

1
00:00:00,000 --> 00:00:07,290
in both directions at an equal rate so

2
00:00:03,928 --> 00:00:09,359
this cannot work and if we sit back for

3
00:00:07,290 --> 00:00:12,629
a moment and think about it we say of

4
00:00:09,359 --> 00:00:14,939
course it can't work because nature is

5
00:00:12,630 --> 00:00:18,149
full of nonlinearities biological matter

6
00:00:14,939 --> 00:00:21,179
has nonlinearities geological matter has

7
00:00:18,149 --> 00:00:23,750
nonlinearities and if in fact we could

8
00:00:21,179 --> 00:00:25,589
have nonlinearities to rectify

9
00:00:23,750 --> 00:00:27,210
fluctuations that would mean there'd be

10
00:00:25,589 --> 00:00:29,670
hot spots all over the place in nature

11
00:00:27,210 --> 00:00:32,850
wherever there was a non-linearity we

12
00:00:29,670 --> 00:00:35,850
don't find that this cannot work putting

13
00:00:32,850 --> 00:00:38,250
this in a more general term ratchets do

14
00:00:35,850 --> 00:00:41,969
not work in systems that are under

15
00:00:38,250 --> 00:00:43,738
equilibrium there was another patent

16
00:00:41,969 --> 00:00:47,550
that came out earlier by Franklin Mead

17
00:00:43,738 --> 00:00:50,128
which according to my analysis uses the

18
00:00:47,549 --> 00:00:51,479
same sort of principle this patent is

19
00:00:50,128 --> 00:00:53,488
called system for converting

20
00:00:51,479 --> 00:00:57,299
electromagnetic radiant radiation energy

21
00:00:53,488 --> 00:00:59,308
to electrical energy and what it uses

22
00:00:57,299 --> 00:01:02,788
are two spheres that are slightly

23
00:00:59,308 --> 00:01:04,829
dissimilar in size they create a beat

24
00:01:02,789 --> 00:01:07,909
frequency a beat resonance frequency

25
00:01:04,829 --> 00:01:11,840
between them which downshifts the

26
00:01:07,909 --> 00:01:15,420
zero-point energy vibrations to a lower

27
00:01:11,840 --> 00:01:18,118
frequency an antenna then absorbs this

28
00:01:15,420 --> 00:01:20,460
radiation it's rectified and we get out

29

00:01:18,118 --> 00:01:23,519
DC power it can't work for the same

30
00:01:20,459 --> 00:01:26,250
reason we're using a we're trying to

31
00:01:23,519 --> 00:01:31,429
rectify background radiation it doesn't

32
00:01:26,250 --> 00:01:34,049
work next mechanical extraction a Pinto

33
00:01:31,430 --> 00:01:36,689
wrote a number of patents a paper

34
00:01:34,049 --> 00:01:38,549
started a company based on this the

35
00:01:36,688 --> 00:01:42,449
method is called method for energy

36
00:01:38,549 --> 00:01:47,060
extraction in a paper he shows a Carnot

37
00:01:42,450 --> 00:01:49,368
cycle in which as with a normal car no

38
00:01:47,060 --> 00:01:51,659
system you can extract energy

39
00:01:49,368 --> 00:01:54,750
continuously by going around the cycle

40
00:01:51,659 --> 00:01:57,868
let's take a look at his basic concept

41
00:01:54,750 --> 00:02:00,450
so he has a Casimir cavity and in the

42
00:01:57,868 --> 00:02:04,140
Casimir cavity there are two plates that

43
00:02:00,450 --> 00:02:06,780

are attracted to each other we make use

44

00:02:04,140 --> 00:02:09,469

of this attraction and allow the plates

45

00:02:06,780 --> 00:02:10,610

to move together extract that energy

46

00:02:09,469 --> 00:02:13,310

then

47

00:02:10,610 --> 00:02:15,620

what he does is he essentially turns off

48

00:02:13,310 --> 00:02:18,500

one of those plates he extracts some

49

00:02:15,620 --> 00:02:20,689

electrons from it by various means that

50

00:02:18,500 --> 00:02:24,740

reduces the attractive force between the

51

00:02:20,689 --> 00:02:26,750

two plates then in step number three he

52

00:02:24,740 --> 00:02:28,400

can pull the plates apart more easily

53

00:02:26,750 --> 00:02:30,919

