

## "Warp Drive"

Moving a chunk of spacetime faster than objects can move within spacetime – cheating the light-speed limit

### Is it possible?

- Einstein's General Relativity and early expansion of the universe suggest that it is possible, in principle
- The energy required, however, is excessively high, even for speeds slower than light-speed
- The most difficult issue is time travel ... which is even less understood



1  
00:00:03,830 --> 00:00:01,490  
I think exploration for inviting me to

2  
00:00:06,980 --> 00:00:03,840  
give this talk and thinking Daniel

3  
00:00:09,169 --> 00:00:06,990  
Sheehan and Dominic are the invitation

4  
00:00:10,669 --> 00:00:09,179  
and the courtesy and the comfort of the

5  
00:00:12,950 --> 00:00:10,679  
nice hotel

6  
00:00:15,020 --> 00:00:12,960  
basically I'm here to talk on behalf of

7  
00:00:17,180 --> 00:00:15,030  
my colleague mark Melissa and I are the

8  
00:00:20,710 --> 00:00:17,190  
co editors of the book that was

9  
00:00:23,179 --> 00:00:20,720  
published last February of 2009 the

10  
00:00:25,820 --> 00:00:23,189  
double-a presses bit frontiers of

11  
00:00:29,810 --> 00:00:25,830  
profession science and there's the book

12  
00:00:32,209 --> 00:00:29,820  
cover and the book was designed to be an

13  
00:00:35,209 --> 00:00:32,219

academic monograph for the purpose of

14  
00:00:38,330 --> 00:00:35,219  
reaching advanced undergraduate students

15  
00:00:40,729 --> 00:00:38,340  
graduate students faculty airspace and

16  
00:00:44,330 --> 00:00:40,739  
physics professors who are interested in

17  
00:00:47,420 --> 00:00:44,340  
exploring propulsion physics as well as

18  
00:00:51,410 --> 00:00:47,430  
that industry scientist we start with

19  
00:00:53,119 --> 00:00:51,420  
our aspirations aspirations are always

20  
00:00:55,119 --> 00:00:53,129  
provided by the wonderful science

21  
00:00:58,880 --> 00:00:55,129  
fiction that we have in world literature

22  
00:01:01,279 --> 00:00:58,890  
that have inspired midnight motorists we

23  
00:01:03,590 --> 00:01:01,289  
know long deceased and who've in spite

24  
00:01:04,939 --> 00:01:03,600  
of the my generation and the other

25  
00:01:09,770 --> 00:01:04,949  
generations to come

26  
00:01:12,020 --> 00:01:09,780  
and basically before 1994 where Brad was

27  
00:01:14,240 --> 00:01:12,030  
only a science fiction that since that

28  
00:01:15,920 --> 00:01:14,250  
time that the advent of algae-based were

29  
00:01:17,899 --> 00:01:15,930  
broad metric theory that was published

30  
00:01:21,679 --> 00:01:17,909  
in classical quantum gravity the

31  
00:01:23,480 --> 00:01:21,689  
principles have now been postulated here

32  
00:01:25,130 --> 00:01:23,490  
the merge of scientific progress has

33  
00:01:27,469 --> 00:01:25,140  
observed that we start with Einstein's

34  
00:01:29,450 --> 00:01:27,479  
general theory of relativity and the

35  
00:01:32,690 --> 00:01:29,460  
evolution of quantum mechanics

36  
00:01:34,999 --> 00:01:32,700  
electrodynamics Bundys negative mass

37  
00:01:36,440 --> 00:01:35,009  
potential Bob for loops guidelines to

38  
00:01:38,719 --> 00:01:36,450

anti-gravity which appeared in the

39

00:01:41,480 --> 00:01:38,729

film's rather than American Journal of

40

00:01:44,060 --> 00:01:41,490

physics there's something that said Kip

41

00:01:46,069 --> 00:01:44,070

Thorne and his grad students derived the

42

00:01:49,130 --> 00:01:46,079

first solution for traversable in his

43

00:01:51,270 --> 00:01:49,140

and then part but now came along with is

44

00:01:53,370 --> 00:01:51,280

our claim of a gravity shield fall

45

00:01:56,430 --> 00:01:53,380

al-kabir publication in the journal of

46

00:02:00,330 --> 00:01:56,440

classical quantum gravity of work drive

47

00:02:02,460 --> 00:02:00,340

they have been house and co-authors help

48

00:02:05,130 --> 00:02:02,470

Rodolfo and so forth and their shelves

49

00:02:07,410 --> 00:02:05,140

as a quantum drag effect called vacuum

50

00:02:10,499 --> 00:02:07,420

bag and chimney lives first patent on

51  
00:02:13,410 --> 00:02:10,509  
his transient market inertial thruster

52  
00:02:15,630 --> 00:02:13,420  
and not visitors publication and his new

53  
00:02:18,530 --> 00:02:15,640  
answer in his book which was a component

54  
00:02:22,220 --> 00:02:18,540  
of everything published from 1988 to

55  
00:02:24,330 --> 00:02:22,230  
1995 all in traditional Bavarian has

56  
00:02:26,400 --> 00:02:24,340  
everything he learned that are about him

57  
00:02:27,810 --> 00:02:26,410  
including time machines and that was

58  
00:02:31,890 --> 00:02:27,820  
peddled by the American Institute of

59  
00:02:33,330 --> 00:02:31,900  
Physics press and they like this at the

60  
00:02:36,180 --> 00:02:33,340  
beginning of the day for propulsion

61  
00:02:39,059 --> 00:02:36,190  
physics program that he was the manager

62  
00:02:41,850 --> 00:02:39,069  
for at NASA Glenn he has a space drawn

63  
00:02:44,970 --> 00:02:41,860

concepts and issues and how put out my

64

00:02:47,400 --> 00:02:44,980

boss has developed the polarizable

65

00:02:49,470 --> 00:02:47,410

vacuum and propulsion George Hathaway

66

00:02:52,559 --> 00:02:49,480

was looking at an old test of the power

67

00:02:54,330 --> 00:02:52,569

of gravity shield and Jade and clay and

68

00:02:56,970 --> 00:02:54,340

Bob Ford we're looking at quantum vacuum

69

00:02:58,830 --> 00:02:56,980

energy propulsion so you have that

70

00:03:00,210 --> 00:02:58,840

progress and that's just not that's not

71

00:03:03,449 --> 00:03:00,220

anything that's not an all-inclusive

72

00:03:05,160 --> 00:03:03,459

list there were many other fields many

73

00:03:08,190 --> 00:03:05,170

other topics and physics that were being

74

00:03:10,800 --> 00:03:08,200

evaluated the books purpose was to look

75

00:03:12,030 --> 00:03:10,810

at comparing all the possibilities of

76

00:03:13,259 --> 00:03:12,040

the different types of breakthrough

77

00:03:15,660 --> 00:03:13,269

propulsion physics that would be

78

00:03:18,300 --> 00:03:15,670

proposed by various investigators around

79

00:03:20,069 --> 00:03:18,310

the world not just the hot topics when

80

00:03:22,680 --> 00:03:20,079

we are interested exploring the physics

81

00:03:23,510 --> 00:03:22,690

aerospace engineers and managers without

82

00:03:25,160 --> 00:03:23,520

any higher

83

00:03:26,930 --> 00:03:25,170

because this is the point the people

84

00:03:28,550 --> 00:03:26,940

that work with the policy makers in

85

00:03:30,530 --> 00:03:28,560

government they get the funding they

86

00:03:32,990 --> 00:03:30,540

start the programs and they execute them

87

00:03:34,550 --> 00:03:33,000

and unfortunately the aerospace

88

00:03:37,190 --> 00:03:34,560

engineers are at the cutting edge of

89

00:03:38,930 --> 00:03:37,200

physics physicists are so the idea is to

90

00:03:41,570 --> 00:03:38,940

pay the cutting edge of physics the

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00:03:44,240 --> 00:03:41,580

