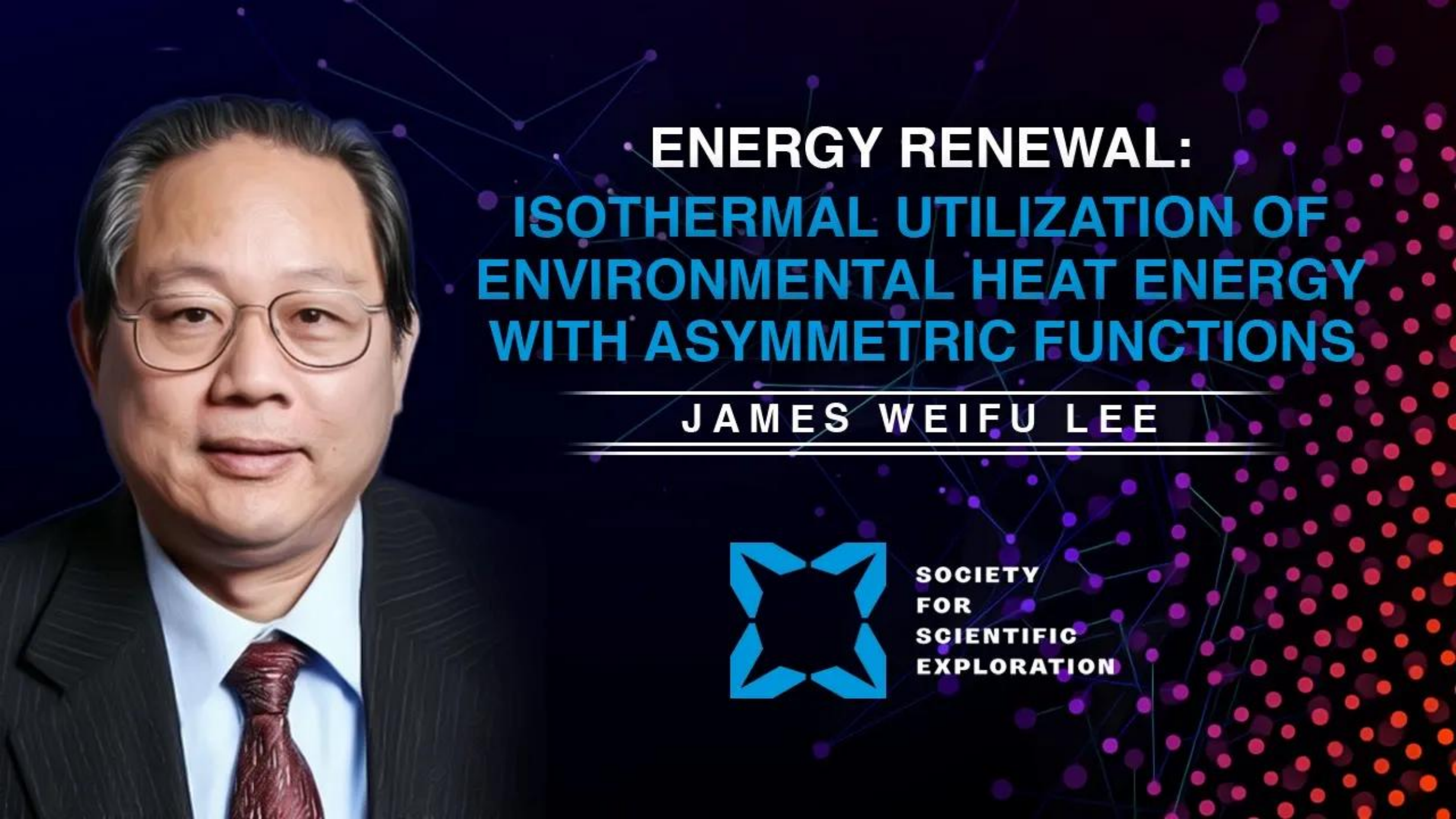
ENERGY RENEWAL:
ISOTHERMAL UTILIZATION OF ENVIRONMENTAL HEAT ENERGY WITH ASYMMETRIC FUNCTIONS
JAMES WEIFU LEE
SOCIETY FOR SCIENTIFIC EXPLORATION

1
00:00:24,870 --> 00:00:15,509
okay

2
00:00:26,070 --> 00:00:24,880
danny for this uh nice introduction

3
00:00:27,990 --> 00:00:26,080
thank you

4
00:00:29,189 --> 00:00:28,000
and so yeah so

5
00:00:33,510 --> 00:00:29,199
uh

6
00:00:36,470 --> 00:00:33,520
the u.s department of energy's orchestra

7
00:00:39,430 --> 00:00:36,480
national lab like for 15 years as daniel

8
00:00:41,510 --> 00:00:39,440
introduced for me i currently work at

9
00:00:44,470 --> 00:00:41,520
order domain university in norfolk

10
00:00:47,350 --> 00:00:44,480
virginia in the united states

11
00:00:49,270 --> 00:00:47,360
and so my topic you can see here is

12
00:00:52,869 --> 00:00:49,280
angelinur okay

13
00:00:54,790 --> 00:00:52,879

isothermal utilization of environmental

14
00:00:57,350 --> 00:00:54,800
heat energy

15
00:00:59,430 --> 00:00:57,360
with symmetric function so the keywords

16
00:01:00,549 --> 00:00:59,440
isothermal right okay you know if you

17
00:01:02,389 --> 00:01:00,559
have a temperature gradient of course

18
00:01:06,070 --> 00:01:02,399
everybody know how to use it

19
00:01:09,350 --> 00:01:06,080
keywords isothermal utilization

20
00:01:11,109 --> 00:01:09,360
so my talk basically we identify there

21
00:01:13,510 --> 00:01:11,119
are um

22
00:01:14,950 --> 00:01:13,520
another type of energy process i now

23
00:01:18,070 --> 00:01:14,960
kind of call it

24
00:01:20,710 --> 00:01:18,080
as a type of b energy processes

25
00:01:22,109 --> 00:01:20,720
okay so uh we identify they actually

26
00:01:25,270 --> 00:01:22,119
have two

27
00:01:26,710 --> 00:01:25,280
thermodynamically distinct type of

28
00:01:29,350 --> 00:01:26,720
processes

29
00:01:31,270 --> 00:01:29,360
naturally occurring on earth okay well i

30
00:01:32,870 --> 00:01:31,280
will give example of it

31
00:01:36,550 --> 00:01:32,880
now type a

32
00:01:38,630 --> 00:01:36,560
such as atp synthesis or the classic

33
00:01:40,469 --> 00:01:38,640
heat engine present everybody of course

34
00:01:42,630 --> 00:01:40,479
for very familiar yes

35
00:01:44,870 --> 00:01:42,640
and they apparently follow the second of

36
00:01:47,030 --> 00:01:44,880
very very well okay so we already talked

37
00:01:49,190 --> 00:01:47,040
about that in the morning as well

38
00:01:51,590 --> 00:01:49,200

now the top b process

39
00:01:54,230 --> 00:01:51,600
that natural occurring on earth

40
00:01:56,389 --> 00:01:54,240
i'll give you the example of exemplified

41
00:01:57,749 --> 00:01:56,399
by these thermophilic

42
00:02:01,109 --> 00:01:57,759
functions

43
00:02:03,590 --> 00:02:01,119
with trans membrane electrostatic

44
00:02:05,270 --> 00:02:03,600
localized protons okay

45
00:02:07,030 --> 00:02:05,280
we'll talk more about this

46
00:02:08,710 --> 00:02:07,040
does not necessarily have to be

47
00:02:10,710 --> 00:02:08,720
constrained

48
00:02:13,430 --> 00:02:10,720
by the second law

49
00:02:15,350 --> 00:02:13,440
or into its special thermodynamic

50
00:02:17,030 --> 00:02:15,360
symmetrical function that's really the

51
00:02:19,510 --> 00:02:17,040
key word here okay

52
00:02:21,750 --> 00:02:19,520
so whenever you have a symmetric process

53
00:02:22,949 --> 00:02:21,760
be careful don't apply the second law

54
00:02:25,190 --> 00:02:22,959
bluntly

55
00:02:27,270 --> 00:02:25,200
yeah you can do it but if you do that

56
00:02:29,750 --> 00:02:27,280
you'll miss many important things that's

57
00:02:32,070 --> 00:02:29,760
my message here okay so i'm gonna just

58
00:02:36,630 --> 00:02:32,080
uh talk about how we discover this type

59
00:02:39,990 --> 00:02:37,430
so

60
00:02:42,390 --> 00:02:40,000
now we actually in issue i'm was

61
00:02:44,869 --> 00:02:42,400
actually not trying to looking for uh

62
00:02:46,710 --> 00:02:44,879
chinese the second law or try to uh you

63
00:02:48,470 --> 00:02:46,720

know discover you know this type b

64
00:02:50,949 --> 00:02:48,480
actually was this kind of in a sense

65
00:02:52,309 --> 00:02:50,959
pretty unexpected

66
00:02:55,350 --> 00:02:52,319
um

67
00:02:57,190 --> 00:02:55,360
like about 10 years ago even like 35

68
00:02:58,309 --> 00:02:57,200
years ago and

69
00:03:00,869 --> 00:02:58,319
um

70
00:03:02,390 --> 00:03:00,879
when i was a phd student we were

71
00:03:04,390 --> 00:03:02,400
a very interesting the you know the

72
00:03:05,670 --> 00:03:04,400
bioenergetic you know the pedometers

73
00:03:08,630 --> 00:03:05,680
theory

74
00:03:12,070 --> 00:03:08,640
uh it describes how our atp is made in

75
00:03:14,630 --> 00:03:12,080
terms of called kami or smart uh

76
00:03:16,390 --> 00:03:14,640
theory right yeah not bad password but

77
00:03:18,710 --> 00:03:16,400
there's a lot of debate whether protons

78
00:03:20,790 --> 00:03:18,720
and localized local light some of the

79
00:03:21,910 --> 00:03:20,800
observation cannot be explained by his

80
00:03:24,149 --> 00:03:21,920
series

81
00:03:26,309 --> 00:03:24,159
although he got an open password he

82
00:03:28,949 --> 00:03:26,319
he didn't get a great contribution of it

83
00:03:33,030 --> 00:03:28,959
but uh we discovered that his series not

84
00:03:35,910 --> 00:03:33,040
entirely correct actually why

85
00:03:39,750 --> 00:03:35,920
so now so the things actually everybody

86
00:03:42,789 --> 00:03:39,760
uh understand was there's a it's like a

87
00:03:44,630 --> 00:03:42,799
problem that the theory the you know the

88
00:03:46,949 --> 00:03:44,640

textbook um

89
00:03:48,630 --> 00:03:46,959
energetic theory by proposed by peter

90
00:03:51,110 --> 00:03:48,640
mitchell cannot explain the

91
00:03:53,429 --> 00:03:51,120
bioenergetics it's actually one of the

92
00:03:57,110 --> 00:03:53,439
very clear example is on the

93
00:04:02,149 --> 00:03:57,120
uh ecophilic bacteria now these bacteria

94
00:04:03,110 --> 00:04:02,159
can grow at ph as high at 10.5 even 11.