since the attractive force has been

54

00:02:28,400 --> 00:02:34,460

decreased then he replenishes the charge

55

00:02:30,919 --> 00:02:36,799

into the plates and then repeats the

56

00:02:34,460 --> 00:02:39,770

process and so he has a process that

57

00:02:36,800 --> 00:02:44,360

goes around and around so question is

58
00:02:39,770 --> 00:02:49,250
can you do this and the basic question

59
00:02:44,360 --> 00:02:51,890
is really is the zero-point force is the

60
00:02:49,250 --> 00:02:53,360
Casimir force a conservative force let

61
00:02:51,889 --> 00:02:55,399
me give you an example of a conservative

62
00:02:53,360 --> 00:02:58,100
force gravity is conservative so if I

63
00:02:55,400 --> 00:02:59,840
take a brick and I let a brick fall

64
00:02:58,099 --> 00:03:02,150
towards the earth and I extract the

65
00:02:59,840 --> 00:03:04,310
energy from it then when I lift the

66
00:03:02,150 --> 00:03:06,709
brick up to do the same thing again I

67
00:03:04,310 --> 00:03:09,050
use just as much energy to lift the

68
00:03:06,709 --> 00:03:10,789
brick up as I got by dropping it down

69
00:03:09,050 --> 00:03:13,340
that's an example of a conservative

70
00:03:10,789 --> 00:03:15,409
force well it turns out that the Casimir

71
00:03:13,340 --> 00:03:17,330
force is conservative there are a number

72
00:03:15,409 --> 00:03:20,959
of analyses that show that this is in

73
00:03:17,330 --> 00:03:25,450
fact the case that means that pentose

74
00:03:20,959 --> 00:03:28,039
idea cannot work in particular

75
00:03:25,449 --> 00:03:30,859
extracting the charge from one of those

76
00:03:28,039 --> 00:03:33,319
plates to reduce the Casimir force the

77
00:03:30,860 --> 00:03:36,799
process of extracting that charge must

78
00:03:33,319 --> 00:03:38,810
use at least as much energy as you get

79
00:03:36,799 --> 00:03:41,510
from letting the two Casimir plates fall

80
00:03:38,810 --> 00:03:43,519
together and so the general principle

81
00:03:41,509 --> 00:03:46,669
here is that you cannot obtain power

82
00:03:43,519 --> 00:03:50,480
continuously from changes in Casimir

83
00:03:46,669 --> 00:03:52,579
cavity spacing let's now take a look at

84
00:03:50,479 --> 00:03:56,139
our third example so our third example

85
00:03:52,580 --> 00:03:59,540
is pumping gas through casimir cavities

86

00:03:56,139 --> 00:04:02,048
there was a patent by two characters

87
00:03:59,539 --> 00:04:06,109
Bernie high-ish and Garrett Modell and

88
00:04:02,049 --> 00:04:09,549
they actually wrote this up in 2005 I

89
00:04:06,110 --> 00:04:12,140
think and the patent was issued in 2008

90
00:04:09,549 --> 00:04:14,409
surprisingly by the way for for our

91
00:04:12,139 --> 00:04:18,168
patent attorney here all of the claims

92
00:04:14,409 --> 00:04:20,358
were accepted by the patent office and

93
00:04:18,168 --> 00:04:21,709
it's called quantum vacuum energy

94
00:04:20,358 --> 00:04:23,120
extraction

95
00:04:21,709 --> 00:04:25,089
and let's take a look at the principal

96
00:04:23,120 --> 00:04:27,910
here it's based on stochastic

97
00:04:25,089 --> 00:04:31,429
electrodynamics according to stochastic

98
00:04:27,910 --> 00:04:34,870
electrodynamics we have atoms and the

99
00:04:31,430 --> 00:04:38,389
atoms have electrons orbiting a nucleus

100
00:04:34,870 --> 00:04:40,250

because the electrons are constantly

101

00:04:38,389 --> 00:04:42,139

oscillating around the nucleus they're

102

00:04:40,250 --> 00:04:44,598

constantly radiating and so there's

103

00:04:42,139 --> 00:04:47,900

constant radiation of energy this

104

00:04:44,598 --> 00:04:49,579

radiation is balanced by incoming

105

00:04:47,899 --> 00:04:52,310

radiation from the zero-point field