filtering and bakery out the the

92

00:03:45,920 --> 00:03:44,250

out-of-the-box ideas to the people in

93

00:03:48,050 --> 00:03:45,930

aerospace engineering who can hopefully

94

00:03:50,390 --> 00:03:48,060

take program develop problems based on

95

00:03:54,110 --> 00:03:50,400

these ideas in order to show it can be

96

00:03:57,950 --> 00:03:54,120

done that could be done next in the way

97

00:04:00,350 --> 00:03:57,960

of here's that we may now here's what's

98

00:04:02,840 --> 00:04:00,360

unresolved and so there's unfinished

99

00:04:04,820 --> 00:04:02,850

business for students and pioneers to

100

00:04:08,840 --> 00:04:04,830

wrap up just to work on to solve

101  
00:04:10,790 --> 00:04:08,850  
problems on the diamonds to distinguish

102  
00:04:13,520 --> 00:04:10,800  
films from frontier where that is very

103  
00:04:15,590 --> 00:04:13,530  
important because this subject is batted

104  
00:04:17,180 --> 00:04:15,600  
they deal initially at the very

105  
00:04:19,699 --> 00:04:17,190  
beginning and it still does to a little

106  
00:04:21,710 --> 00:04:19,709  
small what much smaller degree a lot of

107  
00:04:24,230 --> 00:04:21,720  
division for the ministry an academic

108  
00:04:25,520 --> 00:04:24,240  
community because they know the physics

109  
00:04:27,080 --> 00:04:25,530  
they said they may look at the numbers

110  
00:04:28,460 --> 00:04:27,090  
they look at the equations and say they

111  
00:04:30,110 --> 00:04:28,470  
say to themselves well breakthrough

112  
00:04:32,180 --> 00:04:30,120  
profession physician or such thing they

113  
00:04:35,030 --> 00:04:32,190

will drive the wormholes these things

114

00:04:37,010 --> 00:04:35,040

are impossible to attain so they think

115

00:04:39,530 --> 00:04:37,020

that that kind of stuff is to science

116

00:04:41,750 --> 00:04:39,540

fiction for them to dive into but often

117

00:04:44,120 --> 00:04:41,760

beers paper Morrison theories both are

118

00:04:46,100 --> 00:04:44,130

paper that visitors built and so forth

119

00:04:49,700 --> 00:04:46,110

have a brought that into mainstream

120

00:04:51,740 --> 00:04:49,710

physics or here's this is the first

121

00:04:53,630 --> 00:04:51,750

witness book that covers the concept of

122

00:04:56,000 --> 00:04:53,640

gravity control propulsion faster than

123

00:05:01,190 --> 00:04:56,010

light travel related energy conversion

124

00:05:05,060 --> 00:05:01,200

and managing such research in our 18

125

00:05:07,280 --> 00:05:05,070

years authors 2712 offers 22 chapters on

126

00:05:08,990 --> 00:05:07,290

this alien of pages took us on this

127

00:05:10,940 --> 00:05:09,000

three years to put the book together and

128

00:05:12,830 --> 00:05:10,950

as a varieties in favor to that in

129

00:05:14,750 --> 00:05:12,840

envision correctly approaching 2,000

130

00:05:17,810 --> 00:05:14,760

copies sold and it's actually a

131

00:05:18,770 --> 00:05:17,820

best-seller for the inaudible a press in

132

00:05:22,220 --> 00:05:18,780

that series

133

00:05:24,290 --> 00:05:22,230

nearly these series and progress of

134

00:05:25,590 --> 00:05:24,300

astronautics and Aeronautics are usually

135

00:05:28,440 --> 00:05:25,600

jet engine development

136

00:05:30,120 --> 00:05:28,450

rocket fuel's rocket engineer dynamics

137

00:05:32,880 --> 00:05:30,130

astrodynamics and things like that so

138

00:05:35,760 --> 00:05:32,890

this was a smash head for these guys

139

00:05:38,430 --> 00:05:35,770

mark and I over the other news and of

140

00:05:40,320 --> 00:05:38,440

the lead author affiliations 40% didn't

141

00:05:42,450 --> 00:05:40,330

also thirteen percent whatever the US

142

00:05:44,040 --> 00:05:42,460

government labs and thirty percent were

143

00:05:46,580 --> 00:05:44,050

private industry consultants with ten

144

00:05:50,790 --> 00:05:46,590

percent a university is 70 percent for

145

00:05:53,910 --> 00:05:50,800

and here's the list of authors some of

146

00:05:55,410 --> 00:05:53,920

who maybe wanted to if anyone was going

147

00:05:57,960 --> 00:05:55,420

to be desperately letter Jimmy would

148

00:06:01,020 --> 00:05:57,970

work and what it is my boss all put off

149

00:06:02,880 --> 00:06:01,030

and some of these names you may not

150

00:06:05,670 --> 00:06:02,890

recognize but you may recognize Bob

151  
00:06:07,830 --> 00:06:05,680  
forward we have this power a period of

152  
00:06:09,870 --> 00:06:07,840  
years which were pulled from the LR

153  
00:06:11,910 --> 00:06:09,880  
devil a nuclear and future Floyd

154  
00:06:13,380 --> 00:06:11,920  
Technical Committee they have every a

155  
00:06:15,090 --> 00:06:13,390  
stands for the American Institute of

156  
00:06:17,100 --> 00:06:15,100  
Aeronautics and Astronautics and it's a

157  
00:06:19,680 --> 00:06:17,110  
worldwide aerospace professional Society

158  
00:06:22,380 --> 00:06:19,690  
it's been around since the beginning of

159  
00:06:23,940 --> 00:06:22,390  
the 60s and it was a major of the rel

160  
00:06:26,250 --> 00:06:23,950  
canonical' society with the American

161  
00:06:31,380 --> 00:06:26,260  
Astronomical Society there are these

162  
00:06:33,570 --> 00:06:31,390  
were our period years the organization

163  
00:06:37,200 --> 00:06:33,580

the belt started this way began in

164

00:06:38,700 --> 00:06:37,210

understanding the problem which is

165

00:06:41,660 --> 00:06:38,710

looking at the history of Aitkin for

166

00:06:45,420 --> 00:06:41,670

patient physics and as it was done by

167

00:06:48,300 --> 00:06:45,430

organizations like my Institute project

168

00:06:49,980 --> 00:06:48,310

we lowered the NASA program and so forth

169

00:06:51,660 --> 00:06:49,990

including our days in the context and

170

00:06:53,400 --> 00:06:51,670

then evaluating the limits of

171

00:06:55,140 --> 00:06:53,410

interstellar technology based on the

172

00:06:58,020 --> 00:06:55,150

advanced physics that we know like solar

173

00:07:01,100 --> 00:06:58,030

cells in power propulsion and antimatter

174

00:07:03,330 --> 00:07:01,110

rockets nuclear propulsion and so forth

175

00:07:07,170 --> 00:07:03,340

profession without rocket that was

176  
00:07:09,150 --> 00:07:07,180  
looking at a real journey of reaction in

177  
00:07:11,460 --> 00:07:09,160  
space drives without violating the new

178  
00:07:13,550 --> 00:07:11,470  
conservation that recover space drive

179  
00:07:16,320 --> 00:07:13,560  
physics pioneers gravity control

180  
00:07:18,780 --> 00:07:16,330  
non-viable ages and other approaches

181  
00:07:22,410 --> 00:07:18,790  
then the faster the on travel will be

182  
00:07:24,870 --> 00:07:22,420  
based on faster concepts in general to

183  
00:07:27,300 --> 00:07:24,880  
researchers traversable inhales and

184  
00:07:29,160 --> 00:07:27,310  
web-browser have been faster by

185  
00:07:31,439 --> 00:07:29,170  
communications and quantum physics by a

186  
00:07:34,049 --> 00:07:31,449  
low mortality event

187  
00:07:35,700 --> 00:07:34,059  
considerations basically licking

188  
00:07:38,369 --> 00:07:35,710

animation from the quantum vacuum energy

189

00:07:40,950 --> 00:07:38,379

from sanity lessons and non-viable

190

00:07:42,659 --> 00:07:40,960

attention places like possible cold

191

00:07:45,269 --> 00:07:42,669

fusion and magnetic motors and things

192

00:07:46,769 --> 00:07:45,279

like that from this player failure at

193

00:07:49,920 --> 00:07:46,779

this part of the book published the

194

00:07:52,980 --> 00:07:49,930

computation tears and conventions needed

195

00:07:54,929 --> 00:07:52,990

to have a universe away which when we

196

00:07:56,969 --> 00:07:54,939

talk about these things what kind of

197

00:07:58,290 --> 00:07:56,979

computer programs are applicable for

198

00:08:00,659 --> 00:07:58,300

evaluating breakthrough propulsion

199

00:08:02,369 --> 00:08:00,669

physics translating different orders of

200

00:08:05,450 --> 00:08:02,379

physics into a common injury anything

201  
00:08:08,189 --> 00:08:05,460  
and then how to do pioneering research

202  
00:08:10,350 --> 00:08:08,199  
they I've investigated to make that is

203  
00:08:12,869 --> 00:08:10,360  
to understand the fact that spaceflight

204  
00:08:15,059 --> 00:08:12,879  
is really hard folks if you look at this

205  
00:08:16,860 --> 00:08:15,069  
log scale to find out as we go further

206  
00:08:18,809 --> 00:08:16,870  
and further out of the solar system and

207  
00:08:21,029 --> 00:08:18,819  
further through the Kuiper belt out to

208  
00:08:23,999 --> 00:08:21,039  
the aircar now blowing all the way to

209  
00:08:27,119 --> 00:08:24,009  
Alpha Centauri which is about him just

210  
00:08:29,879 --> 00:08:27,129  
inside of a million astronomical units

211  
00:08:33,810 --> 00:08:29,889  
about half a million astronomical units

212  
00:08:36,569 --> 00:08:33,820  
you see about the technique and energy

213  
00:08:38,790 --> 00:08:36,579

demand infrastructure and change in

214

00:08:41,490 --> 00:08:38,800

velocity is gets harder and harder and

215

00:08:43,350 --> 00:08:41,500

harder and harder so I keep this picture

216

00:08:45,600 --> 00:08:43,360

in mind as we progress further into the

217

00:08:47,250 --> 00:08:45,610

talk here when you look at that picture

218

00:08:49,350 --> 00:08:47,260

we want to say well if they're going to

219

00:08:51,840 --> 00:08:49,360

have a profession technology how much

220

00:08:53,460 --> 00:08:51,850

propeller is going to be needed we will

221

00:08:54,960 --> 00:08:53,470

look at an example propeller required

222

00:08:58,259 --> 00:08:54,970

for the mass of the Space Shuttle

223

00:09:01,829 --> 00:08:58,269

Orbiter past 43 light-years so you have

224

00:09:04,139 --> 00:09:01,839

a three axis trophy or showing the pilot

225

00:09:07,079 --> 00:09:04,149

mass increasing in this direction on

226

00:09:09,660 --> 00:09:07,089

nine axis and then rocket efficiency

227

00:09:12,430 --> 00:09:09,670

given in terms of its specific impulse

228

00:09:14,949 --> 00:09:12,440

and seconds increases fairly well

229

00:09:17,379 --> 00:09:14,959

and fission bomb propulsion to the

230

00:09:20,619 --> 00:09:17,389

antimatter rocket 250 thousand second

231

00:09:23,019 --> 00:09:20,629

specific impulse so Rockets get better

