01:48:40,239

so it's again a self-fulfilling prophecy

2866

01:48:45,830 --> 01:48:42,800

in exactly the same way the idea motor

2867

01:48:48,950 --> 01:48:45,840

theory means that raising my hand is

2868

01:48:51,510 --> 01:48:48,960

just a realization of my beliefs but i

2869

01:48:53,590 --> 01:48:51,520

can literally raise my levels of anxiety

2870

01:48:55,270 --> 01:48:53,600

in exactly the same way but invisibly

2871

01:48:57,030 --> 01:48:55,280

from the outside but not when i can

2872

01:48:58,070 --> 01:48:57,040

sense my own body

2873

01:49:00,470 --> 01:48:58,080

so

2874

01:49:02,629 --> 01:49:00,480

if you got yourself caught up into this

2875

01:49:03,430 --> 01:49:02,639

joint hypothesis

2876  
01:49:26,709 --> 01:49:03,440  
i

2877  
01:49:29,910 --> 01:49:26,719  
you know

2878  
01:49:30,709 --> 01:49:29,920  
in a dark and nihilistic

2879  
01:49:34,629 --> 01:49:30,719  
place

2880  
01:49:36,709 --> 01:49:34,639  
could be no reality

2881  
01:49:38,390 --> 01:49:36,719  
that's a hypothesis

2882  
01:49:39,830 --> 01:49:38,400  
if you can just wait

2883  
01:49:42,950 --> 01:49:39,840  
for the evidence

2884  
01:49:44,950 --> 01:49:42,960  
that that hypothesis is incorrect

2885  
01:49:47,109 --> 01:49:44,960  
simply by letting your body calm down so

2886  
01:49:48,950 --> 01:49:47,119  
there is no further evidence of any

2887  
01:49:51,590 --> 01:49:48,960  
anxiety

2888  
01:49:53,830 --> 01:49:51,600

then you can find secure even from your

2889

01:49:56,550 --> 01:49:53,840

own body without talking to somebody you

2890

01:49:58,070 --> 01:49:56,560

can secure evidence are the hypothesis

2891

01:50:00,470 --> 01:49:58,080

that i am in a state of internal

2892

01:50:03,350 --> 01:50:00,480

nihilism and anxiety is a silly

2893

01:50:05,510 --> 01:50:03,360

hypothesis because the evidence refutes

2894

01:50:06,709 --> 01:50:05,520

it i can now feel my

2895

01:50:10,310 --> 01:50:06,719

cur

2896

01:50:11,910 --> 01:50:10,320

not possibly personally but you you will

2897

01:50:13,030 --> 01:50:11,920

synthesize all your interceptive

2898

01:50:14,790 --> 01:50:13,040

feelings

2899

01:50:16,070 --> 01:50:14,800

um in a way

2900

01:50:21,350 --> 01:50:16,080

that

2901  
01:50:23,590 --> 01:50:21,360  
now i am a deeply nihilistic um anxious

2902  
01:50:25,750 --> 01:50:23,600  
state i think that just is the

2903  
01:50:27,750 --> 01:50:25,760  
motivation for the acceptance it is

2904  
01:50:30,149 --> 01:50:27,760  
pushing through

2905  
01:50:31,189 --> 01:50:30,159  
to get to a state of mind and the state

2906  
01:50:33,430 --> 01:50:31,199  
of body

2907  
01:50:36,070 --> 01:50:33,440  
literally you know realizing you're good

2908  
01:50:37,990 --> 01:50:36,080  
and making sense of your gut feelings

2909  
01:50:41,430 --> 01:50:38,000  
so that you can now refute the joint

2910  
01:50:43,109 --> 01:50:41,440  
hypothesis that i am uh in a state of

2911  
01:50:44,870 --> 01:50:43,119  
nihilism and i should be jolly

2912  
01:50:45,990 --> 01:50:44,880  
frightened of others

2913  
01:50:47,430 --> 01:50:46,000

because there's no evidence you're

2914

01:50:51,189 --> 01:50:47,440

frightened anymore

2915

01:50:53,189 --> 01:50:51,199

so this was just a piece of um

2916

01:50:56,310 --> 01:50:53,199

hypothesis building

2917

01:50:57,669 --> 01:50:56,320

of you know a very sophisticated and um

2918

01:50:59,430 --> 01:50:57,679

uh

2919

01:51:02,629 --> 01:50:59,440

philosophical source you know the

2920

01:51:05,430 --> 01:51:02,639

