

1  
00:00:00,000 --> 00:00:06,870  
that word in laser pointer gutter okay

2  
00:00:05,278 --> 00:00:10,730  
thank you very much I appreciate this

3  
00:00:06,870 --> 00:00:13,859  
opportunity to be here so it's nice and

4  
00:00:10,730 --> 00:00:15,210  
the good news is that my mathematics is

5  
00:00:13,859 --> 00:00:18,089  
not quite as tough as some of them them

6  
00:00:15,210 --> 00:00:20,880  
before so that may be good or bad news i

7  
00:00:18,089 --> 00:00:23,399  
don't know which i've started out kind

8  
00:00:20,879 --> 00:00:26,489  
of strangely in a way because this ye

9  
00:00:23,399 --> 00:00:31,469  
yang symbol so to speak it's a satellite

10  
00:00:26,489 --> 00:00:33,390  
of Saturn it's the moon I artists it has

11  
00:00:31,469 --> 00:00:35,519  
one side which is all mostly right and

12  
00:00:33,390 --> 00:00:37,739  
one side which is basically black which

13  
00:00:35,520 --> 00:00:39,899  
is kind of unusual it's really the only

14  
00:00:37,738 --> 00:00:42,179  
place in the solar system like that this

15  
00:00:39,899 --> 00:00:46,140  
is a somewhat better shot of it closer

16  
00:00:42,179 --> 00:00:47,909  
up thanks to Cassini and looks kind of

17  
00:00:46,140 --> 00:00:49,530  
normal in some respects except for sort

18  
00:00:47,909 --> 00:00:54,299  
of a little Ridge runnin around there

19  
00:00:49,530 --> 00:00:57,329  
which as it turns out shown here this

20  
00:00:54,299 --> 00:01:00,769  
Ridge is a well if it were on earth on a

21  
00:00:57,329 --> 00:01:03,000  
relative basis it would be 60 miles high

22  
00:01:00,770 --> 00:01:06,079  
because all the way around the planet

23  
00:01:03,000 --> 00:01:08,459  
excuse me all the way around the moon

24  
00:01:06,079 --> 00:01:10,319  
this is extremely strange this doesn't

25  
00:01:08,459 --> 00:01:12,750  
like it and there's been some attempts

26  
00:01:10,319 --> 00:01:15,688  
to explain it but it doesn't get

27  
00:01:12,750 --> 00:01:17,609  
explained too well nor does the black

28  
00:01:15,688 --> 00:01:20,129  
white get explained to well we just

29

00:01:17,609 --> 00:01:21,989  
can't quite figure that one out but of

30  
00:01:20,129 --> 00:01:24,569  
course all of them are running around

31  
00:01:21,989 --> 00:01:28,589  
the planet Saturn now as it turns out

32  
00:01:24,569 --> 00:01:31,109  
most of the moons of Saturn are based on

33  
00:01:28,590 --> 00:01:32,670  
the same plane as the Rings and so

34  
00:01:31,109 --> 00:01:34,159  
really if you're one of these are the

35  
00:01:32,670 --> 00:01:36,960  
millions you can't see anything you

36  
00:01:34,159 --> 00:01:38,790  
can't see the ring just kind of a thick

37  
00:01:36,959 --> 00:01:40,759  
line maybe maybe you got a shadow on the

38  
00:01:38,790 --> 00:01:44,670  
planet occasionally but that's about it

39  
00:01:40,759 --> 00:01:48,659  
but I epic taste is a little different

40  
00:01:44,670 --> 00:01:50,219  
you can see that the side and with all

41  
00:01:48,659 --> 00:01:52,590  
the other moons on the Rings are right

42  
00:01:50,219 --> 00:01:55,769  
in here and then I epochs is doing this

43  
00:01:52,590 --> 00:01:57,719

really nice ellipsoid here it's about

44

00:01:55,769 --> 00:02:01,368

900 miles across and it's got a few

45

00:01:57,718 --> 00:02:04,048

things it's really very few few

46

00:02:01,368 --> 00:02:07,120

satellites that has a shall we say a

47

00:02:04,049 --> 00:02:08,770

moon with a view and it really gets to

48

00:02:07,120 --> 00:02:10,840

saturn and you don't get to do it

49

00:02:08,770 --> 00:02:12,250

otherwise and in fact the moon with the

50

00:02:10,840 --> 00:02:14,590

view is a good place to go if you are

51

00:02:12,250 --> 00:02:16,449

interested in doing this and looking in

52

00:02:14,590 --> 00:02:18,849

this photos by Richard Hoagland some

53

00:02:16,449 --> 00:02:21,329

other things and it's really pretty

54

00:02:18,849 --> 00:02:25,689

fascinating and a lot of respects I

55

00:02:21,330 --> 00:02:28,210

mentioned it at this point because from

56

00:02:25,689 --> 00:02:29,530

my viewpoint is do it's my motivation in

57

00:02:28,210 --> 00:02:32,129

the way for the one of some of the

58  
00:02:29,530 --> 00:02:34,719  
things I'm talking about doing and that

59  
00:02:32,129 --> 00:02:37,359  
the whole idea of this talk is that one

60  
00:02:34,719 --> 00:02:39,729  
if I wanted to go to Saturn 1 i'm going

61  
00:02:37,360 --> 00:02:41,590  
to need a good propulsion system not a