232

00:09:25,749 --> 00:09:23,029

that axis and then of course we have

233

00:09:27,910 --> 00:09:25,759

mission adoration the trips get along

234

00:09:30,100 --> 00:09:27,920

the along my toxins and where you learn

235

00:09:33,759 --> 00:09:30,110

from this kind of thing is through the

236

00:09:35,860 --> 00:09:33,769

look at this you see but with specific

237

00:09:38,350 --> 00:09:35,870

impulse in a few thousands of seconds

238

00:09:39,790 --> 00:09:38,360

you're gonna need about 10 billion super

239

00:09:42,220 --> 00:09:39,800

tape there's a propellant in the

240

00:09:44,590 --> 00:09:42,230

dictionary will there's the specific

241

00:09:47,139 --> 00:09:44,600

impulse increases then the propellant

242

00:09:51,069 --> 00:09:47,149

mass drops dramatically that's very less

243

00:09:52,660 --> 00:09:51,079

however consequently the duration of the

244

00:09:55,179 --> 00:09:52,670

mission is going to be a thousand years

245

00:09:58,240 --> 00:09:55,189

if you want to shorten in addition to me

246

00:10:00,100 --> 00:09:58,250

reasonable within a lifespan then as you

247

00:10:02,350 --> 00:10:00,110

see the propellant requiring that your

248

00:10:03,999 --> 00:10:02,360

skyrockets back up again and that's what

249

00:10:06,790 --> 00:10:04,009

you wave for this use and conventionally

250

00:10:08,470 --> 00:10:06,800

until you in physics and this is what

251  
00:10:10,569 --> 00:10:08,480  
the purpose of our research is about is

252  
00:10:13,900 --> 00:10:10,579  
how do we overcome this terrible issue

253  
00:10:15,369 --> 00:10:13,910  
well Bob frisbee who's now retired for

254  
00:10:17,860 --> 00:10:15,379  
the Jet Propulsion Laboratory

255  
00:10:21,220 --> 00:10:17,870  
dead-ass started in our bulky but

256  
00:10:23,769 --> 00:10:21,230  
Davison 85-page chopper 2 and here's the

257  
00:10:25,300 --> 00:10:23,779  
graph of the cruise speed velocity of an

258  
00:10:27,550 --> 00:10:25,310  
interstellar mission versus the trip

259  
00:10:30,519 --> 00:10:27,560  
time and then each of these diagonal

260  
00:10:32,110 --> 00:10:30,529  
values represent interstellar features

261  
00:10:34,689 --> 00:10:32,120  
or planetary features and hair style

262  
00:10:37,509 --> 00:10:34,699  
features at increasing distance for

263  
00:10:38,340 --> 00:10:37,519

example the heliopause is out of here

264

00:10:40,920 --> 00:10:38,350

today

265

00:10:44,300 --> 00:10:40,930

line and the gravitational is of the Sun

266

00:10:48,300 --> 00:10:44,310

is at 550 Lu here and the Kuiper belt is

267

00:10:50,430 --> 00:10:48,310

4,200 to 1000 I will not ban your cloud

268

00:10:52,260 --> 00:10:50,440

rise within this bound and this is

269

00:10:53,940 --> 00:10:52,270

interstellar distance from 33

270

00:10:56,040 --> 00:10:53,950

light-years the fading light so that

271

00:10:58,860 --> 00:10:56,050

would be a vision mission so they're

272

00:11:01,500 --> 00:10:58,870

going to look at the fact that the layer

273

00:11:02,880 --> 00:11:01,510

of the increase velocity the rather it's

274

00:11:06,480 --> 00:11:02,890

going to take to get there

275

00:11:07,710 --> 00:11:06,490

the faster you go the shorter this time

276

00:11:11,100 --> 00:11:07,720

it's going to take you to get there and

277

00:11:12,900 --> 00:11:11,110

then you compare this the requirement of

278

00:11:13,800 --> 00:11:12,910

the propulsion capabilities that are

279

00:11:16,680 --> 00:11:13,810

going to be able to meet those

280

00:11:18,420 --> 00:11:16,690

requirements so here Bob frisbee took a

281

00:11:21,150 --> 00:11:18,430

look and saw how these propulsion

282

00:11:23,940 --> 00:11:21,160

technologies NEP is nuclear electric

283

00:11:25,890 --> 00:11:23,950

propulsion and so how they mesh in how

284

00:11:29,730 --> 00:11:25,900

they cut across the slice of the

285

00:11:31,530 --> 00:11:29,740

distance versus time versus speed axis

286

00:11:32,940 --> 00:11:31,540

and here the other part of the

287

00:11:34,290 --> 00:11:32,950

professional capabilities that we

288

00:11:36,210 --> 00:11:34,300

theater-style initially matter

289

00:11:38,760 --> 00:11:36,220

antimatter beam energy and fusion Ram

290

00:11:40,530 --> 00:11:38,770

Jackson so badass he took a look at the

291

00:11:42,690 --> 00:11:40,540

anus of interstellar flight technology

292

00:11:45,420 --> 00:11:42,700

he looked at those profession concepts

293

00:11:47,070 --> 00:11:45,430

and apply two filters a bag of v

294

00:11:49,200 --> 00:11:47,080

capability man against the change of

295

00:11:51,810 --> 00:11:49,210

velocity needed to be there and to get

296

00:11:53,640 --> 00:11:51,820

to the cruise speedy the infrastructure

297

00:11:55,050 --> 00:11:53,650

requirements are like how big can you

298

00:11:57,390 --> 00:11:55,060

build your talents to carry the

299

00:11:59,040 --> 00:11:57,400

propellant as well as radiation

300

00:12:01,230 --> 00:11:59,050

shielding within the potential system

301  
00:12:03,120 --> 00:12:01,240  
and so forth and then the technology

302  
00:12:05,430 --> 00:12:03,130  
requirements on building it and we apply

303  
00:12:08,370 --> 00:12:05,440  
these three folders and as say for that

304  
00:12:11,160 --> 00:12:08,380  
last big list of possibilities they

305  
00:12:14,040 --> 00:12:11,170  
start getting really them into very few

306  
00:12:15,660 --> 00:12:14,050  
number of possibilities self-serving a

307  
00:12:17,760 --> 00:12:15,670  
questionable you know a theory of a new

308  
00:12:22,110 --> 00:12:17,770  
definitely else they survived all three

309  
00:12:23,700 --> 00:12:22,120  
failure so it's not very helpful so a

310  
00:12:26,130 --> 00:12:23,710  
proportion talk now this tells us

311  
00:12:28,350 --> 00:12:26,140  
application technology even to the even

312  
00:12:30,030 --> 00:12:28,360  
fish to the raiment of innovative

313  
00:12:32,130 --> 00:12:30,040

physics is basically an adequate for

314

00:12:34,260 --> 00:12:32,140

timely interstellar flight to circumvent

315

00:12:35,820 --> 00:12:34,270

these new limits are these limits we

316

00:12:38,290 --> 00:12:35,830

gotta have the new propulsion physics of

317

00:12:40,400 --> 00:12:38,300

some sort even if the

318

00:12:42,740 --> 00:12:40,410

impossible investigating physics in

319

00:12:45,320 --> 00:12:42,750

terms of spaceflight introduces new

320

00:12:47,630 --> 00:12:45,330

perspectives to solving the mysteries of

321

00:12:49,340 --> 00:12:47,640

science may optimistically of

322

00:12:51,290 --> 00:12:49,350

reification physicists discovered a new

323

00:12:52,970 --> 00:12:51,300

class of technologies would result in

324

00:12:55,210 --> 00:12:52,980

revolutionize in space flight and

325

00:12:58,970 --> 00:12:55,220

enabling humanity to reach the other

326

00:13:01,040 --> 00:12:58,980

debate of the stars here's an envelop

327

00:13:03,230 --> 00:13:01,050

that mark likes to use show people its

328

00:13:05,480 --> 00:13:03,240

history repeating itself to exceed the

329

00:13:08,030 --> 00:13:05,490

limits apply our technology we want to

330

00:13:10,040 --> 00:13:08,040

see entirely different technology and

331

00:13:12,350 --> 00:13:10,050

that was given from the book by

332

00:13:14,840 --> 00:13:12,360

fostering titled innovation the

333

00:13:16,790 --> 00:13:14,850

attackers advantage publishing 86 here

334

00:13:19,280 --> 00:13:16,800

is showing that the Masters that have

335

00:13:21,200 --> 00:13:19,290

mastered a certain type of technology

336

00:13:23,870 --> 00:13:21,210

are using incremental evolutionary

337

00:13:26,510 --> 00:13:23,880

approach to improve the technology till

338

00:13:29,360 --> 00:13:26,520

it fills performance flatlines that

339

00:13:31,930 --> 00:13:29,370

revolutionary pioneers engage in

340

00:13:34,760 --> 00:13:31,940

research and develop disruptive in

341

00:13:36,680 --> 00:13:34,770

disruptive innovations that basically

342

00:13:38,270 --> 00:13:36,690

lead to revolutionary technologies that

343

00:13:42,650 --> 00:13:38,280

they're way above the performance

344

00:13:45,140 --> 00:13:42,660

flatline so basically we're looking at

345

00:13:47,540 --> 00:13:45,150

compare revolutionary research twelve

346

00:13:50,390 --> 00:13:47,550

additional research we master the know

347

00:13:52,280 --> 00:13:50,400

like how they mastered said that our

348

00:13:56,210 --> 00:13:52,290

Savior technology and the sea and

349

00:13:59,780 --> 00:13:56,220

advanced it back in tubes if they may we

350

00:14:01,850 --> 00:13:59,790

have the piston driven propeller

351

00:14:02,900 --> 00:14:01,860

fighters that we advanced among the

352

00:14:05,360 --> 00:14:02,910

really line

353

00:14:08,000 --> 00:14:05,370

with the future recorded the main

354

00:14:10,940 --> 00:14:08,010

concept so this is what an example of

355

00:14:12,860 --> 00:14:10,950

evolutionary research mastery what we

356

00:14:14,840 --> 00:14:12,870

already know is looks like and then

357

00:14:16,460 --> 00:14:14,850

revolutionary research leads to the

358

00:14:19,760 --> 00:14:16,470

invention of the steam engine which may

359

00:14:23,720 --> 00:14:19,770

beyond the concept of using cells to

360

00:14:25,460 --> 00:14:23,730

generate thrust sized a transistors the

361

00:14:28,850 --> 00:14:25,470

jet engine and hopefully in the future

362

00:14:32,450 --> 00:14:28,860

warp drives an example of revolutionary

363

00:14:34,310 --> 00:14:32,460

research there very things that we

364

00:14:36,860 --> 00:14:34,320

discovered in the abated profession

365

00:14:38,900 --> 00:14:36,870

physics program at NASA is without a

366

00:14:42,860 --> 00:14:38,910

look at these three things now speed and

367

00:14:45,110 --> 00:14:42,870

energy because really propulsion methods

368

00:14:47,060 --> 00:14:45,120

that eliminate the need for propellant

369

00:14:49,340 --> 00:14:47,070

or beaming energy you just don't want to

370

00:14:51,740 --> 00:14:49,350

take so much with you how can we have a

371

00:14:53,750 --> 00:14:51,750

fast interstellar trip without having to

372

00:14:56,810 --> 00:14:53,760

drive all that power with you or are

373

00:14:59,060 --> 00:14:56,820

that propellant the energy source is the

374