highest level of exploring alternative

2921

01:51:09,350 --> 01:51:05,440

ways of relating to the world you now

2922

01:51:13,430 --> 01:51:09,360

have i think a very useful insight um

2923

01:51:15,669 --> 01:51:13,440

into what into the gift of retaining

2924

01:51:17,510 --> 01:51:15,679

selfhood that we i think we all we all

2925

01:51:19,430 --> 01:51:17,520

take it for granted but it's quite a

2926  
01:51:20,390 --> 01:51:19,440  
fragile thing you know

2927  
01:51:21,750 --> 01:51:20,400  
luckily

2928  
01:51:24,149 --> 01:51:21,760  
um you know

2929  
01:51:27,350 --> 01:51:24,159  
most of us get through the day if not

2930  
01:51:30,070 --> 01:51:27,360  
hopefully most of our lives you know by

2931  
01:51:31,910 --> 01:51:30,080  
retaining that grip and just you know

2932  
01:51:33,990 --> 01:51:31,920  
continue securing evidence that this is

2933  
01:51:36,310 --> 01:51:34,000  
the right hypothesis i'm a person i am

2934  
01:51:37,750 --> 01:51:36,320  
me i am functional this is you know this

2935  
01:51:39,830 --> 01:51:37,760  
is the way i meant to be and these are

2936  
01:51:42,470 --> 01:51:39,840  
the kinds of things i do and the kinds

2937  
01:51:44,790 --> 01:51:42,480  
of people i talk to but that is such a

2938  
01:51:47,910 --> 01:51:44,800

fragile self-assembled and has to be

2939

01:51:50,709 --> 01:51:47,920

maintained hypothesis that you don't

2940

01:51:53,189 --> 01:51:50,719

you know that fragility i think only is

2941

01:51:54,870 --> 01:51:53,199

revealed occasionally and only to some

2942

01:51:58,229 --> 01:51:54,880

people when they have the alternative

2943

01:52:00,790 --> 01:51:58,239

hypothesis that you know i am not me or

2944

01:52:06,229 --> 01:52:00,800

my your me is not quite as functional as

2945

01:52:09,510 --> 01:52:08,310

i am only me and there is no reality out

2946

01:52:11,589 --> 01:52:09,520

there

2947

01:52:13,830 --> 01:52:11,599

how is it that you prevent yourself from

2948

01:52:15,910 --> 01:52:13,840

getting into existential crises when it

2949

01:52:18,390 --> 01:52:15,920

seems at least to me from the outside

2950

01:52:20,070 --> 01:52:18,400

that you study similar not theories per

2951

01:52:22,709 --> 01:52:20,080

se but the free energy principle is

2952

01:52:24,870 --> 01:52:22,719

about existence and is about selfhood so

2953

01:52:26,870 --> 01:52:24,880

is your model so strong carl is your

2954

01:52:29,270 --> 01:52:26,880

model already so strong that you can

2955

01:52:31,270 --> 01:52:29,280

entertain these without worry that

2956

01:52:33,669 --> 01:52:31,280

you'll break yours or without that being

2957

01:52:35,350 --> 01:52:33,679

a potential possibility or is it because

2958

01:52:37,189 --> 01:52:35,360

you purposefully analyze it

2959

01:52:38,550 --> 01:52:37,199

dispassionately analytically

2960

01:52:40,229 --> 01:52:38,560

intellectually so that you're not

2961

01:52:41,830 --> 01:52:40,239

identifying with what you're writing

2962

01:52:43,030 --> 01:52:41,840

down on a piece of paper how is it that

2963

01:52:44,950 --> 01:52:43,040

you prevent yourself or is it

2964

01:52:46,470 --> 01:52:44,960

constitutional like by predilection by

2965

01:52:48,470 --> 01:52:46,480

personality you're not neurotic you're

2966

01:52:50,470 --> 01:52:48,480

not as neurotic as i am um

2967

01:52:51,970 --> 01:52:50,480

i think there's there's probably truth

2968

01:52:53,030 --> 01:52:51,980

to all that and um

2969

01:52:55,589 --> 01:52:53,040

[Music]

