1
00:00:07,590 --> 00:00:06,070
[Music]

2
00:00:09,350 --> 00:00:07,600
hello everybody it's great to be here

3
00:00:11,030 --> 00:00:09,360
with you today and i'm so grateful to be

4
00:00:12,549 --> 00:00:11,040
part of the society for scientific

5
00:00:14,549 --> 00:00:12,559
exploration um

6
00:00:16,150 --> 00:00:14,559
conference again it's probably 12 years

7
00:00:17,830 --> 00:00:16,160
ago when i first walked in the room and

8
00:00:18,870 --> 00:00:17,840
met many of you

9
00:00:20,550 --> 00:00:18,880
i'm going to talk about space-time

10
00:00:22,710 --> 00:00:20,560
holism

11
00:00:25,029 --> 00:00:22,720
i have a master's in physics and two

12
00:00:26,550 --> 00:00:25,039
books living in flow the science of

13
00:00:29,029 --> 00:00:26,560

synchronicity and how your choices shape

14
00:00:31,029 --> 00:00:29,039
your world and leap to wholeness the how

15
00:00:32,549 --> 00:00:31,039
the world is programmed to help us grow

16
00:00:33,750 --> 00:00:32,559
heal and adapt

17
00:00:35,030 --> 00:00:33,760
and

18
00:00:36,310 --> 00:00:35,040
especially the second book both the

19
00:00:37,910 --> 00:00:36,320
books are really based on the research

20
00:00:40,709 --> 00:00:37,920
that i've done trying to understand

21
00:00:42,869 --> 00:00:40,719
synchronicity trying to try to form some

22
00:00:45,029 --> 00:00:42,879
some as a physicist some description of

23
00:00:47,670 --> 00:00:45,039
synchronicity and the latest paper is

24
00:00:49,350 --> 00:00:47,680
really my my has been my target for many

25
00:00:51,350 --> 00:00:49,360
years i'm going to share with it with

26
00:00:52,950 --> 00:00:51,360
you today it's a

27
00:00:55,670 --> 00:00:52,960
formulation of quantum mechanics through

28
00:00:57,189 --> 00:00:55,680
the lens of fourier transforms and

29
00:00:59,590 --> 00:00:57,199
holograms

30
00:01:01,430 --> 00:00:59,600
and as such i think it's a

31
00:01:04,469 --> 00:01:01,440
step forward on our understanding of

32
00:01:05,270 --> 00:01:04,479
time specifically time in physics is a

33
00:01:07,109 --> 00:01:05,280
um

34
00:01:08,710 --> 00:01:07,119
sort of a step child that hasn't been

35
00:01:10,070 --> 00:01:08,720
really fully realized in our

36
00:01:11,750 --> 00:01:10,080
descriptions and i think we need to

37
00:01:13,670 --> 00:01:11,760
understand it as holistic and this

38
00:01:15,270 --> 00:01:13,680

actually helps us move forward in our

39
00:01:16,230 --> 00:01:15,280
descriptions of many other things in

40
00:01:18,390 --> 00:01:16,240
physics

41
00:01:20,070 --> 00:01:18,400
so what we'll cover today a derivation

42
00:01:21,670 --> 00:01:20,080
of holistic time

43
00:01:24,630 --> 00:01:21,680
a re-derivation of the principle of

44
00:01:26,469 --> 00:01:24,640
quantum superposition using holograms

45
00:01:29,190 --> 00:01:26,479
and we'll mention synchronicity as sort

46
00:01:30,550 --> 00:01:29,200
of the potential future research or

47
00:01:32,310 --> 00:01:30,560
connection that we can make and then

48
00:01:33,830 --> 00:01:32,320
after this session i've we've got a

49
00:01:35,590 --> 00:01:33,840
break and i've booked a self-organized

50
00:01:37,590 --> 00:01:35,600
room to talk more about synchronicity as

51
00:01:39,350 --> 00:01:37,600
a collective uh just

52
00:01:41,830 --> 00:01:39,360
an open conversation about synchronicity

53
00:01:43,270 --> 00:01:41,840
based on what we talk about here so all

54
00:01:45,030 --> 00:01:43,280
of you are welcome to join and stay in

55
00:01:47,109 --> 00:01:45,040
this room for that

56
00:01:48,469 --> 00:01:47,119
myself i was already introduced i did

57
00:01:49,910 --> 00:01:48,479
this research through the fagine

58
00:01:52,069 --> 00:01:49,920
foundation and the foundational

59
00:01:54,149 --> 00:01:52,079
questions institute

60
00:01:57,590 --> 00:01:54,159
those are the funding agencies and the

61
00:01:59,749 --> 00:01:57,600
research was done at the tice research

62
00:02:01,749 --> 00:01:59,759
the paper is available for

63
00:02:03,910 --> 00:02:01,759

open access it's called space time pads

64
00:02:06,469 --> 00:02:03,920
as a whole published in quantum reports

65
00:02:08,630 --> 00:02:06,479
this past winter

66
00:02:10,790 --> 00:02:08,640
so why is this research important

67
00:02:13,350 --> 00:02:10,800
well as i mentioned time is not fully

68
00:02:15,270 --> 00:02:13,360
realized in the physics formalisms uh we

69
00:02:17,190 --> 00:02:15,280
get closer to it when we make our

70
00:02:18,949 --> 00:02:17,200
equations lorenzen variant according to

71
00:02:22,470 --> 00:02:18,959
special relativity but there are still

72
00:02:24,229 --> 00:02:22,480
things like the um the time

73
00:02:26,550 --> 00:02:24,239
time ordering operator and things that

74
00:02:29,110 --> 00:02:26,560
sort of stand out as ways we impose

75
00:02:31,350 --> 00:02:29,120
causality on systems that sort of bother

76
00:02:32,869 --> 00:02:31,360
me and in particular the main one is

77
00:02:34,470 --> 00:02:32,879
that if i could summarize quantum

78
00:02:35,990 --> 00:02:34,480
mechanics it's a relationship between

79
00:02:37,190 --> 00:02:36,000
position and momentum and that

80
00:02:39,110 --> 00:02:37,200
relationship

81
00:02:40,390 --> 00:02:39,120
is the fourier transform

82
00:02:42,550 --> 00:02:40,400
and there is a similar relationship

83
00:02:44,630 --> 00:02:42,560
between time and frequency but it's not

84
00:02:46,229 --> 00:02:44,640
leveraged as much they're not leveraged

85
00:02:48,550 --> 00:02:46,239
equally for instance when we study

86
00:02:50,229 --> 00:02:48,560
crystals we often work in the

87
00:02:52,390 --> 00:02:50,239
um in the alternate space in the

88
00:02:54,390 --> 00:02:52,400

momentum space to describe crystals

89
00:02:56,309 --> 00:02:54,400
because it's very useful it's very uh

90
00:02:58,149 --> 00:02:56,319
practical but we don't do that with time

91
00:02:59,589 --> 00:02:58,159
and frequency that much so there's some

92
00:03:01,190 --> 00:02:59,599
differences in the way that we perceive

93
00:03:03,030 --> 00:03:01,200
time and i think it has to do with our

94
00:03:05,750 --> 00:03:03,040
personal experience of time right we

95
00:03:07,830 --> 00:03:05,760
think of time very personally we we live

96
00:03:10,470 --> 00:03:07,840
in the present moment and that's what we

97
00:03:12,550 --> 00:03:10,480
we bias the present in you know in favor

98
00:03:14,229 --> 00:03:12,560
of in favor of the present over the past

99
00:03:15,910 --> 00:03:14,239
and the future and this notion that

100
00:03:17,670 --> 00:03:15,920
we're at a particular point in time we

101
00:03:19,190 --> 00:03:17,680
think of time like a grain of sand a

102
00:03:21,110 --> 00:03:19,200
single grain of sand and we're going to

103
00:03:22,309 --> 00:03:21,120
talk about it in different terms today

104
00:03:25,350 --> 00:03:22,319
rather than a grain of sand we're going

105
00:03:27,430 --> 00:03:25,360
to talk about a line of time

106
00:03:29,430 --> 00:03:27,440
so just a little background on time in

107
00:03:31,110 --> 00:03:29,440
doing my research i did learn about some

108
00:03:33,430 --> 00:03:31,120
other notions of time from other

109
00:03:35,589 --> 00:03:33,440
cultures the aboriginals for instance in

110
00:03:38,550 --> 00:03:35,599
western australia think of time i think

111
00:03:40,229 --> 00:03:38,560
of life like a dream the dreaming and

112
00:03:42,309 --> 00:03:40,239
we're experiencing a dream and the past

113
00:03:44,470 --> 00:03:42,319

continues to exist in the present and

114
00:03:47,509 --> 00:03:44,480
the future is here too so there's this

115
00:03:48,789 --> 00:03:47,519
eternity or eternalness to time versus

116
00:03:50,550 --> 00:03:48,799
it's very hard to understand that when

117
00:03:52,309 --> 00:03:50,560
you're in the western view which is that

118
00:03:55,509 --> 00:03:52,319
we're on the line moving forward you

119
00:03:58,470 --> 00:03:55,519
know point by point through through time

120
00:04:00,949 --> 00:03:58,480
but um that's so i want to align what

121
00:04:03,270 --> 00:04:00,959
i'm researching here in

122
00:04:05,030 --> 00:04:03,280
in moving forward in physics with these

123
00:04:06,470 --> 00:04:05,040
alternate uh ways of looking at time

124
00:04:09,030 --> 00:04:06,480
from other cultures

125
00:04:11,429 --> 00:04:09,040
hippocrates from the greek culture

126
00:04:12,949 --> 00:04:11,439
identified chronos and kairos kronos is

127
00:04:15,110 --> 00:04:12,959
what we're used to the linear passage of

128
00:04:17,349 --> 00:04:15,120
time kairos is a proper or opportune

129
00:04:18,870 --> 00:04:17,359
moment for a given action so kairos is

130
00:04:20,949 --> 00:04:18,880
really helpful for discussing

131
00:04:22,469 --> 00:04:20,959
synchronicity where you know you go to

132
00:04:24,150 --> 00:04:22,479
the airport and you walk into the gate

133
00:04:25,110 --> 00:04:24,160
and there's somebody you know there and

134
00:04:26,550 --> 00:04:25,120
it's like if you had walked into the

135
00:04:28,310 --> 00:04:26,560
gate ten minutes earlier or ten minutes

136
00:04:30,550 --> 00:04:28,320
later you might not have met that person

137
00:04:32,230 --> 00:04:30,560
so the opportune moment to meet them is

138
00:04:34,390 --> 00:04:32,240

right when you happen to walk in and

139
00:04:36,469 --> 00:04:34,400
that's that's what kairos is like kairos

140
00:04:39,350 --> 00:04:36,479
is qualitative time and kronos is

141
00:04:41,350 --> 00:04:39,360
quantitative time in in a sense

142
00:04:43,110 --> 00:04:41,360
so my proposal our way of looking at

143
00:04:45,350 --> 00:04:43,120
this is kind of like the following

144
00:04:48,230 --> 00:04:45,360
instead of life coming at you like

145
00:04:50,070 --> 00:04:48,240
you're sitting there watching it happen

146
00:04:52,390 --> 00:04:50,080
and you're it's a clock ticking in front

147
00:04:54,070 --> 00:04:52,400
of you you're really on a path you're on

148
00:04:56,150 --> 00:04:54,080
a timeline through the multiverse and

149
00:04:58,310 --> 00:04:56,160
this is just a visualization of the menu

150
00:04:59,990 --> 00:04:58,320
world's branching wave function

151
00:05:01,590 --> 00:05:00,000
specifically i've identified the touch

152
00:05:03,029 --> 00:05:01,600
points where you make decisions those

153
00:05:05,029 --> 00:05:03,039
are the flags

154
00:05:06,629 --> 00:05:05,039
and that's where the the multiverse

155
00:05:08,390 --> 00:05:06,639
branches what we're going to speak about

156
00:05:10,469 --> 00:05:08,400
today is the time in between the touch

157
00:05:13,110 --> 00:05:10,479
points those are when you're moving

158
00:05:14,629 --> 00:05:13,120
along a path from a beginning point to

159
00:05:16,469 --> 00:05:14,639
an end point and i'm going to show you

160
00:05:19,110 --> 00:05:16,479
mathematically that these pads are

161
00:05:20,950 --> 00:05:19,120
deterministic they're unitary and they

162
00:05:22,790 --> 00:05:20,960
exist as a whole

163
00:05:24,629 --> 00:05:22,800

you can't divide them in half or take

164
00:05:26,390 --> 00:05:24,639
steps along them but you are on a

165
00:05:27,510 --> 00:05:26,400
trajectory and this this element of

166
00:05:29,189 --> 00:05:27,520
being on a trajectory is really

167
00:05:31,110 --> 00:05:29,199
important because as soon as you talk

168
00:05:32,790 --> 00:05:31,120
about time as a line or as a whole

169
00:05:35,189 --> 00:05:32,800
you've got a beginning and an ending

170
00:05:37,590 --> 00:05:35,199
you've got a plot you've got a storyline

171
00:05:39,510 --> 00:05:37,600
in that in that in that timeline so it

172
00:05:41,670 --> 00:05:39,520
brings into the narrative questions

173
00:05:45,110 --> 00:05:41,680
about meaning and synchronicity fits

174