00:15:00,230 --> 00:14:59,070

big driver of the engineering speed to

375

00:15:01,910 --> 00:15:00,240

spend it all is simply whether existing

376

00:15:03,770 --> 00:15:01,920

units like light speed limit to

377

00:15:04,850 --> 00:15:03,780

dramatically reduce trans at times and

378

00:15:07,760 --> 00:15:04,860

that leads to faster and light

379

00:15:10,130 --> 00:15:07,770

considerations and energy are leaves us

380

00:15:12,620 --> 00:15:10,140

to what methods do we have available to

381

00:15:15,170 --> 00:15:12,630

power these these types of technologies

382

00:15:16,790 --> 00:15:15,180

or these types of physics the

383

00:15:18,860 --> 00:15:16,800

state-of-the-art assessment that we've

384

00:15:19,910 --> 00:15:18,870

looked at now shows that no big things

385

00:15:22,070 --> 00:15:19,920

are aiming it at this time

386

00:15:23,840 --> 00:15:22,080

most research that's being done that

387

00:15:25,880 --> 00:15:23,850

steps more to in the scientific method

388

00:15:27,500 --> 00:15:25,890

which is just defining the problem and

389

00:15:30,530 --> 00:15:27,510

collecting the data theoretically and

390

00:15:32,600 --> 00:15:30,540

some empirically some research has been

391

00:15:34,580 --> 00:15:32,610

on as far as stop stealing fair which is

392

00:15:37,850 --> 00:15:34,590

fairly hypothesis and testing it and

393

00:15:39,080 --> 00:15:37,860

then the degree of activities use dozens

394

00:15:43,760 --> 00:15:39,090

of research they publish directly

395

00:15:45,410 --> 00:15:43,770

related our papers they publish publish

396

00:15:46,790 --> 00:15:45,420

directly related to billions okay other

397

00:15:48,620 --> 00:15:46,800

system should have said their papers

398

00:15:50,360 --> 00:15:48,630

were directly related to goals hundreds

399

00:15:52,820 --> 00:15:50,370

of researchers covered related basic

400

00:15:54,950 --> 00:15:52,830

physics now a recent phase work their

401  
00:15:57,620 --> 00:15:54,960  
mistress credibility and Pete's progress

402  
00:15:59,000 --> 00:15:57,630  
so there's a lot of this going on and

403  
00:16:00,800 --> 00:15:59,010  
this is the problem that has to be

404  
00:16:03,680 --> 00:16:00,810  
avoided because this is where theta

405  
00:16:05,600 --> 00:16:03,690  
sweet word concerns federal policymakers

406  
00:16:09,140 --> 00:16:05,610  
when it comes to time to asking for

407  
00:16:11,720 --> 00:16:09,150  
funding for these type of projects when

408  
00:16:14,400 --> 00:16:11,730  
we look at the women maybe our physics

409  
00:16:16,139 --> 00:16:14,410  
to break through spaceflight

410  
00:16:17,699 --> 00:16:16,149  
those foundations of the main physics

411  
00:16:19,730 --> 00:16:17,709  
that we're looking at now by plugging

412  
00:16:22,619 --> 00:16:19,740  
back in zero point energies

413  
00:16:24,600 --> 00:16:22,629

dark energy dark matter of the Big Bang

414

00:16:27,600 --> 00:16:24,610

and quantum entanglement in

415

00:16:29,309 --> 00:16:27,610

teleportation and what we're asking is

416

00:16:31,319 --> 00:16:29,319

whether than unresolved questions in

417

00:16:33,509 --> 00:16:31,329

these area of physics and then we look

418

00:16:35,429 --> 00:16:33,519

at the debut of envision slightly faster

419

00:16:37,079 --> 00:16:35,439

right in the end of the stars what are

420

00:16:38,970 --> 00:16:37,089

the critical issues in the lens of the

421

00:16:40,590 --> 00:16:38,980

physics and news and you find that

422

00:16:43,769 --> 00:16:40,600

there's the collision where these two

423

00:16:45,240 --> 00:16:43,779

sides intersect the intersection reveals

424

00:16:46,860 --> 00:16:45,250

the important problems that need to be

425

00:16:49,369 --> 00:16:46,870

solved they live in vain through

426  
00:16:52,350 --> 00:16:49,379  
profession conference our concept and

427  
00:16:54,509 --> 00:16:52,360  
this is the foundation of a bill is

428  
00:16:56,100 --> 00:16:54,519  
making out rigorous foundations of what

429  
00:16:59,490 --> 00:16:56,110  
we know in physics and what are the

430  
00:17:01,710 --> 00:16:59,500  
unknowns and then what we desire for our

431  
00:17:03,840 --> 00:17:01,720  
future space transport system for

432  
00:17:07,260 --> 00:17:03,850  
interstellar travel and then we're there

433  
00:17:10,949 --> 00:17:07,270  
intersection occurs is what we are doing

434  
00:17:14,130 --> 00:17:10,959  
in the bill to explain so here are the

435  
00:17:16,500 --> 00:17:14,140  
vision bigger goals mass speed and

436  
00:17:18,569 --> 00:17:16,510  
energy as I described earlier and then

437  
00:17:20,549 --> 00:17:18,579  
read the bill may envision concepts and

438  
00:17:22,649 --> 00:17:20,559

categories and then here are the

439

00:17:25,289 --> 00:17:22,659

rigorous foundations of science that we

440

00:17:27,659 --> 00:17:25,299

well the now let's hear the trades the

441

00:17:29,700 --> 00:17:27,669

theories the spa and the curiosities

442

00:17:31,980 --> 00:17:29,710

that come out of those areas of science

443

00:17:37,289 --> 00:17:31,990

and then in the middle of the important

444

00:17:39,390 --> 00:17:37,299

problems intersection and I mean you

445

00:17:42,380 --> 00:17:39,400

could see there's quite a detailed chart

446

00:17:46,500 --> 00:17:42,390

of very well highly interconnected

447

00:17:47,730 --> 00:17:46,510

concepts it's too long there's only

448

00:17:49,919 --> 00:17:47,740

enough time for me to go through this

449

00:17:52,620 --> 00:17:49,929

but these are all the concepts that we

450

00:17:54,690 --> 00:17:52,630

evaluated in the book in those 22

451

00:17:57,840 --> 00:17:54,700

chapters but we've only looked at a

452

00:18:00,029 --> 00:17:57,850

couple of these topics the books table

453

00:18:02,070 --> 00:18:00,039

of contents is laid out there like this

454

00:18:03,600 --> 00:18:02,080

we have to fail written by Barrett

455

00:18:05,310 --> 00:18:03,610

returned we originally had arthur c

456

00:18:07,070 --> 00:18:05,320

clarke but he died while was we human in

457

00:18:08,749 --> 00:18:07,080

a script so we

458

00:18:11,600 --> 00:18:08,759

asked our good friend that we tend to

459

00:18:15,080 --> 00:18:11,610

occasionally and do the and do that for

460

00:18:17,090 --> 00:18:15,090

us so we have to the contextual history

461

00:18:18,919 --> 00:18:17,100

of breakthrough propulsion physics was

462

00:18:21,739 --> 00:18:18,929

done by Paul Wester who is a space

463

00:18:25,879 --> 00:18:21,749

journalist he has the Centauri Dreams

464

00:18:27,350 --> 00:18:25,889

website his about frisbees chapter Mark

465

00:18:30,440 --> 00:18:27,360

Miller says the chapters and space

466

00:18:33,440 --> 00:18:30,450

drives I've got gravity control George

467

00:18:35,720 --> 00:18:33,450

Hathaway in Toronto has fabulous

468

00:18:38,629 --> 00:18:35,730

superconductors and my environment

469

00:18:41,210 --> 00:18:38,639

mechanical devices is a anti-gravity

470

00:18:43,609 --> 00:18:41,220

gyros which have been tested and shown

471

00:18:45,049 --> 00:18:43,619

not to be anti-gravity they're basically

472

00:18:47,379 --> 00:18:45,059

they basically are non-volatile

473

00:18:49,759 --> 00:18:47,389

anti-gravity devices the on the shooter

474

00:18:52,279 --> 00:18:49,769

examination is done by Steve authority

475

00:18:55,190 --> 00:18:52,289

at the Air Force Academy it's electric

476  
00:18:59,090 --> 00:18:55,200  
gravity unification that that was an oil

477  
00:19:01,489 --> 00:18:59,100  
test counts and very lifters we are a

478  
00:19:05,450 --> 00:19:01,499  
two chapters cover that because that is

479  
00:19:07,220 --> 00:19:05,460  
a long very a several decade old concept

480  
00:19:09,379 --> 00:19:07,230  
that people have been fighting over or

481  
00:19:10,789 --> 00:19:09,389  
the finally found out that telling

482  
00:19:12,259 --> 00:19:10,799  
somebody if there's have nothing to do

483  
00:19:15,229 --> 00:19:12,269  
is they appointed you nothing to do with

484  
00:19:18,080 --> 00:19:15,239  
electro gravity it's not even oil in its

485  
00:19:20,810 --> 00:19:18,090  
neutral particle and they have testing

486  
00:19:23,440 --> 00:19:20,820  
Dennett national some mash Sandia

487  
00:19:25,269 --> 00:19:23,450  
National Laboratory by a mere a tile and

488  
00:19:28,129 --> 00:19:25,279

clarity is a private investigator

489

00:19:30,019 --> 00:19:28,139

scientists in the defense industry who

490

00:19:31,239 --> 00:19:30,029

did is also and then he said others

491

00:19:33,799 --> 00:19:31,249

other topics that we've covered

492

00:19:35,749 --> 00:19:33,809

yesterday this the quantum vacuum

493

00:19:38,450 --> 00:19:35,759

initializer stochastic Petri dynamics

494

00:19:41,239 --> 00:19:38,460

relativistic spaceflight or faster no

495

00:19:44,779 --> 00:19:41,249

topics faster light communications

496

00:19:47,119 --> 00:19:44,789

space powers zero point energy Steiner

497

00:19:49,879 --> 00:19:47,129

in Russells free energy curves

498

00:19:51,529 --> 00:19:49,889

computational tools so now we're going

499

00:19:52,489 --> 00:19:51,539

to get into there a couple of the topics

500

00:19:57,200 --> 00:19:52,499

where drives

501  
00:19:59,479 --> 00:19:57,210  
oh so you make it work drives and they

502  
00:20:01,779 --> 00:19:59,489  
ask the question is it possible and the

503  
00:20:03,609 --> 00:20:01,789  
answer is yes Einstein's theory is where

504  
00:20:06,489 --> 00:20:03,619  
we'll go paint them that's where our

505  
00:20:09,639 --> 00:20:06,499  
Kabir discover the metric by looking at

506  
00:20:10,989 --> 00:20:09,649  
how do I wanna leave a ship the space at

507  
00:20:13,210 --> 00:20:10,999  
web speed how does it work

508  
00:20:15,129 --> 00:20:13,220  
the ship looks like it's ball surfing on

509  
00:20:17,529 --> 00:20:15,139  
a wave of space-time faster than light

510  
00:20:19,479 --> 00:20:17,539  
but yeah the reference frame the ship is

511  
00:20:21,190 --> 00:20:19,489  
in it's not violating the special

512  
00:20:23,080 --> 00:20:21,200  
relativity principle because the

513  
00:20:25,029 --> 00:20:23,090

spaceship is with an inertial frame

514

00:20:27,549 --> 00:20:25,039

that's always traveling less than light

515

