

1

00:00:00,866 --> 00:00:04,033
(gentle upbeat music)

2

00:00:08,850 --> 00:00:11,475
– Hey everyone and welcome back to

3

00:00:11,475 --> 00:00:13,426
Conversations at the Perimeter.

4

00:00:13,426 --> 00:00:14,550
It's Colin and I'm here with Lauren

5

00:00:14,550 --> 00:00:17,880
and on this episode we are
thrilled to share our fascinating

6

00:00:17,880 --> 00:00:19,980
conversation with Lee Smolin.

7

00:00:19,980 --> 00:00:23,250
Lee is a founding faculty member
here at Perimeter Institute

8

00:00:23,250 --> 00:00:25,260
having joined a little over 20 years ago,

9

00:00:25,260 --> 00:00:28,050
when the institute was in
its very earliest stages.

10

00:00:28,050 --> 00:00:30,210
– I remember when I
first came to Perimeter

11

00:00:30,210 --> 00:00:31,950
and it really felt like an honor

12

00:00:31,950 --> 00:00:34,260

just to be thinking
about theoretical physics

13
00:00:34,260 --> 00:00:36,570
in the same building as Lee Smolin.

14
00:00:36,570 --> 00:00:39,578
He's a co-founder of Loop Quantum Gravity

15
00:00:39,578 --> 00:00:41,160
and he's the author of
many popular science books,

16
00:00:41,160 --> 00:00:43,477
including "The Trouble with Physics"

17
00:00:43,477 --> 00:00:45,540
"Three Roads to Quantum Gravity"

18
00:00:45,540 --> 00:00:47,767
and "Einstein's Unfinished Revolution,

19
00:00:47,767 --> 00:00:50,490
"The Search For What
Lies Beyond The Quantum".

20
00:00:50,490 --> 00:00:53,070
- Lee shared with us his
philosophical perspectives

21
00:00:53,070 --> 00:00:54,930
on quantum mechanics too.

22
00:00:54,930 --> 00:00:56,880
He argues that quantum mechanics

23
00:00:56,880 --> 00:00:58,470
isn't actually a final theory,

24
00:00:58,470 --> 00:01:00,090
but is pointing in the direction of

25
00:01:00,090 --> 00:01:02,430
some new understanding of nature.

26
00:01:02,430 --> 00:01:05,070
And I was actually relieved
to hear Lee talk about this

27
00:01:05,070 --> 00:01:07,290
because if Lee Smolin
struggles to make sense

28
00:01:07,290 --> 00:01:08,220
of quantum theory,

29
00:01:08,220 --> 00:01:10,560
then maybe there's hope
for the rest of us.

30
00:01:10,560 --> 00:01:14,250
And Lee sees fundamental
physics as intertwined with art

31
00:01:14,250 --> 00:01:16,800
and with music and
philosophy and other ways

32
00:01:16,800 --> 00:01:19,137
that we humans try to
make sense of our world

33
00:01:19,137 --> 00:01:20,580
and our place in it.

34
00:01:20,580 --> 00:01:23,250
- Lee also opened up to
us about his challenges

35

00:01:23,250 --> 00:01:24,900
with Parkinson's disease

36

00:01:24,900 --> 00:01:27,210
and how these struggles
have shaped his thinking

37

00:01:27,210 --> 00:01:28,680
in recent years.

38

00:01:28,680 --> 00:01:31,050
We typically conduct these
conversations in person,

39

00:01:31,050 --> 00:01:33,480
but for this one, Lee joined us via Zoom.

40

00:01:33,480 --> 00:01:35,220
So, you may notice that it sounds

41

00:01:35,220 --> 00:01:37,380
a little bit different
than other episodes,

42

00:01:37,380 --> 00:01:38,700
but no matter the setting,

43

00:01:38,700 --> 00:01:40,260
we know that you're gonna be fascinated

44

00:01:40,260 --> 00:01:42,450
with Lee's insights and perspectives.

45

00:01:42,450 --> 00:01:45,243
So, let's step inside the
Perimeter with Lee Smolin.

46

00:01:48,390 --> 00:01:50,970

Hi Lee, and thank you
so much for joining us

47

00:01:50,970 --> 00:01:53,310
on Conversations at the Perimeter.

48

00:01:53,310 --> 00:01:55,920
We're so excited to talk to you today.

49

00:01:55,920 --> 00:01:59,010
I know that you're well known as somebody

50

00:01:59,010 --> 00:02:02,310
studying the most fundamental
questions in the universe,

51

00:02:02,310 --> 00:02:05,130
so, we thought we could
start off by asking you

52

00:02:05,130 --> 00:02:08,343
about some of the questions
that you're trying to answer.

53

00:02:09,240 --> 00:02:12,330
- I'm a storyteller and
I'm interested in telling

54

00:02:12,330 --> 00:02:14,700
the biggest story possible,

55

00:02:14,700 --> 00:02:17,880
which means that the
story that I want to tell,

56

00:02:17,880 --> 00:02:19,620
is the story of what we are.

57

00:02:19,620 --> 00:02:21,030
What we human beings are.

58
00:02:21,030 --> 00:02:22,230
Who we are.

59
00:02:22,230 --> 00:02:24,900
Why we are and how it makes sense

60
00:02:24,900 --> 00:02:27,180
that we're in this universe.

61
00:02:27,180 --> 00:02:29,610
In other words, the story I want to tell

62
00:02:29,610 --> 00:02:32,700
is the opposite of a religious story

63
00:02:32,700 --> 00:02:36,030
where the explanation for
every question ultimately

64
00:02:36,030 --> 00:02:40,710
goes down to some arbitrary act of faith.

65
00:02:40,710 --> 00:02:44,490
And I'm also interested
in the opposite of that,

66
00:02:44,490 --> 00:02:48,480
which is epitomized by Steve Weinberg's

67
00:02:48,480 --> 00:02:51,367
Epigram in his first book that says,

68
00:02:51,367 --> 00:02:53,977
"The more we understand
about the universe,

69

00:02:53,977 --> 00:02:56,220
"the more pointless it may be".

70

00:02:56,220 --> 00:02:58,320
And he didn't know that that was pun on

71

00:02:58,320 --> 00:03:01,140
we use of points and general relativity,

72

00:03:01,140 --> 00:03:04,800
but what he was saying was that,

73

00:03:04,800 --> 00:03:07,680
nothing that we know about nature explains

74

00:03:07,680 --> 00:03:09,060
what human beings are,

75

00:03:09,060 --> 00:03:12,090
why we're here, what consciousness is,

76

00:03:12,090 --> 00:03:16,380
or these things that everybody
is really interested in.

77

00:03:16,380 --> 00:03:20,790
So, I'm interested in
understanding the universe so well,

78

00:03:20,790 --> 00:03:24,900
that even such obscure questions like,

79

00:03:24,900 --> 00:03:26,970
why there is life in the universe?

80

00:03:26,970 --> 00:03:28,443
Have an interesting answer.

81

00:03:29,941 --> 00:03:32,070

That includes making sense
of quantum mechanics,

82

00:03:32,070 --> 00:03:34,590

because look, let's be real here.

83

00:03:34,590 --> 00:03:37,116

Quantum mechanics makes no sense.

84

00:03:37,116 --> 00:03:37,949

(Colin laughing)

- I was hoping

85

00:03:37,949 --> 00:03:38,782

you would say that.

86

00:03:38,782 --> 00:03:42,273

- No, it really makes no
sense. Most of my best friends,

87

00:03:43,480 --> 00:03:45,424

many of them like Carlo Rovelli

88

00:03:45,424 --> 00:03:49,290

believe that time is not fundamental.

89

00:03:49,290 --> 00:03:53,670

They believe that reality
is not what we think it is

90

00:03:53,670 --> 00:03:58,670

and we can get into that on
his time and they basically,

91

00:03:59,190 --> 00:04:01,260

in a certain sense given up,

92

00:04:01,260 --> 00:04:04,620
because they don't have the
answers to the questions like,

93
00:04:04,620 --> 00:04:07,440
why is the universe hospitable to life?

94
00:04:07,440 --> 00:04:08,610
That's what I'm interested in.

95
00:04:08,610 --> 00:04:10,740
I'm interested in what
is the law of physics?

96
00:04:10,740 --> 00:04:12,720
Not just what are the laws,

97
00:04:12,720 --> 00:04:14,370
but how do they come to be the laws,

98
00:04:14,370 --> 00:04:15,990
rather than other laws?

99
00:04:15,990 --> 00:04:18,930
And I'm interested in the old problem

100
00:04:18,930 --> 00:04:22,800
of putting together Einstein's
theory of general relativity

101
00:04:22,800 --> 00:04:24,960
with quantum mechanics.

102
00:04:24,960 --> 00:04:27,600
And I actually think I did
that and then I did that again

103
00:04:27,600 --> 00:04:30,090
and then somebody else did

it a different way again.

104

00:04:30,090 --> 00:04:32,787

The problem with that problem is that,

105

00:04:32,787 --> 00:04:33,690

it doesn't seem to be very unique.

106

00:04:33,690 --> 00:04:35,820

But anyway, that's another
one of those things

107

00:04:35,820 --> 00:04:36,723

I'm interested in.

108

00:04:38,250 --> 00:04:41,310

- Going back to your answer
about telling stories,

109

00:04:41,310 --> 00:04:44,250

these are the biggest
stories that you're tackling.

110

00:04:44,250 --> 00:04:46,110

What inspires you to chase

111

00:04:46,110 --> 00:04:49,320

these most fundamental questions?

112

00:04:49,320 --> 00:04:52,950

- You know, I think that
any line of questioning

113

00:04:52,950 --> 00:04:55,860

that you start on leads back to them.

114

00:04:55,860 --> 00:04:58,913

Sooner or later if you're
honest about your ignorance,

115

00:04:58,913 --> 00:05:01,140

you end up thinking about those question.

116

00:05:01,140 --> 00:05:03,570

- I think traditionally there are questions that have been

117

00:05:03,570 --> 00:05:06,330

thought outside of the realm of science, or physics.

118

00:05:06,330 --> 00:05:10,140

These are questions for philosophers and theologians,

119

00:05:10,140 --> 00:05:12,330

or is that a mis-categorization?

120

00:05:12,330 --> 00:05:14,460

Is that a misunderstanding of them?