00:05:49,189 --> 00:05:46,950
so i want to give a little background

175
00:05:52,550 --> 00:05:49,199
educate those folks who are not familiar

176
00:05:54,790 --> 00:05:52,560
with the fourier transform and

177
00:05:56,710 --> 00:05:54,800
image processing is a really helpful way

178
00:05:58,629 --> 00:05:56,720
to understand this so this is just a

179
00:05:59,909 --> 00:05:58,639
little background on the mathematics in

180
00:06:01,830 --> 00:05:59,919
digital photography you can have a

181
00:06:04,230 --> 00:06:01,840
photograph like the city here

182
00:06:05,670 --> 00:06:04,240
and it's made of pixels on your screen

183
00:06:07,430 --> 00:06:05,680
and there's a blue pixel in one position

184
00:06:09,990 --> 00:06:07,440
and a gray pixel in another position to

185
00:06:11,909 --> 00:06:10,000
indicate what what it's representing

186
00:06:13,110 --> 00:06:11,919
this is the territory this is the real

187
00:06:14,390 --> 00:06:13,120
world

188
00:06:16,629 --> 00:06:14,400

but there's also an equivalent

189
00:06:18,870 --> 00:06:16,639
representation that i call the map which

190
00:06:20,870 --> 00:06:18,880
is called the frequency domain

191
00:06:23,029 --> 00:06:20,880
and the frequency domain says okay we

192
00:06:25,909 --> 00:06:23,039
can decompose this city in terms of the

193
00:06:27,430 --> 00:06:25,919
patterns that make up the city

194
00:06:29,270 --> 00:06:27,440
and by patterns i mean like zebra

195
00:06:30,870 --> 00:06:29,280
stripes heading in different directions

196
00:06:32,309 --> 00:06:30,880
at different frequencies

197
00:06:34,870 --> 00:06:32,319
and these patterns when you put them all

198
00:06:36,309 --> 00:06:34,880
together they give you the picture it's

199
00:06:37,830 --> 00:06:36,319
amazing but they do

200
00:06:39,590 --> 00:06:37,840
and on the right we have a map which is

201
00:06:41,590 --> 00:06:39,600
essentially a recipe for how to do that

202
00:06:43,510 --> 00:06:41,600
so every dot on the map corresponds to a

203
00:06:45,510 --> 00:06:43,520
different frequency space that you would

204
00:06:46,830 --> 00:06:45,520
draw on this on the territory and when

205
00:06:48,629 --> 00:06:46,840
you put them together you get the

206
00:06:50,390 --> 00:06:48,639
buildings so let me show you how this

207
00:06:52,710 --> 00:06:50,400
works

208
00:06:54,390 --> 00:06:52,720
if you have lines that are vertical and

209
00:06:57,270 --> 00:06:54,400
sort of spaced far apart like in the

210
00:06:59,589 --> 00:06:57,280
first diagram that would be a small

211
00:07:02,070 --> 00:06:59,599
frequency heading left and right so you

212
00:07:03,990 --> 00:07:02,080
draw two dots slightly off the center

213
00:07:05,749 --> 00:07:04,000

left and right

214
00:07:07,270 --> 00:07:05,759
in the middle one you have horizontal

215
00:07:08,790 --> 00:07:07,280
lines that are pretty high frequency and

216
00:07:09,909 --> 00:07:08,800
those would be two dots pretty far from

217
00:07:13,510 --> 00:07:09,919
the origin

218
00:07:16,230 --> 00:07:14,950
and you can see the third one is just

219
00:07:17,990 --> 00:07:16,240
illustrating that they can go at an

220
00:07:19,270 --> 00:07:18,000
angle as well so these two dots in the

221
00:07:20,950 --> 00:07:19,280
frequency domain

222
00:07:22,390 --> 00:07:20,960
they tell you a lot

223
00:07:24,309 --> 00:07:22,400
when it's just two points in the

224
00:07:26,309 --> 00:07:24,319
frequency domain fill up the entire

225
00:07:27,670 --> 00:07:26,319
spatial domain with information or with

226
00:07:29,189 --> 00:07:27,680
a picture

227
00:07:31,029 --> 00:07:29,199
so you can fill up all of space or

228
00:07:33,749 --> 00:07:31,039
affect all of space with just a point of

229
00:07:35,749 --> 00:07:33,759
information and frequency

230
00:07:37,749 --> 00:07:35,759
so here's an example of two dots that i

231
00:07:40,070 --> 00:07:37,759
put on the map and the territory how

232
00:07:41,749 --> 00:07:40,080
it's affected it puts a

233
00:07:44,550 --> 00:07:41,759
frequency pattern on the screen with

234
00:07:46,550 --> 00:07:44,560
those two dots and i can do that with

235
00:07:48,230 --> 00:07:46,560
more dots

236
00:07:50,070 --> 00:07:48,240
and get sort of an interference pattern

237
00:07:52,309 --> 00:07:50,080
do it with more dots and get more

238
00:07:53,909 --> 00:07:52,319

interference

239
00:07:56,150 --> 00:07:53,919
and i start to get really complicated

240
00:07:57,270 --> 00:07:56,160
shapes and then you see the magic you

241
00:07:58,309 --> 00:07:57,280
start to see that there's buildings

242
00:08:00,950 --> 00:07:58,319
there there's actually something

243
00:08:02,070 --> 00:08:00,960
emerging from the patterns and so this

244
00:08:04,710 --> 00:08:02,080
is the way that

245
00:08:07,670 --> 00:08:04,720
real shapes emerge from the interference

246
00:08:09,589 --> 00:08:07,680
of very complicated um

247
00:08:11,749 --> 00:08:09,599
layout of the frequencies

248
00:08:13,909 --> 00:08:11,759
and that's what the map does it's a very

249
00:08:15,909 --> 00:08:13,919
specific recipe it's not random very

250
00:08:17,430 --> 00:08:15,919
specific to give you exactly the picture

251
00:08:20,070 --> 00:08:17,440
that you're looking at

252
00:08:22,150 --> 00:08:20,080
and i can show you here how i can create

253
00:08:24,469 --> 00:08:22,160
out of pixels i can create the city but

254
00:08:25,749 --> 00:08:24,479
i can also create it out of lines

255
00:08:27,749 --> 00:08:25,759
so by putting this this is the same

256
00:08:29,270 --> 00:08:27,759
amount of data in each case but it's

257
00:08:31,029 --> 00:08:29,280
just building this city in a different

258
00:08:32,870 --> 00:08:31,039
way on the left it's building it in

259
00:08:34,709 --> 00:08:32,880
terms of pixels which is really familiar

260
00:08:36,149 --> 00:08:34,719
that's what i would call reductionist

261
00:08:37,509 --> 00:08:36,159
because every point in the in the

262
00:08:40,149 --> 00:08:37,519
picture corresponds to a different color

263
00:08:42,630 --> 00:08:40,159

pixel but in the on the right it's not

264
00:08:44,149 --> 00:08:42,640
reductionist it's holistic because it's

265
00:08:46,389 --> 00:08:44,159
being created from patterns which take

266
00:08:48,790 --> 00:08:46,399
up the whole screen

267
00:08:50,870 --> 00:08:48,800
and these patterns come together to

268
00:08:52,870 --> 00:08:50,880
relate to each other and interact to

269
00:08:54,470 --> 00:08:52,880
give you the same image when you have

270
00:08:56,630 --> 00:08:54,480
enough of them

271
00:08:58,470 --> 00:08:56,640
so consider that if i wanted to remove a

272
00:09:00,550 --> 00:08:58,480
building i wanted to alter the picture

273
00:09:02,310 --> 00:09:00,560
in a very specific local way

274
00:09:03,590 --> 00:09:02,320
on the left it would be very easy i just

275
00:09:05,750 --> 00:09:03,600
take a pair of scissors and cut around

276
00:09:07,670 --> 00:09:05,760
the building or i take a

277
00:09:08,949 --> 00:09:07,680
drawing tool and i erase it and erase

278
00:09:12,230 --> 00:09:08,959
those pixels

279
00:09:14,470 --> 00:09:12,240
on the right it's impossible

280
00:09:16,150 --> 00:09:14,480
if i erase the frequencies corresponding

281
00:09:17,269 --> 00:09:16,160
to what create that create that building

282
00:09:19,750 --> 00:09:17,279
they're also creating all the other

283
00:09:21,829 --> 00:09:19,760
buildings so i erase any frequencies i'm

284
00:09:23,670 --> 00:09:21,839
going to modify the entire picture with

285
00:09:25,590 --> 00:09:23,680
all the buildings so there's no way to

286
00:09:27,750 --> 00:09:25,600
locally modify something when you build

287
00:09:29,509 --> 00:09:27,760
it from patterns and this is why we call

288
00:09:31,829 --> 00:09:29,519

it holistic there's a one to all

289
00:09:32,949 --> 00:09:31,839
relationship between these domains

290
00:09:35,190 --> 00:09:32,959
let me show you this one to all

291
00:09:37,509 --> 00:09:35,200
relationship even deeper if i take the

292
00:09:39,190 --> 00:09:37,519
map and i

293
00:09:41,269 --> 00:09:39,200
filter out some of those frequencies

294
00:09:42,949 --> 00:09:41,279
this is a low-pass filter so i've

295
00:09:44,150 --> 00:09:42,959
blocked out the high frequencies what

296
00:09:46,710 --> 00:09:44,160
i've done is i've blocked out all

297
00:09:48,470 --> 00:09:46,720
components that contribute to quick

298
00:09:49,990 --> 00:09:48,480
changes in color

299
00:09:51,350 --> 00:09:50,000
across the screen and that means i'm

300
00:09:53,190 --> 00:09:51,360
blurring the edges

301
00:09:54,470 --> 00:09:53,200
so now i have a blurry screen a blurry

302
00:09:56,389 --> 00:09:54,480
territory

303
00:09:57,910 --> 00:09:56,399
but i've made a local change to the map

304
00:10:00,070 --> 00:09:57,920
in the frequency domain and affected the

305
00:10:02,310 --> 00:10:00,080
entire territory at once

306
00:10:03,910 --> 00:10:02,320
one to all

307
00:10:05,670 --> 00:10:03,920
i can do a high pass filter as well

308
00:10:08,069 --> 00:10:05,680
where i block out the middle frequencies

309
00:10:09,910 --> 00:10:08,079
and what i get is an edge finder

310
00:10:12,949 --> 00:10:09,920
this highlights the edges and removes

311
00:10:14,389 --> 00:10:12,959
sort of the dc component of the picture

312
00:10:16,550 --> 00:10:14,399
so you can make these changes which they

313
00:10:18,870 --> 00:10:16,560

do in adobe photoshop graphic designers

314
00:10:20,230 --> 00:10:18,880
are very familiar with this in music you

315
00:10:22,230 --> 00:10:20,240
also do this this is how you do a

316
00:10:24,630 --> 00:10:22,240
graphic equalizer and change the high

317
00:10:26,470 --> 00:10:24,640
end or the low end of a sound so

318
00:10:28,230 --> 00:10:26,480
that's a background on the fourier

319
00:10:29,829 --> 00:10:28,240
transform and how it applies to signals

320
00:10:31,430 --> 00:10:29,839
in in engineering

321
00:10:33,750 --> 00:10:31,440
so now i'm going to take that

322
00:10:35,269 --> 00:10:33,760
background and start to apply it to uh

323
00:10:36,550 --> 00:10:35,279
the quantum formalism

324
00:10:38,550 --> 00:10:36,560
before i even do that i'm going to talk

325
00:10:40,150 --> 00:10:38,560
about holograms

326
00:10:42,710 --> 00:10:40,160
so a hologram is made in the following

327
00:10:44,150 --> 00:10:42,720
way you shine light from a laser onto an

328
00:10:46,550 --> 00:10:44,160
object like the city

329
00:10:48,389 --> 00:10:46,560
and you also shine it onto a mirror and

330
00:10:49,910 --> 00:10:48,399
you you interfere these beams on a piece

331
00:10:51,030 --> 00:10:49,920
of film and the difference between the

332
00:10:52,790 --> 00:10:51,040
beams

333
00:10:54,470 --> 00:10:52,800
uh encodes

334
00:10:56,630 --> 00:10:54,480
the very specific unique information

335
00:10:58,949 --> 00:10:56,640
about the city that you see

336
00:11:01,430 --> 00:10:58,959
so in the film you encode this unique

337
00:11:03,590 --> 00:11:01,440
but impossible to decipher pattern

338
00:11:05,670 --> 00:11:03,600

and it's it's fixed on the film and then

339
00:11:07,670 --> 00:11:05,680
when i shine light again on the film it

340
00:11:09,829 --> 00:11:07,680
reproduces that pattern as if the city

341
00:11:13,750 --> 00:11:09,839
was there and you see you appear to see

342
00:11:18,150 --> 00:11:16,389
so what's special about a hologram

343
00:11:19,990 --> 00:11:18,160
is that each angle of the of the

344
00:11:21,509 --> 00:11:20,000
observer is a unique perspective on the

345
00:11:24,150 --> 00:11:21,519
whole image

346
00:11:26,310 --> 00:11:24,160
so right here the hologram is the

347
00:11:28,949 --> 00:11:26,320
gray rectangle that you see in three

348
00:11:32,069 --> 00:11:28,959
places left middle and right and in it