95
00:04:05,910 --> 00:04:03,120
okay

96
00:04:07,190 --> 00:04:05,920
now so um the inside of the cell you

97
00:04:08,869 --> 00:04:07,200
know these people have the measure those

98
00:04:10,550 --> 00:04:08,879
are the data it's not serious these are

99
00:04:11,910 --> 00:04:10,560
experimental measurement okay right

100
00:04:13,589 --> 00:04:11,920
those are the population data okay

101
00:04:15,030 --> 00:04:13,599
people measuring in the last 30 years

102
00:04:19,430 --> 00:04:15,040
okay

103
00:04:21,909 --> 00:04:19,440
the inside of the ph is 8.2 and then in

104
00:04:23,749 --> 00:04:21,919
bacteria similar to our multicultural we

105
00:04:26,070 --> 00:04:23,759
can talk about later

106
00:04:27,909 --> 00:04:26,080
there are less violation systems

107
00:04:30,070 --> 00:04:27,919
in the membrane so these are biological

108
00:04:32,550 --> 00:04:30,080
membranes so this is the bacterial cell

109
00:04:34,070 --> 00:04:32,560
membrane okay so this is the outside is

110
00:04:36,629 --> 00:04:34,080
inside the cell

111
00:04:39,510 --> 00:04:36,639
the entire cell this ph 8.2 it's also

112
00:04:41,909 --> 00:04:39,520
normal just like us

113
00:04:44,150 --> 00:04:41,919

now these bacteria have respiration

114
00:04:45,670 --> 00:04:44,160
system and natural nodes very defined

115
00:04:48,469 --> 00:04:45,680
well known

116
00:04:50,870 --> 00:04:48,479
uh when used organic materials oxide

117
00:04:52,870 --> 00:04:50,880
oxygen you pumping electron and pump you

118
00:04:55,110 --> 00:04:52,880
know so the electron

119
00:04:56,790 --> 00:04:55,120
movement is coupled with

120
00:04:58,710 --> 00:04:56,800
proton pumping this is a well-known

121
00:05:00,390 --> 00:04:58,720
mechanic it's no theory okay it's it's a

122
00:05:01,909 --> 00:05:00,400
fact basically not exact effect

123
00:05:03,830 --> 00:05:01,919
everybody knows okay

124
00:05:07,189 --> 00:05:03,840
can be protons out

125
00:05:10,550 --> 00:05:07,199
now the proton is supposed to come here

126
00:05:13,670 --> 00:05:10,560
drive atp making this called atp sensor

127
00:05:15,510 --> 00:05:13,680
s is actually a nanometer turbine

128
00:05:18,469 --> 00:05:15,520
uh the structure as well is now also

129
00:05:19,590 --> 00:05:18,479
getting the password after we the

130
00:05:25,350 --> 00:05:19,600
um

131
00:05:27,510 --> 00:05:25,360
paul boyer at ucla actually he proposed

132
00:05:30,230 --> 00:05:27,520
cld and also the people resolved the

133
00:05:31,990 --> 00:05:30,240
structure of it actually was you know uh

134
00:05:34,390 --> 00:05:32,000
this entity also got a very private so

135
00:05:36,950 --> 00:05:34,400
this process is well known it's like a

136
00:05:40,550 --> 00:05:36,960
little turban here makes a turn and then

137
00:05:43,430 --> 00:05:40,560
actually um when the proton come in here

138
00:05:44,629 --> 00:05:43,440

and drive atp making from

139
00:05:47,670 --> 00:05:44,639
atp

140
00:05:50,310 --> 00:05:47,680
plus the inorganic phosphate and then

141
00:05:53,110 --> 00:05:50,320
when these lotum movings convert the

142
00:05:55,189 --> 00:05:53,120
mechanical energy into your atp energy

143
00:05:57,909 --> 00:05:55,199
so that's a well-known process okay now

144
00:05:59,270 --> 00:05:57,919
the key here is that you look here now

145
00:06:01,590 --> 00:05:59,280
you're supposed to have proton pumping

146
00:06:03,990 --> 00:06:01,600
here right but look outside the ph is

147
00:06:05,350 --> 00:06:04,000
10.5 you have very lower proton gradient

148
00:06:08,469 --> 00:06:05,360
is that right

149
00:06:11,029 --> 00:06:08,479
you have we have less ph proton here the

150
00:06:13,990 --> 00:06:11,039
inside right inside ph 8.2 we have more

151
00:06:17,670 --> 00:06:14,000
proton in the medium in the buckle right

152
00:06:20,629 --> 00:06:17,680
so now we use now so these equations are

153
00:06:23,830 --> 00:06:20,639
in the textbook uh based on peter

154
00:06:26,950 --> 00:06:23,840
mitchell's mutuals called the proton

155
00:06:29,670 --> 00:06:26,960
multi multi-force equation now in short

156
00:06:32,070 --> 00:06:29,680
we call the pm8 okay so the proton

157
00:06:33,990 --> 00:06:32,080
multi-force equation okay

158
00:06:36,469 --> 00:06:34,000
so that's he defined that's in the

159
00:06:39,430 --> 00:06:36,479
textbook so is the membrane potential

160
00:06:41,670 --> 00:06:39,440
for this vector 180 that is a water

161
00:06:43,029 --> 00:06:41,680
difference across the membrane here okay

162
00:06:45,189 --> 00:06:43,039
so is

163
00:06:47,430 --> 00:06:45,199

now here's the power outside product you

164
00:06:49,270 --> 00:06:47,440
hear negative so it's a 100 uh the

165
00:06:51,029 --> 00:06:49,280
voltage difference so that we in the

166
00:06:53,270 --> 00:06:51,039
bioenergetic because this is called the

167
00:06:55,990 --> 00:06:53,280
membrane potential

168
00:06:57,670 --> 00:06:56,000
now the measures of hypothesis is

169
00:06:58,950 --> 00:06:57,680
you know the pronoun concentration or

170
00:07:01,189 --> 00:06:58,960
the ph

171
00:07:05,430 --> 00:07:01,199
um the difference from outside to inside

172
00:07:08,710 --> 00:07:05,440
okay now outside 10.5 and you you minus

173
00:07:10,790 --> 00:07:08,720
that 2.3 right okay so these 59 is just

174
00:07:12,230 --> 00:07:10,800
a constant you know like rt constant

175
00:07:14,230 --> 00:07:12,240
okay right and

176
00:07:16,870 --> 00:07:14,240
they're saying you know temperature so

177
00:07:18,150 --> 00:07:16,880
if you calculated with the textbook

178
00:07:21,029 --> 00:07:18,160
equation

179
00:07:22,469 --> 00:07:21,039
the proton module force only 44

180
00:07:25,430 --> 00:07:22,479
millivolts

181
00:07:26,469 --> 00:07:25,440
are materially required to drive atm

182
00:07:30,070 --> 00:07:26,479
making

183
00:07:32,070 --> 00:07:30,080
you require 478

184
00:07:34,950 --> 00:07:32,080
millivolts so even use like three or

185
00:07:37,909 --> 00:07:34,960
four protons you're not enough

186
00:07:40,309 --> 00:07:37,919
so this is like everybody knows this in

187
00:07:43,189 --> 00:07:40,319
the field of bioenergetics

188
00:07:45,749 --> 00:07:43,199

it's like anything alone

189
00:07:48,390 --> 00:07:45,759
you know the tax equation cannot expand

190
00:07:50,950 --> 00:07:48,400
for 30 years people have no way to

191
00:07:52,710 --> 00:07:50,960
actually declare this so like this is a

192
00:07:55,189 --> 00:07:52,720
consumer you know this mystery have been

193
00:07:57,189 --> 00:07:55,199
there like in for 30 years

194
00:07:58,390 --> 00:07:57,199
then i'm coming in

195
00:08:02,070 --> 00:07:58,400
so

196
00:08:04,230 --> 00:08:02,080
[Music]