00:20:30,369 --> 00:20:27,559

that it's the remote observers outside

516

00:20:32,320 --> 00:20:30,379

that we abundant that we're better fed

517

00:20:35,349 --> 00:20:32,330

up by negative vacuum energy that

518

00:20:37,690 --> 00:20:35,359

creates this will drive effect when they

519

00:20:38,519 --> 00:20:37,700

were outside looking at this they say

520

00:20:40,810 --> 00:20:38,529

this thing

521

00:20:43,599 --> 00:20:40,820

transitive space our super limited

522

00:20:45,909 --> 00:20:43,609

speeds and it's absolute supreme speeds

523

00:20:48,159 --> 00:20:45,919

not effective the energy required

524

00:20:50,589 --> 00:20:48,169

however is extremely high and the unity

525

00:20:53,169 --> 00:20:50,599

of the SteriPEN to a negative mass

526  
00:20:54,700 --> 00:20:53,179  
equivalence because your carriers you

527  
00:20:57,489 --> 00:20:54,710  
out of the Balaton is called sub balki

528  
00:21:01,060 --> 00:20:57,499  
energy and this is the most difficult

529  
00:21:04,089 --> 00:21:01,070  
thing to engineer commercially and those

530  
00:21:05,979 --> 00:21:04,099  
are different genre nothing moves except

531  
00:21:09,249 --> 00:21:05,989  
the traveler you set up the negative

532  
00:21:10,899 --> 00:21:09,259  
energy shell and this is a this is a

533  
00:21:12,279 --> 00:21:10,909  
fictitious diagram this is not a world

534  
00:21:15,070 --> 00:21:12,289  
where they live site this is called a

535  
00:21:18,269 --> 00:21:15,080  
thorn diagram and a flam diagram is a

536  
00:21:21,700 --> 00:21:18,279  
constant picture in time and radius and

537  
00:21:24,339 --> 00:21:21,710  
we're looking at a constant angle theta

538  
00:21:26,289 --> 00:21:24,349

and so this not particular spherical and

539

00:21:28,479 --> 00:21:26,299

safer so we're just taking a slice

540

00:21:29,799 --> 00:21:28,489

through constant only one angle so

541

00:21:31,389 --> 00:21:29,809

basically we're going to have a field

542

00:21:33,879 --> 00:21:31,399

with negative energy that has odd

543

00:21:34,690 --> 00:21:33,889

replace of gravitational force it dishes

544

00:21:36,489 --> 00:21:34,700

space out

545

00:21:38,259 --> 00:21:36,499

wholesome fear dopant keeps it from

546

00:21:40,570 --> 00:21:38,269

collapse and there's no event horizon

547

00:21:42,279 --> 00:21:40,580

were singularity like a block wall so

548

00:21:44,259 --> 00:21:42,289

travelers should be able to go inside

549

00:21:46,180 --> 00:21:44,269

that now and then through the fear

550

00:21:48,700 --> 00:21:46,190

without didn't we depart and come out

551

00:21:50,649 --> 00:21:48,710

the other side the night stay at PNA

552

00:21:53,320 --> 00:21:50,659

which is the a theory right but KB which

553

00:21:55,089 --> 00:21:53,330

is serious this is me on this space this

554

00:21:56,589 --> 00:21:55,099

is the normos based on continuing what

555

00:21:58,210 --> 00:21:56,599

you would really otherwise travel

556

00:22:00,820 --> 00:21:58,220

through but this is a shortcut through

557

00:22:04,359 --> 00:22:00,830

hyperspace need and you get there in

558

00:22:08,259 --> 00:22:04,369

just a matter of seconds there's a big

559

00:22:10,210 --> 00:22:08,269

valentine square wave made out nobody on

560

00:22:13,320 --> 00:22:10,220

the Sony you can see what kind of

561

00:22:16,299 --> 00:22:13,330

there's a galaxy there when his

562

00:22:18,419 --> 00:22:16,309

anti-gravitational out they can't

563

00:22:21,759 --> 00:22:18,429

activate now I like to call that snooze

564

00:22:23,200 --> 00:22:21,769

they that know when there's actually

565

00:22:26,289 --> 00:22:23,210

acting like a spherical Christmas

566

00:22:27,789 --> 00:22:26,299

ornament a spherical one's so the image

567

00:22:31,119 --> 00:22:27,799

on the inside coming from the other side

568

00:22:34,299 --> 00:22:31,129

of the world now is basically distorted

569

00:22:36,190 --> 00:22:34,309

and inverted there's a flat Wien whole

570

00:22:37,990 --> 00:22:36,200

one of us can take many shapes that can

571

00:22:39,879 --> 00:22:38,000

be spherical that to be fact that that

572

00:22:45,970 --> 00:22:39,889

we retain the way that can be polyhedral

573

00:22:51,009 --> 00:22:45,980

and self-worth so any of the concepts of

574

00:22:52,600 --> 00:22:51,019

all where drives a locality basically in

575

00:22:55,600 --> 00:22:52,610

the unresolved issues are the

576

00:22:57,869 --> 00:22:55,610

unobtainable mad about energy negative

577

00:23:01,840 --> 00:22:57,879

ten of the formula tools required to

578

00:23:03,669 --> 00:23:01,850

create a 100 meter diameter wheel bubble

579

00:23:06,310 --> 00:23:03,679

so that you can only have a wave the

580

00:23:08,320 --> 00:23:06,320

very corners per second it gets it's

581

00:23:10,509 --> 00:23:08,330

still bad really even today the speed of

582

00:23:12,490 --> 00:23:10,519

the snails crawl when a day as they as a

583

00:23:15,460 --> 00:23:12,500

snails crawl it's about negative 20 or

584

00:23:18,220 --> 00:23:15,470

30 something channels so the this is

585

00:23:20,169 --> 00:23:18,230

this is based on the energy study done

586

00:23:21,940 --> 00:23:20,179

by Matt visitors colleagues who looked

587

00:23:24,669 --> 00:23:21,950

at the gravitational interaction between

588

00:23:27,730 --> 00:23:24,679

web bubble the spaceship and they were

589

00:23:30,580 --> 00:23:27,740

perfect in the space time and the energy

590

00:23:32,919 --> 00:23:30,590

conditions and basically we they

591

00:23:34,600 --> 00:23:32,929

discovered that it deprives you just

592

00:23:35,980 --> 00:23:34,610

impractical if you've been out that this

593

00:23:37,299 --> 00:23:35,990

mission negative energy pulled out of

594

00:23:39,820 --> 00:23:37,309

the vacuum the basically it's

595

00:23:41,740 --> 00:23:39,830

impractical to use another native energy

596

00:23:43,899 --> 00:23:41,750

conditions or the conditions are what

597

00:23:47,590 --> 00:23:43,909

allows you to create that kind of energy

598

00:23:49,090 --> 00:23:47,600

out of the vacuum control ability is are

599

00:23:51,190 --> 00:23:49,100

causally disconnected since i've been

600

00:23:53,049 --> 00:23:51,200

you created world bevel the starship is

601  
00:23:55,060 --> 00:23:53,059  
not able to causally connect to it

602  
00:23:56,680 --> 00:23:55,070  
you're not able to control it so about

603  
00:23:58,899 --> 00:23:56,690  
maybe problem you always have closed

604  
00:24:01,509 --> 00:23:58,909  
timelike curves or time machines in work

605  
00:24:03,580 --> 00:24:01,519  
drives and wormholes and momentum

606  
00:24:05,799 --> 00:24:03,590  
conservation hasn't been evaluated on

607  
00:24:07,600 --> 00:24:05,809  
this caveat though by saying that

608  
00:24:09,759 --> 00:24:07,610  
Einstein's general theory field

609  
00:24:11,499 --> 00:24:09,769  
equations already have conservation was

610  
00:24:13,389 --> 00:24:11,509  
built into them it's just out there

611  
00:24:15,860 --> 00:24:13,399  
having been demonstrated explicitly by

612  
00:24:18,120 --> 00:24:15,870  
any of the theorists are john cream

613  
00:24:20,310 --> 00:24:18,130

requirement more locality by looking at

614

00:24:22,230 --> 00:24:20,320

virtual causal communication and that it

615

00:24:25,340 --> 00:24:22,240

is communicating backwards in time by

616

00:24:27,900 --> 00:24:25,350

way of a corner entitlement experiment

617

00:24:30,779 --> 00:24:27,910

so this is what the book sections look

618

00:24:33,270 --> 00:24:30,789

like four-wheel drives Indian Hills and

619

00:24:35,730 --> 00:24:33,280

interconnected out of the rigorous known

620

00:24:38,970 --> 00:24:35,740

things the unknown of the interesting

621

00:24:41,279 --> 00:24:38,980

curiosities then the hypothesis and test

622

00:24:42,919 --> 00:24:41,289

of the vacuum fluctuations that are

623

00:24:46,440 --> 00:24:42,929

needed to create the negative energy

624

00:24:48,180 --> 00:24:46,450

issues in their names and the concepts

625

00:24:50,700 --> 00:24:48,190

of their of the goal vision driven of

626

00:24:55,399 --> 00:24:50,710

the day up of the veil driven visions

627

00:24:58,440 --> 00:24:55,409

that's right it is that john cream is

628

00:25:01,860 --> 00:24:58,450

experimental design for a retro causal

629

00:25:03,180 --> 00:25:01,870

experience for FTL suddenly and i don't

630

00:25:05,549 --> 00:25:03,190

have too much time to talk about that

631

00:25:07,409 --> 00:25:05,559

but that's in the book this is martin

632

00:25:09,750 --> 00:25:07,419

else's notion of space drives he's

633

00:25:11,760 --> 00:25:09,760

making that you know without violating

634

00:25:13,919 --> 00:25:11,770

in momentum energy conservation is there

635

00:25:16,649 --> 00:25:13,929

where we can manipulate space-time or

636

00:25:18,960 --> 00:25:16,659

inertial frames back to create a space

637

00:25:21,480 --> 00:25:18,970

drive that would submit a differential

638

00:25:23,310 --> 00:25:21,490

sale or an induction sir or a diode sale

639

00:25:26,460 --> 00:25:23,320

and these are just a fairly straight of

640

00:25:29,010 --> 00:25:26,470

purposes only and he's looking at thrust

641

00:25:31,260 --> 00:25:29,020

and pressure in area calculations as a

642

00:25:34,430 --> 00:25:31,270

way of deriving a conceptualization of

643

00:25:37,169 --> 00:25:34,440

these things and this is you know

644

00:25:38,909 --> 00:25:37,179

metadata above a of some sort or change

645

00:25:41,520 --> 00:25:38,919

initial frames would push on that in

646

00:25:43,049 --> 00:25:41,530

space and so this is what he's kind of

647

00:25:47,090 --> 00:25:43,059

thinking in his mind he would like to

648

00:25:51,620 --> 00:25:47,100

see happen but then here's another way

649

00:25:54,779 --> 00:25:51,630

this is the soap bubble analogy of the

650

00:26:01,020 --> 00:25:54,789

space-time be worked in such a way that

651  
00:26:02,700 --> 00:26:01,030  
that pushes you forward okay and so this

652  
00:26:05,100 --> 00:26:02,710  
is the initial for notifications

653  
00:26:07,560 --> 00:26:05,110  
propulsion so these are the concepts be

654  
00:26:10,770 --> 00:26:07,570  
explored that Bob Forge gravitational

655  
00:26:13,620 --> 00:26:10,780  
dipole Martin Taylor is for validating