349
00:11:33,430 --> 00:11:32,079
is this image appearing of the city it

350
00:11:34,949 --> 00:11:33,440
sort of floats there it's sort of

351
00:11:37,509 --> 00:11:34,959
ethereal

352
00:11:39,269 --> 00:11:37,519
and you can tell i've put a star on a

353
00:11:41,110 --> 00:11:39,279
building in front and a circle on the

354
00:11:43,509 --> 00:11:41,120
building and back to illustrate the

355
00:11:46,389 --> 00:11:43,519
depth and you can see that as i move my

356
00:11:49,030 --> 00:11:46,399
position from left to middle to right

357
00:11:50,790 --> 00:11:49,040
the star and the circle move as if

358
00:11:52,870 --> 00:11:50,800
there's parallax as if they're separate

359
00:11:55,190 --> 00:11:52,880
in space and so there's this illusion of

360
00:11:56,550 --> 00:11:55,200
depth perception

361
00:11:57,990 --> 00:11:56,560
what's really crucial this is sort of

362
00:11:59,350 --> 00:11:58,000
the key point so i'm going to say it a

363
00:12:00,150 --> 00:11:59,360

couple times

364
00:12:03,110 --> 00:12:00,160
there's

365
00:12:04,069 --> 00:12:03,120
two different dimen definitions of space

366
00:12:08,389 --> 00:12:04,079
here

367
00:12:11,350 --> 00:12:08,399
buildings each building has a different

368
00:12:13,509 --> 00:12:11,360
as a certain position associated with it

369
00:12:15,269 --> 00:12:13,519
and then there's a position

370
00:12:17,110 --> 00:12:15,279
of the film

371
00:12:19,750 --> 00:12:17,120
and these are different things because

372
00:12:22,150 --> 00:12:19,760
when you move your perspective the star

373
00:12:23,829 --> 00:12:22,160
and the buildings move across the film

374
00:12:26,310 --> 00:12:23,839
so you need two sets of numbers to

375
00:12:28,069 --> 00:12:26,320
describe the position of the of the

376
00:12:30,069 --> 00:12:28,079
system you need to describe the image

377
00:12:31,990 --> 00:12:30,079
itself where it is and then the film

378
00:12:35,190 --> 00:12:32,000
where on the film you're looking so

379
00:12:36,790 --> 00:12:35,200
there's a separation between um

380
00:12:37,990 --> 00:12:36,800
the image and the filament background

381
00:12:40,069 --> 00:12:38,000
itself and this is going to come into

382
00:12:41,829 --> 00:12:40,079
play in a minute when we talk about

383
00:12:43,269 --> 00:12:41,839
actual physical events in space time

384
00:12:45,350 --> 00:12:43,279
being like the image you see in the

385
00:12:46,710 --> 00:12:45,360
hologram and the fields themselves being

386
00:12:51,110 --> 00:12:46,720
like the film that you can't actually

387
00:12:55,590 --> 00:12:53,110
so uh just a quick note if you look at

388
00:12:57,269 --> 00:12:55,600

this uh hologram from an angle or if you

389
00:12:59,350 --> 00:12:57,279
cut off part of it and look from the

390
00:13:01,190 --> 00:12:59,360
side you can it's like looking through a

391
00:13:02,870 --> 00:13:01,200
window like these curtains you can look

392
00:13:05,190 --> 00:13:02,880
behind a place that you've cut to see

393
00:13:07,590 --> 00:13:05,200
what's there so that's just a an

394
00:13:09,829 --> 00:13:07,600
intuitive piece about the hologram it's

395
00:13:12,069 --> 00:13:09,839
holistic in that sense so i want to jump

396
00:13:14,069 --> 00:13:12,079
into the theory and how how time can be

397
00:13:16,069 --> 00:13:14,079
represented in this way so there are two

398
00:13:17,829 --> 00:13:16,079
postulates in my work

399
00:13:19,509 --> 00:13:17,839
and these are sort of replacing the

400
00:13:21,590 --> 00:13:19,519
postulates of quantum mechanics although

401
00:13:23,910 --> 00:13:21,600
this this theory doesn't fully replace

402
00:13:27,190 --> 00:13:23,920
quantum mechanics but just uh quantum

403
00:13:29,190 --> 00:13:27,200
wave functions uh propagation

404
00:13:30,870 --> 00:13:29,200
so in the first postulate a system is

405
00:13:32,389 --> 00:13:30,880
fully described by four-dimensional

406
00:13:33,990 --> 00:13:32,399
signals in the space-time domain and the

407
00:13:36,069 --> 00:13:34,000
frequency domain and these are related

408
00:13:37,269 --> 00:13:36,079
by the fourier transform so this this is

409
00:13:39,189 --> 00:13:37,279
the wave function okay it's a

410
00:13:41,269 --> 00:13:39,199
four-dimensional wave function space end

411
00:13:43,030 --> 00:13:41,279
time and it's got its frequency domain

412
00:13:44,310 --> 00:13:43,040
counterpart which is also

413
00:13:46,629 --> 00:13:44,320

four-dimensional

414
00:13:48,310 --> 00:13:46,639
and interaction is the second postulate

415
00:13:49,590 --> 00:13:48,320
it's accomplished through convolution

416
00:13:51,670 --> 00:13:49,600
this is just what happens when you

417
00:13:54,310 --> 00:13:51,680
filter as data signal so but what i'm

418
00:13:56,230 --> 00:13:54,320
doing is just formulating quantum wave

419
00:13:57,430 --> 00:13:56,240
functions as data signals that's what

420
00:13:58,870 --> 00:13:57,440
this is doing

421
00:14:00,550 --> 00:13:58,880
if you start from there you get an

422
00:14:02,710 --> 00:14:00,560
equation on the bottom here which is the

423
00:14:04,150 --> 00:14:02,720
fundamental equation of evolution this

424
00:14:05,670 --> 00:14:04,160
is what i replace the schrodinger

425
00:14:08,069 --> 00:14:05,680
equation with

426
00:14:09,910 --> 00:14:08,079
so to get to that look at the image the

427
00:14:12,230 --> 00:14:09,920
picture here you've got light coming

428
00:14:14,629 --> 00:14:12,240
from the left hitting a piece of film

429
00:14:16,470 --> 00:14:14,639
that's projecting and so the if you look

430
00:14:19,030 --> 00:14:16,480
at the top symbols you've got g sub i is

431
00:14:19,829 --> 00:14:19,040
the original light it strikes t sub a

432
00:14:21,829 --> 00:14:19,839
and

433
00:14:24,470 --> 00:14:21,839
that turns into g sub t it's a new

434
00:14:27,670 --> 00:14:24,480
signal and so the signal g that

435
00:14:28,710 --> 00:14:27,680
propagates across this the room to go to

436
00:14:31,430 --> 00:14:28,720
a screen

437
00:14:33,829 --> 00:14:31,440
is actually propagated with this letter

438
00:14:35,590 --> 00:14:33,839

capital h capital h is the amplitude

439
00:14:37,670 --> 00:14:35,600
transfer function and it's operating in

440
00:14:39,829 --> 00:14:37,680
the frequency domain so what we do to

441
00:14:41,509 --> 00:14:39,839
move a signal across space and time is

442
00:14:43,750 --> 00:14:41,519
we convert it to the frequency domain

443
00:14:45,430 --> 00:14:43,760
and then we modify it there and then we

444
00:14:46,790 --> 00:14:45,440
convert it back that's what the lens is

445
00:14:49,670 --> 00:14:46,800
for to convert it back to the spatial

446
00:14:51,430 --> 00:14:49,680
domain to get it to the screen

447
00:14:53,269 --> 00:14:51,440
you can do the same thing with the

448
00:14:55,110 --> 00:14:53,279
wavefunction it just the mathematics is

449
00:14:56,949 --> 00:14:55,120
exactly exactly the same when

450
00:14:59,430 --> 00:14:56,959
specifically when you treat the

451
00:15:02,870 --> 00:14:59,440
wavefunction as a four-dimensional

452
00:15:04,310 --> 00:15:02,880
x and t or x y z and t wave function and

453
00:15:05,590 --> 00:15:04,320
i'm going to get to a minute

454
00:15:07,670 --> 00:15:05,600
exactly why that's different from the

455
00:15:09,670 --> 00:15:07,680
schrodinger equation wave function

456
00:15:11,670 --> 00:15:09,680
but what we're doing is sticking really

457
00:15:12,470 --> 00:15:11,680
strictly to the math space and time are

458
00:15:14,629 --> 00:15:12,480
both

459
00:15:16,470 --> 00:15:14,639
just independent variables in this four

460
00:15:18,069 --> 00:15:16,480
dimensional hologram

461
00:15:19,910 --> 00:15:18,079
and the equation is essentially you

462
00:15:20,949 --> 00:15:19,920
start with the psi

463
00:15:21,670 --> 00:15:20,959

in

464
00:15:27,590 --> 00:15:21,680
the

465
00:15:28,949 --> 00:15:27,600
equation you multiply by some function v

466
00:15:30,389 --> 00:15:28,959
of x of t

467
00:15:31,990 --> 00:15:30,399
and this is essentially related to the

468
00:15:34,069 --> 00:15:32,000
potential

469
00:15:35,509 --> 00:15:34,079
of the system and then you fourier

470
00:15:37,269 --> 00:15:35,519
transform it so you convert it to the

471
00:15:39,350 --> 00:15:37,279
frequency domain you multiply it by

472
00:15:41,670 --> 00:15:39,360
another signal which has to do with the

473
00:15:43,990 --> 00:15:41,680
kinetic portion of the hamiltonian and

474
00:15:46,230 --> 00:15:44,000
then you convert it back to

475
00:15:47,509 --> 00:15:46,240
with the inverse fourier transform to

476
00:15:49,269 --> 00:15:47,519
psi prime

477
00:15:50,949 --> 00:15:49,279
and that gives you this updated wave

478
00:15:52,230 --> 00:15:50,959
function

479
00:15:53,430 --> 00:15:52,240
now just quickly what's happening here

480
00:15:55,670 --> 00:15:53,440
is you're taking your signal you're

481
00:15:57,910 --> 00:15:55,680
modifying the phases in a specific way

482
00:16:00,550 --> 00:15:57,920
to evolve it and then you're converting

483
00:16:02,389 --> 00:16:00,560
it back to the space-time domain now

484
00:16:04,629 --> 00:16:02,399
here's the key point

485
00:16:07,189 --> 00:16:04,639
this whole thing is describing

486
00:16:09,509 --> 00:16:07,199
a system of space and time

487
00:16:12,710 --> 00:16:09,519
it's a map of space and time and

488
00:16:14,230 --> 00:16:12,720

therefore it cannot change in time right

489
00:16:16,389 --> 00:16:14,240
because if something has time as its

490
00:16:18,550 --> 00:16:16,399
variable the function itself cannot

491
00:16:20,230 --> 00:16:18,560
evolve in time because it's it's that's

492
00:16:20,949 --> 00:16:20,240
its independent variable

493
00:16:22,790 --> 00:16:20,959
so

494
00:16:26,389 --> 00:16:22,800
the psi in this case unlike the

495
00:16:28,150 --> 00:16:26,399
schrodinger equation psi cannot evolve

496
00:16:30,629 --> 00:16:28,160
and what that means is you know the

497
00:16:33,430 --> 00:16:30,639
equation on the bottom psi and psi prime

498
00:16:35,670 --> 00:16:33,440
have to be exactly the same in variant

499
00:16:38,310 --> 00:16:35,680
and what that means is

500
00:16:40,629 --> 00:16:38,320
v and h have to be specifically

501
00:16:43,189 --> 00:16:40,639
formulated so that they cancel

502
00:16:45,430 --> 00:16:43,199
so that the change that happens from v

503
00:16:46,949 --> 00:16:45,440
in the frequency in the spatial domain

504
00:16:49,030 --> 00:16:46,959
and then cancels with the change that

505
00:16:50,310 --> 00:16:49,040
happens in h in this frequency domain

506
00:16:51,590 --> 00:16:50,320
and so when you get back to the inverse

507
00:16:53,430 --> 00:16:51,600
fourier transform you get back to the

508
00:16:55,110 --> 00:16:53,440
original function so that's what i'm

509
00:16:57,990 --> 00:16:55,120
working with to get the mathematics of

510
00:17:00,069 --> 00:16:58,000
dynamics out of this system

511
00:17:02,310 --> 00:17:00,079
this is not schrodinger's wavefunction

512
00:17:04,069 --> 00:17:02,320
it's i think a generalization of that

513
00:17:06,069 --> 00:17:04,079

in the schrodinger case you have a 3d

514
00:17:07,590 --> 00:17:06,079
function evolving in time

515
00:17:09,750 --> 00:17:07,600
and you can take a cross section or a

516
00:17:11,510 --> 00:17:09,760
time slice of that wave function like

517
00:17:13,510 --> 00:17:11,520
the strobe light of the basketball here

518
00:17:15,909 --> 00:17:13,520
or the quantum fields on the right top

519
00:17:17,829 --> 00:17:15,919
right you have these slices of time each

520
00:17:19,669 --> 00:17:17,839
of which has a distribution of fields

521
00:17:20,620 --> 00:17:19,679
but you can separate at every given time

522
00:17:21,909 --> 00:17:20,630
there's a there's a

523
00:17:23,990 --> 00:17:21,919
[Music]