62  
00:02:39,729 --> 00:02:43,509  
word drive necessarily like that because

63  
00:02:41,590 --> 00:02:45,430  
let's face it if you had work blood

64  
00:02:43,509 --> 00:02:47,229  
there'd be some rules saying you can't

65  
00:02:45,430 --> 00:02:48,939  
do it inside the orbit of Saturn or

66  
00:02:47,229 --> 00:02:51,849  
something like that you know you you

67  
00:02:48,939 --> 00:02:55,930  
know it did cause too much no it just to

68  
00:02:51,849 --> 00:02:58,180  
be terrible but anyway so also need an

69  
00:02:55,930 --> 00:02:59,590  
energy source to get there too and so

70  
00:02:58,180 --> 00:03:00,939  
we're going to a little of a segue here

71  
00:02:59,590 --> 00:03:02,770  
we're going to talk about propulsion and

72  
00:03:00,939 --> 00:03:05,849  
we're going to talk about in going into

73  
00:03:02,770 --> 00:03:08,710  
the developing some energy from all this

74  
00:03:05,849 --> 00:03:10,810  
now the what I want to start with this

75  
00:03:08,710 --> 00:03:12,820  
in terms of propulsion is Newton's third

76  
00:03:10,810 --> 00:03:16,120  
law which is for every action there is

77  
00:03:12,819 --> 00:03:17,530  
an equal and opposite reaction now equal

78  
00:03:16,120 --> 00:03:19,030  
and opposite is probably to be

79  
00:03:17,530 --> 00:03:21,789  
emphasized because the equal and

80  
00:03:19,030 --> 00:03:23,650  
opposite is a conservation that's right

81  
00:03:21,789 --> 00:03:25,599  
if you push against something then we

82  
00:03:23,650 --> 00:03:28,000  
got to have the same lot of push going

83  
00:03:25,599 --> 00:03:30,819  
the other way otherwise it does you know

84  
00:03:28,000 --> 00:03:35,139  
something wrong but maybe maybe that's

85  
00:03:30,819 --> 00:03:36,789  
not quite right for example anytime you

86

00:03:35,139 --> 00:03:38,859  
have a conservation law you have to kind

87  
00:03:36,789 --> 00:03:41,439  
of look at all the assumptions that it

88  
00:03:38,860 --> 00:03:44,620  
makes this one makes for example assumes

89  
00:03:41,439 --> 00:03:48,699  
a point mass it assumes actionable the

90  
00:03:44,620 --> 00:03:50,289  
entire body simultaneously we also know

91  
00:03:48,699 --> 00:03:51,939  
in general in terms of mechanics that

92  
00:03:50,289 --> 00:03:54,069  
the mass is usually concentrated at the

93  
00:03:51,939 --> 00:03:55,509  
center of gravity things act as if

94  
00:03:54,069 --> 00:03:58,629  
they're operating from the center of

95  
00:03:55,509 --> 00:04:00,659  
gravity some of these assumptions are

96  
00:03:58,629 --> 00:04:04,049  
essentially assumption of simultaneity

97  
00:04:00,659 --> 00:04:06,579  
order you're pushing everything at once

98  
00:04:04,050 --> 00:04:08,500  
there also is a similar action upon a

99  
00:04:06,580 --> 00:04:10,719  
rigid body which doesn't work if you're

100  
00:04:08,500 --> 00:04:12,400

dealing with jello jello is not

101

00:04:10,719 --> 00:04:15,240

generally used in most of these talks

102

00:04:12,400 --> 00:04:18,329

but in fact it's it does so

103

00:04:15,240 --> 00:04:21,030

purpose one of the things that all these

104

00:04:18,329 --> 00:04:24,240

laws Newtonian mechanics in particular

105

00:04:21,029 --> 00:04:26,429

it still works you know those mechanics

106

00:04:24,240 --> 00:04:28,650

it does work when you get into very high

107

00:04:26,430 --> 00:04:31,019

velocities like approaching the speed of

108

00:04:28,649 --> 00:04:34,560

light hey great you're gonna have to

109

00:04:31,019 --> 00:04:36,569

make some changes but Einstein really

110

00:04:34,560 --> 00:04:38,759

just extended Newtonian mechanics and to

111

00:04:36,569 --> 00:04:41,159

certain realms and I want to suggest

112

00:04:38,759 --> 00:04:43,769

today that one of the realms will need

113

00:04:41,160 --> 00:04:46,800

to extend it into is extremely seller

114

00:04:43,769 --> 00:04:50,279

Asians not only extremely celebrations

115  
00:04:46,800 --> 00:04:52,379  
but extreme changes in acceleration

116  
00:04:50,279 --> 00:04:58,679  
which is what I'm talking about in terms

117  
00:04:52,379 --> 00:05:00,480  
of a radical change of pace the basic

118  
00:04:58,680 --> 00:05:02,579  
concept we're trying to generate here is

119  
00:05:00,480 --> 00:05:05,189  
that if you have an initiating force

120  
00:05:02,579 --> 00:05:09,469  
applied to an object and it takes some

121  
00:05:05,189 --> 00:05:12,420  
time before that object can absorb an

122  
00:05:09,470 --> 00:05:14,370  