656  
00:26:16,230 --> 00:26:13,630  
device and here the concepts that are

657  
00:26:18,510 --> 00:26:16,240  
involved in the biggest foundations and

658  
00:26:19,950 --> 00:26:18,520  
curiosities have been the theory of

659  
00:26:21,990 --> 00:26:19,960  
envisions the concepts and categories

660  
00:26:24,350 --> 00:26:22,000  
and then everything that intersection

661  
00:26:27,270 --> 00:26:24,360  
between that needs to be studied

662  
00:26:29,070 --> 00:26:27,280  
space drive science issues they are made

663  
00:26:31,860 --> 00:26:29,080

in two dozen approaches to eliminate all

664

00:26:33,450 --> 00:26:31,870

specific issues and opportunities their

665

00:26:35,640 --> 00:26:33,460

objections and objectives

666

00:26:37,409 --> 00:26:35,650

conservation of momentum net external

667

00:26:40,560 --> 00:26:37,419

force that is your conservation because

668

00:26:43,440 --> 00:26:40,570

remember Newton's third law says option

669

00:26:45,419 --> 00:26:43,450

equals reaction and we don't know

670

00:26:48,600 --> 00:26:45,429

everything that has reaction with drives

671

00:26:51,120 --> 00:26:48,610

well drive is probably the closest I

672

00:26:54,930 --> 00:26:51,130

think to meeting this definition because

673

00:26:57,539 --> 00:26:54,940

there is no there is no use of news

674

00:26:59,070 --> 00:26:57,549

they've now it doesn't need to occur our

675

00:26:59,730 --> 00:26:59,080

tradition Bavarian here's that's a

676

00:27:01,890 --> 00:26:59,740

different story

677

00:27:04,020 --> 00:27:01,900

a commercially named he was a fixated

678

00:27:06,600 --> 00:27:04,030

thing in space so it's a fixed total the

679

00:27:08,640 --> 00:27:06,610

Explorer is doing is doing the moving

680

00:27:11,399 --> 00:27:08,650

he's going to be a rocket he's going to

681

00:27:12,690 --> 00:27:11,409

health to expel propellant or in here to

682

00:27:13,980 --> 00:27:12,700

move forward through the air hole but

683

00:27:16,289 --> 00:27:13,990

that's okay because the window is a

684

00:27:18,409 --> 00:27:16,299

shortcut so did seem to study

685

00:27:20,909 --> 00:27:18,419

interstellar distances very quickly and

686

00:27:22,950 --> 00:27:20,919

so there's nothing out there are you

687

00:27:25,530 --> 00:27:22,960

solve curiosities I can issue Fame for

688

00:27:26,580 --> 00:27:25,540

meters we don't know basically from the

689

00:27:28,230 --> 00:27:26,590

earliest times during their initial

690

00:27:28,890 --> 00:27:28,240

frames come from you don't know how they

691

00:27:30,570 --> 00:27:28,900

are

692

00:27:32,730 --> 00:27:30,580

it's the fundamental basis of it

693

00:27:34,289 --> 00:27:32,740

generates are these big out of inertial

694

00:27:35,960 --> 00:27:34,299

frame but we don't know about much about

695

00:27:38,190 --> 00:27:35,970

it other than that machs piece of

696

00:27:40,140 --> 00:27:38,200

space-time density this is interesting

697

00:27:40,649 --> 00:27:40,150

this is not a experimental error here

698

00:27:42,870 --> 00:27:40,659

mark

699

00:27:45,180 --> 00:27:42,880

if this was 10 to the negative n plus or

700

00:27:47,010 --> 00:27:45,190

minus 26 kilogram per cubic meter this

701  
00:27:50,549 --> 00:27:47,020  
is the way she say the arranging for the

702  
00:27:53,430 --> 00:27:50,559  
tend to be negative way to 10 to the 26

703  
00:27:56,370 --> 00:27:53,440  
and I thought was a bad way very not

704  
00:27:59,159 --> 00:27:56,380  
docking according back in density this

705  
00:28:01,799 --> 00:27:59,169  
is again a ways it's not representative

706  
00:28:03,240 --> 00:28:01,809  
of our measuring error this is represent

707  
00:28:05,190 --> 00:28:03,250  
the better table is right there this is

708  
00:28:08,190 --> 00:28:05,200  
the better table I tell you we won't

709  
00:28:09,870 --> 00:28:08,200  
experience the many look at the density

710  
00:28:11,310 --> 00:28:09,880  
of space-time because this gives us an

711  
00:28:14,190 --> 00:28:11,320  
idea what can we do to manipulate

712  
00:28:15,690 --> 00:28:14,200  
initial feelings or a better space-time

713  
00:28:18,450 --> 00:28:15,700

so you look at the density of their

714

00:28:21,060 --> 00:28:18,460

matter they are depressed dark matter

715

00:28:23,310 --> 00:28:21,070

and it helped us to have the same mass

716

00:28:27,210 --> 00:28:23,320

densities dark energy based on the

717

00:28:28,340 --> 00:28:27,220

misery of time to a supernova redshift

718

00:28:30,350 --> 00:28:28,350

far out and

719

00:28:31,700 --> 00:28:30,360

the edge of the universe the mass

720

00:28:33,680 --> 00:28:31,710

density is telling the negative

721

00:28:35,450 --> 00:28:33,690

twenty-six kilograms per cubic meter the

722

00:28:37,999 --> 00:28:35,460

energy density of the Nano joule per

723

00:28:40,430 --> 00:28:38,009

cubic meter if you take the

724

00:28:42,529 --> 00:28:40,440

electromagnetic zero energy and you

725

00:28:44,779 --> 00:28:42,539

integrated to the nucleon Compton

726

00:28:46,220 --> 00:28:44,789

frequency this is the energy basis this

727

00:28:48,620 --> 00:28:46,230

is the mass density you get from that

728

00:28:51,320 --> 00:28:48,630

energy and I think this would be

729

00:28:54,409 --> 00:28:51,330

intended 113 Joule per cubic meter and

730

00:28:57,529 --> 00:28:54,419

then look at these numbers are compared

731

00:28:59,299 --> 00:28:57,539

to the days module is calculated for jdi

732

00:29:01,490 --> 00:28:59,309

eternity the stress versus strain which

733

00:29:03,249 --> 00:29:01,500

is the gravitational coupling constant

734

00:29:06,379 --> 00:29:03,259

out there in Einstein's field equations

735

00:29:08,680 --> 00:29:06,389

relating the geometry will on the left

736

00:29:11,690 --> 00:29:08,690

and the space and letter the matter

737

00:29:12,950 --> 00:29:11,700

energy on the right and this is the

738

00:29:14,990 --> 00:29:12,960

coupling constant multiplied that by

739

00:29:16,909 --> 00:29:15,000

that matter energy here's the units and

740

00:29:19,310 --> 00:29:16,919

it is what you get in terms of kilogram

741

00:29:22,100 --> 00:29:19,320

per cubic meter it's on the area of turn

742

00:29:25,419 --> 00:29:22,110

of the TV five kilogram per cubic meter

743

00:29:28,669 --> 00:29:25,429

shows you that space is extremely stiff

744

00:29:31,159 --> 00:29:28,679

space is extremely stiff the vacuum cpe

745

00:29:33,470 --> 00:29:31,169

if you can add it all up would give you

746

00:29:36,139 --> 00:29:33,480

something that where it's not within

747

00:29:37,909 --> 00:29:36,149

that ballpark but it gets close and it

748

00:29:40,610 --> 00:29:37,919

shows that I am NOT an energy that we

749

00:29:42,289 --> 00:29:40,620

have access to cosmological is very weak

750

00:29:44,450 --> 00:29:42,299

compared to that you would be to been a

751  
00:29:47,389 --> 00:29:44,460  
space and of course up to the point in

752  
00:29:49,639 --> 00:29:47,399  
that space is even stiffer and there's a

753  
00:29:51,200 --> 00:29:49,649  
frame they are they are the reference

754  
00:29:53,240 --> 00:29:51,210  
frames against which acceleration is

755  
00:29:55,119 --> 00:29:53,250  
measured their forms are property of

756  
00:29:58,039 --> 00:29:55,129  
space-time that is not fairly understood

757  
00:29:59,779 --> 00:29:58,049  
everyone we have max Percival times 10

758  
00:30:01,669 --> 00:29:59,789  
versions of knots principals out there

759  
00:30:02,240 --> 00:30:01,679  
with their own ideas of how to explain

760  
00:30:04,610 --> 00:30:02,250  
Yosha

761  
00:30:06,830 --> 00:30:04,620  
our space-time is work by the presence

762  
00:30:09,200 --> 00:30:06,840  
of mass energy viable Einstein equations

763  
00:30:11,509 --> 00:30:09,210

which is given here you see a ball of

764

00:30:13,820 --> 00:30:11,519

matter is very better space around it in

765

00:30:18,200 --> 00:30:13,830

the web machine that nice whether she

766

00:30:20,240 --> 00:30:18,210

registration gravity this is the first

767

00:30:23,419 --> 00:30:20,250

that we associated at the geometrical

768

00:30:24,889 --> 00:30:23,429

craving of that space and that's what we

769

00:30:26,749 --> 00:30:24,899

would call the merical field gradient

770

00:30:29,060 --> 00:30:26,759

generate so  $V$  also predicts my

771

00:30:30,499 --> 00:30:29,070

administrative relative initial forms

772

00:30:32,130 --> 00:30:30,509

and the facility of we're trading losses

773

00:30:33,480 --> 00:30:32,140

and this is well

774

00:30:34,919 --> 00:30:33,490

by general relativity is called the

775

00:30:37,799 --> 00:30:34,929

interstate in fact or the gravitational

776

00:30:40,620 --> 00:30:37,809

Faraday effect and unfortunately the

777

00:30:42,060 --> 00:30:40,630

loss of gravity pull be there's no

778

00:30:43,530 --> 00:30:42,070

successful measuring it because there

779

00:30:45,360 --> 00:30:43,540

were problems with the highest

780

00:30:47,700 --> 00:30:45,370

sensitivity Christian drivers that they

781

00:30:49,049 --> 00:30:47,710

use they were just done there's a

782

00:30:50,700 --> 00:30:49,059

problem there's technical problems they

783

00:30:53,820 --> 00:30:50,710

could not verify the firm dragging

784

00:30:56,250 --> 00:30:53,830

effect at all Montaigne there basically

785

00:30:58,110 --> 00:30:56,260

is in Austria at the National Research

786

00:31:00,810 --> 00:30:58,120

Center's it's now the asterisk to the

787

00:31:04,680 --> 00:31:00,820

technology the trees he was looking at

788

00:31:06,980 --> 00:31:04,690

rotating ways putting him in a cryogenic

789

00:31:09,720 --> 00:31:06,990

Dewar are that could hear him and

790

00:31:11,820 --> 00:31:09,730

putting the ring on a haven a motivator

791

00:31:14,970 --> 00:31:11,830

and spinning them up a few hundred rpm

792

00:31:17,070 --> 00:31:14,980

and basically he put accelerometers out

793

00:31:17,490 --> 00:31:17,080

of armies and I began seeing an unusual

794

00:31:20,940 --> 00:31:17,500

force

795

00:31:23,190 --> 00:31:20,950

he began mopping the fearsome measuring

796

00:31:24,930 --> 00:31:23,200

and discovered a what looked like that

797

00:31:26,730 --> 00:31:24,940

we had a magnetic effect something

798

00:31:28,830 --> 00:31:26,740