197
00:08:06,309 --> 00:08:04,240
so basically the textbook cannot explain

198
00:08:08,070 --> 00:08:06,319
the energetic oh you can make atp you

199
00:08:11,510 --> 00:08:08,080
know the bacteria grow very very well

200
00:08:14,230 --> 00:08:11,520
okay i'll tell you about more

201
00:08:16,710 --> 00:08:14,240
so uh we i'm coming in here you know

202
00:08:18,629 --> 00:08:16,720
water right

203
00:08:22,150 --> 00:08:18,639
is um

204
00:08:23,909 --> 00:08:22,160
can understand as a platonic conductor

205
00:08:25,510 --> 00:08:23,919
for these two reasons

206
00:08:27,589 --> 00:08:25,520
you know these are water molecules so

207
00:08:29,350 --> 00:08:27,599
the proton can hop

208
00:08:32,230 --> 00:08:29,360
like this

209
00:08:34,149 --> 00:08:32,240
okay between among water molecules

210
00:08:35,670 --> 00:08:34,159
another way pro water can act that

211
00:08:37,829 --> 00:08:35,680
proton conducting you know whatever they

212
00:08:38,790 --> 00:08:37,839
could turn a little bit here that way

213
00:08:41,269 --> 00:08:38,800

there

214
00:08:45,750 --> 00:08:41,279
and this that that

215
00:08:48,790 --> 00:08:45,760
and in a sense proton in liquid water

216
00:08:49,910 --> 00:08:48,800
some water behaves somewhat similar to

217
00:09:00,630 --> 00:08:49,920
the

218
00:09:02,870 --> 00:09:00,640
kind of conduct basically that's why we

219
00:09:04,550 --> 00:09:02,880
call the protonic conductor right

220
00:09:06,470 --> 00:09:04,560
of course water does not conduct

221
00:09:07,269 --> 00:09:06,480
electron though but only to the proton

222
00:09:09,910 --> 00:09:07,279
right

223
00:09:12,550 --> 00:09:09,920
so this is a proper to call

224
00:09:14,389 --> 00:09:12,560
water as the protonic conductor of

225
00:09:16,870 --> 00:09:14,399
course the insulator for electrons make

226
00:09:18,870 --> 00:09:16,880
sure that we understand that okay right

227
00:09:21,350 --> 00:09:18,880
now i understand water is a proton

228
00:09:22,790 --> 00:09:21,360
conductor now let's go back to the case

229
00:09:26,150 --> 00:09:22,800
here

230
00:09:27,670 --> 00:09:26,160
the cell right you have platonic

231
00:09:29,190 --> 00:09:27,680
conductor

232
00:09:31,590 --> 00:09:29,200
your membrane

233
00:09:33,829 --> 00:09:31,600
is insulated right okay right

234
00:09:34,829 --> 00:09:33,839
and inside the steel you have water

235
00:09:37,990 --> 00:09:34,839
proton

236
00:09:39,670 --> 00:09:38,000
conductor so you have a conductor

237
00:09:43,110 --> 00:09:39,680
insulator

238
00:09:46,389 --> 00:09:43,120

conductor by definition you have a

239
00:09:48,630 --> 00:09:46,399
protonic capacitor you got it

240
00:09:50,470 --> 00:09:48,640
now so that what happens

241
00:09:51,750 --> 00:09:50,480
the proton pumping across the membrane

242
00:09:53,509 --> 00:09:51,760
by

243
00:09:57,350 --> 00:09:53,519
the this validation will not go to the

244
00:09:59,990 --> 00:09:57,360
bulk but from this protonic capacitor

245
00:10:02,710 --> 00:10:00,000
this has never understood or recognized

246
00:10:05,430 --> 00:10:02,720
before so we are the one first about 10

247
00:10:06,790 --> 00:10:05,440
years ago let's not understand it like

248
00:10:10,949 --> 00:10:06,800
this

249
00:10:13,269 --> 00:10:10,959
capacitor uh similar to electrical

250
00:10:16,550 --> 00:10:13,279
capacity in that case act is electro but

251
00:10:18,550 --> 00:10:16,560
in this case it's protonic protons okay

252
00:10:21,190 --> 00:10:18,560
now if you google the words protonic

253
00:10:23,430 --> 00:10:21,200
capacity that it does not find it

254
00:10:25,190 --> 00:10:23,440
because that was i created if you

255
00:10:27,509 --> 00:10:25,200
control the capacitor james lee's name

256
00:10:29,190 --> 00:10:27,519
of popping up google okay

257
00:10:31,030 --> 00:10:29,200
so so we are the first one to understand

258
00:10:32,630 --> 00:10:31,040
that so now if we understand how there's

259
00:10:34,069 --> 00:10:32,640
a layer of proton here you see that

260
00:10:36,710 --> 00:10:34,079
right

261
00:10:38,550 --> 00:10:36,720
these protons will be just on the liquid

262
00:10:39,350 --> 00:10:38,560
water membrane interfaces are sitting

263
00:10:40,949 --> 00:10:39,360

there

264
00:10:42,790 --> 00:10:40,959
they are cerebrally vibrating we're

265
00:10:44,389 --> 00:10:42,800
talking more sorry about that

266
00:10:46,389 --> 00:10:44,399
they're going to hit that thing and

267
00:10:48,630 --> 00:10:46,399
doing the work right

268
00:10:50,310 --> 00:10:48,640
then you calculated this then as

269
00:10:51,910 --> 00:10:50,320
actually the whole thing making sense

270
00:10:53,269 --> 00:10:51,920
you know so but you need to modify

271
00:10:55,190 --> 00:10:53,279
equation because

272
00:10:57,590 --> 00:10:55,200
the textbook equation never talk about

273
00:10:59,509 --> 00:10:57,600
it that they're not uh they did not they

274
00:11:01,590 --> 00:10:59,519
are not aware of the something like this

275
00:11:04,150 --> 00:11:01,600
going on uh-huh

276
00:11:06,790 --> 00:11:04,160
so what will be the correct uh proton

277
00:11:09,910 --> 00:11:06,800
multiverse equations so

278
00:11:11,829 --> 00:11:09,920
so that's really here now remember

279
00:11:14,550 --> 00:11:11,839
this is the maturing

280
00:11:18,230 --> 00:11:14,560
proton motive force equation in the

281
00:11:22,389 --> 00:11:18,240
textbook okay so if pmf membranes are

282
00:11:24,870 --> 00:11:22,399
2.3 rt okay fairly they constant time

283
00:11:27,030 --> 00:11:24,880
the ph difference across memory so

284
00:11:32,389 --> 00:11:27,040
that's uh in the textbook

285
00:11:35,269 --> 00:11:32,399
so so this is my modified uh revised the

286
00:11:36,870 --> 00:11:35,279
proton multiverse equations

287
00:11:38,389 --> 00:11:36,880
now the first two terms here you see

288
00:11:40,150 --> 00:11:38,399

this is the same

289
00:11:41,750 --> 00:11:40,160
this term is essentially the same as

290
00:11:44,630 --> 00:11:41,760
that just a different way of writing it

291
00:11:46,790 --> 00:11:44,640
remember ph is minus log okay of the

292
00:11:49,509 --> 00:11:46,800
proton concentration right that's right

293
00:11:51,590 --> 00:11:49,519
here okay so this is on the proton on

294
00:11:52,389 --> 00:11:51,600
the pisa outside

295
00:11:54,470 --> 00:11:52,399
uh

296
00:11:57,350 --> 00:11:54,480
over the proton constant in the bark

297
00:11:59,590 --> 00:11:57,360
phase okay and in the inside so this

298
00:12:01,190 --> 00:11:59,600
these two terms are identical to what in

299
00:12:03,829 --> 00:12:01,200
the text but

300
00:12:07,110 --> 00:12:03,839
um the what the uh the text equation

301
00:12:10,629 --> 00:12:07,120
means this term so that's a term i added

302
00:12:12,710 --> 00:12:10,639
so here is you know is a 2.3 log

303
00:12:14,389 --> 00:12:12,720
rt you know gas constant you know

304
00:12:17,110 --> 00:12:14,399
environment temperature

305
00:12:19,190 --> 00:12:17,120
so it's actually this term is the one

306
00:12:20,790 --> 00:12:19,200
here with um

307
00:12:22,870 --> 00:12:20,800
the you know the layer

308
00:12:25,030 --> 00:12:22,880
um for on the surface right

309
00:12:26,710 --> 00:12:25,040
electrostatic i use called the localized

310
00:12:28,710 --> 00:12:26,720
i use l here

311
00:12:31,350 --> 00:12:28,720
so the local proton condition on that

312
00:12:34,389 --> 00:12:31,360
layer protonic capacitor okay

313
00:12:36,150 --> 00:12:34,399

and over the bark phase in the liquid

314
00:12:39,990 --> 00:12:36,160
you know not the same thing with that

315
00:12:41,990 --> 00:12:40,000
one here okay and it's this ratio that

316
00:12:44,710 --> 00:12:42,000
contributes to

317
00:12:46,870 --> 00:12:44,720
so-called uh this component actually uh

318
00:12:49,670 --> 00:12:46,880
later we look uh called the localized

319
00:12:51,750 --> 00:12:49,680
proton pm proton

320
00:12:53,990 --> 00:12:51,760
uh module force okay so this is very

321
00:12:56,949 --> 00:12:54,000
important i want you to recognize that

322
00:12:59,110 --> 00:12:56,959
now the question is yeah you have uh you

323
00:13:00,870 --> 00:12:59,120
have a same layer what the density of

324
00:13:02,790 --> 00:13:00,880
this you know yeah so we this is

325
00:13:05,750 --> 00:13:02,800
basically we're talking about these kind

326
00:13:07,509 --> 00:13:05,760
this layer is a mono layer actually

327
00:13:10,470 --> 00:13:07,519
so you typically will stay within one

328
00:13:12,790 --> 00:13:10,480
nanometer not too far okay so you have

329
00:13:14,629 --> 00:13:12,800
you have a kind of population density so

330
00:13:17,990 --> 00:13:14,639
i call this called the localized proton

331
00:13:20,550 --> 00:13:18,000
density okay i described as

332
00:13:23,110 --> 00:13:20,560
this proton little sub l here okay so

333
00:13:25,590 --> 00:13:23,120
that's just a bug you know just like in

334
00:13:28,150 --> 00:13:25,600
water okay in the body

335
00:13:30,550 --> 00:13:28,160
so the question is what is this are we

336
00:13:32,150 --> 00:13:30,560
able to quantitatively expand this if we

337
00:13:34,150 --> 00:13:32,160
know the quantitative we can then you

338
00:13:35,110 --> 00:13:34,160

can calculate things you can get energy

339
00:13:37,190 --> 00:13:35,120
right

340
00:13:40,150 --> 00:13:37,200
so the proton module force

341
00:13:41,829 --> 00:13:40,160
is uh you know if we time this become uh

342
00:13:43,990 --> 00:13:41,839
you know basically become converted to

343
00:13:46,470 --> 00:13:44,000
data g right so in the field of

344
00:13:48,470 --> 00:13:46,480
bioenergetic people use proton multiples

345
00:13:50,389 --> 00:13:48,480
like little words so that's

346
00:13:52,389 --> 00:13:50,399
i'm going to actually convert to uh give

347
00:13:56,230 --> 00:13:52,399
this energy later okay it's a c

348
00:13:58,389 --> 00:13:57,430
aha

349
00:14:01,670 --> 00:13:58,399
so

350
00:14:04,550 --> 00:14:01,680
my idea of to try to define or to

351
00:14:06,710 --> 00:14:04,560
quantitate to express this thing here