equal and opposite reaction then the

123  
00:05:12,420 --> 00:05:16,319  
initiating force the prime mover if you

124  
00:05:14,370 --> 00:05:21,389  
want to call it can retract an ability

125  
00:05:16,319 --> 00:05:23,819  
reaction the slide that story just

126  
00:05:21,389 --> 00:05:25,379  
showed it was great I loved it where it

127  
00:05:23,819 --> 00:05:26,849  
shows one last kind of bumping into the

128  
00:05:25,379 --> 00:05:29,040  
mass and it just moves it all the way

129  
00:05:26,850 --> 00:05:30,870  
down the right that's kind of what we're

130  
00:05:29,040 --> 00:05:33,000  
talking about except here you're pushing

131  
00:05:30,870 --> 00:05:35,009  
against this mess and then you go and

132  
00:05:33,000 --> 00:05:38,189  
then you get away from it before has a

133  
00:05:35,009 --> 00:05:40,289  
chance to react it's almost like you

134  
00:05:38,189 --> 00:05:41,730  
want to rob a bank you can do it you

135  
00:05:40,290 --> 00:05:44,450  
just have to get out of a system before

136  
00:05:41,730 --> 00:05:46,620  
they catch you so if you're really quick

137  
00:05:44,449 --> 00:05:48,420  
you're doing it you get the money and

138  
00:05:46,620 --> 00:05:49,800  
you leave and of course the system of

139  
00:05:48,420 --> 00:05:52,500  
course has to be the whole country since

140  
00:05:49,800 --> 00:05:54,240  
there's law enforcement thanks of that

141  
00:05:52,500 --> 00:05:58,829  
nature but if you can get in and out it

142  
00:05:54,240 --> 00:06:00,660  
works lilo Davis said many years ago you

143

00:05:58,829 --> 00:06:02,370  
can get away with anything just as long

144  
00:06:00,660 --> 00:06:04,770  
as you're outside the system before it

145  
00:06:02,370 --> 00:06:06,480  
can react and I think that's kind of a

146  
00:06:04,769 --> 00:06:08,819  
name of the game and that's where the

147  
00:06:06,480 --> 00:06:10,800  
propulsion idea comes from that we push

148  
00:06:08,819 --> 00:06:12,930  
against something and we get all the way

149  
00:06:10,800 --> 00:06:15,060  
before it happens you can make push it

150  
00:06:12,930 --> 00:06:16,680  
again just it gets a little confused

151  
00:06:15,060 --> 00:06:18,329  
because it keeps getting pushed and get

152  
00:06:16,680 --> 00:06:21,889  
signals in there but then before it can

153  
00:06:18,329 --> 00:06:21,889  
do anything you're gone

154  
00:06:23,779 --> 00:06:29,059  
what we've done here this is the mission

155  
00:06:26,240 --> 00:06:32,090  
the top equation is one that really was

156  
00:06:29,060 --> 00:06:33,709  
actually started up with you have our

157  
00:06:32,089 --> 00:06:37,819

classical mechanics all these various

158

00:06:33,709 --> 00:06:42,019

things oops excuse me wrong button this

159

00:06:37,819 --> 00:06:45,439

position the viscosity this is base your

160

00:06:42,019 --> 00:06:49,099

resistance term this is the mass emek ma

161

00:06:45,439 --> 00:06:51,439

equals F F equals MA excuse me and this

162

00:06:49,100 --> 00:06:52,850

is the third derivative the third

163

00:06:51,439 --> 00:06:55,040

derivative sought we're not really using

164

00:06:52,850 --> 00:06:57,650

we used to force capacitance resistance

165

00:06:55,040 --> 00:06:59,540

inertia whatever but not so much a third

166

00:06:57,649 --> 00:07:01,909

derivative it's that third derivative

167

00:06:59,540 --> 00:07:03,590

that really counts it's curious that the

168

00:07:01,910 --> 00:07:06,110

right to a certain has the same kind of

169

00:07:03,589 --> 00:07:09,049

form of an equation there is an

170

00:07:06,110 --> 00:07:10,340

assumption here of these two items here

171

00:07:09,050 --> 00:07:13,220

which may be something altogether

172  
00:07:10,339 --> 00:07:14,629  
different and right now this is

173  
00:07:13,220 --> 00:07:16,970  
basically a constant and this would be a

174  
00:07:14,629 --> 00:07:18,800  
mass but that might not be the same and

175  
00:07:16,970 --> 00:07:22,160  
it does not actually required to be done

176  
00:07:18,800 --> 00:07:25,009  
that way this is actually a solution on

177  
00:07:22,160 --> 00:07:29,510  
I'm put this up and primarily because to

178  
00:07:25,009 --> 00:07:32,300  
point out to point out the denominator

179  
00:07:29,509 --> 00:07:34,449  
this term here which is the capacitance

180  
00:07:32,300 --> 00:07:36,800  
excuse me inductance capacitance

181  
00:07:34,449 --> 00:07:41,930  
resistance term and then this other term

182  
00:07:36,800 --> 00:07:44,030  