similar till they understand the fact

799

00:31:32,039 --> 00:31:28,840

that with a very hard gravitational

800

00:31:33,990 --> 00:31:32,049

coupling constant like about probably 18

801  
00:31:35,789 --> 00:31:34,000  
meters or maybe ten or twelve orders of

802  
00:31:38,400 --> 00:31:35,799  
magnitude larger than general seventy

803  
00:31:39,960 --> 00:31:38,410  
would protect but it was rather high so

804  
00:31:41,970 --> 00:31:39,970  
he developed a theory thinking that

805  
00:31:44,669 --> 00:31:41,980  
possibly the superconducting states of

806  
00:31:46,860 --> 00:31:44,679  
the letters in this liquid helium we're

807  
00:31:49,799 --> 00:31:46,870  
covering with gravitational field

808  
00:31:52,770 --> 00:31:49,809  
somehow and create an anomalous constant

809  
00:31:55,860 --> 00:31:52,780  
value are very our firm driving force on

810  
00:31:58,049 --> 00:31:55,870  
the outside of the system as turning on

811  
00:32:00,539 --> 00:31:58,059  
he keeps our here enacted with our group

812  
00:32:02,430 --> 00:32:00,549  
and he gave him a lot of input and he

813  
00:32:04,440 --> 00:32:02,440

took that input to redesign experiment

814

00:32:06,539 --> 00:32:04,450

two or three times to measure he

815

00:32:08,880 --> 00:32:06,549

graduated away from accelerometers and

816

00:32:11,610 --> 00:32:08,890

into laser journals he even obtained the

817

00:32:13,350 --> 00:32:11,620

laser gyros from about a used on Soviet

818

00:32:15,960 --> 00:32:13,360

based of missiles which were highly

819

00:32:17,940 --> 00:32:15,970

sensitive he reproduced the effect

820

00:32:20,100 --> 00:32:17,950

either the coupling constant got smaller

821

00:32:23,909 --> 00:32:20,110

and then he finally got to the point to

822

00:32:25,700 --> 00:32:23,919

where he had to take the waves off who

823

00:32:28,409 --> 00:32:25,710

can measure the fact just with the

824

00:32:30,090 --> 00:32:28,419

holder then he took behave it off and I

825

00:32:32,159 --> 00:32:30,100

was measured with some effect which is

826

00:32:35,310 --> 00:32:32,169

to helium so the thing is

827

00:32:36,989 --> 00:32:35,320

it's a bust he's still getting bad are

828

00:32:39,659 --> 00:32:36,999

still measuring the force but there's no

829

00:32:41,460 --> 00:32:39,669

Thea to explain it we have to spit this

830

00:32:43,470 --> 00:32:41,470

this is jordyn closed chapter in a bit

831

00:32:45,090 --> 00:32:43,480

looking at the quantum vacuum zero point

832

00:32:47,159 --> 00:32:45,100

energies and the dynamical Casimir

833

00:32:49,830 --> 00:32:47,169

effect you take the Casimir cavity but

834

00:32:51,239 --> 00:32:49,840

you also have unbounded in the cavity

835

00:32:54,779 --> 00:32:51,249

and there is a net force that's

836

00:32:57,090 --> 00:32:54,789

generated in keeping with  $F$  equals  $MA$

837

00:32:58,649 --> 00:32:57,100

and the third law and you could push

838

00:33:02,369 --> 00:32:58,659

against the vacuum fluctuations you

839

00:33:04,560 --> 00:33:02,379

generate a really really thrust and it

840

00:33:07,229 --> 00:33:04,570

is not quite measurably that I think

841

00:33:08,669 --> 00:33:07,239

we're just on the verge of possibly

842

00:33:10,139 --> 00:33:08,679

designing it explained to actually

843

00:33:13,889 --> 00:33:10,149

measuring us in the near future

844

00:33:15,960 --> 00:33:13,899

they are the thrust equations when it

845

00:33:19,279 --> 00:33:15,970

design of fusion the robotics are has

846

00:33:21,690 --> 00:33:19,289

been White team Glenn Research Center in

847

00:33:23,249 --> 00:33:21,700

including looked at the possibility of

848

00:33:27,269 --> 00:33:23,259

whether solid fusion could be a power

849

00:33:29,609 --> 00:33:27,279

source it's it's not a it's not an

850

00:33:32,519 --> 00:33:29,619

open-and-shut case yet sign of fusion

851

00:33:35,849 --> 00:33:32,529

does exist and it does produce power but

852

00:33:38,159 --> 00:33:35,859

it's basically on the chemical acoustic

853

00:33:41,399 --> 00:33:38,169

system and it is not going to be any

854

00:33:42,930 --> 00:33:41,409

breakthrough power at all it's not at

855

00:33:44,489 --> 00:33:42,940

the very kind of energy to lead to a

856

00:33:46,919 --> 00:33:44,499

breakthrough that we could that we could

857

00:33:49,259 --> 00:33:46,929

depend on our curiosities as you guys

858

00:33:51,239 --> 00:33:49,269

may have heard by now are voyagers and

859

00:33:53,450 --> 00:33:51,249

pioneers as well as other spacecraft

860

00:33:58,190 --> 00:33:53,460

that have been for the last few years

861

00:34:01,590 --> 00:33:58,200

have been theory an additional sunsetted

862

00:34:04,049 --> 00:34:01,600

attractive force on them and if there's

863

00:34:05,729 --> 00:34:04,059

been at least anybody so basically

864

00:34:08,190 --> 00:34:05,739

there's a real force of gravity acting

865

00:34:10,710 --> 00:34:08,200

the systematic analysis of all these

866

00:34:13,980 --> 00:34:10,720

forces measured by all the different

867

00:34:16,740 --> 00:34:13,990

spacecraft are showing a demonstrable

868

00:34:19,649 --> 00:34:16,750

force that's consistent is repeatable it

869

00:34:20,819 --> 00:34:19,659

has the same elements however we don't

870

00:34:21,780 --> 00:34:20,829

know what the source of it is and so

871

00:34:25,049 --> 00:34:21,790

people are looking at alternative

872

00:34:29,300 --> 00:34:25,059

theories of gravity I think that more

873

00:34:34,040 --> 00:34:29,310

curiosities involving dark energy

874

00:34:37,160 --> 00:34:34,050

the big bang on there are the things

875

00:34:38,800 --> 00:34:37,170

that can these things will tell us these

876

00:34:42,350 --> 00:34:38,810

things may tell us something about

877

00:34:45,080 --> 00:34:42,360

space-time and vacuum energy that might

878

00:34:49,820 --> 00:34:45,090

lead us to explore some names that could

879

00:34:51,380 --> 00:34:49,830

ghosts and very propulsion here's what

880

00:34:55,070 --> 00:34:51,390

the mysteries of physics would look like

881

00:34:56,300 --> 00:34:55,080

as we covered them in our book and we

882

00:35:01,270 --> 00:34:56,310

all interconnected to all these

883

00:35:04,580 --> 00:35:01,280

different concepts and last max

884

00:35:07,520 --> 00:35:04,590

particular challenge was as a man as a

885

00:35:09,500 --> 00:35:07,530

NASA probe banana tree he was tasked

886

00:35:11,570 --> 00:35:09,510

with having to beat down the skeptical

887

00:35:13,910 --> 00:35:11,580

academics and there are incredible

888

00:35:16,040 --> 00:35:13,920

scientists and visionaries who are all

889

00:35:18,380 --> 00:35:16,050

the people who publish in peer review

890

00:35:20,360 --> 00:35:18,390

for out-of-the-box thinkers be able to

891

00:35:22,250 --> 00:35:20,370

come forward get some support to be able

892

00:35:24,920 --> 00:35:22,260

study some of these interesting problems

893

00:35:26,320 --> 00:35:24,930

so we looked at what whether they what

894

00:35:28,880 --> 00:35:26,330

are the features that we want in a

895

00:35:30,710 --> 00:35:28,890

visionary per year we want to combine

896

00:35:33,140 --> 00:35:30,720

vision of credibility to consider the

897

00:35:35,630 --> 00:35:33,150

possibilities research rigorously and

898

00:35:37,580 --> 00:35:35,640

impartially a judge others River and

899

00:35:39,590 --> 00:35:37,590

impartiality but not the feasibility

900

00:35:42,080 --> 00:35:39,600

that's one important characteristics

901  
00:35:43,820 --> 00:35:42,090  
you've got to have you want to do small

902  
00:35:45,380 --> 00:35:43,830  
increments of progress if a little bit

903  
00:35:47,450 --> 00:35:45,390  
less provocative so you know still

904  
00:35:49,090 --> 00:35:47,460  
controversy emphasis on physical

905  
00:35:52,720 --> 00:35:49,100  
observables and use appropriate

906  
00:35:55,580 --> 00:35:52,730  
comparisons with energy for example in

907  
00:35:57,770 --> 00:35:55,590  
space-time propulsion the key driver is

908  
00:35:59,900 --> 00:35:57,780  
rocket efficiency or potential efficacy

909  
00:36:01,610 --> 00:35:59,910  
is measured by the specific impulse you

910  
00:36:04,040 --> 00:36:01,620  
cannot use specific impulse for world

911  
00:36:06,320 --> 00:36:04,050  
drives or where events or applying

912  
00:36:07,880 --> 00:36:06,330  
vacuum thrusts because it has no unit in

913  
00:36:09,740 --> 00:36:07,890

those genres but the specific impulse

914

00:36:11,750 --> 00:36:09,750

comes out of the rocket equation which

915

00:36:14,120 --> 00:36:11,760

is Newtonian physics so you've gotta

916

00:36:16,070 --> 00:36:14,130

talk in terms of energy and then secant

917

00:36:18,200 --> 00:36:16,080

apply qualified critiques by building in

918

00:36:21,650 --> 00:36:18,210

also peer reviewers who are interested

919

00:36:26,030 --> 00:36:21,660

in willing to to examine these things

920

00:36:28,210 --> 00:36:26,040

look at the river and judge the their

921

00:36:30,710 --> 00:36:28,220

effectiveness and whatnot

922

00:36:32,300 --> 00:36:30,720

my concluding remarks I understand a

923

00:36:33,700 --> 00:36:32,310

fault requires discoveries in physics

924

00:36:35,900 --> 00:36:33,710

rather than just technological

925

00:36:37,400 --> 00:36:35,910

refinements physics has advanced

926

00:36:39,590 --> 00:36:37,410

sufficiently beware

927

00:36:41,990 --> 00:36:39,600

research based our breakthroughs has

928

00:36:43,670 --> 00:36:42,000

begun and it's been in progress since

929

00:36:45,410 --> 00:36:43,680

the mid-1990s

930

00:36:47,810 --> 00:36:45,420

even if desired breakthroughs are

931

00:36:49,370 --> 00:36:47,820

impossible at least the path of this

932

00:36:51,260 --> 00:36:49,380

study proves our provides novel

933

00:36:53,360 --> 00:36:51,270

approaches scientific investigations to

934

00:36:55,460 --> 00:36:53,370

continue looking into those curiosities

935

00:36:57,230 --> 00:36:55,470

of nature and the cosmos like dark

936

00:36:59,300 --> 00:36:57,240

energy dark matter and there's an

937

00:37:01,430 --> 00:36:59,310

ominous forces acting on our spacecraft

938

00:37:03,110 --> 00:37:01,440

but are far outside the solar system

939

00:37:04,550 --> 00:37:03,120

and that the breakthroughs are formed