2970

01:52:57,669 --> 01:52:55,599

and by being neurotic um you know that's

2971

01:52:59,350 --> 01:52:57,679

an entirely your neurosis are

2972

01:53:01,910 --> 01:52:59,360

absolutely essential to get through life

2973

01:53:03,109 --> 01:53:01,920

um you know i have a particular set of

2974

01:53:05,750 --> 01:53:03,119

neurologies

2975

01:53:06,390 --> 01:53:05,760

um which you know i treasure and trying

2976

01:53:10,830 --> 01:53:06,400

to

2977

01:53:12,870 --> 01:53:10,840

admit it in the big five model

2978

01:53:15,510 --> 01:53:12,880

yes um

2979

01:53:17,350 --> 01:53:15,520

but i think you're also right that um

2980

01:53:19,189 --> 01:53:17,360

some people might call this mentalizing

2981

01:53:21,189 --> 01:53:19,199

i think what you were doing is that you

2982

01:53:23,189 --> 01:53:21,199

were

2983

01:53:26,149 --> 01:53:23,199

in a

2984

01:53:27,830 --> 01:53:26,159

raw enthusiastic and creative way we're

2985

01:53:30,390 --> 01:53:27,840

just exploring different hypotheses

2986

01:53:35,189 --> 01:53:30,400

about the way that you yourself should

2987

01:53:36,790 --> 01:53:35,199

it exist um um relates to um you know

2988

01:53:40,470 --> 01:53:36,800

the rest of your

2989

01:53:43,430 --> 01:53:40,480

mind and and the outside world but for

2990

01:53:47,990 --> 01:53:43,440

you we got conflated with um

2991

01:53:48,709 --> 01:53:48,000

emotional states like anxiety um

2992

01:53:54,310 --> 01:53:48,719

and

2993

01:53:57,270 --> 01:53:54,320

states of being um

2994

01:53:59,430 --> 01:53:57,280

so if you want to in your words be more

2995

01:54:01,910 --> 01:53:59,440

dispassionate about this kind of mental

2996

01:54:05,109 --> 01:54:01,920

exploration on the inside then you have

2997

01:54:07,669 --> 01:54:05,119

to um you you you have to train yourself

2998

01:54:10,149 --> 01:54:07,679

not to conflate the two one way of doing

2999

01:54:13,990 --> 01:54:10,159

that is because to mentalize

3000

01:54:15,589 --> 01:54:14,000

so mentalizing is usually taken as a way

3001

01:54:18,229 --> 01:54:15,599

of if you like

3002

01:54:19,910 --> 01:54:18,239

disentangling what we what we would

3003

01:54:21,990 --> 01:54:19,920

normally quite functionally put together

3004

01:54:23,430 --> 01:54:22,000

certain states of being

3005

01:54:26,229 --> 01:54:23,440

of a sort of

3006

01:54:27,189 --> 01:54:26,239

intellectual sort or you need a physical

3007

01:54:31,109 --> 01:54:27,199

sort

3008

01:54:35,030 --> 01:54:31,119

along with some

3009

01:54:40,390 --> 01:54:36,950

aspect simply because that's the way the

3010

01:54:41,750 --> 01:54:40,400

world is so if you'll say um um very

3011

01:54:44,070 --> 01:54:41,760

late at night

3012

01:54:45,990 --> 01:54:44,080

um you're normally gonna feel fatigued

3013

01:54:49,030 --> 01:54:46,000

it's like you know uh slightly less

3014

01:54:51,109 --> 01:54:49,040

robust you know in in a way

3015

01:54:52,550 --> 01:54:51,119

physically now it doesn't have to be

3016

01:54:54,629 --> 01:54:52,560

like that but that's the way that

3017

01:54:55,830 --> 01:54:54,639

normally the world works and that's the

3018

01:54:56,790 --> 01:54:55,840

way that you've learned to model

3019

01:54:58,070 --> 01:54:56,800

yourself

3020

01:55:01,030 --> 01:54:58,080

and

3021

01:55:03,030 --> 01:55:01,040

if you train to be a professional say

3022

01:55:05,750 --> 01:55:03,040

like an airline pilot trying to land a

3023

01:55:08,709 --> 01:55:05,760

plane at night or like a psychiatrist

3024

01:55:10,950 --> 01:55:08,719

who has to deal with these um has to see

3025

01:55:14,070 --> 01:55:10,960

people going through

3026

01:55:20,550 --> 01:55:17,669

emotional or valence or effective um

3027

01:55:22,790 --> 01:55:20,560