352
00:14:08,710 --> 00:14:06,720
actually came from here so we understand

353
00:14:11,350 --> 00:14:08,720
the platonic capacity okay now if

354
00:14:14,470 --> 00:14:11,360
platonic cell capacitor

355
00:14:16,790 --> 00:14:14,480
you know we should able bother you know

356
00:14:18,389 --> 00:14:16,800
electric capacitor equation to use here

357
00:14:20,310 --> 00:14:18,399
right that's whole idea okay when we

358
00:14:22,389 --> 00:14:20,320
understand capacity okay

359
00:14:23,829 --> 00:14:22,399
so then we basically borrow the

360
00:14:25,990 --> 00:14:23,839
well-known

361
00:14:28,230 --> 00:14:26,000
um you know capacity equation right so

362
00:14:30,550 --> 00:14:28,240
the concentration of

363
00:14:32,710 --> 00:14:30,560

the local proton and put the zero zero

364
00:14:34,629 --> 00:14:32,720
here the other means like if in a pure

365
00:14:36,949 --> 00:14:34,639
water system okay just like ideal

366
00:14:38,310 --> 00:14:36,959
gasoline let's start from singapore

367
00:14:40,550 --> 00:14:38,320
not gonna see the salt we'll consider

368
00:14:42,069 --> 00:14:40,560
the soil effect later okay otherwise he

369
00:14:44,629 --> 00:14:42,079
may you know too much things just like

370
00:14:48,389 --> 00:14:44,639
cannolis things through okay

371
00:14:51,750 --> 00:14:48,399
so if you in an idealized uh

372
00:14:53,990 --> 00:14:51,760
liquid water membrane water system then

373
00:14:56,310 --> 00:14:54,000
you have this you can apply this if

374
00:14:59,110 --> 00:14:56,320
there are many potentials

375
00:15:01,189 --> 00:14:59,120
uh you will be the the

376
00:15:02,629 --> 00:15:01,199
the you know the specific memory

377
00:15:04,550 --> 00:15:02,639
capacitance

378
00:15:06,710 --> 00:15:04,560
time your

379
00:15:08,150 --> 00:15:06,720
your voltage difference you know memory

380
00:15:10,790 --> 00:15:08,160
potential code

381
00:15:12,470 --> 00:15:10,800
and the divided by your the thickness of

382
00:15:14,230 --> 00:15:12,480
that layer about one nanometer and then

383
00:15:16,470 --> 00:15:14,240
the factory constant that will be your

384
00:15:18,230 --> 00:15:16,480
idealized

385
00:15:19,590 --> 00:15:18,240
localized proton concentration what'd

386
00:15:21,110 --> 00:15:19,600
you find nah

387
00:15:23,590 --> 00:15:21,120
so that's good

388
00:15:25,189 --> 00:15:23,600

but in actual biology you have a salt

389
00:15:26,790 --> 00:15:25,199
right we eat a lot of sodiums in our

390
00:15:29,990 --> 00:15:26,800
body we have plenty of salt you know

391
00:15:31,990 --> 00:15:30,000
sodium chloride or potassium you know

392
00:15:35,590 --> 00:15:32,000
there's many things there okay

393
00:15:37,670 --> 00:15:35,600
so we also further developed

394
00:15:39,910 --> 00:15:37,680
a term to

395
00:15:41,829 --> 00:15:39,920
call the reduction factor

396
00:15:43,030 --> 00:15:41,839
divide the equation to accounting for

397
00:15:48,230 --> 00:15:43,040
that

398
00:15:50,550 --> 00:15:48,240
effect we use the real

399
00:15:52,829 --> 00:15:50,560
local proton concentration

400
00:15:55,030 --> 00:15:52,839
in the presence of those

401
00:15:57,269 --> 00:15:55,040
non-protocation including this here you

402
00:15:59,910 --> 00:15:57,279
know m means like uh

403
00:16:01,430 --> 00:15:59,920
cation it could be sodium

404
00:16:06,790 --> 00:16:01,440
um

405
00:16:08,230 --> 00:16:06,800
your body or in the spin outside inside

406
00:16:09,590 --> 00:16:08,240
the cell okay they can affect they can

407
00:16:13,910 --> 00:16:09,600
exchange okay

408
00:16:15,670 --> 00:16:13,920
they are proton right they can exchange

409
00:16:17,509 --> 00:16:15,680
if we have sodium here they can actually

410
00:16:20,389 --> 00:16:17,519
if you have a large amount of sodium you

411
00:16:22,550 --> 00:16:20,399
can exchange this uh

412
00:16:24,310 --> 00:16:22,560
proton out into the back faces okay

413
00:16:26,470 --> 00:16:24,320

that's really that term

414
00:16:28,389 --> 00:16:26,480
for that okay so when these protons

415
00:16:30,870 --> 00:16:28,399
exchange you have a sodium occupied here

416
00:16:33,189 --> 00:16:30,880
of course the density of the

417
00:16:37,030 --> 00:16:33,199
the proton concentration will reduce

418
00:16:40,069 --> 00:16:37,040
right so that's i call that is this term

419
00:16:42,870 --> 00:16:40,079
basically is a reduction factor so it's

420
00:16:45,590 --> 00:16:42,880
actually the effect is not summation we

421
00:16:47,350 --> 00:16:45,600
figured out it's actually is a product

422
00:16:50,310 --> 00:16:47,360
like each different for you have a

423
00:16:52,069 --> 00:16:50,320
sodium exchange with the proton and you

424
00:16:55,110 --> 00:16:52,079
have potassium those effects are not

425
00:16:57,590 --> 00:16:55,120
additive but products very important

426
00:17:00,949 --> 00:16:57,600
okay so that's why this little symbol

427
00:17:02,870 --> 00:17:00,959
here means all those terms are

428
00:17:04,470 --> 00:17:02,880
product together then we'll be collected

429
00:17:05,990 --> 00:17:04,480
accounting for that so this is very

430
00:17:07,909 --> 00:17:06,000
important otherwise you know the

431
00:17:09,510 --> 00:17:07,919
calculation will be online

432
00:17:11,669 --> 00:17:09,520
okay very important

433
00:17:13,510 --> 00:17:11,679
so we divide this is unique um so you

434
00:17:15,590 --> 00:17:13,520
can see already published okay i already

435
00:17:17,510 --> 00:17:15,600
published these things now if it's that

436
00:17:19,829 --> 00:17:17,520
if you know the true concentration of

437
00:17:21,909 --> 00:17:19,839
now you can use this sign to a leo

438
00:17:24,069 --> 00:17:21,919

system

439
00:17:27,829 --> 00:17:24,079
so this is

440
00:17:30,390 --> 00:17:27,839
the uh system now

441
00:17:32,310 --> 00:17:30,400
so we apply this uh use experimental

442
00:17:34,549 --> 00:17:32,320
data these said people have done that so

443
00:17:38,470 --> 00:17:34,559
the real experimental data okay so

444
00:17:40,710 --> 00:17:38,480
now in the cultural medium all the

445
00:17:43,669 --> 00:17:40,720
non-proton canada concentration like

446
00:17:45,669 --> 00:17:43,679
sodium it's known 300 millimolar in the

447
00:17:48,150 --> 00:17:45,679
culture media so those are experiments

448
00:17:49,830 --> 00:17:48,160
okay from you know it's real fats no no

449
00:17:52,310 --> 00:17:49,840
theory okay

450
00:17:53,750 --> 00:17:52,320
sodium potassium no magnesium all the

451
00:17:56,390 --> 00:17:53,760
evidence is known okay so we use the

452
00:17:58,150 --> 00:17:56,400
real experimental data for this culture

453
00:18:01,590 --> 00:17:58,160
and experiment

454
00:18:03,590 --> 00:18:01,600
and so unknown and uh

455
00:18:05,909 --> 00:18:03,600
another thing is we needed to know in

456
00:18:09,110 --> 00:18:05,919
order to capture that exchange equipment

457
00:18:11,029 --> 00:18:09,120
um um concentration we

458
00:18:13,270 --> 00:18:11,039
needed this called the exchange

459
00:18:15,909 --> 00:18:13,280
equipment constant now that thing was

460
00:18:21,190 --> 00:18:18,070
so actually took my uh

461
00:18:24,150 --> 00:18:21,200
my phd student like five years to manage

462
00:18:25,990 --> 00:18:24,160
this uh these two constants okay

463
00:18:28,310 --> 00:18:26,000

a long time okay so that's why you know

464
00:18:29,350 --> 00:18:28,320
we we know this thing you know i'm

465
00:18:33,430 --> 00:18:29,360
serious

466
00:18:35,190 --> 00:18:33,440
uh explore this in 2010 or 11. it took

467
00:18:37,669 --> 00:18:35,200
like a five years and then finally we

468
00:18:39,909 --> 00:18:37,679
got this number now we can calculate you

469
00:18:42,710 --> 00:18:39,919
know this thing okay this uh

470
00:18:45,029 --> 00:18:42,720
reduction factor so so this is the case

471
00:18:47,750 --> 00:18:45,039
like in potassium you see that right so

472
00:18:49,110 --> 00:18:47,760
it is this effect here but potassium is

473
00:18:50,870 --> 00:18:49,120
an adduction factor in these

474
00:18:53,669 --> 00:18:50,880
concentrations that

475
00:18:56,710 --> 00:18:53,679
your potassium the reduction factor that

476
00:18:58,710 --> 00:18:56,720
and uh for mechanism kind of small equal

477
00:19:01,190 --> 00:18:58,720
close to mine so the very low

478
00:19:04,150 --> 00:19:01,200
concentration guys almost to one so the

479
00:19:06,150 --> 00:19:04,160
total effect is not summation it's time

480
00:19:07,990 --> 00:19:06,160
these all together you have actually

481
00:19:09,270 --> 00:19:08,000
very significant reduction factor okay

482
00:19:13,190 --> 00:19:09,280
you see that right

483
00:19:16,150 --> 00:19:13,200
uh 44 000 right okay yeah so that's for

484
00:19:18,390 --> 00:19:16,160
um the couch immediately at ph 10.5 so

485
00:19:21,909 --> 00:19:18,400
we have to do each of those

486
00:19:24,390 --> 00:19:21,919
uh ph's uh counter ph um

487
00:19:25,990 --> 00:19:24,400
separately okay so because these culture

488
00:19:28,230 --> 00:19:26,000

hacks you've been done

489
00:19:31,029 --> 00:19:28,240
the people culture scientists culture

490
00:19:33,270 --> 00:19:31,039
these bacteria at different ph's okay

491
00:19:35,510 --> 00:19:33,280
so 10.5 is a number i just show you

492
00:19:38,390 --> 00:19:35,520
right okay so we did of course this

493
00:19:41,590 --> 00:19:38,400
bacteria can also grow 7.5 at that time

494
00:19:42,950 --> 00:19:41,600
the deduction factor is this okay so on

495
00:19:45,750 --> 00:19:42,960
okay

496
00:19:47,669 --> 00:19:45,760
now so this is the h

497
00:19:49,510 --> 00:19:47,679
local proton you know idealized

498
00:19:51,590 --> 00:19:49,520
condition we actually can use the

499
00:19:53,190 --> 00:19:51,600
capacitor calculator okay

500
00:19:55,190 --> 00:19:53,200
the membrane potential are measured

501
00:19:56,310 --> 00:19:55,200
experimentally okay these are

502
00:19:57,990 --> 00:19:56,320
experimental there oh those are

503
00:19:59,990 --> 00:19:58,000
experimental data okay

504
00:20:02,070 --> 00:20:00,000
now these are calculated from membrane

