

1
00:00:00,000 --> 00:00:05,700
first speaker this afternoon is Bernard

2
00:00:03,448 --> 00:00:08,009
hide from the Caliph Idzik sin stitute

3
00:00:05,700 --> 00:00:11,759
an astro physicist and author of over

4
00:00:08,009 --> 00:00:13,500
130 scientific publications former

5
00:00:11,759 --> 00:00:15,179
editor of the Astrophysical Journal and

6
00:00:13,500 --> 00:00:18,539
a former editor of the journal of

7
00:00:15,179 --> 00:00:22,768
scientific exploration so without

8
00:00:18,539 --> 00:00:24,960
further ado Bernie Nike York well this

9
00:00:22,768 --> 00:00:26,278
talk grew out of a book that I published

10
00:00:24,960 --> 00:00:28,528
a couple of years ago called the God

11
00:00:26,278 --> 00:00:30,089
theory and i'll be talking about

12
00:00:28,528 --> 00:00:32,700
consciousness having to do with this

13
00:00:30,089 --> 00:00:35,820
theory in the talk this afternoon but it

14
00:00:32,700 --> 00:00:38,010
stems from the discovery of the last 20

15
00:00:35,820 --> 00:00:39,480
years or so that our universe seems to

16
00:00:38,009 --> 00:00:40,920
be a very finely tuned place I'm not

17
00:00:39,479 --> 00:00:42,569
going to go through these in any detail

18
00:00:40,920 --> 00:00:44,700
but these are nine properties of the

19
00:00:42,570 --> 00:00:46,738
universe that pretty much today

20
00:00:44,700 --> 00:00:49,140
astrophysicists agree our rather

21
00:00:46,738 --> 00:00:50,459
remarkably finely tuned to make it

22
00:00:49,140 --> 00:00:51,570
possible for life to evolve in the

23
00:00:50,460 --> 00:00:52,969
universe they are the ratio of the

24
00:00:51,570 --> 00:00:55,198
gravitation with the Coulomb force

25
00:00:52,969 --> 00:00:57,239
strength of the nuclear force if that

26
00:00:55,198 --> 00:00:58,920
one were ten or twenty percent higher or

27
00:00:57,238 --> 00:01:01,288
lower than it is we wouldn't have stars

28
00:00:58,920 --> 00:01:03,000
a certain carbon resonance that allows

29

00:01:01,289 --> 00:01:04,640
carbon to form in the interiors of stars

30
00:01:03,000 --> 00:01:06,989
which of course is necessary for life

31
00:01:04,640 --> 00:01:09,629
the expansion property of water upon

32
00:01:06,989 --> 00:01:11,310
freezing the fact of neutron is slightly

33
00:01:09,629 --> 00:01:13,798
heavier than the proton and not the

34
00:01:11,310 --> 00:01:15,210
other way around the average density of

35
00:01:13,799 --> 00:01:18,299
matter in the universe the strength of

36
00:01:15,209 --> 00:01:20,519
the dark energy quantum clumping and the

37
00:01:18,299 --> 00:01:22,710
slight prevalence of matter over

38
00:01:20,519 --> 00:01:24,030
antimatter in the universe formed now

39
00:01:22,709 --> 00:01:25,949
all of these taken together could have

40
00:01:24,030 --> 00:01:28,290
been rather different than what they are

41
00:01:25,950 --> 00:01:30,689
and if they were we wouldn't be here no

42
00:01:28,290 --> 00:01:32,040
were another life be here but the arbor

43
00:01:30,688 --> 00:01:34,078

rather finely tuned and there are two

44

00:01:32,040 --> 00:01:37,229
explanations for this which I'll talk

45

00:01:34,078 --> 00:01:38,849
about next but first to mention that in

46

00:01:37,228 --> 00:01:39,750
current astrophysical theory we think

47

00:01:38,849 --> 00:01:42,030
that the universe went through a

48

00:01:39,750 --> 00:01:43,500
tremendous period of inflation before it

49

00:01:42,030 --> 00:01:45,780
settled down into the rather slow

50

00:01:43,500 --> 00:01:47,280
expansion that we now call the Hubble

51

00:01:45,780 --> 00:01:49,590
expansion that is characterizing the

52

00:01:47,280 --> 00:01:52,170
universe in the first 10 to the minus 34

53

00:01:49,590 --> 00:01:53,520
seconds or thereabouts and that's sort

54

00:01:52,170 --> 00:01:56,040
of a billionth of a billionth of a

55

00:01:53,519 --> 00:01:58,349
billionth of a millionth of a second the

56

00:01:56,040 --> 00:02:01,049
universe expanded tremendously into a

57

00:01:58,349 --> 00:02:02,908
region of well it became a region of