121

00:05:14,460 --> 00:05:16,470

- Start with any question and in three moves

122

00:05:16,470 --> 00:05:18,870

we'll get to why is the universe here

123

00:05:18,870 --> 00:05:21,090

and why are the laws what they seem to be?

124

00:05:21,090 --> 00:05:23,220

Let me rephrase what you said.

125

00:05:23,220 --> 00:05:27,900

There is a metaphysic that was introduced by Newton

126

00:05:27,900 --> 00:05:30,480
and other people of the time

127

00:05:30,480 --> 00:05:33,210
and it's an expression
of their religious faith,

128

00:05:33,210 --> 00:05:34,650
very much when you look into it,

129

00:05:34,650 --> 00:05:37,000
because they were deep in religion

130

00:05:37,860 --> 00:05:42,453
and even practices of
mysticism and so forth.

131

00:05:44,117 --> 00:05:45,810
And speaking particularly of Isaac Newton,

132

00:05:45,810 --> 00:05:48,030
but there were others like that.

133

00:05:48,030 --> 00:05:51,180
Kepler was a great mystic

134

00:05:51,180 --> 00:05:55,770
and they had a metaphysical fantasy

135

00:05:55,770 --> 00:05:59,820
and their metaphysical
fantasy went like this.

136

00:05:59,820 --> 00:06:02,310
And I want you to guess who I'm quoting

137

00:06:02,310 --> 00:06:04,860
as I give the quote from memory.

138

00:06:04,860 --> 00:06:09,300

Supposing that there were laws

139

00:06:09,300 --> 00:06:13,080

which could tell exactly where

140

00:06:13,080 --> 00:06:17,190

every particle would be

any time in the future,

141

00:06:17,190 --> 00:06:20,850

if you knew where it was

now and how it was traveling

142

00:06:20,850 --> 00:06:24,270

and suppose you were really,

really, really good at algebra

143

00:06:24,270 --> 00:06:28,200

and you could compute all those laws

144

00:06:28,200 --> 00:06:30,720

and figure out where everything,

145

00:06:30,720 --> 00:06:33,330

every particle who would be in the future,

146

00:06:33,330 --> 00:06:36,480

then we would have no agency,

147

00:06:36,480 --> 00:06:39,630

no will, our existence, our decisions,

148

00:06:39,630 --> 00:06:43,740

our ethical quandaries

would be inconsequential,

149

00:06:43,740 --> 00:06:45,510
because everything would be predicted

150
00:06:45,510 --> 00:06:46,980
from the motions of particles,

151
00:06:46,980 --> 00:06:50,220
which has no meaning on those levels.

152
00:06:50,220 --> 00:06:52,050
The amazing thing about
this argument is that

153
00:06:52,050 --> 00:06:54,330
even if you aren't so smart,

154
00:06:54,330 --> 00:06:59,330
just being able to say that
there are laws of that kind

155
00:06:59,640 --> 00:07:03,330
makes those dreadful
consequences apparent.

156
00:07:03,330 --> 00:07:05,130
Now who did I quote?

157
00:07:05,130 --> 00:07:07,110
- I'll go with René Descartes.

158
00:07:07,110 --> 00:07:08,010
- No.
- No?

159
00:07:08,010 --> 00:07:10,380
- I know I saw it quoted
in one of the articles

160
00:07:10,380 --> 00:07:13,230

I was reading about you
before we began the recording,

161
00:07:13,230 --> 00:07:16,410
but I now can't remember who it was by.

162
00:07:16,410 --> 00:07:17,700
- Let's save this for the end

163
00:07:17,700 --> 00:07:19,493
of the podcast.
- Oh suspense, okay.

164
00:07:19,493 --> 00:07:20,410
- Oh, okay.

165
00:07:21,333 --> 00:07:24,030
You know, I wanna ask how you can measure

166
00:07:24,030 --> 00:07:26,880
when you're making progress
on these kinds of questions,

167
00:07:26,880 --> 00:07:29,490
because these are such
fundamental questions.

168
00:07:29,490 --> 00:07:31,950
What are the laws and how
did they come to be laws?

169
00:07:31,950 --> 00:07:35,010
Have you been able to measure
progress in answering these

170
00:07:35,010 --> 00:07:36,660
questions throughout your career?

171
00:07:37,980 --> 00:07:42,120

- All good questions have
contradictory paradoxical answers,

172

00:07:42,120 --> 00:07:44,070
so I'm gonna answer it like that.

173

00:07:44,070 --> 00:07:46,530
One is the answer that has always been,

174

00:07:46,530 --> 00:07:48,990
which is that we can test our ideas,

175

00:07:48,990 --> 00:07:53,730
because we use mathematics
to formulate our ideas.

176

00:07:53,730 --> 00:07:58,590
We can compute exactly as
the quote would tell us to do

177

00:07:58,590 --> 00:08:00,750
the future and test that.

178

00:08:00,750 --> 00:08:03,330
And we can do that in
very restricted cases

179

00:08:03,330 --> 00:08:06,573
like walls rolling down
in (indistinct) planes,

180

00:08:07,841 --> 00:08:09,960
or the motion of a planet like Mars.

181

00:08:09,960 --> 00:08:11,040
But when we can do it,

182

00:08:11,040 --> 00:08:13,590
we really do it and it really works.

183
00:08:13,590 --> 00:08:17,040
So, that's the most impressive thing

184
00:08:17,040 --> 00:08:20,040
because you can have an
argument like Newton says,

185
00:08:20,040 --> 00:08:22,890
here's my calculation
of how the comets move.

186
00:08:22,890 --> 00:08:25,020
And Leibniz is very philosophical,

187
00:08:25,020 --> 00:08:27,382
says blah blah philosophy blah,

188
00:08:27,382 --> 00:08:28,500
philosophy blah philosophy,
blah, blah, philosophy.

189
00:08:28,500 --> 00:08:29,873
And Newton says,

190
00:08:29,873 --> 00:08:30,706
"No, it really works.

191
00:08:30,706 --> 00:08:33,000
"Here's where you'll see the
comet if you look in the sky"

192
00:08:33,000 --> 00:08:34,740
and some other philosophers go,

193
00:08:34,740 --> 00:08:35,910
blah, blah, blah,

194

00:08:35,910 --> 00:08:37,830
well the audience prefers Newton,

195
00:08:37,830 --> 00:08:40,320
because it really works,

196
00:08:40,320 --> 00:08:43,890
even if Newton's metaphysics
is religious nonsense

197
00:08:43,890 --> 00:08:45,720
and philosophical nonsense.

198
00:08:45,720 --> 00:08:50,070
So, that's roughly what happened
and that's still the case.

199
00:08:50,070 --> 00:08:54,150
If I come along as I do and am doing

200
00:08:54,150 --> 00:08:58,620
and claim that I have a deeper
theory of microscopic physics

201
00:08:58,620 --> 00:09:00,960
that explains quantum mechanics.

202
00:09:00,960 --> 00:09:03,720
You don't have to take
all these crazy things

203
00:09:03,720 --> 00:09:08,310
and just ignore that they
don't make any sense.

204
00:09:08,310 --> 00:09:10,530
Ultimately the question is,

205
00:09:10,530 --> 00:09:13,950

can you make a prediction
that shows where your theory

206

00:09:13,950 --> 00:09:16,800
would differ from
ordinary quantum mechanics

207

00:09:16,800 --> 00:09:19,080
and can we run that test?

208

00:09:19,080 --> 00:09:21,390
That's actually always been the answer

209

00:09:21,390 --> 00:09:23,190
and that's the real answer.

210

00:09:23,190 --> 00:09:28,110
But we in the 21st century are
sociologically sophisticated.

211

00:09:28,110 --> 00:09:30,630
So, we tell that story
a little bit different.

212

00:09:30,630 --> 00:09:35,370
We say there are communities
that validates science

213

00:09:35,370 --> 00:09:39,480
and how do you become a
member of that community?

214

00:09:39,480 --> 00:09:41,520
You become a member of that community

215

00:09:41,520 --> 00:09:46,050
by learning the technical side,

216

00:09:46,050 --> 00:09:49,650

by learning the techniques
that those in the community

217

00:09:49,650 --> 00:09:52,680
have discovered are very
good for finding errors

218

00:09:52,680 --> 00:09:53,850
in your work.

219

00:09:53,850 --> 00:09:56,370
Because what a scientific community is,

220

00:09:56,370 --> 00:09:58,740
is a group of people who
are pledged to each other

221

00:09:58,740 --> 00:10:02,160
to be honest and to in good faith

222

00:10:02,160 --> 00:10:03,439
and by the way,

223

00:10:03,439 --> 00:10:04,830
I didn't realize that when
I used that expression,

224

00:10:04,830 --> 00:10:08,610
but it comes from Jean Paul
Sartre in The Existentialist

225

00:10:08,610 --> 00:10:10,620
and so forth apparently.

226

00:10:10,620 --> 00:10:11,943
But we know what it means,

227

00:10:12,943 --> 00:10:14,700
good faith means you're not

trying to play any tricks,

228

00:10:14,700 --> 00:10:16,323

or cheat anybody.

229

00:10:17,277 --> 00:10:19,800

You report honestly the
result of your observations

230

00:10:19,800 --> 00:10:22,320

and your calculations
and your experiments.

231

00:10:22,320 --> 00:10:26,130

And then the community agrees to be bound

232

00:10:26,130 --> 00:10:30,120

by those displays of likelihood.

233

00:10:30,120 --> 00:10:32,130

I become a member of the community

234

00:10:32,130 --> 00:10:36,990

of theoretical physicists,
when I write a PhD thesis,

235

00:10:36,990 --> 00:10:41,550

which impresses my community
enough that they can trust me,

236

00:10:41,550 --> 00:10:44,340

because nobody's gonna go
check everybody else's errors.

237

00:10:44,340 --> 00:10:47,190

So, I think that this is
really how science works.

238

00:10:47,190 --> 00:10:49,020

There at these communities,

239

00:10:49,020 --> 00:10:52,860
membership in the communities
that's highly controlled

240

00:10:52,860 --> 00:10:55,470
as as you might say it should be.

241

00:10:55,470 --> 00:10:57,720
And I know that this will
make some people unhappy,

242

00:10:57,720 --> 00:11:00,570
but I think this is the way it works

243

00:11:00,570 --> 00:11:02,400
and the only way it can work

244

00:11:02,400 --> 00:11:07,350
and something is judged to be part of the

245

00:11:07,350 --> 00:11:09,810
current understanding, or the canon,

246

00:11:09,810 --> 00:11:12,843
when it's past many tests of this kind.