right here now you can get and in terms

183  
00:07:41,930 --> 00:07:46,250  
of if you're trying to get something

184  
00:07:44,029 --> 00:07:50,059  
really good at a dominate you you didn't

185  
00:07:46,250 --> 00:07:51,139  
go to 0 this term here could go to 0 you

186  
00:07:50,060 --> 00:07:53,000  
could have the inductance and

187  
00:07:51,139 --> 00:07:57,409  
capacitance at some point basically

188  
00:07:53,000 --> 00:08:00,199  
matched here if you didn't have this

189  
00:07:57,410 --> 00:08:01,939  
Trump f0 you always have R square it's

190  
00:08:00,199 --> 00:08:04,909  
always going to be something you may get

191  
00:08:01,939 --> 00:08:08,240  
some reduced resistance in the in terms

192  
00:08:04,910 --> 00:08:12,620  
of superconductivity but not it's not

193  
00:08:08,240 --> 00:08:15,680  
going to 0 here though theoretically you

194  
00:08:12,620 --> 00:08:19,579  
can and so you could have a position for

195  
00:08:15,680 --> 00:08:22,959  
suddenly this thing goes to 0 and the

196  
00:08:19,579 --> 00:08:22,959  
charge goes out of sight

197  
00:08:24,629 --> 00:08:31,649  
this shows kind of going over into power

198  
00:08:27,959 --> 00:08:33,840  
now or energy and and we get the same

199  
00:08:31,649 --> 00:08:39,000  
kinds of equations everything is pretty

200

00:08:33,840 --> 00:08:41,370  
much the same excuse me again this is

201  
00:08:39,000 --> 00:08:43,259  
based on charge here but you can also do

202  
00:08:41,370 --> 00:08:44,610  
it in terms of well you can do it in

203  
00:08:43,259 --> 00:08:47,159  
terms of current so it's slightly

204  
00:08:44,610 --> 00:08:49,519  
different but I prefer to use this we're

205  
00:08:47,159 --> 00:08:52,350  
going to keep referring this to this

206  
00:08:49,519 --> 00:08:56,879  
third derivative as being the important

207  
00:08:52,350 --> 00:08:58,139  
thing if you solve the equation one of

208  
00:08:56,879 --> 00:09:00,809  
the things that happens here is that

209  
00:08:58,139 --> 00:09:02,129  
well this is just a rate of at which

210  
00:09:00,809 --> 00:09:05,159  
energy is delivered to the circuit

211  
00:09:02,129 --> 00:09:07,769  
that's your input this is the

212  
00:09:05,159 --> 00:09:11,009  
capacitance this is the inductance terms

213  
00:09:07,769 --> 00:09:14,610  
they're pretty much the same except

214  
00:09:11,009 --> 00:09:16,409

especially with this sign turn and that

215

00:09:14,610 --> 00:09:18,330

sine term can go back and forth you can

216

00:09:16,409 --> 00:09:22,439

get a plus or minus with a sign of any

217

00:09:18,330 --> 00:09:24,480

angle okay so those two go back and

218

00:09:22,440 --> 00:09:26,970

forth they simply just rotate around

219

00:09:24,480 --> 00:09:29,009

each other if you will it's the same

220

00:09:26,970 --> 00:09:31,680

thing on a pendulum you have potential

221

00:09:29,009 --> 00:09:33,090

energy of a potential but no kinetic may

222

00:09:31,679 --> 00:09:34,819

comes rolling down and you lose

223

00:09:33,090 --> 00:09:36,840

potential energy and it goes into

224

00:09:34,820 --> 00:09:40,590

kinetic energy which is the same

225

00:09:36,840 --> 00:09:45,740

basically concept you're doing here the

226

00:09:40,590 --> 00:09:48,540

perm forum excuse me again the term for

227

00:09:45,740 --> 00:09:52,019

the resistance i squared our heating if

228

00:09:48,539 --> 00:09:55,740

you will is it's a sine squared bill so

229  
00:09:52,019 --> 00:09:58,500  
in this term it doesn't switch science

230  
00:09:55,740 --> 00:10:01,049  
your resistance is always going to take

231  
00:09:58,500 --> 00:10:06,450  
energy from the system and deliver to

232  
00:10:01,049 --> 00:10:09,449  
the universe some part okay well it's to

233  
00:10:06,450 --> 00:10:12,810  
the term it matches it is the term we've

234  
00:10:09,450 --> 00:10:15,660  
added here the this would be the third

235  
00:10:12,809 --> 00:10:18,539  
derivative the charge same thing but

236  
00:10:15,659 --> 00:10:20,579  
it's the opposite sign so this third

237  
00:10:18,539 --> 00:10:23,789  
term is basically saying this is the

238  
00:10:20,580 --> 00:10:24,460  
energy whoops again thank you this is

239  
00:10:23,789 --> 00:10:28,839  
energy

240  
00:10:24,460 --> 00:10:32,050  
n by the universe into the system

241  
00:10:28,840 --> 00:10:33,460  
scoring the other direction and I don't

242  
00:10:32,049 --> 00:10:37,389  
have as much time this is a power ratio

243  
00:10:33,460 --> 00:10:40,450  