524
00:17:26,150 --> 00:17:24,000
recognizable distribution

525
00:17:28,069 --> 00:17:26,160
this is not true of the holographic wave

526
00:17:29,830 --> 00:17:28,079
function it's truly a four-dimensional

527
00:17:31,190 --> 00:17:29,840
interference pattern and cross-sections

528
00:17:32,870 --> 00:17:31,200
are meaningless

529
00:17:34,549 --> 00:17:32,880
just like a hologram if you take a

530
00:17:35,830 --> 00:17:34,559
hologram you cut it down the middle and

531
00:17:37,270 --> 00:17:35,840
you look at the data right along the

532
00:17:38,789 --> 00:17:37,280
edge that you cut it doesn't mean

533
00:17:40,390 --> 00:17:38,799
anything it doesn't represent any

534
00:17:42,230 --> 00:17:40,400
position of the image or anything

535
00:17:44,630 --> 00:17:42,240
because the image like the city before

536
00:17:46,150 --> 00:17:44,640
when we tilt the city moves it's not

537
00:17:48,470 --> 00:17:46,160
it's not associated with a specific

538
00:17:50,390 --> 00:17:48,480

point on the film

539
00:17:52,070 --> 00:17:50,400
so there's this separation between the

540
00:17:53,669 --> 00:17:52,080
film and the image and that's what we're

541
00:17:56,150 --> 00:17:53,679
seeing here what we're talking about in

542
00:17:58,310 --> 00:17:56,160
the wave function here is the the film

543
00:18:01,110 --> 00:17:58,320
the background film that gives rise to

544
00:18:05,430 --> 00:18:01,120
the dynamics of particles and events and

545
00:18:08,789 --> 00:18:07,110
so just to give you a specific example

546
00:18:11,350 --> 00:18:08,799
of how this works this is an abstract

547
00:18:12,470 --> 00:18:11,360
version this is not true numbers but

548
00:18:14,230 --> 00:18:12,480
if you have some kind of interference

549
00:18:16,470 --> 00:18:14,240
pattern that looks like this time and

550
00:18:18,070 --> 00:18:16,480
space on the bottom left and but again

551
00:18:19,669 --> 00:18:18,080
this is a hologram in both space and

552
00:18:20,630 --> 00:18:19,679
time

553
00:18:22,549 --> 00:18:20,640
and

554
00:18:23,669 --> 00:18:22,559
that corresponds to some set of points

555
00:18:25,909 --> 00:18:23,679
or objects

556
00:18:28,230 --> 00:18:25,919
sitting in space above the hologram that

557
00:18:30,310 --> 00:18:28,240
is that it's encoding so this hologram

558
00:18:31,669 --> 00:18:30,320
encodes a dynamics it encodes a

559
00:18:33,190 --> 00:18:31,679
trajectory

560
00:18:34,870 --> 00:18:33,200
that's what i'm trying to say and this

561
00:18:36,870 --> 00:18:34,880
trajectory is like the slip and slide

562
00:18:37,750 --> 00:18:36,880
you get on at one point at the top you

563
00:18:39,750 --> 00:18:37,760

know exactly where you're going to end

564
00:18:41,110 --> 00:18:39,760
up at the bottom as some time later

565
00:18:44,870 --> 00:18:41,120
because the

566
00:18:46,710 --> 00:18:44,880
the hologram encodes the entire journey

567
00:18:48,630 --> 00:18:46,720
and so our experience of moving along

568
00:18:49,669 --> 00:18:48,640
the slip inside is a personal subjective

569
00:18:51,750 --> 00:18:49,679
experience

570
00:18:55,029 --> 00:18:51,760
but the the mathematics is pointing to

571
00:18:57,190 --> 00:18:55,039
an abstract a more objective indefinite

572
00:19:00,230 --> 00:18:57,200
reality where there's the entire

573
00:19:01,830 --> 00:19:00,240
timeline is defined all at once

574
00:19:03,909 --> 00:19:01,840
and the mathematics here in the free

575
00:19:06,230 --> 00:19:03,919
particle cases when you set the

576
00:19:08,230 --> 00:19:06,240
potential v equal to zero you just get

577
00:19:09,750 --> 00:19:08,240
this function

578
00:19:11,750 --> 00:19:09,760
f a fourier transform of the wave

579
00:19:14,230 --> 00:19:11,760
function times this phase factor e to

580
00:19:16,630 --> 00:19:14,240
the i k x naught minus omega t naught

581
00:19:18,230 --> 00:19:16,640
this is the general equation of a wave

582
00:19:19,909 --> 00:19:18,240
but you need to make the whole

583
00:19:21,750 --> 00:19:19,919
constraint is to make the wave function

584
00:19:24,070 --> 00:19:21,760
invariant you need k x naught minus

585
00:19:26,230 --> 00:19:24,080
omega t naught to be zero and that's how

586
00:19:29,190 --> 00:19:26,240
we get that constraint is how we get

587
00:19:31,270 --> 00:19:29,200
dynamics because the equation kx minus

588
00:19:33,270 --> 00:19:31,280

omega t is the equation of a traveling

589
00:19:34,789 --> 00:19:33,280
wave or a particle traveling at a

590
00:19:36,230 --> 00:19:34,799
specific velocity

591
00:19:37,750 --> 00:19:36,240
and so this is essentially newton's

592
00:19:40,390 --> 00:19:37,760
third law saying that a particle will

593
00:19:41,830 --> 00:19:40,400
stay in motion at a straight line

594
00:19:43,350 --> 00:19:41,840
in this case

595
00:19:45,029 --> 00:19:43,360
so that's the idea the space time

596
00:19:47,029 --> 00:19:45,039
trajectory is based is created as a

597
00:19:49,270 --> 00:19:47,039
whole from this equation that you see in

598
00:19:50,549 --> 00:19:49,280
the top right

599
00:19:53,590 --> 00:19:50,559
and this is important in the following

600
00:19:55,190 --> 00:19:53,600
way if i take a distance star starlight

601
00:19:57,669 --> 00:19:55,200
traveling to earth for like a million

602
00:20:00,390 --> 00:19:57,679
years and it hits houston well that

603
00:20:02,549 --> 00:20:00,400
trajectory is defined as a hole

604
00:20:05,029 --> 00:20:02,559
in the frequency domain from beginning

605
00:20:06,390 --> 00:20:05,039
to end and that's a really key idea

606
00:20:08,070 --> 00:20:06,400
and i've just drawn a sort of a picture

607
00:20:10,070 --> 00:20:08,080
of what that would look like this is a

608
00:20:11,510 --> 00:20:10,080
sync function a dying sinusoid

609
00:20:13,990 --> 00:20:11,520
corresponding to like a particle in a

610
00:20:16,230 --> 00:20:14,000
box where you've got uh

611
00:20:18,310 --> 00:20:16,240
the the light existed at one point but

612
00:20:19,909 --> 00:20:18,320
not before that time and it traveled and

613
00:20:21,669 --> 00:20:19,919

then stopped existing when it got

614
00:20:23,510 --> 00:20:21,679
absorbed and not afterwards so there's

615
00:20:25,350 --> 00:20:23,520
like a particle in the box where

616
00:20:26,950 --> 00:20:25,360
you've got a sharp beginning and a sharp

617
00:20:29,510 --> 00:20:26,960
ending and that corresponds to some

618
00:20:31,990 --> 00:20:29,520
pattern in the frequency domain

619
00:20:33,350 --> 00:20:32,000
well if i insert a satellite i've got a

620
00:20:34,710 --> 00:20:33,360
different endpoint

621
00:20:36,549 --> 00:20:34,720
and so the fourier transform of this

622
00:20:37,669 --> 00:20:36,559
second example is fundamentally

623
00:20:39,830 --> 00:20:37,679
different

624
00:20:41,830 --> 00:20:39,840
every frequency has changed there's not

625
00:20:44,470 --> 00:20:41,840
like part of it stays the same so the

626
00:20:46,070 --> 00:20:44,480
journey before it hits the satellite

627
00:20:48,390 --> 00:20:46,080
is paradoxical

628
00:20:49,830 --> 00:20:48,400
because i've now changed the pattern in

629
00:20:51,990 --> 00:20:49,840
the frequency domain according to which

630
00:20:54,310 --> 00:20:52,000
it was traveling

631
00:20:56,789 --> 00:20:54,320
but i've modified it like after the fact

632
00:20:58,230 --> 00:20:56,799
but the frequency domain doesn't have

633
00:20:59,909 --> 00:20:58,240
time in it

634
00:21:02,070 --> 00:20:59,919
time is removed from the frequency

635
00:21:04,149 --> 00:21:02,080
domain and so this timelessness is

636
00:21:06,149 --> 00:21:04,159
really a conundrum

637
00:21:07,750 --> 00:21:06,159
and the only way to resolve this issue

638
00:21:10,070 --> 00:21:07,760

or at the way that i resolve it is by

639
00:21:11,669 --> 00:21:10,080
suggesting that there are both possible

640
00:21:13,669 --> 00:21:11,679
frequency patterns both possible

641
00:21:15,029 --> 00:21:13,679
holograms that

642
00:21:16,789 --> 00:21:15,039
are possible and it's not until the

643
00:21:19,190 --> 00:21:16,799
satellite comes into place that one of

644
00:21:20,470 --> 00:21:19,200
them becomes the one that has been the

645
00:21:22,070 --> 00:21:20,480
light's been traveling according to the

646
00:21:23,909 --> 00:21:22,080
whole time

647
00:21:25,190 --> 00:21:23,919
so this is just reinforcing the notion

648
00:21:28,390 --> 00:21:25,200
of a

649
00:21:29,510 --> 00:21:28,400
way many worlds or multiverse but we

650
00:21:30,870 --> 00:21:29,520
didn't start with the traditional

651
00:21:33,750 --> 00:21:30,880
quantum mechanics we started with the

652
00:21:35,430 --> 00:21:33,760
mathematics of fourier transforms

653
00:21:37,510 --> 00:21:35,440
and there's a key point which is that

654
00:21:39,590 --> 00:21:37,520
the satellite now becomes an essential

655
00:21:41,110 --> 00:21:39,600
part of the system it's just because

656
00:21:43,750 --> 00:21:41,120
it's a macroscopic object makes no

657
00:21:46,070 --> 00:21:43,760
difference here it is part of what

658
00:21:48,390 --> 00:21:46,080
creates the frequency domain pattern and

659
00:21:49,590 --> 00:21:48,400
part of what uh macroscopically is in a

660
00:21:52,070 --> 00:21:49,600
superposition on these different

661
00:21:55,029 --> 00:21:52,080
branches of the hologram so from this

662
00:21:57,350 --> 00:21:55,039
holism comes the notion that macroscopic

663
00:21:59,110 --> 00:21:57,360

objects as a as a whole also have

664
00:22:01,190 --> 00:21:59,120
qualities that they can be defined

665
00:22:03,590 --> 00:22:01,200
quantum mechanically not

666
00:22:05,270 --> 00:22:03,600
from building them up from parts but as

667
00:22:07,270 --> 00:22:05,280
a whole and this is really different

668
00:22:09,270 --> 00:22:07,280
because the idea of decoherence is not

669
00:22:10,710 --> 00:22:09,280
an issue you're not adding up the little

670
00:22:12,230 --> 00:22:10,720
atoms one at a time and having them

671
00:22:13,590 --> 00:22:12,240
decode here you're talking about the

672
00:22:16,950 --> 00:22:13,600
quantum mechanical properties of an

673
00:22:19,350 --> 00:22:16,960
entire object a symbol a symbolic object

674
00:22:21,990 --> 00:22:19,360
so that's one of the i think most

675
00:22:24,149 --> 00:22:22,000
controversial pieces here

676
00:22:26,950 --> 00:22:24,159
uh so just to emphasize a couple of

677
00:22:29,510 --> 00:22:26,960
points before we close

678
00:22:31,990 --> 00:22:29,520
i want to clarify this idea of

679
00:22:33,669 --> 00:22:32,000
different types of descriptions of space

680
00:22:35,669 --> 00:22:33,679
and time you've got the visible

681
00:22:37,190 --> 00:22:35,679
coordinates of the city like this that's

682
00:22:38,710 --> 00:22:37,200
what the star is it's a thing you can

683
00:22:40,789 --> 00:22:38,720
measure

684
00:22:42,710 --> 00:22:40,799
oops i went back

685
00:22:44,390 --> 00:22:42,720
and it's what you see and then there's

686
00:22:46,470 --> 00:22:44,400
the non-visible parameters which is the

687
00:22:48,310 --> 00:22:46,480
film and this is a distinction that's

688
00:22:50,630 --> 00:22:48,320

very important it leads to this notion

689
00:22:52,149 --> 00:22:50,640
of relationality that

690
00:22:54,390 --> 00:22:52,159
in this in this

691
00:22:55,460 --> 00:22:54,400
formalism the quantum mechanics is

692
00:22:57,110 --> 00:22:55,470
required to be relational

693
00:22:58,630 --> 00:22:57,120
[Music]