58
00:02:01,049 --> 00:02:04,259
space that led to the formation of our

59
00:02:02,909 --> 00:02:07,079
universe and perhaps even other

60
00:02:04,259 --> 00:02:08,580
universes so the idea that there could

61
00:02:07,078 --> 00:02:12,060
be other universes forming out of this

62
00:02:08,580 --> 00:02:13,890
inflation function leads to the

63
00:02:12,060 --> 00:02:15,960
explanation that maybe our universes

64
00:02:13,889 --> 00:02:17,099
not really special it's only that there

65
00:02:15,960 --> 00:02:18,689
are lots and lots of other universes

66
00:02:17,099 --> 00:02:21,090
that came out of this inflationary

67
00:02:18,689 --> 00:02:23,250
period in fact there may be literally an

68
00:02:21,090 --> 00:02:25,080
infinite number of other universes that

69
00:02:23,250 --> 00:02:26,759
came out of this inflationary period and

70
00:02:25,080 --> 00:02:28,830
therefore there must be a whole

71
00:02:26,759 --> 00:02:30,679
distribution whole ensemble of different

72
00:02:28,830 --> 00:02:32,670
laws and constants of nature that

73
00:02:30,680 --> 00:02:34,500
characterizes in different universes and

74
00:02:32,669 --> 00:02:35,729
ours is the one we happen to be able to

75
00:02:34,500 --> 00:02:36,840
live in we wouldn't be in any of the

76
00:02:35,729 --> 00:02:38,819
others because we couldn't have arisen

77
00:02:36,840 --> 00:02:40,650
in them and so this multiverse

78
00:02:38,819 --> 00:02:42,359
explanation for why our universe is

79
00:02:40,650 --> 00:02:44,010
finely tuned is the one that you'll find

80
00:02:42,360 --> 00:02:46,350
in mainstream astrophysics and there are

81
00:02:44,009 --> 00:02:47,729
books out on this by by people such as

82
00:02:46,349 --> 00:02:49,859
Sir Martin Rees the astronomer royal

83
00:02:47,729 --> 00:02:51,599
Leonard Susskind the Stanford physicist

84
00:02:49,860 --> 00:02:53,040
and one of the fathers of string theory

85
00:02:51,599 --> 00:02:55,259
and it's a perfectly plausible

86

00:02:53,039 --> 00:02:57,120
explanation that we are not special it's

87
00:02:55,259 --> 00:02:59,069
just that we are part of an ensemble of

88
00:02:57,120 --> 00:03:01,860
a huge vast number of other universes

89
00:02:59,069 --> 00:03:03,449
that unfortunately we can never see we

90
00:03:01,860 --> 00:03:06,209
can never directly detect we can never

91
00:03:03,449 --> 00:03:07,589
measure the other alternative of course

92
00:03:06,209 --> 00:03:09,450
the alternative is that there is an

93
00:03:07,590 --> 00:03:11,370
intelligence with a purpose behind the

94
00:03:09,449 --> 00:03:12,599
laws of nature not at all something

95
00:03:11,370 --> 00:03:14,489
having to do with intelligent design by

96
00:03:12,599 --> 00:03:16,769
the way but having to do with dreaming

97
00:03:14,489 --> 00:03:18,719
into existence the laws of nature and

98
00:03:16,769 --> 00:03:20,700
constants that would lead to a life

99
00:03:18,719 --> 00:03:23,280
friendly universe not just life on Earth

100
00:03:20,699 --> 00:03:24,869

I'm assuming but presumably life on many

101

00:03:23,280 --> 00:03:27,090

other planets around lots of other stars

102

00:03:24,870 --> 00:03:29,069

and lots of other galaxies in fact even

103

00:03:27,090 --> 00:03:31,319

sir Fred Hoyle for the end of his life

104

00:03:29,069 --> 00:03:33,060

called universe and obvious fix when we

105

00:03:31,319 --> 00:03:36,060

looked at the the properties of the

106

00:03:33,060 --> 00:03:38,009

universe so I began to think about the

107

00:03:36,060 --> 00:03:39,659

notion that maybe the universe is the

108

00:03:38,009 --> 00:03:42,030

way it is because there is a conscious

109

00:03:39,659 --> 00:03:44,699

intelligence behind it behind the the

110

00:03:42,030 --> 00:03:46,199

origin of the universe this is Sir James

111

00:03:44,699 --> 00:03:47,609

jeans one of the the prominent

112

00:03:46,199 --> 00:03:50,518

astrophysicists of the first half of the

113

00:03:47,610 --> 00:03:52,170

last century and he wrote about this he