106

00:04:49,579 --> 00:04:54,859

that's in the background and so we have

107

00:04:52,310 --> 00:04:57,889

a dynamic equilibrium between incoming

108

00:04:54,860 --> 00:05:01,220

and outgoing energy this is not the

109

00:04:57,889 --> 00:05:04,610

usual way that physics looks at an atom

110

00:05:01,220 --> 00:05:07,729

but it works it's been shown to work as

111

00:05:04,610 --> 00:05:11,689

much accuracy as the traditional quantum

112

00:05:07,728 --> 00:05:15,408

mechanical view that means that if we

113

00:05:11,689 --> 00:05:18,918

take an atom and we put it inside of a

114

00:05:15,408 --> 00:05:20,538

Casimir cavity then in that Casimir

115
00:05:18,918 --> 00:05:22,758
cavity we know that there are going to

116
00:05:20,538 --> 00:05:25,788
be a fewer electromagnetic modes

117
00:05:22,759 --> 00:05:29,658
available and if we tune the cavity

118
00:05:25,788 --> 00:05:31,699
right what we can do is we remove some

119
00:05:29,658 --> 00:05:34,819
of those modes that support the

120
00:05:31,699 --> 00:05:39,319
electronic orbital the end result is

121
00:05:34,819 --> 00:05:44,000
that the electron spins down it spins to

122
00:05:39,319 --> 00:05:47,689
a lower energy and we end up with a

123
00:05:44,000 --> 00:05:50,478
different sort of orbital in within the

124
00:05:47,689 --> 00:05:53,180
Casimir cavity so how is this used to

125
00:05:50,478 --> 00:05:57,500
obtain energy from the vacuum the idea

126
00:05:53,180 --> 00:06:00,379
is pretty simple take gas flow it into

127
00:05:57,500 --> 00:06:03,978
the Casimir cavity as the gas enters the

128
00:06:00,379 --> 00:06:06,529
Casimir cavity energy is emitted shown

129
00:06:03,978 --> 00:06:09,079
by these two blue arrows that excess

130
00:06:06,529 --> 00:06:11,779
energy that's emitted is absorbed you

131
00:06:09,079 --> 00:06:14,839
can absorb it in a detector you can

132
00:06:11,779 --> 00:06:16,939
absorb it in a bath of water and so on

133
00:06:14,839 --> 00:06:19,310
and it's used and that's that's the

134
00:06:16,939 --> 00:06:23,389
energy that we get from the process then

135
00:06:19,310 --> 00:06:25,430
when the gas is continues to flow out of

136
00:06:23,389 --> 00:06:29,810
the Casimir cavity and back into the

137
00:06:25,430 --> 00:06:31,600
ambient universe it's recharged the

138
00:06:29,810 --> 00:06:34,149
electron is recharged

139
00:06:31,600 --> 00:06:36,370
the ambient zero-point energy and goes

140
00:06:34,149 --> 00:06:38,139
back to its initial state then repeat

141
00:06:36,370 --> 00:06:41,019
this process and so you can pump the gas

142
00:06:38,139 --> 00:06:48,009
over and over through the Casimir cavity

143

00:06:41,019 --> 00:06:50,889
and in principle obtain energy so the

144
00:06:48,009 --> 00:06:52,930
idea can be thought of as a heat pump

145
00:06:50,889 --> 00:06:56,680
but for zero point energy where we're

146
00:06:52,930 --> 00:06:59,740
simply pumping energy from one place the

147
00:06:56,680 --> 00:07:04,840
the ambient universe to a local place

148
00:06:59,740 --> 00:07:08,230
our absorber so a question is can we

149
00:07:04,839 --> 00:07:10,989
make this practical and are we

150
00:07:08,230 --> 00:07:14,319
disobeying any fundamental laws so the

151
00:07:10,990 --> 00:07:18,040
initial reaction is wait a minute the

152
00:07:14,319 --> 00:07:21,519
zero-point energy background is uniform

153
00:07:18,040 --> 00:07:25,060
and we've said that it's in equilibrium

154
00:07:21,519 --> 00:07:26,529
how can you obtain energy from a uniform

155
00:07:25,060 --> 00:07:28,180
background imagine that you've got an

156
00:07:26,529 --> 00:07:30,939
ocean that's all the same temperature

157
00:07:28,180 --> 00:07:33,759