694
00:23:00,230 --> 00:22:58,640
you've got the separation between the

695
00:23:01,590 --> 00:23:00,240
the film and the image that you're

696
00:23:02,870 --> 00:23:01,600
seeing

697
00:23:04,710 --> 00:23:02,880
so

698
00:23:07,270 --> 00:23:04,720
timelessness is one of the coral areas

699
00:23:10,070 --> 00:23:07,280
here the wave functions are unchanging a

700
00:23:11,430 --> 00:23:10,080
smoothly evolving present doesn't exist

701
00:23:14,310 --> 00:23:11,440
in the frequency domain there is no such

702
00:23:16,549 --> 00:23:14,320
thing as time so if the time if the path

703
00:23:18,390 --> 00:23:16,559
is describing if the frequency domain is

704
00:23:20,870 --> 00:23:18,400
describing an entire path through space

705
00:23:22,710 --> 00:23:20,880
time you can't single out a particular

706
00:23:23,669 --> 00:23:22,720
point on that path in the frequency

707
00:23:25,350 --> 00:23:23,679
domain

708
00:23:27,590 --> 00:23:25,360
there's no such thing

709
00:23:29,430 --> 00:23:27,600
so there can't be any physical reality

710
00:23:31,510 --> 00:23:29,440
or significance to that

711
00:23:32,950 --> 00:23:31,520
particular point on the path if it

712
00:23:35,430 --> 00:23:32,960
doesn't get represented in the frequency

713
00:23:37,029 --> 00:23:35,440

domain so the idea of a present moment

714
00:23:39,830 --> 00:23:37,039
is a subjective

715
00:23:41,830 --> 00:23:39,840
idea not an objective idea

716
00:23:43,669 --> 00:23:41,840
we've also talked about holism frequency

717
00:23:45,750 --> 00:23:43,679
space defines paths through spacetime as

718
00:23:47,590 --> 00:23:45,760
a whole motion is encoded as a whole

719
00:23:49,669 --> 00:23:47,600
into the phase distribution

720
00:23:51,269 --> 00:23:49,679
and relationality the idea that only

721
00:23:53,510 --> 00:23:51,279
interactions are physically meaningful

722
00:23:55,190 --> 00:23:53,520
only relationships only the measurement

723
00:23:57,510 --> 00:23:55,200
the measurement i make is relative to me

724
00:23:58,630 --> 00:23:57,520
and the results i get are relative to me

725
00:24:01,269 --> 00:23:58,640
and so there's two different types of

726
00:24:02,630 --> 00:24:01,279
space time and we this this comes from

727
00:24:05,510 --> 00:24:02,640
the sense that the world is holographic

728
00:24:09,190 --> 00:24:05,520
in a real sense it's really mirroring

729
00:24:11,029 --> 00:24:10,070
so

730
00:24:12,710 --> 00:24:11,039
uh

731
00:24:14,390 --> 00:24:12,720
novel conclusions here quantum

732
00:24:16,710 --> 00:24:14,400
superposition emerges for systems as a

733
00:24:18,630 --> 00:24:16,720
whole including macroscopic objects

734
00:24:21,029 --> 00:24:18,640
and the world must be relational and

735
00:24:22,789 --> 00:24:21,039
this is specifically targeting

736
00:24:25,750 --> 00:24:22,799
some of the interpretations of quantum

737
00:24:26,950 --> 00:24:25,760
mechanics which can be distinguished

738
00:24:28,230 --> 00:24:26,960

it's a famous problem that you can't

739
00:24:30,230 --> 00:24:28,240
distinguish interpretations of quantum

740
00:24:32,390 --> 00:24:30,240
mechanics but penrose's gravitational

741
00:24:34,070 --> 00:24:32,400
model and the arc or orchestrated

742
00:24:36,870 --> 00:24:34,080
objective reduction are not consistent

743
00:24:37,590 --> 00:24:36,880
with my proposal here because they

744
00:24:39,990 --> 00:24:37,600
they

745
00:24:42,230 --> 00:24:40,000
imply objective collapse and this

746
00:24:44,390 --> 00:24:42,240
requires a relative sense in which the

747
00:24:46,470 --> 00:24:44,400
world is really informational

748
00:24:48,149 --> 00:24:46,480
and not objectively collapsing

749
00:24:50,470 --> 00:24:48,159
so this is some ability to distinguish

750
00:24:51,510 --> 00:24:50,480
experimentally between these views

751
00:24:53,750 --> 00:24:51,520
um

752
00:24:56,070 --> 00:24:53,760
we have five minutes

753
00:24:57,110 --> 00:24:56,080
so i'm just going to hint at to how this

754
00:24:59,110 --> 00:24:57,120
points to the possibility of

755
00:25:00,950 --> 00:24:59,120
synchronicity

756
00:25:03,029 --> 00:25:00,960
so this leads to because of the

757
00:25:04,950 --> 00:25:03,039
relational aspect here and the fact that

758
00:25:06,630 --> 00:25:04,960
only events are real only the

759
00:25:07,990 --> 00:25:06,640
interactions are real

760
00:25:08,950 --> 00:25:08,000
when light leaves the sun that's an

761
00:25:10,549 --> 00:25:08,960
event

762
00:25:12,230 --> 00:25:10,559
but it's not until you see it on earth

763
00:25:13,590 --> 00:25:12,240

that another event happens and in

764
00:25:14,950 --> 00:25:13,600
between there's all these branches of

765
00:25:16,070 --> 00:25:14,960
possibility

766
00:25:17,750 --> 00:25:16,080
so here's the layout of all the

767
00:25:20,149 --> 00:25:17,760
multiverse branches

768
00:25:22,710 --> 00:25:20,159
when you see the light

769
00:25:23,990 --> 00:25:22,720
it retroactively becomes the path that

770
00:25:25,669 --> 00:25:24,000
it traveled

771
00:25:26,789 --> 00:25:25,679
this is known as the delayed choice

772
00:25:28,630 --> 00:25:26,799
phenomenon

773
00:25:30,710 --> 00:25:28,640
but in this theory it applies to all

774
00:25:31,990 --> 00:25:30,720
scales of objects macroscopic or

775
00:25:33,190 --> 00:25:32,000
microscopic

776
00:25:34,789 --> 00:25:33,200
and so there's eight minutes of

777
00:25:36,710 --> 00:25:34,799
undetermined time here that get

778
00:25:38,230 --> 00:25:36,720
retroactively filled in based on the

779
00:25:40,310 --> 00:25:38,240
observation that i make to see the light

780
00:25:41,990 --> 00:25:40,320
at the last minute

781
00:25:43,750 --> 00:25:42,000
and this is similar in language you can

782
00:25:45,990 --> 00:25:43,760
get a sense for what this means i call

783
00:25:48,470 --> 00:25:46,000
it retroactive event determination

784
00:25:51,190 --> 00:25:48,480
uh if you say the sentence the old train

785
00:25:53,029 --> 00:25:51,200
you probably picture a train like that

786
00:25:54,230 --> 00:25:53,039
the old train left the station so you're

787
00:25:55,750 --> 00:25:54,240
picturing a train moving out of the

788
00:25:58,230 --> 00:25:55,760

station but if you change the end of the

789
00:26:00,470 --> 00:25:58,240
sentence the old train the young

790
00:26:02,630 --> 00:26:00,480
then you have a very different meaning

791
00:26:03,669 --> 00:26:02,640
the elders are training the youth

792
00:26:05,430 --> 00:26:03,679
the words in the beginning of the

793
00:26:06,950 --> 00:26:05,440
sentence change their meaning

794
00:26:08,470 --> 00:26:06,960
according to the end of

795
00:26:10,950 --> 00:26:08,480
the sentence so this is called local

796
00:26:12,710 --> 00:26:10,960
ambiguity and it's what makes possible

797
00:26:15,029 --> 00:26:12,720
synchronicity in my view

798
00:26:16,630 --> 00:26:15,039
a synchronicity in my definition is an

799
00:26:19,269 --> 00:26:16,640
unusual circumstance whose meaning

800
00:26:20,870 --> 00:26:19,279
becomes clear in the future

801
00:26:22,630 --> 00:26:20,880
so it's not until later that there's a

802
00:26:24,950 --> 00:26:22,640
connection and there's a connection

803
00:26:27,669 --> 00:26:24,960
across time that's possible with this

804
00:26:29,510 --> 00:26:27,679
notion of timelines we have a tree drawn

805
00:26:30,950 --> 00:26:29,520
here and you can see each of these tree

806
00:26:33,669 --> 00:26:30,960
branches is like one of those lines i

807
00:26:35,990 --> 00:26:33,679
drew earlier this unitary evolution and

808
00:26:37,590 --> 00:26:36,000
there's the branching points and the the

809
00:26:39,350 --> 00:26:37,600
future experiences at the top that we're

810
00:26:40,390 --> 00:26:39,360
seeking to have are what we call the

811
00:26:42,549 --> 00:26:40,400
apples

812
00:26:44,390 --> 00:26:42,559
the the target experiences and in the

813
00:26:45,669 --> 00:26:44,400

middle are these events that happen to

814
00:26:47,190 --> 00:26:45,679
us which we don't understand why they're

815
00:26:48,390 --> 00:26:47,200
happening but they're happening because

816
00:26:49,909 --> 00:26:48,400
they're part of the story line that

817
00:26:51,510 --> 00:26:49,919
leads to the the apples at the top of

818
00:26:53,029 --> 00:26:51,520
the tree so because there's this

819
00:26:55,190 --> 00:26:53,039
connection from past to present to

820
00:26:57,510 --> 00:26:55,200
future in a timeline you can actually

821
00:26:58,789 --> 00:26:57,520
start to look at how these things

822
00:27:00,870 --> 00:26:58,799
interrelate

823
00:27:03,029 --> 00:27:00,880
a temporally and that this is exactly

824
00:27:05,110 --> 00:27:03,039
what we need for synchronicity i think

825
00:27:06,950 --> 00:27:05,120
and so synchronicity is possible because

826
00:27:08,390 --> 00:27:06,960
of unobserved timelines because of the

827
00:27:09,990 --> 00:27:08,400
nature of unobserved timelines and how

828
00:27:13,190 --> 00:27:10,000
they can fall into place in different

829
00:27:14,470 --> 00:27:13,200
ways based on the the choices we make

830
00:27:15,909 --> 00:27:14,480
and then that's something i'm

831
00:27:17,510 --> 00:27:15,919
speculating here that we can go beyond

832
00:27:19,350 --> 00:27:17,520
maybe in the follow-up room but i think

833
00:27:24,310 --> 00:27:19,360
it's all supported by this notion of

834
00:27:29,669 --> 00:27:27,350
so and takeaways are timelessness holism

835
00:27:30,470 --> 00:27:29,679
and relationality

836
00:27:31,830 --> 00:27:30,480
and

837
00:27:32,870 --> 00:27:31,840
i'll skip the piece about quantum field

838
00:27:34,149 --> 00:27:32,880

theory but if you're interested in the

839
00:27:35,750 --> 00:27:34,159
relationship to quantum field theory we

840
00:27:37,750 --> 00:27:35,760
can talk about that i'll just touch on

841
00:27:38,950 --> 00:27:37,760
bohm's implicate order bohm sought to

842
00:27:41,110 --> 00:27:38,960
develop quantum mechanics into the

843
00:27:42,870 --> 00:27:41,120
implicated explicit order

844
00:27:44,389 --> 00:27:42,880
and his structure emerges naturally in

845
00:27:46,310 --> 00:27:44,399
this formalism he's been a huge

846
00:27:47,430 --> 00:27:46,320
inspiration and motivation for me his

847
00:27:48,630 --> 00:27:47,440
theories

848
00:27:50,789 --> 00:27:48,640
and his favorite metaphor was the

849
00:27:52,789 --> 00:27:50,799
hologram and the fourier transform

850
00:27:54,549 --> 00:27:52,799
so that's what drew me to this

851
00:27:57,350 --> 00:27:54,559
and here we've described the implicat

852
00:27:59,669 --> 00:27:57,360
order without space or time parameter as

853
00:28:01,590 --> 00:27:59,679
one would expect for an implicate order

854
00:28:03,190 --> 00:28:01,600
yet a space-time explicate description

855
00:28:04,789 --> 00:28:03,200
can be obtained from the implicate

856
00:28:07,190 --> 00:28:04,799
description through the fourier

857
00:28:08,950 --> 00:28:07,200
transform so i think it's a very natural

858
00:28:10,549 --> 00:28:08,960
clue that the fourier transform does all

859
00:28:13,350 --> 00:28:10,559
this and i've tried to formulate it in

860
00:28:14,710 --> 00:28:13,360
the simplest possible way using

861
00:28:16,470 --> 00:28:14,720
the mathematics that we already know and

862
00:28:19,029 --> 00:28:16,480
love and just apply that mathematics

863
00:28:21,269 --> 00:28:19,039

really purely to space momentum and to

864
00:28:22,710 --> 00:28:21,279
time and energy equally and seeing what

865
00:28:25,830 --> 00:28:22,720
that tells us about this about the

866
00:28:27,669 --> 00:28:25,840
mathematics and the physics

867
00:28:30,149 --> 00:28:27,679
so if you want to follow up on the paper

868
00:28:32,310 --> 00:28:30,159
it's available through the mdpi website

869
00:28:34,310 --> 00:28:32,320
at quantum reports journal it's called

870
00:28:35,350 --> 00:28:34,320
space time pads as a whole if you want

871
00:28:37,110 --> 00:28:35,360
to read an

872
00:28:38,710 --> 00:28:37,120
interview that i just was part of

873
00:28:40,750 --> 00:28:38,720
recently on holographic simulation

874
00:28:43,190 --> 00:28:40,760
theory you can go to the link there the

875
00:28:45,750 --> 00:28:43,200
tinyurl.com it's also on my website or

876
00:28:47,110 --> 00:28:45,760
on medium.com and again the research was

877
00:28:49,669 --> 00:28:47,120
supported by the foundational questions

878
00:28:51,669 --> 00:28:49,679
institute via funding from the fagin

879
00:28:53,750 --> 00:28:51,679
foundation great folks to work with i

880
00:28:55,269 --> 00:28:53,760
really am grateful for them and i do

881
00:28:57,350 --> 00:28:55,279
have workshops that i lead on flow

882
00:28:59,269 --> 00:28:57,360
synchronicity and wholeness so i have

883
00:29:00,630 --> 00:28:59,279
one coming up this weekend in fact

884
00:29:02,389 --> 00:29:00,640
you can just go to my website below to

885
00:29:03,909 --> 00:29:02,399
find out more about what i do and other

886
00:29:05,669 --> 00:29:03,919
research and my books that are there on