114

00:03:50,519 --> 00:03:53,640

says the universe begins to look more

115
00:03:52,169 --> 00:03:56,458
like a great thought than like a great

116
00:03:53,639 --> 00:03:57,958
machine mine no longer appears as an

117
00:03:56,459 --> 00:04:00,659
accidental intruder into the realm of

118
00:03:57,959 --> 00:04:02,789
matter we are beginning to think that we

119
00:04:00,659 --> 00:04:04,919
ought rather to hail it that is mind as

120
00:04:02,789 --> 00:04:06,929
the creator and governor of the realm of

121
00:04:04,919 --> 00:04:08,280
matter and so he was proposing that

122
00:04:06,930 --> 00:04:10,680
there is an intelligence behind the

123
00:04:08,280 --> 00:04:12,349
universe to make it be the sort of

124
00:04:10,680 --> 00:04:15,000
special place that we're now we really

125
00:04:12,349 --> 00:04:17,250
determined with the great precision that

126
00:04:15,000 --> 00:04:18,988
it appears to be another brilliant

127
00:04:17,250 --> 00:04:20,129
astrophysicist from that same error sir

128
00:04:18,988 --> 00:04:22,469
arthur eddington and here he is with

129
00:04:20,129 --> 00:04:24,598
Einstein Eddington was the one who made

130
00:04:22,470 --> 00:04:27,780
Einstein famous and you can see on the

131
00:04:24,598 --> 00:04:29,250
left side the headlines

132
00:04:27,779 --> 00:04:31,049
I seem to have lost the other point are

133
00:04:29,250 --> 00:04:34,230
there it is the headlines from the new

134
00:04:31,050 --> 00:04:37,530
york times when the discovery was made

135
00:04:34,230 --> 00:04:39,720
that the the Sun causes the bending of

136
00:04:37,529 --> 00:04:41,638
starlight during the eclipse of 1919

137
00:04:39,720 --> 00:04:43,590
lights all askew in the heavens men of

138
00:04:41,639 --> 00:04:45,300
science more or less agog of results of

139
00:04:43,589 --> 00:04:49,529
eclipse observations einstein theory

140
00:04:45,300 --> 00:04:51,030
triumphs a book for 12 wise men so this

141
00:04:49,529 --> 00:04:52,138
is what made Einstein famous and it was

142
00:04:51,029 --> 00:04:54,000
Sir Arthur Eddington who led that

143

00:04:52,139 --> 00:04:56,970
Eclipse expedition to print repay in

144
00:04:54,000 --> 00:04:58,290
1919 that made the observation sir

145
00:04:56,970 --> 00:05:00,300
arthur eddington was a brilliant man

146
00:04:58,290 --> 00:05:01,860
probably the predominant the most

147
00:05:00,300 --> 00:05:04,259
prominent astrophysicist of the first

148
00:05:01,860 --> 00:05:07,110
half of the last century and he wrote as

149
00:05:04,259 --> 00:05:09,149
many books one of them the mathematical

150
00:05:07,110 --> 00:05:11,040
theory of relativity which was a the

151
00:05:09,149 --> 00:05:13,109
exposition of general relativity the

152
00:05:11,040 --> 00:05:14,310
first textbook on that which by the way

153
00:05:13,110 --> 00:05:18,090
I also used when I was a graduate

154
00:05:14,310 --> 00:05:20,699
student back in the 1970s and 1980s the

155
00:05:18,089 --> 00:05:22,469
original edition came out in 1923 he was

156
00:05:20,699 --> 00:05:24,719
also the one who proposed the

157
00:05:22,470 --> 00:05:28,770

thermonuclear reactions as the basis for

158

00:05:24,720 --> 00:05:31,260

the the energy of stars a brilliant man

159

00:05:28,769 --> 00:05:33,329

he also wrote however science and the

160

00:05:31,259 --> 00:05:35,819

unseen world because he was also a

161

00:05:33,329 --> 00:05:37,560

mystic it was a Quaker new mystic and he

162

00:05:35,819 --> 00:05:39,689

asked the question therein are we in

163

00:05:37,560 --> 00:05:41,399

pursuing the mystical outlook facing the

164

00:05:39,689 --> 00:05:44,728

hard facts of experience surely we are

165

00:05:41,399 --> 00:05:47,009

and so he was not on the shame to write

166

00:05:44,728 --> 00:05:49,560

about and talked about his view that in

167

00:05:47,009 --> 00:05:50,939

fact there's more to the reality more to

168

00:05:49,560 --> 00:05:57,720

reality than simply the physical

169

00:05:50,939 --> 00:05:59,579