247

00:11:13,800 --> 00:11:17,100
It gives a fantastic
surprising predictions,

248

00:11:17,100 --> 00:11:20,820
but the whole social
structure explains to me

249

00:11:20,820 --> 00:11:25,200
what I see happening all
the time in seminars and..

250

00:11:25,200 --> 00:11:27,300

- Well, I was gonna
ask, you mentioned that

251

00:11:27,300 --> 00:11:29,430

a lot of your efforts and your work

252

00:11:29,430 --> 00:11:31,830

have been trying to make
sense of quantum mechanics,

253

00:11:31,830 --> 00:11:35,370

trying to figure out what's
missing, or what's incomplete.

254

00:11:35,370 --> 00:11:38,040

Can you just take us back
a little bit for listeners

255

00:11:38,040 --> 00:11:40,170

who may not be familiar with the challenge

256

00:11:40,170 --> 00:11:41,640

that you're up against.

257

00:11:41,640 --> 00:11:44,030

Why is figuring out quantum mechanics

258

00:11:44,030 --> 00:11:49,030

such a a challenge and and
unifying with general relativity?

259

00:11:49,140 --> 00:11:52,800

Why is this such a
focal point for physics?

260

00:11:52,800 --> 00:11:54,810

- Because it's embarrassing.

261

00:11:54,810 --> 00:11:58,410

It's really embarrassing
that the best explanation

262

00:11:58,410 --> 00:12:02,970

that we have has so much
that's contradictory

263

00:12:02,970 --> 00:12:05,070

and against realism.

264

00:12:05,070 --> 00:12:07,920

So, let me give some definitions here.

265

00:12:07,920 --> 00:12:08,820

I am a realist,

266

00:12:08,820 --> 00:12:10,380

I hope you are realist.

267

00:12:10,380 --> 00:12:15,380

If you believe that there
is a reality independent

268

00:12:16,140 --> 00:12:19,110

of our experience and
our knowledge, or belief

269

00:12:19,110 --> 00:12:24,110

and that it is possible to gain
knowledge about that reality

270

00:12:24,750 --> 00:12:28,560

by some methodology like the
one that I was describing,

271

00:12:28,560 --> 00:12:32,460

that as it's stable

enough and concrete enough

272

00:12:32,460 --> 00:12:35,391
that you can gain knowledge of it,

273

00:12:35,391 --> 00:12:36,930
then we're realist and we
sometimes say we're realist

274

00:12:36,930 --> 00:12:37,890
about different things.

275

00:12:37,890 --> 00:12:40,050
I'm a realist about atoms.

276

00:12:40,050 --> 00:12:43,200
That means I don't think that
atoms are just a contrivance

277

00:12:43,200 --> 00:12:44,970
to do a calculation.

278

00:12:44,970 --> 00:12:46,810
They're really, really are atoms

279

00:12:48,329 --> 00:12:51,930
and I'm also a realist about
life, about consciousness,

280

00:12:51,930 --> 00:12:56,790
about colors and I'm also
a realist about electrons

281

00:12:56,790 --> 00:13:01,020
and protons and atoms and
molecules and quarks and so forth,

282

00:13:01,020 --> 00:13:04,530
which means I want a version of the theory

283

00:13:04,530 --> 00:13:08,640
that explains and
describes all those things,

284

00:13:08,640 --> 00:13:11,370
which doesn't depend on my observation,

285

00:13:11,370 --> 00:13:14,310
or my belief, or my existence.

286

00:13:14,310 --> 00:13:17,670
Finally, mechanics come
as in many formulations,

287

00:13:17,670 --> 00:13:19,500
which is interesting enough

288

00:13:19,500 --> 00:13:23,580
and many of those
formulations not only violate

289

00:13:23,580 --> 00:13:25,350
that principle of realism,

290

00:13:25,350 --> 00:13:28,200
but they have all sorts of
rhetoric about how it's dead

291

00:13:28,200 --> 00:13:30,150
and it was killed off by Nietzsche,

292

00:13:30,150 --> 00:13:33,330
or the Nazis, or whoever.

293

00:13:33,330 --> 00:13:36,990
That now we live in a
relational world where,

294

00:13:36,990 --> 00:13:40,020
your belief is as good as
mine, or anybody else's

295

00:13:40,020 --> 00:13:44,700
because we're all just relative
man and I'm against that.

296

00:13:44,700 --> 00:13:49,410
But that is a very, that
relativistic point of view

297

00:13:49,410 --> 00:13:53,970
is very common in the
20th and the 21st century.

298

00:13:53,970 --> 00:13:58,020
And many of the people who
developed quantum mechanics

299

00:13:58,020 --> 00:13:59,460
were anti-realist.

300

00:13:59,460 --> 00:14:02,190
They didn't believe that
there were any facts

301

00:14:02,190 --> 00:14:04,350
about the world which were true,

302

00:14:04,350 --> 00:14:07,590
except when they were
created by intervention,

303

00:14:07,590 --> 00:14:10,323
by human beings doing experiments.

304

00:14:11,490 --> 00:14:13,140
- Just to ask one question there,

305

00:14:13,140 --> 00:14:15,600

would those people have
described themselves

306

00:14:15,600 --> 00:14:18,360

as anti-realists at the time?

307

00:14:18,360 --> 00:14:20,730

- Oh for sure.

- Really?

308

00:14:20,730 --> 00:14:23,010

- Sure, read Niels Bohr.

309

00:14:23,010 --> 00:14:25,300

I mean these people had agendas

310

00:14:26,280 --> 00:14:30,270

and you have to think this
was after the first world war,

311

00:14:30,270 --> 00:14:35,100

there was a lot of people
who were anti-realist

312

00:14:35,100 --> 00:14:36,450

and all kinds of things,

313

00:14:36,450 --> 00:14:40,050

because they were so
dismayed and disappointed

314

00:14:40,050 --> 00:14:41,703

by what had just happened.

315

00:14:42,720 --> 00:14:47,220

Niels Bohr was a close
student of Schopenhauer

316

00:14:47,220 --> 00:14:51,003
and other anti-realist philosophers.

317

00:14:52,350 --> 00:14:54,990
- When I hear the term anti-realist,

318

00:14:54,990 --> 00:14:57,120
I read it in your book many times,

319

00:14:57,120 --> 00:14:58,770
realist versus anti-realist.

320

00:14:58,770 --> 00:15:01,470
The anti-realist strikes me
as a shorthand for saying,

321

00:15:01,470 --> 00:15:02,940
well it must be wrong.

322

00:15:02,940 --> 00:15:05,550
If it's not real then it
must be unreal, incorrect.

323

00:15:05,550 --> 00:15:09,153
But that's not the exact
distinction we're making is it?

324

00:15:10,020 --> 00:15:12,450
- My distinction since I'm a realist.

325

00:15:12,450 --> 00:15:14,010
But I have, as I said,

326

00:15:14,010 --> 00:15:17,460
genuinely many very good
friends who are not realists.

327

00:15:17,460 --> 00:15:20,495
- So how do they like
being called anti-realists?

328
00:15:20,495 --> 00:15:21,619
- They love it.

329
00:15:21,619 --> 00:15:23,640
It puts them right there
where they wanna be.

330
00:15:23,640 --> 00:15:27,690
See, a lot of this is about
people positioning themselves

331
00:15:27,690 --> 00:15:31,200
in a bigger context than
theoretical physics.

332
00:15:31,200 --> 00:15:33,540
They wanted to see themselves

333
00:15:33,540 --> 00:15:35,730
in the big philosophical fights

334
00:15:35,730 --> 00:15:37,140
of the late 20th century,

335
00:15:37,140 --> 00:15:41,340
which have to do with
modernism and postmodernism,

336
00:15:41,340 --> 00:15:45,900
and so there is a consistent
story about quantum physics

337
00:15:45,900 --> 00:15:50,900
as a great advance of
non-realism, or anti-realism.

338

00:15:52,620 --> 00:15:54,802

- You know, I think about

339

00:15:54,802 --> 00:15:57,030

the Copenhagen interpretation
and the idea of many worlds,

340

00:15:57,030 --> 00:15:58,683

some of the things that people,

341

00:15:59,971 --> 00:16:02,040

that their minds tend to rebel against,

342

00:16:02,040 --> 00:16:03,570

because these things are so strange.

343

00:16:03,570 --> 00:16:05,490

But you make it clear in in your books

344

00:16:05,490 --> 00:16:08,460

that quantum mechanics is
you said it to us earlier,

345

00:16:08,460 --> 00:16:10,413

it's strange, it's bizarre.

346

00:16:11,305 --> 00:16:13,230

It if it's inherently unusual,

347

00:16:13,230 --> 00:16:16,110

or counter intuitive to us,

348

00:16:16,110 --> 00:16:19,053

that doesn't make it
anti realistic theory?

349

00:16:20,040 --> 00:16:21,840

- Yes I think it does.

350

00:16:21,840 --> 00:16:24,330

But there are versions
of quantum mechanics

351

00:16:24,330 --> 00:16:26,550

that are completely realists,

352

00:16:26,550 --> 00:16:29,700

like pilot wave theory of de Broglie

353

00:16:29,700 --> 00:16:32,340

which was actually the first
version of quantum mechanics

354

00:16:32,340 --> 00:16:34,830

that was developed because de Broglie

355

00:16:34,830 --> 00:16:37,560

developed his version of quantum mechanics

356

00:16:37,560 --> 00:16:41,040

which was completely
realist about a year before,

357

00:16:41,040 --> 00:16:43,470

if I remember the history right,

358

00:16:43,470 --> 00:16:47,190

Heisenberg and Schrödinger
developed their versions,

359

00:16:47,190 --> 00:16:48,333

which was 1927.

360

00:16:50,556 --> 00:16:52,140

Schrödinger also was a realist

361

00:16:52,140 --> 00:16:54,930
and he thought he was
developing a realist formulation

362
00:16:54,930 --> 00:16:57,970
of quantum mechanic but
he turned out he was wrong

363
00:16:57,970 --> 00:16:59,580
about his own formulation.

364
00:16:59,580 --> 00:17:00,843
Truly his great regret.