887
00:29:06,350 --> 00:29:05,679
the left if you'd like to reach me and

888
00:29:07,909 --> 00:29:06,360

that's

889
00:29:09,190 --> 00:29:07,919
synchronicityinstitute.com which is my

890
00:29:10,710 --> 00:29:09,200
organization

891
00:29:12,549 --> 00:29:10,720
thanks a lot to the sse and the

892
00:29:13,750 --> 00:29:12,559
organizers this week i really appreciate

893
00:29:22,149 --> 00:29:13,760
being here and appreciate all of your

894
00:29:25,269 --> 00:29:24,070
so i'm assuming we're out of time and

895
00:29:27,110 --> 00:29:25,279
we're going to do questions i'd love to

896
00:29:28,310 --> 00:29:27,120
do q a and i think there were some

897
00:29:29,350 --> 00:29:28,320
questions in the chat so let me open

898
00:29:30,710 --> 00:29:29,360
that up

899
00:29:33,430 --> 00:29:30,720
oh of course

900
00:29:35,269 --> 00:29:33,440
first of all excellent presentations guy

901
00:29:37,510 --> 00:29:35,279
it was a

902
00:29:39,669 --> 00:29:37,520
it was something it was something really

903
00:29:41,830 --> 00:29:39,679
so um there are some comments regarding

904
00:29:43,110 --> 00:29:41,840
that

905
00:29:44,470 --> 00:29:43,120
some part of your target was a great

906
00:29:47,430 --> 00:29:44,480
metaphor i think

907
00:29:49,269 --> 00:29:47,440
there it was related to the holograms

908
00:29:51,029 --> 00:29:49,279
there's a question here so if your

909
00:29:53,269 --> 00:29:51,039
formulation is in some sense an

910
00:29:54,950 --> 00:29:53,279
improvement of regular quantum mechanics

911
00:29:57,350 --> 00:29:54,960
of course it would still agree with all

912
00:29:59,110 --> 00:29:57,360
the well-verified tests right have you

913
00:30:03,430 --> 00:29:59,120

reproduced anything like the double slit

914
00:30:07,269 --> 00:30:05,669
the hydrogen atom is the best example

915
00:30:08,630 --> 00:30:07,279
the hydrogen atom is a slightly

916
00:30:10,710 --> 00:30:08,640
different mathematics because it's

917
00:30:12,230 --> 00:30:10,720
radial so you take this fourier

918
00:30:14,549 --> 00:30:12,240
transform idea

919
00:30:16,549 --> 00:30:14,559
the examples i use in the paper are

920
00:30:18,470 --> 00:30:16,559
tying it into basic systems with spin

921
00:30:19,669 --> 00:30:18,480
and with the simple harmonic oscillator

922
00:30:20,950 --> 00:30:19,679
of the quantum harmonic oscillator

923
00:30:22,870 --> 00:30:20,960
because those are some basic examples

924
00:30:24,310 --> 00:30:22,880
that are foundational i do touch on the

925
00:30:26,070 --> 00:30:24,320
hydrogen atom i don't work it out

926
00:30:27,750 --> 00:30:26,080
explicitly but what you would do instead

927
00:30:29,750 --> 00:30:27,760
of using the fourier transform you use

928
00:30:31,190 --> 00:30:29,760
the spherical harmonic transform because

929
00:30:33,430 --> 00:30:31,200
what you're dealing with the basis

930
00:30:35,909 --> 00:30:33,440
states are spherical harmonics as we

931
00:30:37,430 --> 00:30:35,919
well know for for hydrogen atom so

932
00:30:39,350 --> 00:30:37,440
that's what's so beautiful the the

933
00:30:41,510 --> 00:30:39,360
mathematics that we see in the periodic

934
00:30:44,149 --> 00:30:41,520
table from the hydrogen atom uh the the

935
00:30:45,750 --> 00:30:44,159
states of energy is exactly the clue for

936
00:30:46,950 --> 00:30:45,760
what basis state we're working with and

937
00:30:49,430 --> 00:30:46,960
that's the transform that we're using

938
00:30:50,630 --> 00:30:49,440

here so i haven't done that but i i feel

939
00:30:52,310 --> 00:30:50,640
pretty um

940
00:30:54,070 --> 00:30:52,320
optimistic that that's that's one of the

941
00:30:56,389 --> 00:30:54,080
clues that led me on here but you'd use

942
00:30:58,470 --> 00:30:56,399
a different transform for that

943
00:31:00,710 --> 00:30:58,480
so and one one other point you do is

944
00:31:02,630 --> 00:31:00,720
that the potential which is the

945
00:31:04,630 --> 00:31:02,640
essentially a filter that you apply in

946
00:31:06,070 --> 00:31:04,640
the spacetime domain that's the way the

947
00:31:08,070 --> 00:31:06,080
potential comes up that would be the

948
00:31:09,990 --> 00:31:08,080
coulomb potential for the hydrogen atom

949
00:31:11,269 --> 00:31:10,000
and that's that's why you need those

950
00:31:12,630 --> 00:31:11,279
spherical harmonic transforms because

951
00:31:15,350 --> 00:31:12,640
that's a coulomb potential is in a

952
00:31:16,950 --> 00:31:15,360
radial um coordinate system

953
00:31:18,630 --> 00:31:16,960
and then you work out the same

954
00:31:22,310 --> 00:31:18,640
mathematics where the phases have to

955
00:31:24,070 --> 00:31:22,320
vanish and then you you get the

956
00:31:24,950 --> 00:31:24,080
supposedly theoretically you would get

957
00:31:30,389 --> 00:31:24,960
the

958
00:31:34,630 --> 00:31:31,590
interesting stuff

959
00:31:37,269 --> 00:31:34,640
so um there's another comment uh slash

960
00:31:39,669 --> 00:31:37,279
question uh regarding a part of your

961
00:31:42,710 --> 00:31:39,679
presentation that reminds uh of barriers

962
00:31:46,230 --> 00:31:42,720
lagrangians approaches and also

963
00:31:48,710 --> 00:31:46,240

kohin or kohen and elite as well sort of

964
00:31:50,630 --> 00:31:48,720
a mashup of those theories uh

965
00:31:53,430 --> 00:31:50,640
can you elabor can you comment on that

966
00:31:57,750 --> 00:31:55,990
yeah um so very much lagrangian

967
00:31:59,750 --> 00:31:57,760
lagrangian is a

968
00:32:01,430 --> 00:31:59,760
timeless representation

969
00:32:04,070 --> 00:32:01,440
sort of a timeless theory because you're

970
00:32:05,830 --> 00:32:04,080
dealing with the whole path

971
00:32:07,029 --> 00:32:05,840
and then calculating what's the action

972
00:32:08,470 --> 00:32:07,039
associated with that path and then

973
00:32:10,389 --> 00:32:08,480
calculating the action associated with a

974
00:32:12,149 --> 00:32:10,399
different path one of the main

975
00:32:14,789 --> 00:32:12,159
calculations i do in the paper which is

976
00:32:17,029 --> 00:32:14,799
not original is showing that

977
00:32:18,549 --> 00:32:17,039
you know how you essentially get

978
00:32:20,870 --> 00:32:18,559
from

979
00:32:22,230 --> 00:32:20,880
the path integral formulation which is

980
00:32:24,149 --> 00:32:22,240
generally formulated in terms of the

981
00:32:26,549 --> 00:32:24,159
lagrangian exponential

982
00:32:28,710 --> 00:32:26,559
and the action minimizing the action how

983
00:32:31,750 --> 00:32:28,720
you get from that to essentially a

984
00:32:33,669 --> 00:32:31,760
recursive fourier transform so when you

985
00:32:35,029 --> 00:32:33,679
time slice

986
00:32:36,950 --> 00:32:35,039
in the lagrangian formulation you don't

987
00:32:38,310 --> 00:32:36,960
time slice you look at the whole path

988
00:32:39,909 --> 00:32:38,320

and all these different possible paths

989
00:32:41,269 --> 00:32:39,919
you weigh them according to the action

990
00:32:43,430 --> 00:32:41,279
and then you find your what's your

991
00:32:45,269 --> 00:32:43,440
classical path or whatever

992
00:32:46,789 --> 00:32:45,279
but if you time slice that what you're

993
00:32:49,190 --> 00:32:46,799
doing is essentially observing the

994
00:32:51,909 --> 00:32:49,200
system at every time you're enforcing an

995
00:32:54,549 --> 00:32:51,919
order in time by by that mathematical

996
00:32:56,710 --> 00:32:54,559
structure and what that does is it takes

997
00:32:59,509 --> 00:32:56,720
the path integral and you it turns it

998
00:33:01,029 --> 00:32:59,519
into a inverse forward inverse forward

999
00:33:03,190 --> 00:33:01,039
inverse forward inverse fourier

1000
00:33:04,710 --> 00:33:03,200
transform so this recursiveness of the

1001
00:33:06,070 --> 00:33:04,720
fourier transform

1002
00:33:07,990 --> 00:33:06,080
is what works

1003
00:33:09,750 --> 00:33:08,000
the experience we have of steady

1004
00:33:11,269 --> 00:33:09,760
progression of the present moment is

1005
00:33:12,789 --> 00:33:11,279
essentially this recursive fourier

1006
00:33:14,950 --> 00:33:12,799
transform back and forth between these

1007
00:33:16,630 --> 00:33:14,960
two domains the spatial domain and the

1008
00:33:17,830 --> 00:33:16,640
frequency domain

1009
00:33:19,590 --> 00:33:17,840
there's a lot to say there and that's

1010
00:33:21,830 --> 00:33:19,600
really the essence of the paper

1011
00:33:24,070 --> 00:33:21,840
uh so i appreciate the question and um

1012
00:33:25,509 --> 00:33:24,080
cohen and ellis are two of my role

1013
00:33:27,909 --> 00:33:25,519

models so i really appreciate the

1014
00:33:29,509 --> 00:33:27,919
comparison um i've referred to a lot of

1015
00:33:31,110 --> 00:33:29,519
their work in my paper and in my own

1016
00:33:34,789 --> 00:33:31,120
research um

1017
00:33:38,470 --> 00:33:36,789
and actually they have a specific paper

1018
00:33:40,470 --> 00:33:38,480
on um

1019
00:33:41,990 --> 00:33:40,480
whole top-down

1020
00:33:43,430 --> 00:33:42,000
hierarchies so that's something you can

1021
00:33:45,430 --> 00:33:43,440
check out but that's what i'm talking

1022
00:33:46,789 --> 00:33:45,440
about here is a holism or a top-down

1023
00:33:49,830 --> 00:33:46,799
hierarchy and they've done work on that

1024
00:33:54,149 --> 00:33:52,630
okay great so here's more of a

1025
00:33:57,509 --> 00:33:54,159
broad question

1026
00:34:01,269 --> 00:33:57,519
can can you expand on how free will

1027
00:34:05,590 --> 00:34:03,590
great question so let's think about that

1028
00:34:06,470 --> 00:34:05,600
so free will

1029
00:34:08,389 --> 00:34:06,480
i mean

1030
00:34:10,149 --> 00:34:08,399
yes what i'm discussing here with these

1031
00:34:11,430 --> 00:34:10,159
paths and the slip and slide is like you

1032
00:34:13,349 --> 00:34:11,440
don't have free will right you're on

1033
00:34:14,629 --> 00:34:13,359
this path and you're sliding down the

1034
00:34:16,629 --> 00:34:14,639
slip and slide and you can't get off

1035
00:34:17,909 --> 00:34:16,639
until you get to the end

1036
00:34:19,829 --> 00:34:17,919
so when we're talking about light

1037
00:34:22,869 --> 00:34:19,839
traveling from sun to earth that's a

1038
00:34:25,109 --> 00:34:22,879

great description because the light is

1039
00:34:26,069 --> 00:34:25,119
a single trajectory from the sun to my

1040
00:34:28,550 --> 00:34:26,079
eyes

1041
00:34:29,990 --> 00:34:28,560
if it hits a piece of dust and bounces

1042
00:34:33,349 --> 00:34:30,000
in a different direction or hits a

1043
00:34:35,349 --> 00:34:33,359
satellite instead then

1044
00:34:36,710 --> 00:34:35,359
a different map is associated with that

1045
00:34:38,149 --> 00:34:36,720
trajectory a different branch of the

1046
00:34:41,109 --> 00:34:38,159
multiverse and we can't know until it

1047
00:34:42,310 --> 00:34:41,119
happens which branch we're on

1048
00:34:43,990 --> 00:34:42,320
and there's free will to put the

1049
00:34:45,909 --> 00:34:44,000
satellite in place or not or i have the

1050
00:34:46,869 --> 00:34:45,919
free will to move my head or not

1051
00:34:51,270 --> 00:34:46,879
so

1052
00:34:53,349 --> 00:34:51,280
would say there's there's free will to

1053
00:34:55,109 --> 00:34:53,359
choose between the branches of this

1054
00:34:56,149 --> 00:34:55,119
multiverse

1055
00:34:57,430 --> 00:34:56,159
and

1056
00:34:59,190 --> 00:34:57,440
those

1057
00:35:01,030 --> 00:34:59,200
and the way i see this unfolding at a

1058
00:35:03,910 --> 00:35:01,040
broader level regarding synchronicity is

1059
00:35:04,870 --> 00:35:03,920
that we reach specific choice points in

1060
00:35:07,430 --> 00:35:04,880
our

1061
00:35:08,870 --> 00:35:07,440
macroscopic life that lead us somewhere

1062
00:35:11,910 --> 00:35:08,880
and we're not completely constrained but

1063
00:35:13,829 --> 00:35:11,920

we're partially constrained so if i um

1064
00:35:16,710 --> 00:35:13,839
you know if i apply for

1065
00:35:18,230 --> 00:35:16,720
school and i enroll in school now i'm on

1066
00:35:19,750 --> 00:35:18,240
that trajectory and this is sort of a

1067
00:35:21,670 --> 00:35:19,760
metaphor for what we're talking about

1068
00:35:23,030 --> 00:35:21,680
you have free will to make that choice

1069
00:35:24,230 --> 00:35:23,040
to apply to school and go to school but

1070
00:35:26,150 --> 00:35:24,240
then once you're on the trajectory

1071
00:35:28,230 --> 00:35:26,160
you're sort of on it for four years

1072
00:35:29,510 --> 00:35:28,240
and that's it's not exactly the same as

1073
00:35:31,349 --> 00:35:29,520
the light leaving the sun and going to

1074
00:35:33,430 --> 00:35:31,359
earth but it's a metaphor for how free

1075
00:35:34,950 --> 00:35:33,440
will we do have free will and yet

1076
00:35:37,589 --> 00:35:34,960
there's a sense in which we are

1077
00:35:39,270 --> 00:35:37,599
constrained to paths and there's there's

1078
00:35:42,310 --> 00:35:39,280
there's kairos moments that are more

1079
00:35:44,630 --> 00:35:42,320
opportune for change

1080
00:35:45,750 --> 00:35:44,640