505
00:20:03,990 --> 00:20:02,080
potential so it's also in your sample

506
00:20:06,710 --> 00:20:04,000
from based on experiment okay so these

507
00:20:08,390 --> 00:20:06,720
are not like proposal numbers okay those

508
00:20:11,350 --> 00:20:08,400
calculate the factors

509
00:20:13,430 --> 00:20:11,360
now use that you know calculate the real

510
00:20:15,909 --> 00:20:13,440
localized proton concentration okay

511
00:20:19,190 --> 00:20:15,919
right so this is here

512
00:20:22,149 --> 00:20:19,200
now when when this uh low class proton

513
00:20:23,590 --> 00:20:22,159

consultation is you know it's here then

514
00:20:26,070 --> 00:20:23,600
the lessons are hopefully you can

515
00:20:28,310 --> 00:20:26,080
calculate the local product multiples

516
00:20:29,350 --> 00:20:28,320
that's the third term in my equation

517
00:20:32,230 --> 00:20:29,360
okay

518
00:20:33,990 --> 00:20:32,240
now the classic proton multiples is

519
00:20:35,669 --> 00:20:34,000
based on the textbook you know the first

520
00:20:37,909 --> 00:20:35,679
two terms

521
00:20:40,710 --> 00:20:37,919
and the total proton multiverse is two

522
00:20:42,070 --> 00:20:40,720
together that's your total is that right

523
00:20:42,870 --> 00:20:42,080
yeah

524
00:20:44,710 --> 00:20:42,880
now

525
00:20:46,630 --> 00:20:44,720
so let's plot this out you're making

526
00:20:49,669 --> 00:20:46,640
sense of it okay so i'm plotting this

527
00:20:52,070 --> 00:20:49,679
data out now you will see it

528
00:20:54,390 --> 00:20:52,080
so this work is already published in the

529
00:20:57,590 --> 00:20:54,400
assist journal okay

530
00:21:00,070 --> 00:20:57,600
now so this access is a proton multiples

531
00:21:03,430 --> 00:21:00,080
and that's your cultural

532
00:21:05,190 --> 00:21:03,440
medium phs okay so

533
00:21:07,990 --> 00:21:05,200
now the couch you're able to grow these

534
00:21:10,230 --> 00:21:08,000
are sale doubling times on this axis so

535
00:21:12,549 --> 00:21:10,240
the sales doubling times like

536
00:21:14,789 --> 00:21:12,559
it's how long it takes in a cell for

537
00:21:17,350 --> 00:21:14,799
making a sale division making you know

538
00:21:20,390 --> 00:21:17,360

one become two right four become

539
00:21:22,710 --> 00:21:20,400
two become uh four four become eight it

540
00:21:23,669 --> 00:21:22,720
becomes you know 16 right the doubling

541
00:21:25,750 --> 00:21:23,679
time okay

542
00:21:28,470 --> 00:21:25,760
so you can see this bacteria so the

543
00:21:30,710 --> 00:21:28,480
doubling time of the minutes here

544
00:21:34,149 --> 00:21:30,720
the other culture you know can grow from

545
00:21:36,230 --> 00:21:34,159
ph 7.5 all the way ph about

546
00:21:38,950 --> 00:21:36,240
11 here this doubling time it's like

547
00:21:40,230 --> 00:21:38,960
below 100 minutes so like this sale is

548
00:21:42,230 --> 00:21:40,240
not slow

549
00:21:44,789 --> 00:21:42,240
you know every two hours

550
00:21:46,789 --> 00:21:44,799
doubles okay right very good very uh

551
00:21:48,230 --> 00:21:46,799
have this cell actually go excellent

552
00:21:51,110 --> 00:21:48,240
growth

553
00:21:52,870 --> 00:21:51,120
so now when the when the ph go higher

554
00:21:55,669 --> 00:21:52,880
further and then the doubling times

555
00:21:57,350 --> 00:21:55,679
significant currently go up okay

556
00:21:58,950 --> 00:21:57,360
that was observed those experimental

557
00:22:00,470 --> 00:21:58,960
observations

558
00:22:03,110 --> 00:22:00,480
so you look at the

559
00:22:05,110 --> 00:22:03,120
the textbook uh

560
00:22:06,630 --> 00:22:05,120
proton multifirst equation calculate the

561
00:22:09,590 --> 00:22:06,640
proton multiples you know called the

562
00:22:13,190 --> 00:22:09,600
classic um pmf you see

563
00:22:16,470 --> 00:22:13,200

now on 10p 10.5 you see your proton

564
00:22:18,950 --> 00:22:16,480
motive force is about 44

565
00:22:22,870 --> 00:22:18,960
how much required to make atp for the

566
00:22:24,950 --> 00:22:22,880
program you need at least 110 or 20.

567
00:22:26,870 --> 00:22:24,960
so you have four together

568
00:22:29,190 --> 00:22:26,880
fall together you were able to meet a

569
00:22:31,510 --> 00:22:29,200
lot by 400. you see that right that's

570
00:22:34,070 --> 00:22:31,520
why you know that's why like for the

571
00:22:36,870 --> 00:22:34,080
last 30 years nobody able to expand

572
00:22:38,950 --> 00:22:36,880
these these are totally unexpendable

573
00:22:40,870 --> 00:22:38,960
with the tax equation right the last 30

574
00:22:43,029 --> 00:22:40,880
years sitting there okay

575
00:22:45,750 --> 00:22:43,039
now what you look at that is this also

576
00:22:47,029 --> 00:22:45,760
the pattern of the the classic uh proton

577
00:22:49,110 --> 00:22:47,039
motive force

578
00:22:50,070 --> 00:22:49,120
doesn't make in any sense here now then

579
00:22:52,390 --> 00:22:50,080
the ph

580
00:22:54,710 --> 00:22:52,400
actually go down right

581
00:22:59,190 --> 00:22:54,720
and then from this point like ph you

582
00:23:01,270 --> 00:22:59,200
know from here you go to 11 and uh

583
00:23:03,510 --> 00:23:01,280
called closer 12 you see the total

584
00:23:04,310 --> 00:23:03,520
multiples actually increased

585
00:23:06,390 --> 00:23:04,320
now

586
00:23:07,430 --> 00:23:06,400
increase your sales doubling time should

587
00:23:08,470 --> 00:23:07,440
be

588
00:23:10,710 --> 00:23:08,480

getting

589
00:23:12,070 --> 00:23:10,720
smaller she's not not like bending up

590
00:23:14,470 --> 00:23:12,080
you see that the code should be bending

591
00:23:15,830 --> 00:23:14,480
down right so the not only is a pursuit

592
00:23:17,669 --> 00:23:15,840
of value

593
00:23:20,070 --> 00:23:17,679
that's not able to it doesn't make any

594
00:23:21,110 --> 00:23:20,080
sense to observe the true doubling

595
00:23:25,029 --> 00:23:21,120
pattern

596
00:23:26,870 --> 00:23:25,039
see that that's why this

597
00:23:29,909 --> 00:23:26,880
this thing really cannot explain about

598
00:23:32,549 --> 00:23:29,919
the textbook because of it mutual's

599
00:23:35,029 --> 00:23:32,559
theory okay per se okay

600
00:23:38,149 --> 00:23:35,039
so now the reason why

601
00:23:40,870 --> 00:23:38,159
it miss the term i discovered it's the

602
00:23:42,310 --> 00:23:40,880
local proton models they are here

603
00:23:43,110 --> 00:23:42,320
and you calculate

604
00:23:45,590 --> 00:23:43,120
okay

605
00:23:48,310 --> 00:23:45,600
you see that the the missed component

606
00:23:50,470 --> 00:23:48,320
the mixed component actually much bigger

607
00:23:53,110 --> 00:23:50,480
than the classical one here so the milk

608
00:23:54,630 --> 00:23:53,120
means a small thing it's a big component

609
00:23:56,789 --> 00:23:54,640
you know the layer of proton on the

610
00:23:58,230 --> 00:23:56,799
surface you know protonic capacity thing

611
00:24:00,470 --> 00:23:58,240
right okay

612
00:24:04,950 --> 00:24:00,480
so the total is these two together

613
00:24:07,430 --> 00:24:04,960

that's your total so it's way here okay

614
00:24:09,990 --> 00:24:07,440
so now you look at this and here as ph

615
00:24:12,070 --> 00:24:10,000
go up yeah the proton motif was actually

616
00:24:14,870 --> 00:24:12,080
go down the reason is

617
00:24:16,630 --> 00:24:14,880
when the ph goes high the the the proton

618
00:24:18,710 --> 00:24:16,640
concentration in the back liquid phase

619
00:24:20,149 --> 00:24:18,720
go down so the favors the pro cation

620
00:24:22,310 --> 00:24:20,159
proton exchange

621
00:24:24,789 --> 00:24:22,320
that's why you have this uh the low

622
00:24:27,750 --> 00:24:24,799
chloride proton uh concentration goes

623
00:24:30,230 --> 00:24:27,760
down so that of course the localized uh

624
00:24:33,269 --> 00:24:30,240
pmf component also decreased right

625
00:24:35,830 --> 00:24:33,279
so you can see here and that's go down

626
00:24:38,149 --> 00:24:35,840
but still above this minority quite so

627
00:24:40,390 --> 00:24:38,159
you can explain this that's why these

628
00:24:42,950 --> 00:24:40,400
signs still able to grow

629
00:24:45,029 --> 00:24:42,960
but when you go down you see they are

630
00:24:48,070 --> 00:24:45,039
more difficult to double you see so now

631
00:24:49,590 --> 00:24:48,080
matches so the total problem is like

632
00:24:50,950 --> 00:24:49,600
this go down

633
00:24:53,190 --> 00:24:50,960
and

634
00:24:54,230 --> 00:24:53,200
the doubling time go up means grow slow

635
00:24:56,630 --> 00:24:54,240
right

636
00:24:58,470 --> 00:24:56,640
so now at the first first time this 30

637
00:24:59,750 --> 00:24:58,480
years mystery

638
00:25:02,870 --> 00:24:59,760

has been solved in terms of

639
00:25:04,710 --> 00:25:02,880
bioenergetics okay like uh why

640
00:25:06,789 --> 00:25:04,720
and now we cannot explain how they call

641
00:25:08,310 --> 00:25:06,799
this bacteria can grow okay they have to

642
00:25:10,390 --> 00:25:08,320
have enough energy

643
00:25:13,430 --> 00:25:10,400
you can see that because the the total

644
00:25:14,870 --> 00:25:13,440
protomodel falls is well above that okay

645
00:25:17,110 --> 00:25:14,880
so that's what's good

646
00:25:19,590 --> 00:25:17,120
initially that's my only purpose i try

647
00:25:21,590 --> 00:25:19,600
to explain how this thing can grow or

648
00:25:24,070 --> 00:25:21,600
how this can make atp right it's just

649
00:25:26,950 --> 00:25:24,080
all that mystery but now you look i want

650
00:25:31,350 --> 00:25:26,960
to pay attention to here

651
00:25:33,269 --> 00:25:31,360
now these 220 millimo or 228 or 230

652
00:25:36,870 --> 00:25:33,279
millivolts called

653
00:25:38,390 --> 00:25:36,880
the redox potential energy limit

654
00:25:40,470 --> 00:25:38,400
what this came from

655
00:25:43,510 --> 00:25:40,480
now in our motor condition you know all

656
00:25:47,110 --> 00:25:43,520
the bacteria they use uh electron right

657
00:25:48,480 --> 00:25:47,120
uh uh free electron okay like nadh okay

658
00:25:50,390 --> 00:25:48,490
or this organic uh

659
00:25:51,510 --> 00:25:50,400
[Music]