365
00:17:01,770 --> 00:17:04,890
- Some theories like
Heisenberg's and others,

366
00:17:04,890 --> 00:17:07,800
seem to rise the top of
the pile so to speak.

367
00:17:07,800 --> 00:17:09,630
They seem to be more popular,

368
00:17:09,630 --> 00:17:12,300
or more widely taught than others.

369
00:17:12,300 --> 00:17:14,760
Is that a fluke of history, or is that

370
00:17:14,760 --> 00:17:17,790
why is de Broglie pilot wave theory

371
00:17:17,790 --> 00:17:21,300
not the theory that
everybody's most familiar with?

372
00:17:21,300 --> 00:17:22,950

- First of all, let me say at the start,

373

00:17:22,950 --> 00:17:25,620

I think it's changing, thankfully.

374

00:17:25,620 --> 00:17:28,830

This is the part of the
story I want to tell.

375

00:17:28,830 --> 00:17:33,780

There was a generation that
invented quantum mechanics

376

00:17:33,780 --> 00:17:36,930

and that included Einstein, who
started the whole thing off,

377

00:17:36,930 --> 00:17:40,380

even though he repudiated
the direction it took.

378

00:17:40,380 --> 00:17:44,670

Niels Bohr, Heisenberg,
Schrödinger, Max Born

379

00:17:44,670 --> 00:17:46,943

and a bunch of other people,

380

00:17:46,943 --> 00:17:49,470

who were all about as old as the century.

381

00:17:49,470 --> 00:17:51,840

Einstein was older and Bohr was older

382

00:17:52,940 --> 00:17:55,200

and Schrödinger it was a bit older.

383

00:17:55,200 --> 00:17:59,520

But typically we're

talking sort of 1925, 1926

384

00:18:00,600 --> 00:18:05,600
and Heisenberg was 22,
23 and they were all

385

00:18:07,290 --> 00:18:09,510
foundationally oriented.

386

00:18:09,510 --> 00:18:13,260
And what I mean by that, is
that they thought in terms of

387

00:18:13,260 --> 00:18:18,260
these fundamental questions
and they had a good education

388

00:18:19,280 --> 00:18:22,860
in the history of attempts
to answer these questions,

389

00:18:22,860 --> 00:18:24,780
which means that they
could read philosophy

390

00:18:24,780 --> 00:18:27,420
and they had school read philosophy

391

00:18:27,420 --> 00:18:31,410
and they were philosophically
sophisticated.

392

00:18:31,410 --> 00:18:36,410
And that is a style of
physics to reference

393

00:18:37,920 --> 00:18:41,310
the great philosophers, or
philosophical physicists

394

00:18:41,310 --> 00:18:46,310
in your arguments to
make the slow, careful,

395

00:18:46,650 --> 00:18:50,020
deep, reflective arguments in thought

396

00:18:51,270 --> 00:18:53,130
that is the best of that kind of science.

397

00:18:53,130 --> 00:18:56,520
And they dominated science in the period

398

00:18:56,520 --> 00:18:57,390
that we're talking about,

399

00:18:57,390 --> 00:19:02,080
which is sort of 1900 to early 1930s

400

00:19:03,300 --> 00:19:06,330
'cause that you had to
think about those questions

401

00:19:06,330 --> 00:19:08,280
to push science forward.

402

00:19:08,280 --> 00:19:11,580
Things were so unexpected and surprising

403

00:19:11,580 --> 00:19:14,760
that if you didn't have a
philosophical orientation

404

00:19:14,760 --> 00:19:16,290
you might give up.

405

00:19:16,290 --> 00:19:20,910
So, that community was

also centered in Europe,

406

00:19:20,910 --> 00:19:22,530

it's important to say.

407

00:19:22,530 --> 00:19:25,110

It was centered in Paris and Berlin

408

00:19:25,110 --> 00:19:29,040

and a little bit in London,
not Cambridge, Oxford,

409

00:19:29,040 --> 00:19:31,050

a little bit in the northern countries

410

00:19:31,050 --> 00:19:32,680

like Copenhagen

411

00:19:33,600 --> 00:19:37,140

and the one place that didn't take on

412

00:19:37,140 --> 00:19:39,820

that philosophical orientation was really

413

00:19:41,073 --> 00:19:42,803

and always was in the United States.

414

00:19:43,753 --> 00:19:45,630

But what happened in World War II,

415

00:19:45,630 --> 00:19:49,260

is first of all the
countries and the cultures

416

00:19:49,260 --> 00:19:53,700

that supported that kind
of science where desolated

417

00:19:53,700 --> 00:19:57,690
and the center of physics

418
00:19:57,690 --> 00:20:00,570
moved very quickly to the United States

419
00:20:00,570 --> 00:20:02,130
and there it encountered

420
00:20:02,130 --> 00:20:06,840
a very pragmatic scientific
and otherwise culture.

421
00:20:06,840 --> 00:20:09,120
So, here's an example.

422
00:20:09,120 --> 00:20:13,500
Freeman Dyson who was the
more I reflect on him,

423
00:20:13,500 --> 00:20:17,370
he died a few years ago and
he was a little bit a friend

424
00:20:17,370 --> 00:20:19,170
and I wish I had been a better friend.

425
00:20:19,170 --> 00:20:22,170
But anyway, Freeman Dyson
liked to put it this way,

426
00:20:22,170 --> 00:20:26,047
he said "In most
generations the old people

427
00:20:26,047 --> 00:20:29,010
"of the conservatives and the
young people are the rebels".

428

00:20:29,010 --> 00:20:31,050
But in physics in his generation,

429
00:20:31,050 --> 00:20:33,810
the old people were a bunch of rebels

430
00:20:33,810 --> 00:20:35,910
who were (indistinct) and
they were always arguing

431
00:20:35,910 --> 00:20:38,020
about philosophy and meaning

432
00:20:39,060 --> 00:20:42,240
and meanwhile there were all
these great physics problems

433
00:20:42,240 --> 00:20:44,790
to solve by taking the theory,

434
00:20:44,790 --> 00:20:48,420
however badly understood
and just applying it

435
00:20:48,420 --> 00:20:51,390
to atoms and molecules
and solids and gases

436
00:20:51,390 --> 00:20:55,230
and nuclear gravity and
particles and so forth.

437
00:20:55,230 --> 00:20:59,010
And they were making tremendous progress

438
00:20:59,010 --> 00:21:01,350
without worrying about the foundations.

439
00:21:01,350 --> 00:21:03,650

- Is that the met up and
calculate generation?

440

00:21:04,560 --> 00:21:07,440
Yes, that's the allegedly the set

441

00:21:07,440 --> 00:21:08,760
and calculating generation.

442

00:21:08,760 --> 00:21:10,050
- For more practical matters,

443

00:21:10,050 --> 00:21:13,023
were pressing rather than
the philosophical ones?

444

00:21:14,070 --> 00:21:19,070
- Yes and Richard Feynman is
the great hero of that period.

445

00:21:20,850 --> 00:21:23,640
- Do you think it's possible to say,

446

00:21:23,640 --> 00:21:26,400
is there an ideal balance
between addressing

447

00:21:26,400 --> 00:21:28,290
these more philosophical questions,

448

00:21:28,290 --> 00:21:30,723
versus more pragmatic ones?

449

00:21:31,590 --> 00:21:35,130
- I think it depends
on what has to be done,

450

00:21:35,130 --> 00:21:38,700
for what was happening in

science in that period,

451

00:21:38,700 --> 00:21:41,800

which is sort of 1930 to

452

00:21:42,720 --> 00:21:46,140

1973 or so, 19

453

00:21:46,140 --> 00:21:48,870

and I'll tell you in a
minute how I'm dating them.

454

00:21:48,870 --> 00:21:50,370

It was what was needed.

455

00:21:50,370 --> 00:21:52,680

The people who were
arguing about philosophy,

456

00:21:52,680 --> 00:21:54,123

were not getting anywhere.

457

00:21:55,650 --> 00:21:56,483

What they were doing

458

00:21:56,483 --> 00:21:58,740

was not appealing to the younger people.

459

00:21:58,740 --> 00:22:03,600

But let me introduce a contrast
and raise some questions

460

00:22:03,600 --> 00:22:07,170

that I've recently been
thinking a lot about.

461

00:22:07,170 --> 00:22:10,710

I've been reading Menards in New York,

462

00:22:10,710 --> 00:22:13,290

he's a New Yorker editor and writer

463

00:22:13,290 --> 00:22:15,843

and a professor of English at Harvard.

464

00:22:16,814 --> 00:22:19,290

He's a very great sort
of intellectual historian

465

00:22:19,290 --> 00:22:22,290

and he has a book about the history of art

466

00:22:22,290 --> 00:22:24,990

and thought during the Cold War

467

00:22:24,990 --> 00:22:27,930

and of course the same
thing happened in art.

468

00:22:27,930 --> 00:22:29,520

That is the center of art,

469

00:22:29,520 --> 00:22:33,460

which in Europe in old
Europe was of course Paris

470

00:22:34,428 --> 00:22:36,420

and Paris is where you had to go,

471

00:22:36,420 --> 00:22:41,420

moved to New York in the 1930s and 1940s,

472

00:22:41,520 --> 00:22:44,310

because people were fleeing Nazism

473

00:22:44,310 --> 00:22:47,738

and it's, he documents that

and it's extraordinary,

474

00:22:47,738 --> 00:22:50,190
500 of the best painters in the world

475

00:22:50,190 --> 00:22:52,440
moved from Paris to New York.

476

00:22:52,440 --> 00:22:56,880
The Americans took over
and learned a great deal

477

00:22:56,880 --> 00:22:59,520
from the Europeans and then the Europeans,

478

00:22:59,520 --> 00:23:00,990
many of them went back to Europe

479

00:23:00,990 --> 00:23:05,040
but the center of art stayed in New York.

480

00:23:05,040 --> 00:23:08,130
Something like that
happens in physics too,

481

00:23:08,130 --> 00:23:10,524
I think there's a great
book to be written.

482

00:23:10,524 --> 00:23:12,783
I couldn't write, of those artists

483

00:23:12,783 --> 00:23:15,033
and those physicists
encountering each other.

484

00:23:15,870 --> 00:23:20,220
For example, the great
anthropologist Levy Strauss

485

00:23:20,220 --> 00:23:23,940

lived in the same
building as Claude Shannon

486

00:23:23,940 --> 00:23:25,263

and they never met,

487

00:23:26,220 --> 00:23:29,033

but I think there were some meets.