940

00:37:17,530 --> 00:37:04,560

space flight and much more will be

941

00:37:27,860 --> 00:37:17,540

revolutionized thank you very much and

942

00:37:31,120 --> 00:37:27,870

we do have time for questions ok tell me

943

00:37:34,730 --> 00:37:31,130

what his question was ok

944

00:37:36,170 --> 00:37:34,740

Bobby good idea to use the microphone is

945

00:37:38,660 --> 00:37:36,180

there any thought using the known

946

00:37:41,240 --> 00:37:38,670

properties of UFOs as a guide to your

947

00:37:43,190 --> 00:37:41,250

thinking and or such I'm still having

948

00:37:48,920 --> 00:37:43,200

trouble hearing what's going on the

949

00:37:51,980 --> 00:37:48,930

question is is there any asking ok is

950

00:37:54,380 --> 00:37:51,990

there any application or wisdom to be

951  
00:37:58,940 --> 00:37:54,390  
taken from UFO research that might help

952  
00:38:03,500 --> 00:37:58,950  
you or the answer is yes enero secretly

953  
00:38:05,600 --> 00:38:03,510  
also an overtly no because they the

954  
00:38:07,970 --> 00:38:05,610  
mainstream academic still about the

955  
00:38:09,530 --> 00:38:07,980  
topic of UFOs are you really having

956  
00:38:11,330 --> 00:38:09,540  
credibility with them especially with

957  
00:38:12,830 --> 00:38:11,340  
policymakers and decision makers in

958  
00:38:15,110 --> 00:38:12,840  
charge of funding and programmatic

959  
00:38:16,760 --> 00:38:15,120  
better than here the topic of UFOs so

960  
00:38:19,190 --> 00:38:16,770  
for the purpose of doing this officially

961  
00:38:22,860 --> 00:38:19,200  
without billionaire phones but we did

962  
00:38:25,050 --> 00:38:22,870  
consider it under the table and yes

963  
00:38:27,210 --> 00:38:25,060

there is a subset of us we've looked at

964

00:38:30,140 --> 00:38:27,220

UFO data and we've looked at all the

965

00:38:31,890 --> 00:38:30,150

physical events and physical

966

00:38:33,950 --> 00:38:31,900

descriptions that were provided by

967

00:38:37,500 --> 00:38:33,960

investigators from shark Valley to

968

00:38:39,360 --> 00:38:37,510

yourself and and whatnot and George

969

00:38:41,760 --> 00:38:39,370

Hathaway and so forth and we've been

970

00:38:45,540 --> 00:38:41,770

able to use that data as input to give

971

00:38:47,850 --> 00:38:45,550

us an idea and that data does drive the

972

00:38:49,230 --> 00:38:47,860

concepts that we did derive later on

973

00:38:50,790 --> 00:38:49,240

that we were the brought the millions of

974

00:38:53,250 --> 00:38:50,800

the original NASA program white whale

975

00:38:55,950 --> 00:38:53,260

drives and wormholes for example at the

976  
00:38:57,390 --> 00:38:55,960  
lives Utah launched that all right would

977  
00:39:01,080 --> 00:38:57,400  
used to work for Bob bivolo for six

978  
00:39:04,440 --> 00:39:01,090  
years we have the experience of a

979  
00:39:06,900 --> 00:39:04,450  
scientist and the investigator seeing a

980  
00:39:08,490 --> 00:39:06,910  
window that look like a rainbow open up

981  
00:39:10,830 --> 00:39:08,500  
with the creature crawling through and

982  
00:39:13,260 --> 00:39:10,840  
then the potential use that I actually

983  
00:39:14,970 --> 00:39:13,270  
see eliminating the sky in broad

984  
00:39:16,620 --> 00:39:14,980  
daylight with the travel of thought that

985  
00:39:18,600 --> 00:39:16,630  
came through it well that's an example

986  
00:39:22,740 --> 00:39:18,610  
of data about indicators around there

987  
00:39:24,690 --> 00:39:22,750  
involved I mean our geometry tells you

988  
00:39:27,000 --> 00:39:24,700

that a man who looks like we intersect

989

00:39:29,460 --> 00:39:27,010

surf space it appears as a very bright

990

00:39:31,710 --> 00:39:29,470

intense intensity by way of light and

991

00:39:34,170 --> 00:39:31,720

then as it was an intersection that's

992

00:39:36,000 --> 00:39:34,180

larger larger then it opens up indicated

993

00:39:37,560 --> 00:39:36,010

through the hole and things will be

994

00:39:39,900 --> 00:39:37,570

billion out of it so that's a detail

995

00:39:42,420 --> 00:39:39,910

appear to datasets that we've verified

996

00:39:44,670 --> 00:39:42,430

that the day of Utah range that matched

997

00:39:49,020 --> 00:39:44,680

well I know as a physicist or burglar

998

00:39:51,510 --> 00:39:49,030

would do what was we haven't seen UFOs

999

00:39:54,150 --> 00:39:51,520

do performances that adhere to the world

1000

00:39:55,980 --> 00:39:54,160

web because the web driver basically

1001  
00:39:58,270 --> 00:39:55,990  
it's just between stars that we don't

1002  
00:40:00,670 --> 00:39:58,280  
see EF is more beware

1003  
00:40:03,420 --> 00:40:00,680  
we see them doing related materials and

1004  
00:40:07,900 --> 00:40:03,430  
proclamations they disappear reappear

1005  
00:40:09,940 --> 00:40:07,910  
that's that's that one is undeterred yet

1006  
00:40:14,050 --> 00:40:09,950  
I'll would think the Ravens be

1007  
00:40:16,240 --> 00:40:14,060  
possibility still prepared effective

1008  
00:40:18,190 --> 00:40:16,250  
anything else and I think they're anti

1009  
00:40:20,260 --> 00:40:18,200  
gravity we have anti-gravity and

1010  
00:40:22,060 --> 00:40:20,270  
Einstein's true theory but although it's

1011  
00:40:24,970 --> 00:40:22,070  
overdue and I talked about in my chopper

1012  
00:40:27,670 --> 00:40:24,980  
you both in my three chapters there are

1013  
00:40:29,350 --> 00:40:27,680

other aspects of anti-gravity the

1014

00:40:31,360 --> 00:40:29,360

properties of negative ocular energy

1015

00:40:33,760 --> 00:40:31,370

that will create a repressive force that

1016

00:40:36,310 --> 00:40:33,770

allows simply levitated up and he refers

1017

00:40:39,310 --> 00:40:36,320

to exhibit that so there's an how could

1018

00:40:40,990 --> 00:40:39,320

a scale as my vacuum model it's a

1019

00:40:43,330 --> 00:40:41,000

different fate of relativity where

1020

00:40:44,530 --> 00:40:43,340

instead of the space-time univision a

1021

00:40:47,350 --> 00:40:44,540

spacetime

1022

00:40:50,140 --> 00:40:47,360

as a paralyzed by vacuum of the 2008

1023

00:40:53,410 --> 00:40:50,150

fluctuations and if you observe a field

1024

00:40:56,110 --> 00:40:53,420

on that medium the fluctuations are

1025

00:40:59,050 --> 00:40:56,120

polarized that creates a spacetime been

1026  
00:41:01,420 --> 00:40:59,060  
in effect 72 will grab you one holes and

1027  
00:41:03,190 --> 00:41:01,430  
we say we see that we surround aspects

1028  
00:41:10,440 --> 00:41:03,200  
of what he put in cherry can take one or

1029  
00:41:19,720 --> 00:41:16,660  
I hate to continue the fear potent topic

1030  
00:41:24,280 --> 00:41:19,730  
of UFOs but I'm driven to ask if you

1031  
00:41:27,580 --> 00:41:24,290  
know the name Bob Lazar about what the

1032  
00:41:30,040 --> 00:41:27,590  
name Bob Lazar you don't know that name

1033  
00:41:33,130 --> 00:41:30,050  
he claims to have worked in the area 51

1034  
00:41:35,650 --> 00:41:33,140  
and to have worked with captured UFOs

1035  
00:41:39,040 --> 00:41:35,660  
and to have investigated the physics of

1036  
00:41:41,950 --> 00:41:39,050  
propulsion and he states that I believe

1037  
00:41:45,460 --> 00:41:41,960  
element 113 which is as-yet-undiscovered

1038  
00:41:45,799 --> 00:41:45,470

on earth is an island of stability and

1039

00:41:49,219 --> 00:41:45,809

other

1040

00:41:51,729 --> 00:41:49,229

as unstable regions of nuclei and that

1041

00:41:54,319 --> 00:41:51,739

in element 113 the strong nuclear force

1042

00:41:56,779 --> 00:41:54,329

extends slightly behind the nucleus and

1043

00:41:58,609 --> 00:41:56,789

aliens have discovered a way to amplify

1044

00:42:03,009 --> 00:41:58,619

that force and use it to create

1045

00:42:04,779 --> 00:42:03,019

artificial wormholes for transport so I

1046

00:42:08,569 --> 00:42:04,789

know I'm sorry

1047

00:42:11,150 --> 00:42:08,579

this is hard to do shortly but that that

1048

00:42:12,920 --> 00:42:11,160

is one Avenue I think the wormhole idea

1049

00:42:16,910 --> 00:42:12,930

is the solution to this problem and that

1050

00:42:19,099 --> 00:42:16,920

is one bit of forbidden knowledge that

1051  
00:42:19,400 --> 00:42:19,109  
you might use in the future okay thank

1052  
00:42:23,660 --> 00:42:19,410  
you

1053  
00:42:28,209 --> 00:42:23,670  
question about the legitimate the end of

1054  
00:42:30,739 --> 00:42:28,219  
the table really have to be brief

1055  
00:42:33,469 --> 00:42:30,749  
how many of sky Nelson and my question

1056  
00:42:35,749 --> 00:42:33,479  
is you mentioned retroactive causation

1057  
00:42:38,679 --> 00:42:35,759  
as a means of communicating into the

1058  
00:42:42,829 --> 00:42:38,689  
past can you elaborate on how that would

1059  
00:42:43,999 --> 00:42:42,839  
impact space travel so how a retroactive

1060  
00:42:45,559 --> 00:42:44,009  
communication into the past could

1061  
00:42:46,459 --> 00:42:45,569  
actually influence space travel is there

1062  
00:42:48,859 --> 00:42:46,469  
some connection there that you were

1063  
00:42:52,309 --> 00:42:48,869

making which part of being able to

1064

00:42:54,259 --> 00:42:52,319

operate how retroactive communication

1065

00:42:55,759 --> 00:42:54,269

where you just transfer your vision back

1066

00:42:57,439 --> 00:42:55,769

and forth you're just transferring

1067

00:42:59,150 --> 00:42:57,449

information does that actually I know

1068

00:43:01,669 --> 00:42:59,160

really well now and where there's a

1069

00:43:03,380 --> 00:43:01,679

thought that doesn't apply the space

1070

00:43:05,749 --> 00:43:03,390

travel that we don't know we've all

1071

00:43:06,979 --> 00:43:05,759

personally don't think so FTL

1072

00:43:10,989 --> 00:43:06,989

communications it's just going to need

1073

00:43:13,489 --> 00:43:10,999

FTL communications I don't think that I

1074

00:43:14,779 --> 00:43:13,499

put that on the side probably because he

1075

00:43:16,819 --> 00:43:14,789

won't believe that question will be to

1076

00:43:19,160 --> 00:43:16,829

be addressed and why well join

1077

00:43:21,349 --> 00:43:19,170

creaminess research is specifically for

1078

00:43:22,910 --> 00:43:21,359

a communication system and it doesn't

1079

00:43:25,849 --> 00:43:22,920

have any application for space travel