okay thank you very much for the answer

1081
00:35:48,310 --> 00:35:45,760
um

1082
00:35:50,470 --> 00:35:48,320
for a test of this theory is there a way

1083
00:35:53,990 --> 00:35:50,480
to falsify it have you thought of an

1084
00:35:55,510 --> 00:35:54,000
experiment or of any way to test it

1085
00:35:57,589 --> 00:35:55,520
yeah so i refer to a number of

1086
00:35:59,589 --> 00:35:57,599
experiments that have already been done

1087
00:36:01,589 --> 00:35:59,599
we we keep getting data that reinforces

1088
00:36:03,270 --> 00:36:01,599

the relational model of quantum

1089
00:36:05,349 --> 00:36:03,280
mechanics which is essentially if you're

1090
00:36:07,109 --> 00:36:05,359
familiar with vigner's friend experiment

1091
00:36:08,950 --> 00:36:07,119
a thought experiment vigner suggested

1092
00:36:10,870 --> 00:36:08,960
that you know if he goes into a

1093
00:36:13,109 --> 00:36:10,880
room and measures an electron in this in

1094
00:36:14,710 --> 00:36:13,119
a spin state he'll get a result and then

1095
00:36:16,950 --> 00:36:14,720
his friend comes into the room and what

1096
00:36:18,390 --> 00:36:16,960
will she measure well she'll also be

1097
00:36:19,670 --> 00:36:18,400
able to measure the electron but will

1098
00:36:21,910 --> 00:36:19,680
she measure something that's already

1099
00:36:24,390 --> 00:36:21,920
determined or will she be interacting

1100
00:36:26,790 --> 00:36:24,400
with a superposition state for vigner

1101
00:36:28,230 --> 00:36:26,800
and the electron in other words is the

1102
00:36:30,069 --> 00:36:28,240
is the each measurement just a

1103
00:36:32,069 --> 00:36:30,079
correlation or is it some objective

1104
00:36:33,829 --> 00:36:32,079
statement about the facts of the world

1105
00:36:36,030 --> 00:36:33,839
and there's there's an experiment by

1106
00:36:37,589 --> 00:36:36,040
priority at all

1107
00:36:38,390 --> 00:36:37,599
p-r-o-i-e-t-t-i

1108
00:36:40,790 --> 00:36:38,400
that

1109
00:36:42,230 --> 00:36:40,800
has tested the vigorous friend formalism

1110
00:36:45,109 --> 00:36:42,240
and i don't think anybody expected it to

1111
00:36:47,190 --> 00:36:45,119
fail but it was successful and it it

1112
00:36:48,550 --> 00:36:47,200
supports i wouldn't say it proves but

1113
00:36:51,109 --> 00:36:48,560

it's very consistent with the notion of

1114
00:36:53,190 --> 00:36:51,119
relationality so all of my suggestions

1115
00:36:56,069 --> 00:36:53,200
have to do with relationality my theory

1116
00:36:57,990 --> 00:36:56,079
is fully committed to relationality and

1117
00:36:59,829 --> 00:36:58,000
that is testable according to vigner's

1118
00:37:02,310 --> 00:36:59,839
friend and some other ways of looking at

1119
00:37:05,510 --> 00:37:02,320
it the other um paper i would refer to

1120
00:37:08,710 --> 00:37:05,520
is frautriger and renner who put a paper

1121
00:37:10,790 --> 00:37:08,720
called quantum mechanics is inconsistent

1122
00:37:12,470 --> 00:37:10,800
with itself or something like that and

1123
00:37:14,230 --> 00:37:12,480
it just shows theoretically that there

1124
00:37:15,589 --> 00:37:14,240
are some cases where you have to drop

1125
00:37:17,589 --> 00:37:15,599
one of the assumptions we make about

1126
00:37:19,270 --> 00:37:17,599
space and time one of those assumptions

1127
00:37:20,710 --> 00:37:19,280
that i think is the best one to drop is

1128
00:37:22,390 --> 00:37:20,720
that there's an objective set of facts

1129
00:37:23,910 --> 00:37:22,400
about the world for everybody

1130
00:37:25,829 --> 00:37:23,920
so that points to relationality once

1131
00:37:28,470 --> 00:37:25,839
again

1132
00:37:29,990 --> 00:37:28,480
okay super interesting so um

1133
00:37:31,750 --> 00:37:30,000
here's another question does this have

1134
00:37:33,829 --> 00:37:31,760
the same quality as the block universe

1135
00:37:35,910 --> 00:37:33,839
where everything that ever happened or

1136
00:37:37,990 --> 00:37:35,920
will happen is part of a single holiest

1137
00:37:40,069 --> 00:37:38,000
map that simply exists how does it

1138
00:37:41,990 --> 00:37:40,079

relate to the branches of the multiverse

1139
00:37:43,589 --> 00:37:42,000
yeah it's the same what's specifically

1140
00:37:45,270 --> 00:37:43,599
about the block universe that needs to

1141
00:37:46,710 --> 00:37:45,280
be pointed out here is that the block

1142
00:37:48,950 --> 00:37:46,720
universe in special relativity is

1143
00:37:50,470 --> 00:37:48,960
usually thought of as a space-time block

1144
00:37:52,310 --> 00:37:50,480
universe where you've got

1145
00:37:53,829 --> 00:37:52,320
a trajectory like a block is like a

1146
00:37:55,109 --> 00:37:53,839
piece of ice and the cracks in the ice

1147
00:37:57,750 --> 00:37:55,119
are the trajectories of the of the

1148
00:37:59,750 --> 00:37:57,760
particles in space and time that does

1149
00:38:01,990 --> 00:37:59,760
not hold up here what holds up is a

1150
00:38:04,230 --> 00:38:02,000
frequency domain version of that

1151
00:38:06,950 --> 00:38:04,240
so the block is the frequency domain

1152
00:38:08,310 --> 00:38:06,960
holographic pattern that encodes the

1153
00:38:10,310 --> 00:38:08,320
motions but does not resemble the

1154
00:38:12,390 --> 00:38:10,320
motions i think that's a useful way to

1155
00:38:13,990 --> 00:38:12,400
put it it encodes the motions and it

1156
00:38:15,910 --> 00:38:14,000
does it doesn't change that block

1157
00:38:18,150 --> 00:38:15,920
universe in frequency domain is

1158
00:38:21,190 --> 00:38:18,160
unchanging and it encodes a single

1159
00:38:25,190 --> 00:38:21,200
branch of that tree of that multiverse

1160
00:38:28,550 --> 00:38:27,030
that is the block universe it doesn't

1161
00:38:30,069 --> 00:38:28,560
correspond to

1162
00:38:34,150 --> 00:38:30,079
a single

1163
00:38:35,750 --> 00:38:34,160

block universe in space and time um

1164
00:38:37,030 --> 00:38:35,760
but i think that that's clear and it's

1165
00:38:39,109 --> 00:38:37,040
one of the points i make in the paper is

1166
00:38:41,910 --> 00:38:39,119
that it's the frequency domain that is

1167
00:38:44,550 --> 00:38:41,920
has this frozen of frozen nature to it

1168
00:38:46,390 --> 00:38:44,560
that encodes actual dynamics space-time

1169
00:38:52,230 --> 00:38:46,400
dynamic dynamics in it

1170
00:38:57,670 --> 00:38:54,470
okay uh and what happened to the roads

1171
00:38:58,950 --> 00:38:57,680
not taken in this formulation

1172
00:39:00,710 --> 00:38:58,960
well that's a great question that comes

1173
00:39:04,390 --> 00:39:00,720
down to relationality that's one of the

1174
00:39:06,870 --> 00:39:04,400
big questions of a relational universe

1175
00:39:07,829 --> 00:39:06,880
when you talk about a physical

1176
00:39:09,750 --> 00:39:07,839
world

1177
00:39:11,510 --> 00:39:09,760
in the relational universe

1178
00:39:13,430 --> 00:39:11,520
you're talking about you're always

1179
00:39:16,069 --> 00:39:13,440
taking a perspective

1180
00:39:18,710 --> 00:39:16,079
so as i said one of the conclusions from

1181
00:39:21,109 --> 00:39:18,720
this formalism is that only events

1182
00:39:25,589 --> 00:39:21,119
are real are physical

1183
00:39:28,790 --> 00:39:26,870
only

1184
00:39:30,230 --> 00:39:28,800
so if no if no one is around to observe

1185
00:39:31,990 --> 00:39:30,240
an event then you describe the event

1186
00:39:33,109 --> 00:39:32,000
from the perspective of the one electron

1187
00:39:34,630 --> 00:39:33,119
hitting another electron that's

1188
00:39:38,069 --> 00:39:34,640

perfectly legitimate

1189
00:39:39,910 --> 00:39:38,079
and that event is a physical reality

1190
00:39:41,750 --> 00:39:39,920
but there's some way in which

1191
00:39:42,870 --> 00:39:41,760
it has to you have to take a perspective

1192
00:39:44,310 --> 00:39:42,880
so you take the perspective of that

1193
00:39:45,910 --> 00:39:44,320
electron and describe the interaction

1194
00:39:47,990 --> 00:39:45,920
from that perspective or you take the

1195
00:39:48,710 --> 00:39:48,000
perspective of a detector

1196
00:39:50,310 --> 00:39:48,720
and

1197
00:39:52,150 --> 00:39:50,320
describe the interaction from the

1198
00:39:54,150 --> 00:39:52,160
perspective of that detector the

1199
00:39:55,589 --> 00:39:54,160
branches not taken

1200
00:39:58,069 --> 00:39:55,599
are still

1201
00:40:00,390 --> 00:39:58,079
just as just as mathematically

1202
00:40:02,390 --> 00:40:00,400
present or real as they ever were and

1203
00:40:04,630 --> 00:40:02,400
all of that is accessible

1204
00:40:06,550 --> 00:40:04,640
not accessible necessarily to me in my

1205
00:40:07,829 --> 00:40:06,560
lifetime i don't actually think

1206
00:40:09,510 --> 00:40:07,839
and i'm sure there's others here that

1207
00:40:10,870 --> 00:40:09,520
might have shown differently or believe

1208
00:40:13,109 --> 00:40:10,880
experience have different thoughts about

1209
00:40:15,109 --> 00:40:13,119
this i don't look for ways to travel

1210
00:40:16,390 --> 00:40:15,119
back in time i look for ways to

1211
00:40:18,390 --> 00:40:16,400
understand

1212
00:40:19,670 --> 00:40:18,400
time differently that includes the past

1213
00:40:21,910 --> 00:40:19,680

kind of like the

1214
00:40:23,510 --> 00:40:21,920
the dreaming of the aboriginals that i

1215
00:40:25,270 --> 00:40:23,520
don't think we need to physically move

1216
00:40:27,589 --> 00:40:25,280
to the past or future

1217
00:40:28,790 --> 00:40:27,599
but that all of that is still in the

1218
00:40:29,910 --> 00:40:28,800
fourier domain

1219
00:40:31,589 --> 00:40:29,920
it's it's

1220
00:40:33,190 --> 00:40:31,599
omnipresent right

1221
00:40:35,510 --> 00:40:33,200
when i transform into the frequency

1222
00:40:38,069 --> 00:40:35,520
domain the fourier domain i don't go

1223
00:40:39,750 --> 00:40:38,079
somewhere it's it's all right here and

1224
00:40:41,030 --> 00:40:39,760
so all of the all that information of

1225
00:40:43,589 --> 00:40:41,040
all the branches of throughout all of

1226
00:40:45,750 --> 00:40:43,599
history is all right here

1227
00:40:47,670 --> 00:40:45,760
and so it does point to some sense in

1228
00:40:49,190 --> 00:40:47,680
which there's a non-locality in space

1229
00:40:51,349 --> 00:40:49,200
and time that's very much just

1230
00:40:53,510 --> 00:40:51,359
associated with the fourier the the one

1231
00:40:54,950 --> 00:40:53,520
to all nature of the fourier transform

1232
00:40:57,510 --> 00:40:54,960
and i don't think it means we can space

1233
00:40:59,430 --> 00:40:57,520
time travel back in time but we can

1234
00:41:01,670 --> 00:40:59,440
access that information so whether it's

1235
00:41:02,470 --> 00:41:01,680
the akashic records or or any other of

1236
00:41:04,550 --> 00:41:02,480
the

1237
00:41:07,109 --> 00:41:04,560
things that would benefit from this this

1238
00:41:09,109 --> 00:41:07,119

model i think it's consistent

1239
00:41:11,430 --> 00:41:09,119
and those again coming back to

1240
00:41:13,270 --> 00:41:11,440
relational observation

1241
00:41:14,630 --> 00:41:13,280
there's a sense in which everything

1242
00:41:16,790 --> 00:41:14,640
physical is described from the

1243
00:41:18,470 --> 00:41:16,800
perspective of an observer there's no

1244
00:41:20,390 --> 00:41:18,480
such thing as the physical world without

1245
00:41:22,710 --> 00:41:20,400
an observer that's a postulate or a

1246
00:41:24,150 --> 00:41:22,720
proposal that comes with relationality

1247
00:41:26,309 --> 00:41:24,160
and so the branches of the wave function

1248
00:41:27,910 --> 00:41:26,319
that i didn't choose

1249
00:41:30,550 --> 00:41:27,920
there's no physical reality to them

1250
00:41:31,829 --> 00:41:30,560
because i'm the observer and i'm not on

1251
00:41:33,510 --> 00:41:31,839
those branches

1252
00:41:35,270 --> 00:41:33,520
so i think it gets rid of the

1253
00:41:37,270 --> 00:41:35,280
extravagant notion of there's multiple

1254
00:41:38,950 --> 00:41:37,280
versions of me out there

1255
00:41:40,069 --> 00:41:38,960
that doesn't really have any kind of

1256
00:41:43,589 --> 00:41:40,079
meaningful

1257
00:41:47,109 --> 00:41:45,030
yeah of course

1258
00:41:49,190 --> 00:41:47,119
at least not for you as the observer per

1259
00:41:50,950 --> 00:41:49,200
se right

1260
00:41:53,589 --> 00:41:50,960
there's another question here well

1261
00:41:54,870 --> 00:41:53,599
there's a lot actually but um what is

1262
00:41:56,710 --> 00:41:54,880
your view on

1263
00:41:59,190 --> 00:41:56,720

of super deterministic models which

1264
00:42:03,589 --> 00:41:59,200
seems to combine localism plus some kind

1265
00:42:06,550 --> 00:42:05,270
that's interesting i'm not sure i'm

1266
00:42:07,910 --> 00:42:06,560
going to be able to answer that fully in

1267
00:42:10,309 --> 00:42:07,920
a technical way

1268
00:42:13,990 --> 00:42:11,829
i'd like to know more about the what the

1269
00:42:17,030 --> 00:42:14,000
speaker is is because they i don't know

1270
00:42:19,270 --> 00:42:17,040
as much as they do about the subject

1271
00:42:20,230 --> 00:42:19,280