episodes whether it's uh sort of um

3028

01:55:27,510 --> 01:55:22,800

effective in the sense of uh you know

3029

01:55:29,750 --> 01:55:27,520

mania or depression or whether it's um

3030

01:55:32,470 --> 01:55:29,760

the the you know the co-morbidity

3031

01:55:35,109 --> 01:55:32,480

associated with psychotic states uh say

3032

01:55:38,550 --> 01:55:35,119

schizoaffective schizophrenia uh sorry

3033

01:55:40,470 --> 01:55:38,560

schizoaffective disorders um what's that

3034

01:55:44,950 --> 01:55:40,480

it's a mixture of um

3035

01:55:46,790 --> 01:55:44,960

um abnormal mood um with having

3036

01:55:49,510 --> 01:55:46,800

psychosis of the kind you'd associate

3037

01:55:51,669 --> 01:55:49,520

with schizophrenia um so it's having an

3038

01:55:53,430 --> 01:55:51,679

emotional aspect to

3039

01:55:55,750 --> 01:55:53,440

say delusions and hallucinations for

3040

01:55:57,030 --> 01:55:55,760

example oh i thought that those those

3041

01:55:59,589 --> 01:55:57,040

don't go hand in hand so some people

3042

01:56:00,870 --> 01:55:59,599

have delusions but they're okay with it

3043

01:56:02,790 --> 01:56:00,880

yes yes

3044

01:56:05,109 --> 01:56:02,800

some people have hallucinations and and

3045

01:56:06,550 --> 01:56:05,119

would not uh would not even seek medical

3046

01:56:07,990 --> 01:56:06,560

help or their family and friends would

3047

01:56:08,950 --> 01:56:08,000

not not seek

3048

01:56:10,870 --> 01:56:08,960

help

3049

01:56:14,550 --> 01:56:10,880

so there are people out there i guess my

3050

01:56:16,870 --> 01:56:14,560

point you know um here is that you can

3051

01:56:19,510 --> 01:56:16,880

mentalize it and build professional

3052

01:56:21,270 --> 01:56:19,520

defenses against the emotional aspects

3053

01:56:23,510 --> 01:56:21,280

and i think that's what i've done

3054

01:56:26,830 --> 01:56:23,520

so i think about these things as a

3055

01:56:29,910 --> 01:56:26,840

doctor or a mathematician not as a

3056

01:56:33,030 --> 01:56:29,920

person and if you want uh if you want an

3057

01:56:35,830 --> 01:56:33,040

honest answer the other trick uh is to

3058

01:56:38,310 --> 01:56:35,840

is is to uh not use psychedelics but you

3059

01:56:42,950 --> 01:56:38,320

should you should try smoking so smoking

3060

01:56:46,870 --> 01:56:44,550

or cigarettes

3061

01:56:49,030 --> 01:56:46,880

or i actually smoke a pipe but

3062

01:56:50,629 --> 01:56:49,040

cigarettes will do in an emergency so

3063

01:56:52,790 --> 01:56:50,639

there are certain neurotron

3064

01:56:55,589 --> 01:56:52,800

manipulations of neurotransmitters the

3065

01:56:57,589 --> 01:56:55,599

first time a doctor has recommended

3066

01:56:59,189 --> 01:56:57,599

yes

3067

01:57:00,870 --> 01:56:59,199

well i hope we have a select audience

3068

01:57:02,470 --> 01:57:00,880

for this

3069

01:57:03,669 --> 01:57:02,480

well yeah

3070

01:57:06,149 --> 01:57:03,679

continue could you finish up your

3071

01:57:07,589 --> 01:57:06,159

thought i'm sorry

3072

01:57:09,189 --> 01:57:07,599

you're saying the smoking of the pipe

3073

01:57:10,870 --> 01:57:09,199

does what because i'm not the type of i

3074

01:57:12,870 --> 01:57:10,880

don't smoke and nor do i want to smoke

3075

01:57:15,430 --> 01:57:12,880

but you're saying that the smoking does

3076

01:57:18,310 --> 01:57:15,440

what was the purpose of the smoking

3077

01:57:20,310 --> 01:57:18,320

it's just a way of using um nuancing

3078

01:57:22,709 --> 01:57:20,320

your neurotransmitters that control that

3079

01:57:24,950 --> 01:57:22,719

synaptic gain or the gain and the weight

3080

01:57:28,390 --> 01:57:24,960

view afford different uh different parts

3081

01:57:29,910 --> 01:57:28,400

of your um belief updating so it has the