universe now as it turns out there is

170

00:05:57,720 --> 00:06:00,840

more reason than ever today to take

171

00:05:59,579 --> 00:06:02,728

seriously the notion that the

172
00:06:00,839 --> 00:06:04,949
consciousness is not some epithet

173
00:06:02,728 --> 00:06:06,779
nominal byproduct of life arising

174
00:06:04,949 --> 00:06:08,728
through evolution but rather than

175
00:06:06,779 --> 00:06:10,918
consciousness as a primary primary

176
00:06:08,728 --> 00:06:13,560
formative element in the universe and in

177
00:06:10,918 --> 00:06:17,370
fact consciousness is the basis of the

178
00:06:13,560 --> 00:06:19,139
universe this is another book that just

179
00:06:17,370 --> 00:06:21,750
came out a couple of years ago by a

180
00:06:19,139 --> 00:06:23,370
couple of physicists at the University

181
00:06:21,750 --> 00:06:26,100
of California Santa Cruz in fact one of

182
00:06:23,370 --> 00:06:27,689
the bruce rosenblum was the chair of the

183
00:06:26,100 --> 00:06:31,110
department and what they've done is to

184
00:06:27,689 --> 00:06:32,819
write a book for undergraduates or

185
00:06:31,110 --> 00:06:35,550
anyone interested in the philosophy of

186
00:06:32,819 --> 00:06:39,000
quantum physics the idea being that

187
00:06:35,550 --> 00:06:40,500
there are the interpretation of quantum

188
00:06:39,000 --> 00:06:41,399
physics has now gotten us to the point

189
00:06:40,500 --> 00:06:43,019
where

190
00:06:41,399 --> 00:06:45,929
it's really necessary to invoke

191
00:06:43,019 --> 00:06:47,909
consciousness as the necessary

192
00:06:45,930 --> 00:06:49,430
ingredient to make reality happen to

193
00:06:47,910 --> 00:06:52,169
shape reality at the quantum level

194
00:06:49,430 --> 00:06:53,728
conscious is something you can't do

195
00:06:52,168 --> 00:06:55,529
without that's up going to be talking

196
00:06:53,728 --> 00:06:57,418
about doing the rest of the presentation

197
00:06:55,529 --> 00:07:00,000
let me give you a few quotes from the

198
00:06:57,418 --> 00:07:02,189
book quantum theory is the most

199
00:07:00,000 --> 00:07:04,410
stunningly successful theory in all of

200

00:07:02,189 --> 00:07:06,060
science not a single one of its

201
00:07:04,410 --> 00:07:08,550
predictions has ever been proven wrong

202
00:07:06,060 --> 00:07:11,699
so quantum mechanics quantum theory

203
00:07:08,550 --> 00:07:14,280
really is a a wonderfully valid one

204
00:07:11,699 --> 00:07:16,228
wonderfully robust theory however

205
00:07:14,279 --> 00:07:18,809
quantum experiments hint at a worldview

206
00:07:16,228 --> 00:07:20,189
that has not yet been grasped the

207
00:07:18,810 --> 00:07:22,379
existence of something beyond what we

208
00:07:20,189 --> 00:07:23,969
usually consider physics beyond what we

209
00:07:22,379 --> 00:07:26,339
usually consider the physical world and

210
00:07:23,970 --> 00:07:28,560
they wrote this sort of thing with you

211
00:07:26,339 --> 00:07:30,239
can read in the book their trepidation

212
00:07:28,560 --> 00:07:33,089
at putting ideas like this out because

213
00:07:30,240 --> 00:07:35,389
they're afraid of being criticized by

214
00:07:33,089 --> 00:07:38,879

their colleagues for putting a sort of

215

00:07:35,389 --> 00:07:40,439

new-age fuzzy-wuzzy kinds of notions out

216

00:07:38,879 --> 00:07:41,759

there that might confuse people into

217

00:07:40,439 --> 00:07:42,930

thinking that somehow physics proves

218

00:07:41,759 --> 00:07:45,000

that there's God it doesn't of course

219

00:07:42,930 --> 00:07:46,978

and I'm not about to say that it is

220

00:07:45,000 --> 00:07:49,410

lecture either but what physics does do

221

00:07:46,978 --> 00:07:51,389

today at the quantum level and therefore

222

00:07:49,410 --> 00:07:53,400

at all higher levels i think is to

223

00:07:51,389 --> 00:07:57,060

require that consciousness is necessary

224

00:07:53,399 --> 00:07:59,339

element in creating reality at that in

225

00:07:57,060 --> 00:08:02,310

the measurement of things at the quantum