okay so super deterministic means that

1272
00:42:21,670 --> 00:42:20,240
there's

1273
00:42:23,750 --> 00:42:21,680
i think that it's over determined in

1274
00:42:25,510 --> 00:42:23,760
some way that and so it has to do with

1275
00:42:27,109 --> 00:42:25,520
free will but i'm not actually not sure

1276
00:42:29,190 --> 00:42:27,119
i'd love to know more

1277
00:42:31,349 --> 00:42:29,200
oh that may

1278
00:42:33,109 --> 00:42:31,359
wait for the for the next uh emerging

1279
00:42:34,230 --> 00:42:33,119
event that we have after the session

1280
00:42:35,190 --> 00:42:34,240
have ended

1281
00:42:36,790 --> 00:42:35,200
um

1282
00:42:39,030 --> 00:42:36,800
does this relate to the demonstration of

1283
00:42:41,589 --> 00:42:39,040
the observer effect of the wave particle

1284
00:42:41,599 --> 00:42:47,190
yeah let me think about how

1285
00:42:50,950 --> 00:42:49,510
so one of the basic examples i use in

1286
00:42:53,829 --> 00:42:50,960
the paper which is really simple

1287
00:42:55,829 --> 00:42:53,839
mathematically is a detector

1288
00:42:58,470 --> 00:42:55,839

and a sine wave

1289
00:43:00,069 --> 00:42:58,480
you're detecting a sine wave and the

1290
00:43:01,990 --> 00:43:00,079
sine wave is you know got its

1291
00:43:04,230 --> 00:43:02,000
mathematical form which is actually the

1292
00:43:05,430 --> 00:43:04,240
fourier transform mathematically of the

1293
00:43:07,190 --> 00:43:05,440
detector's

1294
00:43:08,870 --> 00:43:07,200
waveform the detector i just call a

1295
00:43:10,390 --> 00:43:08,880
delta function and for those of you who

1296
00:43:12,390 --> 00:43:10,400
are familiar the delta function is just

1297
00:43:15,430 --> 00:43:12,400
a totally localized function

1298
00:43:16,790 --> 00:43:15,440
just a one point and so if you if this

1299
00:43:19,190 --> 00:43:16,800
if you interact a delta function with a

1300
00:43:20,470 --> 00:43:19,200
sine wave you identify where that sine

1301
00:43:22,069 --> 00:43:20,480
wave is

1302
00:43:23,990 --> 00:43:22,079
and so that's really the function of a

1303
00:43:25,349 --> 00:43:24,000
detector

1304
00:43:27,270 --> 00:43:25,359
so can you read the question again so i

1305
00:43:29,589 --> 00:43:27,280
make sure i answer it

1306
00:43:32,150 --> 00:43:29,599
sure so uh if this relates to the

1307
00:43:34,309 --> 00:43:32,160
demonstration of the observer effect or

1308
00:43:37,190 --> 00:43:34,319
wave particle duality of light yeah so

1309
00:43:38,309 --> 00:43:37,200
i'm using that example to show that

1310
00:43:39,750 --> 00:43:38,319
um

1311
00:43:42,230 --> 00:43:39,760
you know

1312
00:43:44,870 --> 00:43:42,240
when when you

1313
00:43:47,510 --> 00:43:44,880

it's it's uh with a wave the whole

1314
00:43:49,190 --> 00:43:47,520
frequency domain is waves right and and

1315
00:43:51,589 --> 00:43:49,200
the description that we get of the wave

1316
00:43:55,589 --> 00:43:51,599
function the waveform out of that is a

1317
00:43:56,950 --> 00:43:55,599
distribution in in

1318
00:43:58,790 --> 00:43:56,960
it's a wavy distribution in the

1319
00:44:00,309 --> 00:43:58,800
frequency domain it's also corresponds

1320
00:44:01,510 --> 00:44:00,319
to a wavy distribution in the space-time

1321
00:44:03,589 --> 00:44:01,520
domain

1322
00:44:05,430 --> 00:44:03,599
when we talk about the wave function and

1323
00:44:07,109 --> 00:44:05,440
the wave particle duality we're talking

1324
00:44:10,470 --> 00:44:07,119
about the difference between wave

1325
00:44:12,309 --> 00:44:10,480
propagation and detection so a quantum

1326
00:44:13,349 --> 00:44:12,319
system essentially propagates like a

1327
00:44:16,870 --> 00:44:13,359
wave

1328
00:44:18,630 --> 00:44:16,880
and is observed like a particle

1329
00:44:19,990 --> 00:44:18,640
and so when i do these calculations that

1330
00:44:21,829 --> 00:44:20,000
are basically saying you're interacting

1331
00:44:24,790 --> 00:44:21,839
a waveform with the detector that

1332
00:44:28,150 --> 00:44:24,800
localizes it i'm basically saying the

1333
00:44:30,309 --> 00:44:28,160
the method of observation is a fourier

1334
00:44:32,150 --> 00:44:30,319
and inverse fourier transform pair

1335
00:44:34,710 --> 00:44:32,160
that's what observation is

1336
00:44:37,349 --> 00:44:34,720
and so it is absolutely a restatement of

1337
00:44:38,870 --> 00:44:37,359
the observer effect and

1338
00:44:40,790 --> 00:44:38,880

you know if you if you understand

1339
00:44:42,230 --> 00:44:40,800
fourier transforms you know that that is

1340
00:44:43,910 --> 00:44:42,240
exactly where

1341
00:44:44,790 --> 00:44:43,920
heisenberg got the uncertainty principle

1342
00:44:46,150 --> 00:44:44,800
from

1343
00:44:47,910 --> 00:44:46,160
because in the in the kernel of the

1344
00:44:49,349 --> 00:44:47,920
fourier transform is momentum times

1345
00:44:50,630 --> 00:44:49,359
energy and they have to have a certain

1346
00:44:51,990 --> 00:44:50,640
minimal value

1347
00:44:54,390 --> 00:44:52,000
and that's where that's why we can't

1348
00:44:55,990 --> 00:44:54,400
have a completely localized position and

1349
00:44:57,829 --> 00:44:56,000
a completely localized momentum because

1350
00:45:00,710 --> 00:44:57,839
of the fourier transform so i'm saying

1351
00:45:02,230 --> 00:45:00,720
that that comes because observation is

1352
00:45:05,589 --> 00:45:02,240
a fourier and an inverse fourier

1353
00:45:06,470 --> 00:45:05,599
transform pair by definition

1354
00:45:08,710 --> 00:45:06,480
okay

1355
00:45:10,550 --> 00:45:08,720
super interesting too um what's the

1356
00:45:12,470 --> 00:45:10,560
perspective or your perspective of the

1357
00:45:14,630 --> 00:45:12,480
photon on the way from the sun to the

1358
00:45:16,710 --> 00:45:14,640
earth during its journey does it know

1359
00:45:19,109 --> 00:45:16,720
the final outcome or leaving all

1360
00:45:21,589 --> 00:45:19,119
possible outcomes until you arrived and

1361
00:45:23,349 --> 00:45:21,599
is or not seen

1362
00:45:25,270 --> 00:45:23,359
right that's a great question it's sort

1363
00:45:27,589 --> 00:45:25,280

of slightly um

1364
00:45:29,750 --> 00:45:27,599
not formulated in an answerable way

1365
00:45:30,870 --> 00:45:29,760
because the questioner has said it

1366
00:45:33,030 --> 00:45:30,880
really well but what they're saying is

1367
00:45:35,270 --> 00:45:33,040
that they're ascribing a reality to the

1368
00:45:37,109 --> 00:45:35,280
photons journey at every point

1369
00:45:38,390 --> 00:45:37,119
unless you're the photon you can't do

1370
00:45:39,990 --> 00:45:38,400
that

1371
00:45:41,750 --> 00:45:40,000
because the path is described as a whole

1372
00:45:43,349 --> 00:45:41,760
and there's no reality to the nature of

1373
00:45:45,510 --> 00:45:43,359
things between observations or between

1374
00:45:47,190 --> 00:45:45,520
events between interactions

1375
00:45:49,030 --> 00:45:47,200
so that's part of the nature of the

1376
00:45:51,109 --> 00:45:49,040
wholeness of the path we have to think

1377
00:45:52,150 --> 00:45:51,119
about anything that we're observing

1378
00:45:55,349 --> 00:45:52,160
existing

1379
00:45:56,790 --> 00:45:55,359
until we observe it

1380
00:45:59,829 --> 00:45:56,800
and this is what i call

1381
00:46:01,670 --> 00:45:59,839
retroactive determination

1382
00:46:03,190 --> 00:46:01,680
whether it's a photon or a satellite or

1383
00:46:04,790 --> 00:46:03,200
the moon in einstein's case you're

1384
00:46:06,470 --> 00:46:04,800
talking about does the moon really exist

1385
00:46:07,270 --> 00:46:06,480
if i'm not there to see it

1386
00:46:10,630 --> 00:46:07,280
um

1387
00:46:12,790 --> 00:46:10,640
what's happening in this theory is that

1388
00:46:14,870 --> 00:46:12,800

the anything that happens to the moon is

1389
00:46:17,109 --> 00:46:14,880
you're not observing it a set a meteor

1390
00:46:18,790 --> 00:46:17,119
crashes on it all of that is is

1391
00:46:19,990 --> 00:46:18,800
unobserved reality that is a

1392
00:46:21,829 --> 00:46:20,000
superposition this is where

1393
00:46:23,670 --> 00:46:21,839
superposition comes in because the path

1394
00:46:25,829 --> 00:46:23,680
or the reality as a whole

1395
00:46:28,069 --> 00:46:25,839
exists in a whole timeline until you

1396
00:46:29,829 --> 00:46:28,079
observe it then it's open to collapse a

1397
00:46:31,430 --> 00:46:29,839
different way or one way or the other

1398
00:46:33,589 --> 00:46:31,440
when you finally do observe it so

1399
00:46:35,030 --> 00:46:33,599
histories in this sense are flexible the

1400
00:46:37,030 --> 00:46:35,040
history of the photon is flexible

1401
00:46:39,190 --> 00:46:37,040
depending on how you observe it

1402
00:46:41,190 --> 00:46:39,200
we can't describe a

1403
00:46:45,510 --> 00:46:41,200
reality to the photon

1404
00:46:49,190 --> 00:46:47,589
okay so thank you very much sky i will

1405
00:46:50,870 --> 00:46:49,200
probably just end with one additional

1406
00:46:53,829 --> 00:46:50,880
question and then we can close this

1407
00:46:55,829 --> 00:46:53,839
amazing presentation with q a so

1408
00:46:58,470 --> 00:46:55,839
in few words if you can what would you

1409
00:47:01,510 --> 00:46:58,480
define as the observer

1410
00:47:03,829 --> 00:47:01,520
that's a great question um

1411
00:47:04,710 --> 00:47:03,839
well in relationality

1412
00:47:11,670 --> 00:47:04,720
you

1413
00:47:14,470 --> 00:47:11,680

any kind of physical

1414
00:47:17,829 --> 00:47:14,480
a description of the system

1415
00:47:20,230 --> 00:47:17,839
so physicalness depends on

1416
00:47:22,470 --> 00:47:20,240
picking an observer to be

1417
00:47:24,710 --> 00:47:22,480
so without the observer

1418
00:47:27,510 --> 00:47:24,720
i think of it in these two words you can

1419
00:47:28,549 --> 00:47:27,520
either have an objective indefinite

1420
00:47:30,470 --> 00:47:28,559
world

1421
00:47:32,470 --> 00:47:30,480
the multiverse is objective it's like

1422
00:47:34,470 --> 00:47:32,480
the whole reality right the whole cosmos

1423
00:47:35,829 --> 00:47:34,480
but it's not definite nobody's there

1424
00:47:38,150 --> 00:47:35,839
observing it it's a whole bunch of

1425
00:47:40,710 --> 00:47:38,160
branches and that's sort of you know the

1426
00:47:42,630 --> 00:47:40,720
god's view is all the possibilities but

1427
00:47:44,150 --> 00:47:42,640
that's an objective indefinite world if

1428
00:47:46,549 --> 00:47:44,160
you want to have a definite world it's

1429
00:47:47,430 --> 00:47:46,559
by definition subjective

1430
00:47:48,950 --> 00:47:47,440
so

1431
00:47:50,870 --> 00:47:48,960
that's where the observer comes in

1432
00:47:52,710 --> 00:47:50,880
there's no such thing as a combination

1433
00:47:55,109 --> 00:47:52,720
of those two that i would call objective

1434
00:47:57,190 --> 00:47:55,119
definite objective definite is forbidden

1435
00:48:01,349 --> 00:47:57,200
by this model

1436
00:48:05,990 --> 00:48:04,870
but uh we can continue further on but i

1437
00:48:08,630 --> 00:48:06,000
thank you very much skype for your

1438
00:48:10,230 --> 00:48:08,640

excellent presentation and i think uh

1439
00:48:11,910 --> 00:48:10,240
their program sure has some uh

1440
00:48:12,950 --> 00:48:11,920
announcements and other words that he

1441
00:48:15,030 --> 00:48:12,960
may want to

1442
00:48:16,069 --> 00:48:15,040
share with us yeah and we'll go on uh if

1443
00:48:17,670 --> 00:48:16,079
folks want to continue in this

1444
00:48:19,990 --> 00:48:17,680
conversation we'll talk more openly

1445
00:48:21,670 --> 00:48:20,000
about the idea of synchronicity and your

1446
00:48:25,349 --> 00:48:21,680
thoughts on it as well in the in the

1447
00:48:31,270 --> 00:48:28,309
so uh sky i have to congratulate you

1448
00:48:33,270 --> 00:48:31,280
this is a very ambitious

1449
00:48:34,470 --> 00:48:33,280
theory that you created here and i mean

1450
00:48:37,270 --> 00:48:34,480
you you

1451
00:48:39,349 --> 00:48:37,280
made me understand fourier transforms

1452
00:48:41,430 --> 00:48:39,359
and holograms in a way i never have

1453
00:48:43,589 --> 00:48:41,440
before it's really great to see that

1454
00:48:45,670 --> 00:48:43,599
you're able to express it simply enough

1455
00:48:47,349 --> 00:48:45,680
to get through to people like me

1456
00:48:49,670 --> 00:48:47,359
so i can make sense of it it was really

1457
00:48:51,910 --> 00:48:49,680
wonderful and and you know when you have

1458
00:48:54,710 --> 00:48:51,920
such an all-encompassing

1459
00:48:57,510 --> 00:48:54,720
theory that's this complete you're going

1460
00:48:59,190 --> 00:48:57,520
to get questions about everything under

1461
00:49:02,549 --> 00:48:59,200
the sun and more

1462
00:49:04,309 --> 00:49:02,559
behind the sun and everywhere yeah so um

1463
00:49:06,390 --> 00:49:04,319

so we could probably go on for quite a

1464
00:49:08,230 --> 00:49:06,400
while uh i just want to thank you this

1465
00:49:10,630 --> 00:49:08,240
is really interesting to see a

1466
00:49:12,630 --> 00:49:10,640
mathematical foundation for some of the