which says is sort of the same thing if

244  
00:10:37,389 --> 00:10:42,189  
this was zero it would be just this is

245  
00:10:40,450 --> 00:10:44,200  
why you don't get over unity because

246  
00:10:42,190 --> 00:10:46,390  
there's always some losses here this is

247  
00:10:44,200 --> 00:10:48,790  
always a positive number and the oils

248  
00:10:46,389 --> 00:10:52,179  
gonna have losses but if you don't you

249  
00:10:48,789 --> 00:10:56,009  
do something altogether different now

250  
00:10:52,179 --> 00:10:56,009  
the thing that's important here is that

251  
00:10:56,639 --> 00:11:01,600  
this term here this is kind of your

252  
00:10:59,919 --> 00:11:03,250  
mainstream physics this is what we've

253  
00:11:01,600 --> 00:11:04,720  
always been operating with this is what

254  
00:11:03,250 --> 00:11:07,360  
everything is kind of beige stone-built

255  
00:11:04,720 --> 00:11:09,340  
own but what we want to do is go to this

256  
00:11:07,360 --> 00:11:14,710  
term here and try to make something of

257

00:11:09,340 --> 00:11:16,240  
it now this is a quote by Arthur Young

258  
00:11:14,710 --> 00:11:18,639  
who got into this third derivative

259  
00:11:16,240 --> 00:11:20,289  
aspect he said the science is based on

260  
00:11:18,639 --> 00:11:22,840  
the derivatives discovered by believe

261  
00:11:20,289 --> 00:11:24,159  
Justin Newton I like the fact he keeps

262  
00:11:22,840 --> 00:11:26,170  
leading us in there as well as Newton

263  
00:11:24,159 --> 00:11:28,750  
the derivatives are rates of change

264  
00:11:26,169 --> 00:11:30,969  
first really change position velocity

265  
00:11:28,750 --> 00:11:33,399  
the second derivatives the acceleration

266  
00:11:30,970 --> 00:11:36,100  
the third derivative is a change of

267  
00:11:33,399 --> 00:11:38,289  
acceleration of acceleration of current

268  
00:11:36,100 --> 00:11:41,409  
either one that's always ignored by

269  
00:11:38,289 --> 00:11:43,469  
science but it is because we can change

270  
00:11:41,409 --> 00:11:45,730  
the acceleration that we can drive a car

271  
00:11:43,470 --> 00:11:47,290

in a few did you couldn't stop you need

272

00:11:45,730 --> 00:11:48,940

officially accelerator and couldn't

273

00:11:47,289 --> 00:11:51,849

change that you're not doing somewhat

274

00:11:48,940 --> 00:11:55,870

trouble and this is basically through

275

00:11:51,850 --> 00:11:58,600

the idea it is through control we use

276

00:11:55,870 --> 00:11:59,980

the laws of determinism the control is a

277

00:11:58,600 --> 00:12:02,320

principle which makes it possible for

278

00:11:59,980 --> 00:12:04,840

life in similar fashion to use the laws

279

00:12:02,320 --> 00:12:07,410

of determination to control metabolism

280

00:12:04,840 --> 00:12:09,940

to store energy and move against entropy

281

00:12:07,409 --> 00:12:13,029

this is the theory process that author

282

00:12:09,940 --> 00:12:17,500

young put out and I emphasize it because

283

00:12:13,029 --> 00:12:19,419

it's got the it's got this zero first

284

00:12:17,500 --> 00:12:21,509

second and third derivatives the first

285

00:12:19,419 --> 00:12:24,819

is what he called unconscious action and

286  
00:12:21,509 --> 00:12:27,819  
then the second unconscious reaction and

287  
00:12:24,820 --> 00:12:31,390  
then conscious reaction these three

288  
00:12:27,820 --> 00:12:34,030  
again are the determinism this is why in

289  
00:12:31,389 --> 00:12:36,269  
physics if you look at the hard core

290  
00:12:34,029 --> 00:12:38,789  
physics in the way everything

291  
00:12:36,269 --> 00:12:39,929  
determined it's just a clock we're just

292  
00:12:38,789 --> 00:12:41,429  
running along we're just trying to get

293  
00:12:39,929 --> 00:12:45,299  
all the details but nothing can only be

294  
00:12:41,429 --> 00:12:47,250  
added or taken away but when you go into

295  
00:12:45,299 --> 00:12:50,339  
the third derivative this control it's

296  
00:12:47,250 --> 00:12:52,139  
conscious action you change something so

297  
00:12:50,340 --> 00:12:53,610  
there's even a certain sense that

298  
00:12:52,139 --> 00:12:55,230  
something you have to think about

299  
00:12:53,610 --> 00:12:57,870  
consciousness which other they would

300  
00:12:55,230 --> 00:13:03,330  
probably rather not think about not in

301  
00:12:57,870 --> 00:13:05,129  
physics is too hard to deal with what i

302  
00:13:03,330 --> 00:13:06,450  
am trying to send it's very very brief

303  
00:13:05,129 --> 00:13:10,080  
thing because I'm just about out of time