660
00:25:54,630 --> 00:25:51,520
substrate

661
00:25:56,310 --> 00:25:54,640
so oxide to oxygen but that redux

662
00:25:59,110 --> 00:25:56,320
potential energy amount of chemical

663
00:26:02,149 --> 00:25:59,120

energy available is known it's about

664
00:26:05,190 --> 00:26:02,159
close to about um

665
00:26:07,669 --> 00:26:05,200
so redux potential from for example nadh

666
00:26:08,830 --> 00:26:07,679
to oxygen you know this whole chain

667
00:26:10,390 --> 00:26:08,840
is about

668
00:26:13,029 --> 00:26:10,400
1100

669
00:26:14,870 --> 00:26:13,039
millivolts okay so you develop so we

670
00:26:16,870 --> 00:26:14,880
know that for each

671
00:26:19,710 --> 00:26:16,880
electron uh each electron goes through

672
00:26:23,110 --> 00:26:19,720
they're pumping five protons so

673
00:26:24,390 --> 00:26:23,120
1100 divided by five you know about 220

674
00:26:26,710 --> 00:26:24,400
something right

675
00:26:28,549 --> 00:26:26,720
that's this chemical energy so that's

676
00:26:30,149 --> 00:26:28,559
your life when you're assuming like 100

677
00:26:32,549 --> 00:26:30,159
energy efficiency

678
00:26:34,950 --> 00:26:32,559
you convert all the food

679
00:26:36,950 --> 00:26:34,960
you eat together energy right

680
00:26:39,990 --> 00:26:36,960
that should be a glass ceiling right

681
00:26:42,470 --> 00:26:40,000
should not have a proton motor force

682
00:26:44,390 --> 00:26:42,480
should be higher than that right

683
00:26:46,230 --> 00:26:44,400
so initial event this is about seven or

684
00:26:48,230 --> 00:26:46,240
eight years ago when the first episode i

685
00:26:50,070 --> 00:26:48,240
thought maybe this is my calculations

686
00:26:51,669 --> 00:26:50,080
and all my equations i checked

687
00:26:53,590 --> 00:26:51,679
everything

688
00:26:55,190 --> 00:26:53,600

was correct

689
00:26:56,630 --> 00:26:55,200
and then i think about hiking that is

690
00:26:58,950 --> 00:26:56,640
where the energy came from you know

691
00:27:00,630 --> 00:26:58,960
these signs well above the energy you

692
00:27:02,549 --> 00:27:00,640
put in your chemical energy right even

693
00:27:04,390 --> 00:27:02,559
hundred percent efficiency

694
00:27:05,990 --> 00:27:04,400
you should know higher than that so this

695
00:27:08,870 --> 00:27:06,000
height is not a little bit right you

696
00:27:11,350 --> 00:27:08,880
know a factor two here

697
00:27:12,470 --> 00:27:11,360
and so then suddenly the story i my

698
00:27:13,669 --> 00:27:12,480
early work

699
00:27:15,909 --> 00:27:13,679
um

700
00:27:18,789 --> 00:27:15,919
during my college years like that's like

701
00:27:20,549 --> 00:27:18,799
40 years ago in 1979

702
00:27:22,630 --> 00:27:20,559
and 1980

703
00:27:25,590 --> 00:27:22,640
i was actually doing a student project

704
00:27:28,470 --> 00:27:25,600
to explore the question of whether

705
00:27:30,789 --> 00:27:28,480
this uh somophilic uh kind of

706
00:27:31,750 --> 00:27:30,799
thermo-traffic property or thermal

707
00:27:33,510 --> 00:27:31,760
traffic

708
00:27:35,510 --> 00:27:33,520
kind of type of life is possible that

709
00:27:37,350 --> 00:27:35,520
means is it the heat energy in the

710
00:27:39,669 --> 00:27:37,360
environment can be used by life to

711
00:27:41,350 --> 00:27:39,679
making sense to the work

712
00:27:43,590 --> 00:27:41,360
so actually if that time i will cover

713
00:27:44,870 --> 00:27:43,600

that actually i did that and then i was

714
00:27:47,909 --> 00:27:44,880
like haha

715
00:27:50,870 --> 00:27:47,919
this is the thing actually i was looking

716
00:27:52,389 --> 00:27:50,880
for this maybe 30 40 years ago i kind of

717
00:27:55,190 --> 00:27:52,399
put aside

718
00:27:57,590 --> 00:27:55,200
because all my professors when i came to

719
00:27:59,590 --> 00:27:57,600
us at cornell my old regular professor

720
00:28:00,789 --> 00:27:59,600
they all say hey james

721
00:28:08,710 --> 00:28:00,799
you know

722
00:28:10,630 --> 00:28:08,720
want to do that and we cannot advise you

723
00:28:12,630 --> 00:28:10,640
so i just learned if you know chemistry

724
00:28:16,870 --> 00:28:12,640
you know working for divine energy or

725
00:28:19,110 --> 00:28:16,880
classic you know traditional energy

726
00:28:20,950 --> 00:28:19,120
so i kind of already possessing aside

727
00:28:23,669 --> 00:28:20,960
you know all those you know very uh

728
00:28:24,710 --> 00:28:23,679
conventional research and until now

729
00:28:26,549 --> 00:28:24,720
aha

730
00:28:30,789 --> 00:28:26,559
that's a certain thing here because it

731
00:28:31,909 --> 00:28:30,799
must be certain okay so i carefully look

732
00:28:34,230 --> 00:28:31,919
now

733
00:28:36,870 --> 00:28:34,240
so you look at that this component you

734
00:28:39,510 --> 00:28:36,880
know the localized

735
00:28:41,430 --> 00:28:39,520
um proton multiples right you remember

736
00:28:43,510 --> 00:28:41,440
this is a local you know that that one

737
00:28:46,310 --> 00:28:43,520
missed okay so it's a concentration of

738
00:28:47,990 --> 00:28:46,320

your local proton versus the one in the

739
00:28:50,070 --> 00:28:48,000
in the bulk phases

740
00:28:52,549 --> 00:28:50,080
actually contributed to

741
00:28:55,110 --> 00:28:52,559
your free energy you know these local uh

742
00:28:56,870 --> 00:28:55,120
proton motive force actually have you

743
00:28:58,310 --> 00:28:56,880
know it's the same population become a

744
00:28:59,990 --> 00:28:58,320
data g right at first i'm going to

745
00:29:01,909 --> 00:29:00,000
explain that okay

746
00:29:04,230 --> 00:29:01,919
so that in a sense the protonic and

747
00:29:07,830 --> 00:29:04,240
multiple force for this

748
00:29:10,310 --> 00:29:07,840
is just the utah you know you just um

749
00:29:12,149 --> 00:29:10,320
uh time your father constant for this

750
00:29:15,029 --> 00:29:12,159
one time failure you cancel that one

751
00:29:15,990 --> 00:29:15,039
that's it so so clear okay

752
00:29:18,230 --> 00:29:16,000
right

753
00:29:19,909 --> 00:29:18,240
so because you have a you know it's it's

754
00:29:22,549 --> 00:29:19,919
a minus saturday constant time your

755
00:29:24,870 --> 00:29:22,559
product multiple become um gives free

756
00:29:26,950 --> 00:29:24,880
energy so right there uh-huh

757
00:29:29,830 --> 00:29:26,960
but you look at that

758
00:29:31,990 --> 00:29:29,840
now where did he come from they're

759
00:29:33,029 --> 00:29:32,000
hiding right here

760
00:29:35,029 --> 00:29:33,039
rt

761
00:29:36,149 --> 00:29:35,039
so in this audience i know i think you

762
00:29:39,430 --> 00:29:36,159
know um

763
00:29:41,990 --> 00:29:39,440

you know the ah is the

764
00:29:44,389 --> 00:29:42,000
boltzmann constant times avogadro's

765
00:29:45,990 --> 00:29:44,399
number right you have a kt term hiding

766
00:29:48,870 --> 00:29:46,000
right there

767
00:29:50,870 --> 00:29:48,880
so is the thermal energy your body

768
00:29:52,070 --> 00:29:50,880
equation tells us here

769
00:29:54,549 --> 00:29:52,080
you see it

770
00:29:56,789 --> 00:29:54,559
let's use this kt terms it's hiding

771
00:29:58,630 --> 00:29:56,799
there in the past we just kind of oh gas

772
00:30:00,950 --> 00:29:58,640
constant we just take for granted that's

773
00:30:03,029 --> 00:30:00,960
not anything very hard

774
00:30:05,430 --> 00:30:03,039
so i immediately realized this actually

775
00:30:08,149 --> 00:30:05,440
now the temperature remember

776
00:30:10,710 --> 00:30:08,159
inside the cell outside the cell is the

777
00:30:15,110 --> 00:30:12,789
there's no temperature grading here

778
00:30:17,430 --> 00:30:15,120
inside outside cell okay

779
00:30:19,190 --> 00:30:17,440
so that's really truly isothermal so

780
00:30:21,430 --> 00:30:19,200
that's why the single t

781
00:30:23,029 --> 00:30:21,440
okay

782
00:30:25,510 --> 00:30:23,039
yeah so i

783
00:30:29,110 --> 00:30:25,520
go so that's why we now understand that

784
00:30:31,510 --> 00:30:29,120
this year is um

785
00:30:33,269 --> 00:30:31,520
is the energies came from

786
00:30:35,350 --> 00:30:33,279
this term called the local proton

787
00:30:37,750 --> 00:30:35,360
multiples i call the local protonic

788
00:30:40,630 --> 00:30:37,760

multiples where it came from

789
00:30:42,710 --> 00:30:40,640
now we can also define

790
00:30:44,070 --> 00:30:42,720
we actually found out

791
00:30:45,990 --> 00:30:44,080
the

792
00:30:48,070 --> 00:30:46,000
entropy change

793
00:30:50,950 --> 00:30:48,080
that you're showing here

794
00:30:51,669 --> 00:30:50,960
for this localized proton

795
00:30:55,510 --> 00:30:51,679
is

796
00:30:57,269 --> 00:30:55,520
see right you divide by t here you got

797
00:30:59,350 --> 00:30:57,279
that okay

798
00:31:02,389 --> 00:30:59,360
and that's actually the ratio of the

799
00:31:03,990 --> 00:31:02,399
local proton over proton

800
00:31:06,710 --> 00:31:04,000
uh the concentration in the bark phase

801
00:31:08,149 --> 00:31:06,720
you know in the bulk lipid okay

802
00:31:10,230 --> 00:31:08,159
uh of the

803
00:31:11,509 --> 00:31:10,240
of this system basically is this your

804
00:31:13,990 --> 00:31:11,519
electrical

805
00:31:17,430 --> 00:31:14,000
uh transmitting electrostatic local

806
00:31:19,430 --> 00:31:17,440
protons versus the bug phase protons

807
00:31:22,630 --> 00:31:19,440
is related to called

808
00:31:25,909 --> 00:31:22,640
negative entropy change database l

809
00:31:28,789 --> 00:31:25,919
is mathematically now defined

810
00:31:31,110 --> 00:31:28,799
so now this is very important

811
00:31:33,750 --> 00:31:31,120
so that says that

812
00:31:36,070 --> 00:31:33,760
now as long as you have your low quad

813
00:31:38,470 --> 00:31:36,080

protonic capacity behavior that all

814
00:31:39,990 --> 00:31:38,480
biological memory actually has

815
00:31:42,230 --> 00:31:40,000