226

00:07:59,339 --> 00:08:03,839

phase the other point they made which I

227

00:08:02,310 --> 00:08:06,959

had not really appreciated was that to

228

00:08:03,839 --> 00:08:08,459

really understand the philosophical

229
00:08:06,959 --> 00:08:10,529
implications of quantum physics you

230
00:08:08,459 --> 00:08:12,209
don't have to be a physicist you don't

231
00:08:10,529 --> 00:08:14,429
have to know the mathematics at all of

232
00:08:12,209 --> 00:08:16,978
quantum physics to appreciate the

233
00:08:14,430 --> 00:08:19,439
conundrum in quantum mechanics of

234
00:08:16,978 --> 00:08:21,930
requiring an observer with consciousness

235
00:08:19,439 --> 00:08:23,819
to actually make things happen you can

236
00:08:21,930 --> 00:08:25,740
perfectly well engage in philosophical

237
00:08:23,819 --> 00:08:27,120
discussions of quantum physics by

238
00:08:25,740 --> 00:08:30,389
understanding quantum physics at a

239
00:08:27,120 --> 00:08:32,519
qualitative level the operators the the

240
00:08:30,389 --> 00:08:34,440
Hilbert spaces all of that that's fine

241
00:08:32,519 --> 00:08:36,718
if you're going to manipulate equations

242
00:08:34,440 --> 00:08:38,490
and you know solve quantum problems but

243
00:08:36,719 --> 00:08:40,740
in terms of understanding what quantum

244
00:08:38,490 --> 00:08:43,139
physics really implies philosophically

245
00:08:40,740 --> 00:08:44,639
you don't need any of that you can be an

246
00:08:43,139 --> 00:08:46,500
undergraduate having taken this course

247
00:08:44,639 --> 00:08:49,649
with some deep thinking about what it

248
00:08:46,500 --> 00:08:51,750
means and discuss with other people and

249
00:08:49,649 --> 00:08:54,778
with physicists what it all means with

250
00:08:51,750 --> 00:08:55,110
some level of credibility and with you

251
00:08:54,778 --> 00:08:57,838
know

252
00:08:55,110 --> 00:08:59,220
no no less a deep understanding of what

253
00:08:57,839 --> 00:09:00,870
it means then if you could manipulate

254
00:08:59,220 --> 00:09:03,060
all the mathematics of quantum theory

255
00:09:00,870 --> 00:09:05,190
which is quite formidable which I've had

256
00:09:03,059 --> 00:09:09,208
some experience with both positively and

257

00:09:05,190 --> 00:09:11,160
negatively the quantum enigma quantum

258
00:09:09,208 --> 00:09:12,599
mechanics applies to everything we can

259
00:09:11,159 --> 00:09:15,000
now manipulate individual atoms and

260
00:09:12,600 --> 00:09:17,009
here's an example from 1989 already of a

261
00:09:15,000 --> 00:09:21,200
scanning tunneling microscope image of

262
00:09:17,009 --> 00:09:25,019
the IBM spelled out on individual atoms

263
00:09:21,200 --> 00:09:26,700
now what's not widely realized is that

264
00:09:25,019 --> 00:09:29,278
an atom and it's wavefunction are the

265
00:09:26,700 --> 00:09:30,778
same thing it you know when I first

266
00:09:29,278 --> 00:09:33,629
started studying quantum physics I

267
00:09:30,778 --> 00:09:34,950
thought that the wave function which is

268
00:09:33,629 --> 00:09:36,149
the thing that the fuzzy thing that

269
00:09:34,950 --> 00:09:37,500
describes sort of where you're going to

270
00:09:36,149 --> 00:09:40,440
find a party when we make a measurement

271
00:09:37,500 --> 00:09:42,600

that that wave function is something to

272

00:09:40,440 --> 00:09:44,940

sort of over and above the particle that

273

00:09:42,600 --> 00:09:46,680

it's there and the particle is sort of

274

00:09:44,940 --> 00:09:48,810

jostled around or somehow is spread out

275

00:09:46,679 --> 00:09:50,819

within this wave function but it's

276

00:09:48,809 --> 00:09:53,458

actually the case that the wave function

277

00:09:50,820 --> 00:09:55,410

is the object and when you collapse the

278

00:09:53,458 --> 00:09:57,359

wave function you're causing the object

279

00:09:55,409 --> 00:09:59,610

to appear in a certain place it's not a

280

00:09:57,360 --> 00:10:01,820

separate thing at all this is a very key

281

00:09:59,610 --> 00:10:01,820

s