304  
00:13:06,450 --> 00:13:13,430  
the universe always contributes a steady

305  
00:13:10,080 --> 00:13:16,259  
state the contribution is probably

306  
00:13:13,429 --> 00:13:18,539  
minuscule it simply wouldn't show up on

307  
00:13:16,259 --> 00:13:20,789  
anything transient conditions you have

308  
00:13:18,539 --> 00:13:22,049  
greater University contribution one of

309  
00:13:20,789 --> 00:13:25,500  
the things that people have noticed in

310  
00:13:22,049 --> 00:13:27,419  
mechanical engineering is that if you

311  
00:13:25,500 --> 00:13:29,250  
turn it on some it you know motors use

312  
00:13:27,419 --> 00:13:31,559  
first when you first apply it you get

313  
00:13:29,250 --> 00:13:34,169  
this transient condition and before you

314

00:13:31,559 --> 00:13:36,509  
know it they just takes off and it's

315  
00:13:34,169 --> 00:13:39,089  
goes berserk goes up some case so

316  
00:13:36,509 --> 00:13:41,250  
literally comes apart that trend they

317  
00:13:39,090 --> 00:13:43,860  
have to spend a lot of time to make sure

318  
00:13:41,250 --> 00:13:45,570  
the transients don't get out of hand but

319  
00:13:43,860 --> 00:13:48,450  
the transient condition is the deal is

320  
00:13:45,570 --> 00:13:49,410  
the change and the greater the change

321  
00:13:48,450 --> 00:13:52,140  
the grid of the universe its

322  
00:13:49,409 --> 00:13:55,829  
contribution the greater the rate of

323  
00:13:52,139 --> 00:13:59,090  
change the system there's a system delay

324  
00:13:55,830 --> 00:14:02,310  
if I if I like I'm pushing against this

325  
00:13:59,090 --> 00:14:04,379  
register here there's a message goes

326  
00:14:02,309 --> 00:14:07,259  
from here into the center of gravity

327  
00:14:04,379 --> 00:14:09,120  
that comes back just push back but a bit

328  
00:14:07,259 --> 00:14:10,889

real quick it won't have a chance and

329

00:14:09,120 --> 00:14:13,320  
this time delay is the name of

330

00:14:10,889 --> 00:14:14,879  
everything this whole thing actually

331

00:14:13,320 --> 00:14:16,379  
gets shown up a little bit in something

332

00:14:14,879 --> 00:14:19,279  
called sonoluminescence supposed to be

333

00:14:16,379 --> 00:14:22,470  
you're probably familiar with and the

334

00:14:19,279 --> 00:14:25,139  
this case this is an ideal place to kind

335

00:14:22,470 --> 00:14:27,950  
of look for a little bit because the

336

00:14:25,139 --> 00:14:31,139  
you're growing from a acceleration

337

00:14:27,950 --> 00:14:33,780  
billions of times the acceleration of

338

00:14:31,139 --> 00:14:36,689  
gravity to zero acceleration in going

339

00:14:33,779 --> 00:14:38,669  
the other direction and obviously a rate

340

00:14:36,690 --> 00:14:41,520  
of change of acceleration is enormous

341

00:14:38,669 --> 00:14:43,259  
and then you put the sum of the numbers

342

00:14:41,519 --> 00:14:45,870  
to it it comes out you start getting

343  
00:14:43,259 --> 00:14:47,299  
what's out of this contribution and it's

344  
00:14:45,870 --> 00:14:49,580  
so it's not told ians

345  
00:14:47,299 --> 00:14:54,829  
and that's being fairly conservative in

346  
00:14:49,580 --> 00:14:56,660  
terms of your assumptions the big key of

347  
00:14:54,830 --> 00:14:58,580  
course is that time to let big number

348  
00:14:56,659 --> 00:15:02,600  
which in this case was either the Dior

349  
00:14:58,580 --> 00:15:04,370  
the W so that the that's what makes it

350  
00:15:02,600 --> 00:15:08,690  
but you still need local energy in the

351  
00:15:04,370 --> 00:15:13,940  
system to initiate the reaction okay

352  
00:15:08,690 --> 00:15:24,410  
that's I'm all out of time ok so if any

353  
00:15:13,940 --> 00:15:26,089  
questions our speaker ended right on

354  
00:15:24,409 --> 00:15:30,049  
time so we have about five minutes for

355  
00:15:26,089 --> 00:15:31,160  
questions ok Bernie's closest so I'm

356  
00:15:30,049 --> 00:15:34,309  
just curious what does this have to do

357  
00:15:31,159 --> 00:15:35,899  
with the moon your Paytas and secondly I

358  
00:15:34,309 --> 00:15:39,439  
didn't hear the first of all this have

359  
00:15:35,899 --> 00:15:41,360  
to do with the moon oh it is we the moon

360  
00:15:39,440 --> 00:15:43,370  
in the sense of I'm just want to go

361  
00:15:41,360 --> 00:15:45,500  
there we need a manned space mission to

362  
00:15:43,370 --> 00:15:47,778  
go there so no I don't know where it

363  
00:15:45,500 --> 00:15:48,950  
comes from no stone question of course

364  