3082

01:57:31,830 --> 01:57:29,920

opposite effect of psychedelics

3083

01:57:33,990 --> 01:57:31,840

basically so

3084

01:57:36,310 --> 01:57:34,000

that's why people like tea and you know

3085

01:57:39,589 --> 01:57:36,320

have a cup of tea come that you'll stay

3086

01:57:41,669 --> 01:57:39,599

calm and uh and carry on wherever it is

3087

01:57:43,990 --> 01:57:41,679

nice cup of tea cigarette and cup of

3088

01:57:46,390 --> 01:57:44,000

coffee yeah that'll sort you out and

3089

01:57:48,790 --> 01:57:46,400

it's because all of these um drugs the

3090

01:57:50,070 --> 01:57:48,800

caffeine the nicotine they all act on

3091

01:57:53,510 --> 01:57:50,080

the same

3092

01:57:55,189 --> 01:57:53,520

kind of um receptors um

3093

01:57:57,910 --> 01:57:55,199

at different levels in your neuronal

3094

01:57:59,990 --> 01:57:57,920

hierarchy um that are responsible for

3095

01:58:01,830 --> 01:58:00,000

setting that gain control and gaiting

3096

01:58:03,669 --> 01:58:01,840

doing the intentional and the the

3097

01:58:05,589 --> 01:58:03,679

attenuation aspects that we're talking

3098

01:58:08,149 --> 01:58:05,599

about so it's just a way of getting

3099

01:58:09,830 --> 01:58:08,159

physical control over your hierarchical

3100

01:58:11,750 --> 01:58:09,840

belief updating

3101

01:58:12,790 --> 01:58:11,760

a bit like you're about

3102

01:58:14,070 --> 01:58:12,800

i would have thought that the caffeine

3103

01:58:17,510 --> 01:58:14,080

would have the opposite effect of

3104

01:58:24,070 --> 01:58:20,870

not not necessarily no um you know

3105

01:58:27,109 --> 01:58:24,080

you know if well it clearly depends um

3106

01:58:28,470 --> 01:58:27,119

if you're very agitated um

3107

01:58:30,310 --> 01:58:28,480

then um

3108

01:58:33,589 --> 01:58:30,320

that could certainly be the case but if

3109

01:58:34,550 --> 01:58:33,599

you're if if you are

3110

01:58:36,229 --> 01:58:34,560

worried

3111

01:58:39,830 --> 01:58:36,239

that you might be anxious and in fact

3112

01:58:43,669 --> 01:58:39,840

you're not then desensitizing certain um

3113

01:58:45,430 --> 01:58:43,679

certain interceptive sensations um

3114

01:58:46,870 --> 01:58:45,440

that register that in fact you're not

3115

01:58:48,629 --> 01:58:46,880

terribly you know your heart isn't

3116

01:58:50,870 --> 01:58:48,639

pounding that'll actually calm you down

3117

01:58:52,709 --> 01:58:50,880

a little bit uh if it goes too far then

3118

01:58:55,270 --> 01:58:52,719

beta blockers will be an another nice

3119

01:58:57,270 --> 01:58:55,280

example of that's what i used actually

3120

01:58:59,350 --> 01:58:57,280

all right oh well there you go so what

3121

01:59:02,149 --> 01:58:59,360

i'm trying to say is sometimes

3122

01:59:04,470 --> 01:59:02,159

with skillful use the use of a tobacco

3123

01:59:06,790 --> 01:59:04,480

pipe can have the same kind of effects

3124

01:59:08,550 --> 01:59:06,800

as a beta blocker

3125

01:59:10,070 --> 01:59:08,560

that's all i would say all right all

3126

01:59:11,830 --> 01:59:10,080

right professor

3127

01:59:13,430 --> 01:59:11,840

again thank you so much much safe to

3128

01:59:15,430 --> 01:59:13,440

stick with beta blockers that you won't

3129

01:59:16,629 --> 01:59:15,440

get mouth cancer or anything so so if

3130

01:59:17,990 --> 01:59:16,639

you could

3131

01:59:19,350 --> 01:59:18,000

i found the beta blockers work and

3132

01:59:21,270 --> 01:59:19,360

there's also some evidence of fear

3133

01:59:22,790 --> 01:59:21,280

extinction have you heard of that right

3134

01:59:24,229 --> 01:59:22,800

there's this uh professor named merrell

3135

01:59:25,830 --> 01:59:24,239

kenditt who i'm going to speak to at

3136

01:59:27,510 --> 01:59:25,840