very important or biological i'm talking

816
00:31:43,590 --> 00:31:42,240
about not only this bacteria including

817
00:31:44,710 --> 00:31:43,600
amount of country i'm going to cover

818
00:31:47,430 --> 00:31:44,720
later

819
00:31:49,750 --> 00:31:47,440
or in the trees in the algae or in the

820
00:31:51,750 --> 00:31:49,760
trees in the oceans uh-huh

821
00:31:53,830 --> 00:31:51,760
in your homes everywhere when you have a

822
00:31:54,870 --> 00:31:53,840
life you have these things

823
00:31:56,789 --> 00:31:54,880
okay

824
00:31:58,389 --> 00:31:56,799
so what happened here well as long as i

825
00:32:01,669 --> 00:31:58,399
have this

826
00:32:03,909 --> 00:32:01,679
so this will be is if this as long as

827
00:32:05,990 --> 00:32:03,919
it's not a zero load now if zero here a

828
00:32:08,070 --> 00:32:06,000
logarithm of one becomes zero right your

829
00:32:10,630 --> 00:32:08,080
pendulum which is zero

830
00:32:12,549 --> 00:32:10,640
as long as this is non-zero above zero

831
00:32:14,710 --> 00:32:12,559
you have a you have an active entropy

832
00:32:16,789 --> 00:32:14,720
change you see that right so this is

833
00:32:18,950 --> 00:32:16,799
happening

834
00:32:21,750 --> 00:32:18,960
so this really you know the first time

835
00:32:23,029 --> 00:32:21,760
we mathematically are scientifically

836
00:32:25,590 --> 00:32:23,039
discovered

837
00:32:27,190 --> 00:32:25,600
the natural uh system

838
00:32:28,870 --> 00:32:27,200

they have these

839
00:32:31,590 --> 00:32:28,880
they utilize these

840
00:32:34,149 --> 00:32:31,600
um natural occurring

841
00:32:36,710 --> 00:32:34,159
negative entropy change events they try

842
00:32:38,389 --> 00:32:36,720
to utilize that

843
00:32:41,430 --> 00:32:38,399
basically taking advantage of this

844
00:32:44,710 --> 00:32:42,389
able to

845
00:32:46,549 --> 00:32:44,720
utilize attract

846
00:32:48,549 --> 00:32:46,559
the energy from a silver vibration of

847
00:32:50,470 --> 00:32:48,559
the protons okay they usually will be

848
00:32:52,710 --> 00:32:50,480
net you know they will let them okay but

849
00:32:54,310 --> 00:32:52,720
they will if they are in the bulk

850
00:32:55,669 --> 00:32:54,320
no matter they crazy does it they're not

851
00:32:57,990 --> 00:32:55,679
able to do the work but if they're

852
00:32:59,509 --> 00:32:58,000
electrostatic and local surface

853
00:33:01,509 --> 00:32:59,519
you have a high probability of

854
00:33:05,350 --> 00:33:01,519
kidnapping right that's really this data

855
00:33:07,830 --> 00:33:05,360
g data g4 okay so it's really it's very

856
00:33:09,269 --> 00:33:07,840
clear it is the

857
00:33:11,509 --> 00:33:09,279
they are using

858
00:33:14,230 --> 00:33:11,519
um in one hidden energy actual iso

859
00:33:16,070 --> 00:33:14,240
ceremony because temperature is

860
00:33:17,669 --> 00:33:16,080
you have a single t there's no

861
00:33:20,789 --> 00:33:17,679
difference across memory okay so i

862
00:33:22,470 --> 00:33:20,799
hopefully ever did not get it

863
00:33:24,470 --> 00:33:22,480

so this is a product i just converted

864
00:33:25,990 --> 00:33:24,480
that to free energy you know the total

865
00:33:28,070 --> 00:33:26,000
model force

866
00:33:29,750 --> 00:33:28,080
uh convert to you know just call it as

867
00:33:31,590 --> 00:33:29,760
uh give us free energy right same thing

868
00:33:33,350 --> 00:33:31,600
right you see it's same pattern okay so

869
00:33:35,750 --> 00:33:33,360
i just want to make sure that you know

870
00:33:37,669 --> 00:33:35,760
in biological uh bioenergy uh by energy

871
00:33:39,350 --> 00:33:37,679
attitude is a proton multiples but in

872
00:33:40,870 --> 00:33:39,360
thermodynamic everybody here in this

873
00:33:43,750 --> 00:33:40,880
audience probably more familiar with

874
00:33:45,909 --> 00:33:43,760
says data gm so okay so you can see here

875
00:33:47,750 --> 00:33:45,919
that's your total data g that's a

876
00:33:50,310 --> 00:33:47,760
classic proton

877
00:33:53,029 --> 00:33:50,320
uh multiple state g that's your local

878
00:33:54,549 --> 00:33:53,039
pms uh free free energy so same thing

879
00:33:56,630 --> 00:33:54,559
okay right okay i just make sure that

880
00:33:59,110 --> 00:33:56,640
clear

881
00:34:00,870 --> 00:33:59,120
nah so one thing i want to pay that

882
00:34:02,630 --> 00:34:00,880
attention you know so you're lucky how

883
00:34:04,710 --> 00:34:02,640
you turn over

884
00:34:08,629 --> 00:34:04,720
where because the guy's seen me

885
00:34:11,109 --> 00:34:08,639
now i predict from this data

886
00:34:13,990 --> 00:34:11,119
if this is correct if my intervention

887
00:34:16,950 --> 00:34:14,000
correct i would predict

888
00:34:18,389 --> 00:34:16,960

the structure so this is a piece of uh

889
00:34:20,149 --> 00:34:18,399
biological membrane in your

890
00:34:22,389 --> 00:34:20,159
multicultural okay you know it's very

891
00:34:23,990 --> 00:34:22,399
similar to one in the bacteria okay

892
00:34:26,230 --> 00:34:24,000
but this one is like well different

893
00:34:28,869 --> 00:34:26,240
everybody actually know okay

894
00:34:32,790 --> 00:34:28,879
i expect so those are the respiration

895
00:34:36,069 --> 00:34:32,800
for example this system use nadh

896
00:34:39,589 --> 00:34:37,510
and um

897
00:34:41,109 --> 00:34:39,599
uh so electron from here you know all

898
00:34:42,710 --> 00:34:41,119
the way to here to go the oxygen and

899
00:34:45,190 --> 00:34:42,720
pump b protons because those are the

900
00:34:47,270 --> 00:34:45,200
proton pumps okay so i expect

901
00:34:49,109 --> 00:34:47,280
the proton pump is the protein you know

902
00:34:51,349 --> 00:34:49,119
the exit should be like

903
00:34:53,430 --> 00:34:51,359
extended about one or three nanometers

904
00:34:55,750 --> 00:34:53,440
away from the membrane

905
00:34:59,430 --> 00:34:55,760
aha like this one here this one here

906
00:35:02,470 --> 00:34:59,440
this is actually sticking up into liquid

907
00:35:04,630 --> 00:35:02,480
and the proton user the mouse of it has

908
00:35:05,990 --> 00:35:04,640
like the atp sensors it had to be stayed

909
00:35:07,510 --> 00:35:06,000
there okay

910
00:35:10,230 --> 00:35:07,520
because otherwise

911
00:35:11,910 --> 00:35:10,240
so they are not if these uh now if this

912
00:35:13,910 --> 00:35:11,920
is not sticking out

913
00:35:15,510 --> 00:35:13,920

now if they were pumping against this

914
00:35:16,950 --> 00:35:15,520
layer then your backfire you see that

915
00:35:18,950 --> 00:35:16,960
right okay

916
00:35:21,270 --> 00:35:18,960
so this is my prediction that's why the

917
00:35:23,430 --> 00:35:21,280
how can they they can break the glass

918
00:35:25,190 --> 00:35:23,440
ceiling so that means this system is

919
00:35:27,430 --> 00:35:25,200
symmetric remember that's keywords i

920
00:35:29,430 --> 00:35:27,440
discovered okay so these two sides are

921
00:35:30,710 --> 00:35:29,440
not the same okay if symmetry you don't

922
00:35:33,190 --> 00:35:30,720
have a game

923
00:35:34,790 --> 00:35:33,200
you see the two side symmetric that's

924
00:35:36,950 --> 00:35:34,800
really the key here okay you see the

925
00:35:39,109 --> 00:35:36,960
memory are symmetric biological one

926
00:35:41,030 --> 00:35:39,119
so this came from bilingual evolution

927
00:35:42,710 --> 00:35:41,040
you know these are predicted exactly

928
00:35:46,030 --> 00:35:42,720
this is not

929
00:35:48,150 --> 00:35:46,040
the data's from cryogenic

930
00:35:50,550 --> 00:35:48,160
electromicroscopic data this is true

931
00:35:53,990 --> 00:35:50,560
it's not my cartoon that's a published

932
00:35:56,550 --> 00:35:54,000
here in the in this article i dig it up

933
00:35:58,550 --> 00:35:56,560
match exactly what i predicted

934
00:36:00,390 --> 00:35:58,560
so i feel very confident what we

935
00:36:02,150 --> 00:36:00,400
discover is real okay

936
00:36:04,870 --> 00:36:02,160
so this came from beings of the

937
00:36:07,750 --> 00:36:04,880
evolution but seeing you and me it's in

938
00:36:09,430 --> 00:36:07,760

the whole many all organisms on earth

939
00:36:12,390 --> 00:36:09,440
have that so that's why

940
00:36:14,470 --> 00:36:12,400
top two process actually is in the past

941
00:36:15,910 --> 00:36:14,480
we just do not know it we not understand

942
00:36:17,349 --> 00:36:15,920
that okay so

943
00:36:19,430 --> 00:36:17,359
because of time i go learning a little

944
00:36:21,109 --> 00:36:19,440
fast okay

945
00:36:23,510 --> 00:36:21,119
so this part

946
00:36:28,230 --> 00:36:23,520
the present study you know this this uh

947
00:36:33,510 --> 00:36:30,550
have been better explained the decades

948
00:36:36,470 --> 00:36:33,520
long standing you know conjunct can

949
00:36:39,190 --> 00:36:36,480
journal okay you know the mystery of atp

950
00:36:41,030 --> 00:36:39,200
synthesis in aquifer bacteria the

951
00:36:43,349 --> 00:36:41,040
calculated the

952
00:36:44,230 --> 00:36:43,359
pmf curve matches

953
00:36:45,910 --> 00:36:44,240
uh

954
00:36:47,510 --> 00:36:45,920
excellent whale is observed with the

955
00:36:49,109 --> 00:36:47,520
population group's pattern okay that's

956
00:36:50,870 --> 00:36:49,119
just that

957
00:36:53,109 --> 00:36:50,880
now more importantly we use after

958
00:36:55,510 --> 00:36:53,119
thermal utilization of my heat energy

959
00:36:57,990 --> 00:36:55,520
with low carb proton at the liquid

960
00:37:01,109 --> 00:36:58,000
interface to do useful work

961
00:37:03,589 --> 00:37:01,119
driving atp synthesis okay it's leo okay

962
00:37:05,030 --> 00:37:03,599
yes so it's like cardio chemistry 5g

963
00:37:07,270 --> 00:37:05,040

amount of heat

964
00:37:09,349 --> 00:37:07,280
now that's the thing came from or just

965
00:37:10,870 --> 00:37:09,359
talk about okay right

966
00:37:14,230 --> 00:37:10,880