00:15:47,778 --> 00:15:50,539  
you keep going to higher and higher

365  
00:15:48,950 --> 00:15:53,240  
derivatives why stop at three why not

366  
00:15:50,539 --> 00:15:55,519  
four or five six be if you do the fourth

367  
00:15:53,240 --> 00:15:56,930  
derivative is a good question i like it

368  
00:15:55,519 --> 00:15:58,549  
i say it's good question because i

369  
00:15:56,929 --> 00:16:01,099  
actually thought about it before and i

370  
00:15:58,549 --> 00:16:02,689  
have an answer but if you actually do

371

00:16:01,100 --> 00:16:04,639  
the mathematics the fourth derivative

372  
00:16:02,690 --> 00:16:07,399  
the form of the fourth year we turns out

373  
00:16:04,639 --> 00:16:08,870  
to be the same as the 0th derivative the

374  
00:16:07,399 --> 00:16:11,360  
fifth is the same as the first

375  
00:16:08,870 --> 00:16:14,690  
derivative and there's the difference is

376  
00:16:11,360 --> 00:16:16,700  
a frequency to the fourth power so it's

377  
00:16:14,690 --> 00:16:19,040  
like there and i think of it as kind of

378  
00:16:16,700 --> 00:16:21,620  
a resonance or harmonic maybe that's a

379  
00:16:19,039 --> 00:16:24,528  
better term of the 0th rivet of the

380  
00:16:21,620 --> 00:16:25,909  
fifth is on the floor excuse me so it

381  
00:16:24,528 --> 00:16:31,809  
just it works out that way in the

382  
00:16:25,909 --> 00:16:31,809  
mathematics where the questions

383  
00:16:34,169 --> 00:16:37,899  
okay then we got to have one over there

384  
00:16:36,159 --> 00:16:42,399  
next because I want to see them run back

385  
00:16:37,899 --> 00:16:44,470

and there I was just kind of wondering

386

00:16:42,399 --> 00:16:46,480

you said you have to push very quickly

387

00:16:44,470 --> 00:16:49,528

do you have an order of magnitude on how

388

00:16:46,480 --> 00:16:52,300

quick you push before it reacts the

389

00:16:49,528 --> 00:16:54,159

Summoner luminescence as it is to an

390

00:16:52,299 --> 00:16:56,679

example at least we have something to do

391

00:16:54,159 --> 00:16:59,769

with about twenty-five thousand cycles

392

00:16:56,679 --> 00:17:02,349

per second so it's a pretty good size

393

00:16:59,769 --> 00:17:03,850

number if you apply the numbers it it

394

00:17:02,350 --> 00:17:06,160

does require some pretty high

395

00:17:03,850 --> 00:17:11,890

frequencies which means we may be

396

00:17:06,160 --> 00:17:15,130

limited in some fashion by technology

397

00:17:11,890 --> 00:17:18,490

but it's not it's not limited in

398

00:17:15,130 --> 00:17:21,130

principle so so but I have seen other

399

00:17:18,490 --> 00:17:22,328

things too that this is not completely

400

00:17:21,130 --> 00:17:24,730

part of it it's also part of the

401

00:17:22,328 --> 00:17:28,328

situation if you've got even any kind of

402

00:17:24,730 --> 00:17:29,380

reaction to this or that you do you

403

00:17:28,328 --> 00:17:31,589

would sort of prove that the law of

404

00:17:29,380 --> 00:17:34,809

conservation of energy is somewhat

405

00:17:31,589 --> 00:17:36,099

lacking my own feeling is the

406

00:17:34,808 --> 00:17:38,589

conservation of energy is kind of a

407

00:17:36,099 --> 00:17:41,529

bookkeeping that's what we'd use it for

408

00:17:38,589 --> 00:17:43,509

but there's round off error you know you

409

00:17:41,529 --> 00:17:45,339

now you know if it's only 49 cents we're

410

00:17:43,509 --> 00:17:47,410

not going to count it as a dollar and so

411

00:17:45,339 --> 00:17:53,678

forth so that helps I think a little bit

412

00:17:47,410 --> 00:17:58,720

there another question you talked about

413

00:17:53,679 --> 00:18:01,870

that the transients I remember was some

414  
00:17:58,720 --> 00:18:04,000  
consulting i was doing we had a 700

415  
00:18:01,869 --> 00:18:07,359  
horsepower electric motor that was not

416  
00:18:04,000 --> 00:18:09,880  
induction and we had to tell Kansas

417  
00:18:07,359 --> 00:18:11,500  
power in like 20 minutes before we

418  
00:18:09,880 --> 00:18:17,500  
pushed the start button otherwise it

419  
00:18:11,500 --> 00:18:21,669  
would bring down the hole 0 Kansas do

420  
00:18:17,500 --> 00:18:23,049  
you consider the impact load when you

421  
00:18:21,669 --> 00:18:26,770  
talk about transiency talking about

422  
00:18:23,049 --> 00:18:29,079  
impact load or is it out or do you

423  
00:18:26,769 --> 00:18:31,179  
include the impact of when you first

424  
00:18:29,079 --> 00:18:34,569  
start something because there is an

425  
00:18:31,179 --> 00:18:37,179  