488

00:23:29,033 --> 00:23:30,263

I think Feynman hung out.

489

00:23:31,505 --> 00:23:33,155

Feynman was also a jazz musician,

490

00:23:34,209 --> 00:23:35,303

he was also an abstract
expressionist painter.

491

00:23:36,310 --> 00:23:39,150

I think Einstein hung out in the so-called

492

00:23:39,150 --> 00:23:40,920

black side of Princeton.

493

00:23:40,920 --> 00:23:43,660

Freeman certainly did, David Bone did

494

00:23:45,361 --> 00:23:50,361

and I think there's a lot
of history about how science

495

00:23:50,700 --> 00:23:52,800

was taken over by the Americans

496

00:23:52,800 --> 00:23:55,740

and the American pragmatic philosophy.

497

00:23:55,740 --> 00:23:59,906

Now, I said that you asked
me, is that the right thing?

498

00:23:59,906 --> 00:24:02,080

Well, it's the right thing in the context

499

00:24:03,121 --> 00:24:06,011

in which you have a lot of
discoveries experimentally,

500

00:24:06,011 --> 00:24:08,640

which fit in to the existing paradigm.

501

00:24:08,640 --> 00:24:12,060

What happens is that that paradigm

502

00:24:12,060 --> 00:24:14,980

runs out in the middle late 1970s

503

00:24:16,152 --> 00:24:18,960

it's in a very interesting
question why it runs out.

504

00:24:18,960 --> 00:24:21,750

But basically, it's largest triumph

505

00:24:21,750 --> 00:24:25,014

was the standard model
of particle physics.

506

00:24:25,014 --> 00:24:27,750

It's stopped producing new discoveries,

507

00:24:27,750 --> 00:24:30,510

communicating to our
friends here at Perimeter,

508

00:24:30,510 --> 00:24:32,310
who do particle physics.

509

00:24:32,310 --> 00:24:34,950
Excuse me, your theory has been dead

510

00:24:34,950 --> 00:24:37,050
since before you were born.

511

00:24:37,050 --> 00:24:39,420
Seriously, I mean do they react to it?

512

00:24:39,420 --> 00:24:43,830
Well maybe now in 2022,

513

00:24:43,830 --> 00:24:46,380
the bravest of them write
papers about the crisis

514

00:24:46,380 --> 00:24:48,120
in particle physics.

515

00:24:48,120 --> 00:24:50,010
But anybody with eyes to see,

516

00:24:50,010 --> 00:24:53,190
understood there was a
crisis in the methodology

517

00:24:53,190 --> 00:24:58,190
of elementary particle
physics already in 1975, 1976.

518

00:24:58,740 --> 00:25:02,520
For example, Abraham
Price who somewhat later

519

00:25:02,520 --> 00:25:05,940
became a friend of mine,
we used to have lunch off

520
00:25:05,940 --> 00:25:07,683
in the Rockefeller University.

521
00:25:09,110 --> 00:25:13,050
And he was a great physicist
who was in New York

522
00:25:13,050 --> 00:25:16,910
and was a great appreciator of art.

523
00:25:16,910 --> 00:25:20,940
For example, he had a Picasso
that he had bought in Paris

524
00:25:20,940 --> 00:25:25,940
in 1945 with all his
family's like savings,

525
00:25:26,160 --> 00:25:28,623
which survived the war one Picasso.

526
00:25:29,550 --> 00:25:32,460
Ron was of that earlier culture

527
00:25:32,460 --> 00:25:36,270
and we often talked about the transition

528
00:25:36,270 --> 00:25:39,450
and of course he wrote some
great books about himself

529
00:25:39,450 --> 00:25:41,853
and about Einstein and Bohn and so forth.

530
00:25:43,773 --> 00:25:46,433

My view has been since I entered physics

531

00:25:46,433 --> 00:25:50,460
in the middle 70s, that
the current dominant

532

00:25:50,460 --> 00:25:53,190
methodology was failing.

533

00:25:53,190 --> 00:25:55,840
I don't understand why
everybody else doesn't see it.

534

00:25:57,053 --> 00:26:00,033
(Indistinct) and he pointed out clearly.

535

00:26:01,460 --> 00:26:03,810
- So, how do you think we
need to shift our focus,

536

00:26:03,810 --> 00:26:06,903
or perspective moving forward from today?

537

00:26:07,830 --> 00:26:11,370
- We all need to take
a deep breath and say,

538

00:26:11,370 --> 00:26:14,040
we theorists of all kinds,

539

00:26:14,040 --> 00:26:16,860
everything we've been
working has yet to lead to

540

00:26:16,860 --> 00:26:20,820
substantial progress since the 1970s.

541

00:26:20,820 --> 00:26:22,260
Can we say it again?

542

00:26:22,260 --> 00:26:26,910

We need to get normalized
to that, the situation.

543

00:26:26,910 --> 00:26:29,040

Therefore what do we need?

544

00:26:29,040 --> 00:26:32,700

We need people who are rebels,

545

00:26:32,700 --> 00:26:35,610

who are not concerned
with their social status

546

00:26:35,610 --> 00:26:38,190

within the field of science, or otherwise.

547

00:26:38,190 --> 00:26:41,250

We always need people who
are great technically,

548

00:26:41,250 --> 00:26:44,160

but we need them to be imaginative,

549

00:26:44,160 --> 00:26:46,620

to be independent thinkers,

550

00:26:46,620 --> 00:26:51,620

to have their own compass
and to have deep curiosity

551

00:26:51,930 --> 00:26:54,240

and abundant current.

552

00:26:54,240 --> 00:26:55,500

- Lee, throughout your career

553

00:26:55,500 --> 00:26:57,960
you've been seen as a rebel yourself,

554
00:26:57,960 --> 00:27:00,240
someone who's a little
outside of the norms

555
00:27:00,240 --> 00:27:02,400
and likes to challenge conventions.

556
00:27:02,400 --> 00:27:04,350
Did that come naturally?

557
00:27:04,350 --> 00:27:06,870
Do you consider that a
professional hallmark of yours?

558
00:27:06,870 --> 00:27:08,920
Where does that rebelliousness come from?

559
00:27:10,340 --> 00:27:12,005
- But it's not true.

560
00:27:12,005 --> 00:27:13,463
I mean I'm not that kind of person.

561
00:27:14,323 --> 00:27:16,770
My stick, or my gain,

562
00:27:16,770 --> 00:27:19,590
which is very clear if
you look at all my papers,

563
00:27:19,590 --> 00:27:22,260
is stealing a really good idea

564
00:27:22,260 --> 00:27:24,980
from one domain in theoretical physics

565

00:27:24,980 --> 00:27:26,700
and applying it to another,

566

00:27:26,700 --> 00:27:30,150
or sometimes another domain
of science outside of physics.

567

00:27:30,150 --> 00:27:33,640
That's when I'm good at
sniffing out congruences

568

00:27:34,586 --> 00:27:38,460
and similes and metaphors
in the mathematics spheres.

569

00:27:38,460 --> 00:27:42,210
Which means that I know the
present stuff pretty well.

570

00:27:42,210 --> 00:27:44,460
If you want rebels, real rebels,

571

00:27:44,460 --> 00:27:46,980
you want people who are taking much more

572

00:27:46,980 --> 00:27:50,040
outlandish risks than I do.

573

00:27:50,040 --> 00:27:52,830
I take a very controlled risk.

574

00:27:52,830 --> 00:27:55,830
I take the most important
idea in particle physics

575

00:27:55,830 --> 00:27:57,750
for the last 100 years,

576

00:27:57,750 --> 00:28:02,580
which is the close connection
between quantum gauge fields

577

00:28:02,580 --> 00:28:07,580
and dynamics having of strings
and membranes and so forth.

578

00:28:08,790 --> 00:28:12,690
That idea was invented by
Russian high energy physicists,

579

00:28:12,690 --> 00:28:15,330
Sasha Parley (indistinct) and his friends

580

00:28:15,330 --> 00:28:20,330
and I just took that idea and
applied it to Quantum Gravity

581

00:28:20,550 --> 00:28:25,290
with a few more necessary
inputs from friends,

582

00:28:25,290 --> 00:28:27,910
like (indistinct) and Carlo Rovelli

583

00:28:29,928 --> 00:28:30,801
I don't understand.

584

00:28:30,801 --> 00:28:33,270
To me that was a deeply
conservative move to me.

585

00:28:33,270 --> 00:28:35,370
Now, of course it may not be right,

586

00:28:35,370 --> 00:28:37,170
'cause we don't have experiments,

587

00:28:37,170 --> 00:28:39,393
but it's doing pretty well.

588
00:28:40,260 --> 00:28:44,220
- On the topic of some of
these maybe rebel ideas.

589
00:28:44,220 --> 00:28:46,950
I wanted to go to a
question that was sent in

590
00:28:46,950 --> 00:28:48,120
from one of our listeners.

591
00:28:48,120 --> 00:28:50,583
So, this question comes from Kenneth.

592
00:28:51,480 --> 00:28:52,470
- Hello everyone,

593
00:28:52,470 --> 00:28:53,460
my name is Kenneth

594
00:28:53,460 --> 00:28:58,325
and I am a student of the
Perimeter Institute's PSI Start

595
00:28:58,325 --> 00:29:01,399
summer program and currently
a software engineer

596
00:29:01,399 --> 00:29:03,063
in Cambridge, Massachusetts.

597
00:29:03,063 --> 00:29:05,250
My question for Dr. Lee Smolin is,

598
00:29:05,250 --> 00:29:08,310
what new potential

theories of quantum gravity

599

00:29:08,310 --> 00:29:12,010
have not been investigated
to their furthest extents yet

600

00:29:12,010 --> 00:29:12,990
and you believe are worth the efforts

601

00:29:12,990 --> 00:29:15,360
of future mathematicians and physicists

602

00:29:15,360 --> 00:29:17,463
hoping to break new grounds in the space?

603

00:29:18,900 --> 00:29:19,950
- Mine.

604

00:29:19,950 --> 00:29:20,783
No, it's,

605

00:29:21,912 --> 00:29:23,070
(people laughing)

606

00:29:23,070 --> 00:29:23,910
I need help.