and in this ocean you want to make use

158

00:07:30,939 --> 00:07:35,800

of the heat well you can't pump the heat

159

00:07:33,759 --> 00:07:38,019

or allow the heat to flow from one

160

00:07:35,800 --> 00:07:39,220

region to another region and use it

161

00:07:38,019 --> 00:07:41,259

because the temperature is the same

162

00:07:39,220 --> 00:07:43,300

everywhere so isn't that going to be the

163

00:07:41,259 --> 00:07:45,250

same with the zero-point energy and

164

00:07:43,300 --> 00:07:47,710

aren't you going to end up with the same

165

00:07:45,250 --> 00:07:49,839

sort of problem and not be able to use

166

00:07:47,709 --> 00:07:54,639

the energy well the answer is actually

167

00:07:49,839 --> 00:07:57,009

no because the vacuum state changes with

168

00:07:54,639 --> 00:07:59,229

boundary conditions it's not uniform

169

00:07:57,009 --> 00:08:01,120

everywhere we can change the ground

170

00:07:59,230 --> 00:08:03,850

level and that is if we have a Casimir

171

00:08:01,120 --> 00:08:06,100

cavity within that geometrical

172
00:08:03,850 --> 00:08:09,700
geometrically constrained region we've

173
00:08:06,100 --> 00:08:12,010
got a lower ground energy level and so

174
00:08:09,699 --> 00:08:14,199
we actually do have multiple levels

175
00:08:12,009 --> 00:08:17,349
which allow energy to flow from one

176
00:08:14,199 --> 00:08:22,149
level to another so we're not being

177
00:08:17,350 --> 00:08:24,840
constrained by the the fact that that

178
00:08:22,149 --> 00:08:27,969
zero-point energy is at equilibrium

179
00:08:24,839 --> 00:08:34,689
similarly were not being constrained by

180
00:08:27,970 --> 00:08:36,070
the fact that that we need to that the

181
00:08:34,690 --> 00:08:38,320
zero-point energy is a conservative

182
00:08:36,070 --> 00:08:41,140
force because we're not using any sort

183
00:08:38,320 --> 00:08:42,790
of mechanical process moving Casimir

184
00:08:41,139 --> 00:08:46,840
cavity plates

185
00:08:42,789 --> 00:08:49,149
two flaws in the previous two types of

186
00:08:46,840 --> 00:08:54,550
zero point energy extraction methods I

187
00:08:49,149 --> 00:08:57,399
believe do not apply to this so is it

188
00:08:54,549 --> 00:08:59,649
practical I did some calculations based

189
00:08:57,399 --> 00:09:03,189
on how much energy we think is going to

190
00:08:59,649 --> 00:09:05,350
be emitted from each atomic transition

191
00:09:03,190 --> 00:09:07,300
as it goes through the Casimir cavity

192
00:09:05,350 --> 00:09:09,700
and what we need is about ten to the

193
00:09:07,299 --> 00:09:14,429
twenty two transitions per second to get

194
00:09:09,700 --> 00:09:17,980
a kilowatt you can do that in a stack of

195
00:09:14,429 --> 00:09:21,489
of cds for example about 20 cds that's

196
00:09:17,980 --> 00:09:24,930
about this big and you can then allow

197
00:09:21,490 --> 00:09:27,940
and pump the gas through this and

198
00:09:24,929 --> 00:09:30,609
continuously radiate about a kilowatt of

199
00:09:27,940 --> 00:09:33,690
zero point energy it takes if you do a

200

00:09:30,610 --> 00:09:37,690
calculation about point four wats to

201
00:09:33,690 --> 00:09:40,270
carry out the pumping and so the energy

202
00:09:37,690 --> 00:09:42,790
out is at least a factor of a thousand

203
00:09:40,269 --> 00:09:47,949
greater than the energy in so in

204
00:09:42,789 --> 00:09:50,860
principle this should work is there

205
00:09:47,950 --> 00:09:53,290
another flaw an underlying principle

206
00:09:50,860 --> 00:09:56,409
that we're breaking here that says that

207
00:09:53,289 --> 00:10:01,769
this cannot work and the answer is I

208
00:09:56,409 --> 00:10:01,769
don't know let's find out thank you