impact Liz it is greater than than the

426  
00:18:34,569 --> 00:18:39,490  
normal load yeah I think that's actually

427  
00:18:37,179 --> 00:18:44,000  
part of what it is I think it's if you

428

00:18:39,490 --> 00:18:46,819  
you include that startup impact

429  
00:18:44,000 --> 00:18:48,019  
really that transient area the whole lot

430  
00:18:46,819 --> 00:18:50,269  
of things are possible that weren't

431  
00:18:48,019 --> 00:18:53,950  
possible at all before and that's really

432  
00:18:50,269 --> 00:18:58,490  
far basically agreeing with you on that

433  
00:18:53,950 --> 00:19:00,590  
other questions can't say no since we

434  
00:18:58,490 --> 00:19:03,319  
have a a moment or two before I need to

435  
00:19:00,589 --> 00:19:06,529  
cut this off I will comment that the

436  
00:19:03,319 --> 00:19:10,789  
reason third derivatives are ignored at

437  
00:19:06,529 --> 00:19:12,680  
least in dynamical laws for moving

438  
00:19:10,789 --> 00:19:16,399  
objects is simply that when you work out

439  
00:19:12,680 --> 00:19:18,259  
the laws of motion uh they only go as

440  
00:19:16,400 --> 00:19:21,170  
high as the second derivative there's

441  
00:19:18,259 --> 00:19:24,109  
nothing further going on third

442  
00:19:21,170 --> 00:19:25,820

derivatives can appear in in physical

443

00:19:24,109 --> 00:19:28,819

systems when there's where there's some

444

00:19:25,819 --> 00:19:32,359

activities such as a rigid objects

445

00:19:28,819 --> 00:19:35,869

colliding on but those don't emerge from

446

00:19:32,359 --> 00:19:39,699

the fundamental dynamics well I would

447

00:19:35,869 --> 00:19:42,529

say that if you go in and you go to

448

00:19:39,700 --> 00:19:46,150

questions and you assume for example a

449

00:19:42,529 --> 00:19:47,930

continuous space time if your assume

450

00:19:46,150 --> 00:19:49,490

conservation of energy you will

451

00:19:47,930 --> 00:19:51,799

definitely get conservation of energy

452

00:19:49,490 --> 00:19:53,690

and continuous deal but if you don't

453

00:19:51,799 --> 00:19:57,740

make those assumptions it's a whole new

454

00:19:53,690 --> 00:19:59,269

ballgame okay so ah there's a question

455

00:19:57,740 --> 00:20:09,470

back there if we still got time for one

456

00:19:59,269 --> 00:20:11,990

more last question Thanks so I just want

457  
00:20:09,470 --> 00:20:14,329  
to confirm that which some something

458  
00:20:11,990 --> 00:20:17,210  
that I agree with to it to a good extent

459  
00:20:14,329 --> 00:20:19,549  
that the third derivative is essentially

460  
00:20:17,210 --> 00:20:21,049  
you called it control it's an ability to

461  
00:20:19,549 --> 00:20:22,789  
change from an acceleration to a

462  
00:20:21,049 --> 00:20:27,169  
different acceleration and does that

463  
00:20:22,789 --> 00:20:28,879  
essentially point to free will or a lack

464  
00:20:27,170 --> 00:20:30,830  
of determinism is that what gives us the

465  
00:20:28,880 --> 00:20:34,700  
element of ability to have free will in

466  
00:20:30,829 --> 00:20:37,039  
in life yes I somehow didn't actually

467  
00:20:34,700 --> 00:20:39,080  
use the word free will do just realize

468  
00:20:37,039 --> 00:20:41,539  
that no that's precisely what it is to

469  
00:20:39,079 --> 00:20:42,829  
control the third derivative would be at

470  
00:20:41,539 --> 00:20:44,450  
least from author Young's point of view

471  
00:20:42,829 --> 00:20:47,049  
free will and I think that's probably

472  
00:20:44,450 --> 00:20:49,519  
where it comes in but it's that key

473  
00:20:47,049 --> 00:20:51,579  
earlier today we are mr. hope was

474  
00:20:49,519 --> 00:20:53,019  
talking about this wonderful where he

475  
00:20:51,579 --> 00:20:55,480  
good spoon bending and I have to tell

476  
00:20:53,019 --> 00:20:58,750  
you I did 11 turn her spoon like this

477  
00:20:55,480 --> 00:21:01,360  
and then I was ready to go who's it and

478  
00:20:58,750 --> 00:21:03,309  
then you know I later I couldn't bend

479  
00:21:01,359 --> 00:21:05,829  
that spoon by myself but it just did

480  
00:21:03,309 --> 00:21:09,609  
that and it's just that real real quick

481  
00:21:05,829 --> 00:21:10,899  
point and somehow there's the source or

482  
00:21:09,609 --> 00:21:12,879  
something that I'm getting energy from

483  
00:21:10,900 --> 00:21:17,170  
some when they are the rest the universe

484  
00:21:12,880 --> 00:21:19,830  
and it worked so yeah that would be the

485

00:21:17,170 --> 00:21:19,830  
freewheel part