607

00:29:23,910 --> 00:29:26,970
I have a great theory
about quantum gravity

608

00:29:26,970 --> 00:29:29,520
and quantum quantum mechanics
and how they fit together

609

00:29:30,713 --> 00:29:33,630
and start to advertise it if you let me.

610

00:29:33,630 --> 00:29:37,320
No, the whole point of being a scientist

611
00:29:37,320 --> 00:29:40,410
as opposed to an engineer is that

612
00:29:40,410 --> 00:29:42,690
you choose your research problems.

613
00:29:42,690 --> 00:29:47,400
And the thing that most
characterizes a scientist

614
00:29:47,400 --> 00:29:51,540
and is most correlated
with their success, or not,

615
00:29:51,540 --> 00:29:54,390
is their choice of research problems.

616
00:29:54,390 --> 00:29:57,120
So, I'm not gonna tell him my
choice of research problems.

617
00:29:57,120 --> 00:30:00,480
If he wants to offer his
services as an engineer

618
00:30:00,480 --> 00:30:04,860
to a research program,
which would be very welcome,

619
00:30:04,860 --> 00:30:08,310
then find somebody doing
something you're interested in.

620
00:30:08,310 --> 00:30:11,430
But I'm not gonna tell
you what's interesting.

621
00:30:11,430 --> 00:30:12,900
- I actually have a follow up question

622
00:30:12,900 --> 00:30:15,300
from another listener.

623
00:30:15,300 --> 00:30:17,970
This is from Sandeep in India.

624
00:30:17,970 --> 00:30:19,560
- Hi Dr. Smolin.

625
00:30:19,560 --> 00:30:21,870
My name is Sandeep and I am from India.

626
00:30:21,870 --> 00:30:24,150
What charm does physics have in the era of

627
00:30:24,150 --> 00:30:26,490
high paying tech and finance jobs,

628
00:30:26,490 --> 00:30:29,343
if you think completely
in terms of employability?

629
00:30:30,540 --> 00:30:33,390
- I don't wanna be one of
these old guys who says

630
00:30:33,390 --> 00:30:36,067
what is the current generation coming to?

631
00:30:36,067 --> 00:30:39,323
They've got no values and no passion

632
00:30:39,323 --> 00:30:41,850
and they don't care about
anything except job security.

633

00:30:41,850 --> 00:30:43,470

I mean, who are these people?

634

00:30:43,470 --> 00:30:48,470

It's a privilege to be paid to work on understanding nature.

635

00:30:49,410 --> 00:30:53,400

It's a privilege to be able to paint

636

00:30:53,400 --> 00:30:56,730

and further the understanding that art has

637

00:30:56,730 --> 00:30:58,808

of the world in the future.

638

00:30:58,808 --> 00:31:02,040

It's a privilege to be able to play musical instruments

639

00:31:02,040 --> 00:31:07,040

for other people's enjoyment and pleasure and that's it.

640

00:31:08,760 --> 00:31:12,090

If you wanna be more highly paid than your neighbor,

641

00:31:12,090 --> 00:31:13,620

then do something else.

642

00:31:13,620 --> 00:31:15,020

Please don't get in our way.

643

00:31:16,320 --> 00:31:17,850

- You've mentioned several times

644

00:31:17,850 --> 00:31:20,150
when referring to Feynman
and other scientists

645
00:31:21,202 --> 00:31:22,590
that an important factor
is the company they keep.

646
00:31:22,590 --> 00:31:23,820
Who they're hanging out with,

647
00:31:23,820 --> 00:31:25,590
where and when.

648
00:31:25,590 --> 00:31:28,019
Can you speak to that in your own life

649
00:31:28,019 --> 00:31:28,852
and your own work,

650
00:31:28,852 --> 00:31:30,480
how the company you've kept has helped you

651
00:31:30,480 --> 00:31:32,820
in your life and work?

652
00:31:32,820 --> 00:31:33,750
- Yes.

653
00:31:33,750 --> 00:31:35,190
First of all, I've been very,

654
00:31:35,190 --> 00:31:37,380
very fortunate in friends in science.

655
00:31:37,380 --> 00:31:40,560
And that's something I didn't
know when I went into science

656
00:31:40,560 --> 00:31:43,290
inspired by this fairytale about Einstein

657
00:31:43,290 --> 00:31:45,780
and transcending blah blah, blah, blah,

658
00:31:45,780 --> 00:31:48,570
is that you can make great friends,

659
00:31:48,570 --> 00:31:50,550
wonderful friends in science

660
00:31:50,550 --> 00:31:52,230
and I have done so

661
00:31:52,230 --> 00:31:55,740
and Carlo Rovelli for example,
we did great work together.

662
00:31:55,740 --> 00:31:58,080
Our best work Carlo likes to say,

663
00:31:58,080 --> 00:31:59,970
is the work we did together

664
00:31:59,970 --> 00:32:02,190
and we disagree about a lot of things,

665
00:32:02,190 --> 00:32:06,120
but we're deeply friends
and support each other.

666
00:32:06,120 --> 00:32:10,290
And I feel that way about
(indistinct) who with Carlo,

667
00:32:10,290 --> 00:32:12,960
we made the quantum gravity more, or less

668
00:32:12,960 --> 00:32:15,780
and other people (indistinct) Jacobson,

669
00:32:15,780 --> 00:32:19,050
I now am working with some amazing people.

670
00:32:19,050 --> 00:32:20,700
In addition to that,

671
00:32:20,700 --> 00:32:24,300
I was very fortunate in meeting artists,

672
00:32:24,300 --> 00:32:25,590
good artists (indistinct).

673
00:32:25,590 --> 00:32:28,680
And this is a strange story,

674
00:32:28,680 --> 00:32:32,250
but it really was very influential on me.

675
00:32:32,250 --> 00:32:34,980
I now look back and I've written six books

676
00:32:34,980 --> 00:32:36,870
and I'm working on the next two.

677
00:32:36,870 --> 00:32:40,740
And let me first say that
it's been a great privilege

678
00:32:40,740 --> 00:32:42,480
to write those books,

679
00:32:42,480 --> 00:32:44,580
because each one offered an opportunity

680
00:32:44,580 --> 00:32:48,030
to think carefully through some problems

681
00:32:48,030 --> 00:32:50,403
that was bugging me in science.

682
00:32:51,570 --> 00:32:52,922
That's what they really,

683
00:32:52,922 --> 00:32:54,090
each of them should be understood as.

684
00:32:54,090 --> 00:32:56,970
They're not journalistic,
they're not popularization,

685
00:32:56,970 --> 00:33:01,970
they are meant for curious non-scientists,

686
00:33:02,280 --> 00:33:06,990
who have the same
questions, but they're not,

687
00:33:06,990 --> 00:33:09,300
both science outreach is going for,

688
00:33:09,300 --> 00:33:11,850
which I'm frankly very puzzled by.

689
00:33:11,850 --> 00:33:15,123
And as a result of writing these books,

690
00:33:15,966 --> 00:33:20,100
I was in a position to meet
and again, genuine friends,

691
00:33:20,100 --> 00:33:23,820
a number of people who are

at the edge of their field

692

00:33:23,820 --> 00:33:26,820
in some of the key fundamental fields.

693

00:33:26,820 --> 00:33:30,450
You see, I think that
everything human beings do

694

00:33:30,450 --> 00:33:32,880
is about the future.

695

00:33:32,880 --> 00:33:34,320
We've always been developing,

696

00:33:34,320 --> 00:33:37,620
we've always been changing and learning.

697

00:33:37,620 --> 00:33:42,390
And I think that there are
a small number of domains

698

00:33:42,390 --> 00:33:46,814
in which we human beings have
since the very beginning,

699

00:33:46,814 --> 00:33:48,000
been driving into the future.

700

00:33:48,000 --> 00:33:50,220
There have been people who've
been trying to understand

701

00:33:50,220 --> 00:33:53,220
about nature that we find ourselves in.

702

00:33:53,220 --> 00:33:56,820
And there are people
who have tried to push

703
00:33:56,820 --> 00:33:58,950
our understanding of the spiritual world

704
00:33:58,950 --> 00:34:01,347
that we find ourself in

705
00:34:01,347 --> 00:34:03,720
and there are people who have
been trying to understand

706
00:34:03,720 --> 00:34:07,800
our political world, the
world of other human beings,

707
00:34:07,800 --> 00:34:10,143
and that's it, that's sort of it.

708
00:34:11,043 --> 00:34:13,290
All the creative arts and so forth to me

709
00:34:13,290 --> 00:34:16,050
go back to those small numbers
and then you'll imagine

710
00:34:16,050 --> 00:34:19,563
the early artists, the early scientists,

711
00:34:20,515 --> 00:34:22,680
the early mystics sitting
around their campfire,

712
00:34:22,680 --> 00:34:25,680
whatever they did and talking

713
00:34:25,680 --> 00:34:27,840
because it's all about talk.

714

00:34:27,840 --> 00:34:32,840
And so, through some almost
purely accidental meetings,

715
00:34:33,270 --> 00:34:35,760
most of which had to do with

716
00:34:35,760 --> 00:34:37,050
that I was writing these books.

717
00:34:37,050 --> 00:34:39,480
I met some extraordinary artists.

718
00:34:39,480 --> 00:34:41,340
And they've become very good friends

719
00:34:41,340 --> 00:34:44,490
and that greatly, greatly, greatly,

720
00:34:44,490 --> 00:34:48,003
enriched my understanding
of my life and the world.

721
00:34:49,192 --> 00:34:50,940
St. Chris and (indistinct)

722
00:34:50,940 --> 00:34:54,420
Beth Turr and many, many others.

723
00:34:54,420 --> 00:34:56,370
- Is there a direct relationship there

724
00:34:56,370 --> 00:34:59,190
in that your scientific ideas sometimes

725
00:34:59,190 --> 00:35:01,380
get a spark from their creative ideas ,

726

00:35:01,380 --> 00:35:03,240
or is it less tangible than that

727
00:35:03,240 --> 00:35:05,230
and more just about speaking

728
00:35:06,176 --> 00:35:08,190
to creative people about the world?

729
00:35:08,190 --> 00:35:09,660
- It's less tangible than that.

730
00:35:09,660 --> 00:35:12,030
One of the things that
I would never do is,

731
00:35:12,030 --> 00:35:16,050
do a art and science and
how are they related talk.