some point she

3137

01:59:29,750 --> 01:59:27,520

takes people through phobias where she

3138

01:59:32,470 --> 01:59:29,760

gets them to be extremely frightened

3139

01:59:34,070 --> 01:59:32,480

she actually makes them almost manic or

3140

01:59:35,910 --> 01:59:34,080

panicking at least and then she gives

3141

01:59:37,430 --> 01:59:35,920

them a beta blocker and then there's

3142

01:59:39,109 --> 01:59:37,440

they still feel fear that day it's only

3143

01:59:41,669 --> 01:59:39,119

the next day when there's memory

3144

01:59:43,350 --> 01:59:41,679

reconsolidation and the emotional tags

3145

01:59:45,109 --> 01:59:43,360

are removed because of the beta blocker

3146

01:59:46,950 --> 01:59:45,119

so you have to have a good night's sleep

3147

01:59:50,629 --> 01:59:46,960

and then the fear seems to dissipate

3148

01:59:52,149 --> 01:59:50,639

drastically for incurable ptsd i was

3149

01:59:54,229 --> 01:59:52,159

trying to do that to myself so when i

3150

01:59:55,990 --> 01:59:54,239

was feeling some fear i would take a

3151  
01:59:57,750 --> 01:59:56,000  
beta blocker and then i would feel the

3152  
01:59:59,910 --> 01:59:57,760  
fear less still wouldn't be zero but

3153  
02:00:01,990 --> 01:59:59,920  
then thinking okay great maybe this will

3154  
02:00:04,550 --> 02:00:02,000  
be like my own intervention of a fear

3155  
02:00:07,350 --> 02:00:04,560  
extinction technique

3156  
02:00:09,030 --> 02:00:07,360  
yes i i i was that's a very clever idea

3157  
02:00:10,310 --> 02:00:09,040  
actually to combine uh beta blockers

3158  
02:00:12,629 --> 02:00:10,320  
with uh what

3159  
02:00:15,030 --> 02:00:12,639  
extinction or some people call flooding

3160  
02:00:16,950 --> 02:00:15,040  
so that the uh so that that's exactly

3161  
02:00:19,270 --> 02:00:16,960  
the kind of way i was um

3162  
02:00:21,990 --> 02:00:19,280  
uh counseling you you you would use the

3163  
02:00:28,950 --> 02:00:22,000

people who smoke you smoking to moderate

3164

02:00:32,709 --> 02:00:30,470

thank you so much i

3165

02:00:34,310 --> 02:00:32,719

will talk again and perhaps the next

3166

02:00:35,750 --> 02:00:34,320

time we speak there were some questions

3167

02:00:38,229 --> 02:00:35,760

that i didn't even get to from michael

3168

02:00:40,390 --> 02:00:38,239

levin from professor norman weinberger

3169

02:00:42,070 --> 02:00:40,400

who's a mathematician and and there's

3170

02:00:44,390 --> 02:00:42,080

quite a few okay

3171

02:00:46,070 --> 02:00:44,400

carl i kept you on for so long and this

3172

02:00:48,149 --> 02:00:46,080

is gone

3173

02:00:49,270 --> 02:00:48,159

well this didn't i didn't intend for it

3174

02:00:51,589 --> 02:00:49,280

to go in this direction but i'm

3175

02:00:53,830 --> 02:00:51,599

extremely glad it has and maybe my

3176

02:00:56,390 --> 02:00:53,840

episode could serve and your advice

3177

02:00:58,870 --> 02:00:56,400

that's a plus the advice can serve as a

3178

02:01:00,709 --> 02:00:58,880

cautionary tale and as well as some

3179

02:01:02,550 --> 02:01:00,719

practical advice as to what to do and

3180

02:01:04,709 --> 02:01:02,560

how to avoid situations like this when

3181

02:01:07,589 --> 02:01:04,719

exploring topics like this thank you so

3182

02:01:12,229 --> 02:01:07,599

much professor i appreciate

3183

02:01:15,910 --> 02:01:14,149

the podcast is now finished if you'd

3184

02:01:19,030 --> 02:01:15,920

like to support conversations like this

3185

02:01:23,189 --> 02:01:19,040

then do consider going to [patreon.com](https://patreon.com)

3186

02:01:25,750 --> 02:01:23,199

c-u-r-t j-a-i-m-u-n

3187

02:01:27,589 --> 02:01:25,760

that is kurt jaimungle it's support from

3188

02:01:29,430 --> 02:01:27,599

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