732
00:35:16,050 --> 00:35:19,023
When St Claire and I get together,

733
00:35:19,868 --> 00:35:22,140
which isn't as often as I'd like it to be,

734
00:35:22,140 --> 00:35:27,140
we still talk about techniques
and we talk about ideas.

735
00:35:27,840 --> 00:35:32,103
We talk about it as two
people who are very curious.

736
00:35:32,970 --> 00:35:34,560
- Do you have an artistic side as well?

737
00:35:34,560 --> 00:35:37,290
Are you a creator of art, or music?

738

00:35:37,290 --> 00:35:41,520

- No, I mean, I can play
around, but I used to play jazz,

739

00:35:41,520 --> 00:35:43,590

but I got good enough to play with people

740

00:35:43,590 --> 00:35:45,210

who were really, really good

741

00:35:45,210 --> 00:35:47,760

and then I understood then I would never,

742

00:35:47,760 --> 00:35:48,710

there was no point.

743

00:35:49,920 --> 00:35:51,960

- I wanna go back to
the topic of your books.

744

00:35:51,960 --> 00:35:54,660

As you mentioned, you've
written six books.

745

00:35:54,660 --> 00:35:56,460

This is a really huge endeavor

746

00:35:56,460 --> 00:35:58,950

and I wanna ask if you can
say a little bit more on

747

00:35:58,950 --> 00:36:02,070

why you decided to start
writing these books

748

00:36:02,070 --> 00:36:05,373

and what you hope readers
will take away from them?

749

00:36:06,744 --> 00:36:10,020

- There was an opportunity
to think through

750

00:36:10,020 --> 00:36:12,240

what I was very puzzled about,

751

00:36:12,240 --> 00:36:15,780

which are the questions of what determines

752

00:36:15,780 --> 00:36:17,250

what the laws and physics are.

753

00:36:17,250 --> 00:36:19,860

How are the laws of physics chosen?

754

00:36:19,860 --> 00:36:23,940

The theory, or the speculation
about string theory

755

00:36:23,940 --> 00:36:28,110

had expressed the view that
there might be one theory

756

00:36:28,110 --> 00:36:29,910

that was somehow perfect

757

00:36:29,910 --> 00:36:33,360

and was picked out by
its mathematical beauty,

758

00:36:33,360 --> 00:36:34,920

or something like that.

759

00:36:34,920 --> 00:36:38,586

And we had then discovered
through the 1980s

760
00:36:38,586 --> 00:36:39,870
that that wasn't true.

761
00:36:39,870 --> 00:36:44,433
That there were vast
numbers of string theorists.

762
00:36:46,110 --> 00:36:50,880
So, I went looking for a
way you could understand

763
00:36:50,880 --> 00:36:54,120
how the laws were chosen
by some process analogous

764
00:36:54,120 --> 00:36:58,920
to natural selection and I
had found an answer to that.

765
00:36:58,920 --> 00:37:02,760
That is several scenarios
that worked exactly

766
00:37:02,760 --> 00:37:04,620
and did make predictions.

767
00:37:04,620 --> 00:37:08,760
And I was confused
about how that could be,

768
00:37:08,760 --> 00:37:11,580
how could a theory like natural selection,

769
00:37:11,580 --> 00:37:16,170
which is statistical and probabilistic,

770
00:37:16,170 --> 00:37:18,570
let's just say is probabilistic

771
00:37:18,570 --> 00:37:20,910
can produce a deeper understanding

772
00:37:20,910 --> 00:37:24,270
than a more traditional theory,

773
00:37:24,270 --> 00:37:27,270
which just has one version of the laws.

774
00:37:27,270 --> 00:37:29,760
So, that's why I took
on writing that book.

775
00:37:29,760 --> 00:37:33,330
I was given the opportunity,
never look back.

776
00:37:33,330 --> 00:37:35,280
I mean each time I've said that's it.

777
00:37:35,280 --> 00:37:37,810
I'm never writing another book again.

778
00:37:37,810 --> 00:37:41,103
It is not easy to write, it's
not easy to write a good book.

779
00:37:42,005 --> 00:37:44,043
I think I have written six good books.

780
00:37:45,240 --> 00:37:48,540
Oh, but some of it is also
that I like to express myself,

781
00:37:48,540 --> 00:37:53,520
I like to write, because it
allowed me to think through

782

00:37:53,520 --> 00:37:55,710
the questions that I was struggling with.

783
00:37:55,710 --> 00:37:58,620
It wasn't a waste of time for me.

784
00:37:58,620 --> 00:37:59,610
- I was gonna ask that,

785
00:37:59,610 --> 00:38:02,580
if writing the books for a non-specialist,

786
00:38:02,580 --> 00:38:05,160
a curious, non-scientific audience,

787
00:38:05,160 --> 00:38:08,700
if that forces you to get
a sense of your own work

788
00:38:08,700 --> 00:38:10,382
in a different way.

789
00:38:10,382 --> 00:38:12,210
If it forces you to look
through a different lens?

790
00:38:12,210 --> 00:38:14,760
Perhaps not the mathematical lens.

791
00:38:14,760 --> 00:38:19,050
- Yeah, the mathematics
is often a scaffold

792
00:38:19,050 --> 00:38:21,720
to hold you in a position

793
00:38:21,720 --> 00:38:24,930
where you're not actually very stable.

794

00:38:24,930 --> 00:38:29,310

So making, explaining why
something is a good idea

795

00:38:29,310 --> 00:38:31,500

without mathematics is harder

796

00:38:31,500 --> 00:38:33,810

than explaining it with mathematics.

797

00:38:33,810 --> 00:38:36,270

I mean, everything you do
influences everything else.

798

00:38:36,270 --> 00:38:37,950

I mean, when you're writing a book

799

00:38:37,950 --> 00:38:40,230

that you want to capture
people's attention

800

00:38:40,230 --> 00:38:44,403

for two or 300 pages, style
is very, very important.

801

00:38:45,318 --> 00:38:48,393

And we don't teach style
in physics class at school.

802

00:38:49,597 --> 00:38:52,530

- How did you develop your
own sense of voice, or style?

803

00:38:52,530 --> 00:38:55,170

Was it trial and error over time?

804

00:38:55,170 --> 00:38:59,700

- It was good teachers including
some very good editors.

805

00:38:59,700 --> 00:39:02,550

It's a very different
than an academic style.

806

00:39:02,550 --> 00:39:03,990

In an academic style,

807

00:39:03,990 --> 00:39:07,080

you tell them what you're
gonna tell it to them,

808

00:39:07,080 --> 00:39:09,090

you tell them what you just told them.

809

00:39:09,090 --> 00:39:12,540

It's very linear, it's very structured.

810

00:39:12,540 --> 00:39:14,290

And we can argue about that whether

811

00:39:15,276 --> 00:39:17,250

to what extent that's
a good, or a bad thing.

812

00:39:17,250 --> 00:39:21,480

But you can't do that in a
book for general readers.

813

00:39:21,480 --> 00:39:24,540

That kills a book if
you use that structure

814

00:39:24,540 --> 00:39:26,430

from your academic mind.

815

00:39:26,430 --> 00:39:28,410

- And you've written six books now,

816

00:39:28,410 --> 00:39:30,330
each is on a different topic,

817

00:39:30,330 --> 00:39:32,430
but are there any common themes

818

00:39:32,430 --> 00:39:35,400
that kind of go through all of your books?

819

00:39:35,400 --> 00:39:37,800
- Yes, they're all interested in time.

820

00:39:37,800 --> 00:39:42,800
They're all interested in the
consequences for the future

821

00:39:43,890 --> 00:39:46,740
of how we understand the world now.

822

00:39:46,740 --> 00:39:49,470
And I mean in some sense there,

823

00:39:49,470 --> 00:39:54,300
the one research program
laid out over many pages,

824

00:39:54,300 --> 00:39:58,380
but in the last book "Einstein's
Unfinished Revolution"

825

00:39:58,380 --> 00:40:00,720
I explicitly lay out that research program

826

00:40:00,720 --> 00:40:04,740
and that is my research
program and it has always been,

827

00:40:04,740 --> 00:40:07,977

but somehow it stayed in the background.

828

00:40:07,977 --> 00:40:12,977

The other thing is the more
personal feelings about nature

829

00:40:13,800 --> 00:40:16,863

and society and how the future is going.

830

00:40:17,700 --> 00:40:20,190

Several of the books have epilogues

831

00:40:20,190 --> 00:40:22,590

and what I was going to do,

832

00:40:22,590 --> 00:40:24,870

at some time, I'd like
to just do something

833

00:40:24,870 --> 00:40:28,380

where I read all the epilogues in order.

834

00:40:28,380 --> 00:40:31,860

I won't read the epilogue
of the first one,

835

00:40:31,860 --> 00:40:35,310

but there's a quote from
St Chris (indistinct)

836

00:40:35,310 --> 00:40:38,310

which opens it and I
can do that from memory.

837

00:40:38,310 --> 00:40:40,560

And this is in response to a question

838

00:40:40,560 --> 00:40:42,840

of what is postmodernism?

839
00:40:42,840 --> 00:40:47,840
And he said, "If the purpose of modernism

840
00:40:48,187 --> 00:40:52,203
"was to burn down the old classic house,

841
00:40:53,047 --> 00:40:55,559
"which we've gotten quite bored with,

842
00:40:55,559 --> 00:40:58,507
"then the achievement of postmodernism

843
00:40:58,507 --> 00:41:00,337
"has been just to play around with

844
00:41:00,337 --> 00:41:03,900
"the little char pieces that are left".

845
00:41:03,900 --> 00:41:06,360
Which is a pretty pure thing to be doing

846
00:41:06,360 --> 00:41:08,790
given that winter is coming.

847
00:41:08,790 --> 00:41:11,340
And that's typical.

848
00:41:11,340 --> 00:41:12,173
That's not me.

849
00:41:13,118 --> 00:41:14,674
That's typical St Clair,

850
00:41:14,674 --> 00:41:16,558
but we're after the same thing.

851

00:41:16,558 --> 00:41:17,430
- What would you say you're after?

852
00:41:17,430 --> 00:41:22,140
- I'm after having a scientific
understanding of nature,

853
00:41:22,140 --> 00:41:26,820
which gives us human
beings a place in nature

854
00:41:26,820 --> 00:41:28,980
where we can feel at home.

855
00:41:28,980 --> 00:41:32,430
- Is there a a sense of consolation
that you are looking for

856
00:41:32,430 --> 00:41:36,720
where perhaps religions,
or moralities or all short,

857
00:41:36,720 --> 00:41:41,103
are you looking for a sense
of meaning behind the science?

858
00:41:42,030 --> 00:41:42,903
- Maybe.

859
00:41:43,738 --> 00:41:45,288
I want better than consolation.

860
00:41:46,260 --> 00:41:48,093
Look, what's tragic about life,

861
00:41:49,088 --> 00:41:51,090
which is of course death
and pain and illness

862

00:41:51,090 --> 00:41:55,140
is where it's really not
consolable, it's inconsolable.

863
00:41:55,140 --> 00:41:58,440
But living a happy life, a good life,

864
00:41:58,440 --> 00:42:02,640
in my very minor view
because I'm not very wise,

865
00:42:02,640 --> 00:42:05,460
is that there's no answer to that.

866
00:42:05,460 --> 00:42:09,420
The only good thing about them
is that more for most of us,

867
00:42:09,420 --> 00:42:12,990
the price we pay for a
wonderful life comes at the end.

868
00:42:12,990 --> 00:42:14,943
I don't think there's a consolation.

869
00:42:16,170 --> 00:42:20,790
There I'm very influenced
by Roberto Mangabeira Unger

870
00:42:20,790 --> 00:42:23,490
who I wrote the fourth book with.

871
00:42:23,490 --> 00:42:25,980
- You mentioned earlier
that you're working on one,

872
00:42:25,980 --> 00:42:29,200
or two more books and you said
you wouldn't talk about them

873

00:42:29,200 --> 00:42:30,033
unless we asked you to.

874

00:42:30,033 --> 00:42:32,150
So, can I ask you to tell
us what you're working on?

875

00:42:33,150 --> 00:42:34,200
- Sure.

876

00:42:34,200 --> 00:42:38,580
One is about what we've
learned, or what I've learned

877

00:42:38,580 --> 00:42:39,930
and it will be a short book

878

00:42:39,930 --> 00:42:42,720
and it might even be a
part of the other book.

879

00:42:42,720 --> 00:42:45,120
When you ask me what I'm interested in,

880

00:42:45,120 --> 00:42:46,620
it's not a very interesting story.

881

00:42:46,620 --> 00:42:48,810
But I dropped out of high school

882

00:42:48,810 --> 00:42:52,650
and I was working in the
San Fernando Valley in LA

883

00:42:52,650 --> 00:42:55,290
and as an apprentice sheet metal guy.

884

00:42:55,290 --> 00:42:59,730

And I used to take my lunches
and rather than hang out

885

00:42:59,730 --> 00:43:03,300
with the other guys who I
didn't really understand.

886

00:43:03,300 --> 00:43:06,480
And it was all guys by the way.

887

00:43:06,480 --> 00:43:08,130
I would take a notebook

888

00:43:08,130 --> 00:43:11,610
and write thoughts about
physics and science.

889

00:43:11,610 --> 00:43:13,560
And one day I wrote down in that notebook

890

00:43:13,560 --> 00:43:15,170
what I'm interested in,

891

00:43:15,170 --> 00:43:17,610
is first of all what the universe is

892

00:43:17,610 --> 00:43:21,840
and second, what life is in the
context of the first answer.

893

00:43:21,840 --> 00:43:23,700
And third, what a human being is,

894

00:43:23,700 --> 00:43:25,950
in the context of the first two answer.

895

00:43:25,950 --> 00:43:28,377
And so I thought it
would be nice to write it

896

00:43:28,377 --> 00:43:30,720

at least a section of
the book that sums up

897

00:43:30,720 --> 00:43:34,260

what I've learned during
my life in science.

898

00:43:34,260 --> 00:43:37,650

The other book is about
Parkinson's disease,

899

00:43:37,650 --> 00:43:39,930

which I happen to have.

900

00:43:39,930 --> 00:43:43,920

And I've been reflecting
on the implications

901

00:43:43,920 --> 00:43:48,540

of a new treatment, which
involves putting a chip basically

902

00:43:48,540 --> 00:43:52,800

in your head and becoming
what the feminist

903

00:43:52,800 --> 00:43:55,710

science fiction writers call a Cyborg.

904

00:43:55,710 --> 00:43:58,530

That is somebody whose brain is half,

905

00:43:58,530 --> 00:44:03,210

or in any right part
machine and part human.

906

00:44:03,210 --> 00:44:05,310

- Can you tell us a bit
about that experience

907

00:44:05,310 --> 00:44:07,200
so far with Parkinson's?

908

00:44:07,200 --> 00:44:10,693
Has this affected how
you go about your life?

909

00:44:10,693 --> 00:44:14,073
- I don't recommend it, if you
wanna recreational disease.

910

00:44:15,480 --> 00:44:16,313
- Stay away?

911

00:44:17,409 --> 00:44:19,140
- It's like you have a high school friend

912

00:44:19,140 --> 00:44:20,670
who has become an alcoholic

913

00:44:20,670 --> 00:44:23,790
and he shows up every few months,

914

00:44:23,790 --> 00:44:25,530
thrown out by his girlfriend

915

00:44:25,530 --> 00:44:28,680
and stays on your couch a few nights

916

00:44:28,680 --> 00:44:30,720
and pulls himself together.

917

00:44:30,720 --> 00:44:35,400
And then time goes on and
you wake up one morning

918
00:44:35,400 --> 00:44:37,230
and you are on the couch.

919
00:44:37,230 --> 00:44:39,930
At first it's relatively minor,

920
00:44:39,930 --> 00:44:42,150
it progresses if you're lucky.

921
00:44:42,150 --> 00:44:45,270
And I am in that case slowly.

922
00:44:45,270 --> 00:44:48,720
I'm still more inconvenienced
than anything else by it.

923
00:44:48,720 --> 00:44:50,913
But it grows in your life.

924
00:44:51,840 --> 00:44:54,210
That's not the story I
want to tell because,

925
00:44:54,210 --> 00:44:56,850
many, many people suffer of course.

926
00:44:56,850 --> 00:44:59,280
Everybody, at least in their family

927
00:44:59,280 --> 00:45:01,980
and I have nothing to say about that.

928
00:45:01,980 --> 00:45:04,530
But I do have maybe some reflections

929
00:45:04,530 --> 00:45:07,500
that I think we ought to think about,

930

00:45:07,500 --> 00:45:09,360
becoming cyborgs,

931

00:45:09,360 --> 00:45:12,273
because I suspect it's
gonna become more common.

932

00:45:13,530 --> 00:45:15,690
- Are you feeling trepidation about this,

933

00:45:15,690 --> 00:45:17,190
or are you optimistic?

934

00:45:17,190 --> 00:45:18,490
Do you know what to think?

935

00:45:19,380 --> 00:45:22,146
- Well, I don't know what
to think of the experience,

936

00:45:22,146 --> 00:45:24,180
but it's not a difficult decision to make.

937

00:45:24,180 --> 00:45:26,130
I mean all you have to do is meet somebody

938

00:45:26,130 --> 00:45:28,770
who's had the implants,

939

00:45:28,770 --> 00:45:30,180
hang out with them for a while

940

00:45:30,180 --> 00:45:34,530
and they'll show you what they're
like with them turned off.

941

00:45:34,530 --> 00:45:37,536
'Cause everybody has an off button.

942

00:45:37,536 --> 00:45:40,260

They hold it over their chip
that controls the networks

943

00:45:40,260 --> 00:45:42,720

in the brain and they click off

944

00:45:42,720 --> 00:45:44,670

and then you see what they would be like

945

00:45:44,670 --> 00:45:49,357

without the implant and it's
not a difficult (indistinct).

946

00:45:50,280 --> 00:45:53,160

- And this book that
you're thinking of writing

947

00:45:53,160 --> 00:45:55,170

about your experience with Parkinson's,

948

00:45:55,170 --> 00:45:58,680

do you think it would tie
in with some of the themes

949

00:45:58,680 --> 00:46:00,690

that came up in other
books you have written?

950

00:46:00,690 --> 00:46:03,900

Would there be still some
connective tissue there?

951

00:46:03,900 --> 00:46:04,733

- Maybe.

952

00:46:04,733 --> 00:46:05,850

Let's see.

953

00:46:05,850 --> 00:46:09,600

Certainly it convinces
me happiness in life

954

00:46:09,600 --> 00:46:13,530

is more about character than
anything else and success.

955

00:46:13,530 --> 00:46:17,460

And so, the most important scientist

956

00:46:17,460 --> 00:46:20,820

who make the most important influences

957

00:46:20,820 --> 00:46:23,500

and changes and progress in science

958

00:46:24,390 --> 00:46:26,370

are not doing that because they're smarter

959

00:46:26,370 --> 00:46:28,770

than other people, or better situated,

960

00:46:28,770 --> 00:46:30,180

or anything like that.

961

00:46:30,180 --> 00:46:33,360

They're more curious
and they're more honest.

962

00:46:33,360 --> 00:46:34,740

- Well, thank you so much Lee.

963

00:46:34,740 --> 00:46:37,680

This has been really a
pleasure to speak with you.

964

00:46:37,680 --> 00:46:38,580
Thank you.

965
00:46:38,580 --> 00:46:39,413
- Thank you.

966
00:46:39,413 --> 00:46:40,875
Thank you very much.

967
00:46:40,875 --> 00:46:41,708
This is fun.

968
00:46:41,708 --> 00:46:43,130
- Thanks so much Lee.

969
00:46:43,130 --> 00:46:44,370
(upbeat music)

970
00:46:44,370 --> 00:46:46,920
- Thanks for stepping
inside The Perimeter.

971
00:46:46,920 --> 00:46:48,360
If you like what you hear,

972
00:46:48,360 --> 00:46:50,160
please help us spread the word.

973
00:46:50,160 --> 00:46:52,440
You can rate, review and subscribe

974
00:46:52,440 --> 00:46:54,210
to conversations at The Perimeter

975
00:46:54,210 --> 00:46:56,610
wherever you get your podcasts.

976
00:46:56,610 --> 00:46:58,740

Every review really helps us a lot

977

00:46:58,740 --> 00:47:01,740

and it helps more science
enthusiasts find us.

978

00:47:01,740 --> 00:47:03,963

Thank you for being part of the equation.

979

00:47:04,907 --> 00:47:07,490

(gentle music)