and it's the

967
00:37:16,950 --> 00:37:14,240
uh scientifically in this audience most

968
00:37:19,270 --> 00:37:16,960
uh interesting one is this uh nappy

969
00:37:21,750 --> 00:37:19,280
entropy happens okay so this first time

970
00:37:24,950 --> 00:37:21,760
we really kind of dimension this

971
00:37:27,190 --> 00:37:24,960
so this system also happens in

972
00:37:29,990 --> 00:37:27,200
uh in

973
00:37:32,390 --> 00:37:30,000
uh ahmad kunja okay so i'm going to talk

974
00:37:34,230 --> 00:37:32,400
about that so this is our body

975
00:37:36,310 --> 00:37:34,240
mitochondria okay so those are

976
00:37:37,910 --> 00:37:36,320
well-resolved structure you have this

977
00:37:39,349 --> 00:37:37,920
inner membrane like this called the

978
00:37:41,670 --> 00:37:39,359
crystal okay

979
00:37:43,589 --> 00:37:41,680
now the atp synthesis actually they're

980
00:37:45,990 --> 00:37:43,599
located on the tip of that

981
00:37:49,190 --> 00:37:46,000
okay those are reviewed by

982
00:37:51,270 --> 00:37:49,200
cryogenic electron microscopic work

983
00:37:53,190 --> 00:37:51,280
so people in the field cannot explain

984
00:37:55,270 --> 00:37:53,200
why they do that you know why are these

985
00:37:56,310 --> 00:37:55,280
things localized so neatly on the tip

986
00:38:01,990 --> 00:37:56,320
here

987
00:38:03,829 --> 00:38:02,000
so for example why mitochondria develop

988
00:38:05,910 --> 00:38:03,839

the crysta

989
00:38:09,750 --> 00:38:05,920
i understand first of all

990
00:38:11,910 --> 00:38:09,760
the formation of crystal creating more

991
00:38:13,990 --> 00:38:11,920
membrane in the membrane surface area

992
00:38:15,990 --> 00:38:14,000
because this is a photonic capacitor

993
00:38:18,230 --> 00:38:16,000
right the bigger the more membrane

994
00:38:20,230 --> 00:38:18,240
surface area you have more capacitor

995
00:38:21,990 --> 00:38:20,240
capacitance you're able to store more

996
00:38:24,550 --> 00:38:22,000
energy right that's what they do there

997
00:38:26,550 --> 00:38:24,560
right that's one thing

998
00:38:28,630 --> 00:38:26,560
but also there's a story here you know

999
00:38:30,870 --> 00:38:28,640
you form this kind of structure

1000
00:38:32,710 --> 00:38:30,880
called the crysta you know so you have

1001
00:38:34,790 --> 00:38:32,720
membrane here but you look decent here

1002
00:38:37,349 --> 00:38:34,800
there's another effect

1003
00:38:39,510 --> 00:38:37,359
for electrostatic you have this your

1004
00:38:41,750 --> 00:38:39,520
proton concentration on here because

1005
00:38:43,670 --> 00:38:41,760
this uh you know this is uh you have

1006
00:38:45,030 --> 00:38:43,680
this special shape okay it's not round

1007
00:38:47,670 --> 00:38:45,040
okay

1008
00:38:49,190 --> 00:38:47,680
crystal actually this concentration is

1009
00:38:51,910 --> 00:38:49,200
high here so

1010
00:38:53,670 --> 00:38:51,920
although um the pump your your proton

1011
00:38:56,069 --> 00:38:53,680
pump i show actually earmarked which is

1012
00:38:58,829 --> 00:38:56,079
here so they're pumping at the lower

1013
00:39:01,589 --> 00:38:58,839

concentration part of it but

1014
00:39:02,870 --> 00:39:01,599
electrostatically making it even

1015
00:39:04,310 --> 00:39:02,880
higher

1016
00:39:06,470 --> 00:39:04,320
and that's why they're sitting there

1017
00:39:08,230 --> 00:39:06,480
they basically utilize the best way to

1018
00:39:10,630 --> 00:39:08,240
utilize this you know heat energy see

1019
00:39:12,550 --> 00:39:10,640
that right this again came from

1020
00:39:15,109 --> 00:39:12,560
beginnings of evolution of evolution

1021
00:39:17,829 --> 00:39:15,119
they are natural forming okay

1022
00:39:19,109 --> 00:39:17,839
so this is another finding here okay

1023
00:39:20,390 --> 00:39:19,119
this is already published in the

1024
00:39:22,630 --> 00:39:20,400
nature's

1025
00:39:24,950 --> 00:39:22,640
uh research journal scientifically parts

1026
00:39:27,190 --> 00:39:24,960
okay this work

1027
00:39:29,349 --> 00:39:27,200
and also we calculate exchange effect

1028
00:39:30,710 --> 00:39:29,359
for this bacteria alpha matrix in your

1029
00:39:33,030 --> 00:39:30,720
body okay okay

1030
00:39:34,790 --> 00:39:33,040
that factor is um

1031
00:39:37,670 --> 00:39:34,800
you know the reduction factor so we

1032
00:39:39,190 --> 00:39:37,680
calculated from there we calculated the

1033
00:39:41,109 --> 00:39:39,200
mitochondria

1034
00:39:44,390 --> 00:39:41,119
with our crysta

1035
00:39:47,990 --> 00:39:44,400
is here with crystal you have much more

1036
00:39:50,550 --> 00:39:48,000
um proton local proton per mitochondria

1037
00:39:51,990 --> 00:39:50,560
that's evolutionary make that crystal

1038
00:39:53,589 --> 00:39:52,000

formation have a dimension although you

1039
00:39:55,430 --> 00:39:53,599
don't have to you know some of that may

1040
00:39:58,069 --> 00:39:55,440
not have but the more you have you have

1041
00:40:00,390 --> 00:39:58,079
more protons local product right so you

1042
00:40:02,230 --> 00:40:00,400
can use the heat energy more you see so

1043
00:40:03,750 --> 00:40:02,240
evolutionary they're making sense so

1044
00:40:06,550 --> 00:40:03,760
that's another piece

1045
00:40:07,430 --> 00:40:06,560
so also in this article we discussed

1046
00:40:09,109 --> 00:40:07,440
that

1047
00:40:11,109 --> 00:40:09,119
and more important we check the energy

1048
00:40:14,550 --> 00:40:11,119
for mitochondria okay so because of

1049
00:40:16,069 --> 00:40:14,560
telling me um the calculation is similar

1050
00:40:18,470 --> 00:40:16,079
okay so i'll catch in this case i

1051
00:40:20,710 --> 00:40:18,480
calculate the data s okay you know this

1052
00:40:22,870 --> 00:40:20,720
is a membrane potential those are

1053
00:40:24,790 --> 00:40:22,880
experimental okay

1054
00:40:26,309 --> 00:40:24,800
and these are the calculated data from

1055
00:40:27,589 --> 00:40:26,319
the real experiment

1056
00:40:29,190 --> 00:40:27,599
and you see the first time you

1057
00:40:31,910 --> 00:40:29,200
numerically emerge your data is a

1058
00:40:33,829 --> 00:40:31,920
negative number okay first time so it's

1059
00:40:34,870 --> 00:40:33,839
this case is a logic

1060
00:40:37,270 --> 00:40:34,880
okay

1061
00:40:38,470 --> 00:40:37,280
it's like it it's a similar traffic

1062
00:40:41,349 --> 00:40:38,480
feature

1063
00:40:43,430 --> 00:40:41,359

and these are the data um

1064
00:40:46,069 --> 00:40:43,440
g for your local component this is the

1065
00:40:48,069 --> 00:40:46,079
classic the total is this

1066
00:40:49,670 --> 00:40:48,079
that's your how much is needed for

1067
00:40:52,470 --> 00:40:49,680
making atp

1068
00:40:54,950 --> 00:40:52,480
that's your chemical limits because all

1069
00:40:56,630 --> 00:40:54,960
the chemical energy see the requirement

1070
00:40:57,910 --> 00:40:56,640
is right you know higher than the

1071
00:40:59,750 --> 00:40:57,920
chemical energy you can okay and it

1072
00:41:01,589 --> 00:40:59,760
cannot explain atp making about it

1073
00:41:04,470 --> 00:41:01,599
that's basically what it is so

1074
00:41:07,190 --> 00:41:04,480
that's how the product is okay

1075
00:41:10,230 --> 00:41:07,200
so that's your classic yamato india from

1076
00:41:13,109 --> 00:41:10,240
memory potential in your body can from 6

1077
00:41:16,630 --> 00:41:13,119
60 to you know 200 milliwatts

1078
00:41:18,950 --> 00:41:16,640
and so that's your classic proton free

1079
00:41:21,990 --> 00:41:18,960
energy that's how much you require so

1080
00:41:24,390 --> 00:41:22,000
this um the classic uh calculation

1081
00:41:26,150 --> 00:41:24,400
really cannot explain how amount of

1082
00:41:27,910 --> 00:41:26,160
geometric atp's

1083
00:41:30,390 --> 00:41:27,920
now the local product modes here way

1084
00:41:33,510 --> 00:41:30,400
above that that's your total

1085
00:41:36,150 --> 00:41:33,520
and that's the only quiet

1086
00:41:39,190 --> 00:41:36,160
proton multiple so our efficiency about

1087
00:41:40,950 --> 00:41:39,200
50 or 60 percent you know it's they so

1088
00:41:42,630 --> 00:41:40,960

the system they grab a significant heat

1089
00:41:45,109 --> 00:41:42,640
energy they use you know

1090
00:41:48,630 --> 00:41:45,119
they use very freely

1091
00:41:50,470 --> 00:41:48,640
they use very generously and

1092
00:41:52,150 --> 00:41:50,480
so second like in that case applies very

1093
00:41:53,910 --> 00:41:52,160
well so don't say second law is long we

1094
00:41:56,790 --> 00:41:53,920
are not trying to take law

1095
00:41:59,270 --> 00:41:56,800
yeah so so second law only uh when in a

1096
00:42:00,710 --> 00:41:59,280
free system yeah you do

1097
00:42:02,470 --> 00:42:00,720
but for the member you have a two

1098
00:42:04,550 --> 00:42:02,480
dimensional thing you have a symmetric

1099
00:42:06,870 --> 00:42:04,560
be careful it's still second law that

1100
00:42:08,710 --> 00:42:06,880
does not apply okay so just that's type

1101
00:42:10,550 --> 00:42:08,720
of b okay

1102
00:42:12,790 --> 00:42:10,560
yeah so i will need to show you this so

1103
00:42:16,150 --> 00:42:12,800
this is you know a symmetric thing i

1104
00:42:17,349 --> 00:42:16,160
just revisited okay i showed you before

1105
00:42:19,589 --> 00:42:17,359
and uh

1106
00:42:22,950 --> 00:42:19,599
how this edge is exactly used remember

1107
00:42:26,790 --> 00:42:25,030
this is structured to dissolve so let's

1108
00:42:29,270 --> 00:42:26,800
look you know where this structure is

1109
00:42:31,430 --> 00:42:29,280
protocol that you use

1110
00:42:33,190 --> 00:42:31,440
so remember that thing okay

1111
00:42:35,589 --> 00:42:33,200
so this is the result structure you see

1112
00:42:37,990 --> 00:42:35,599
from this science paper okay right

1113
00:42:40,069 --> 00:42:38,000

so this is structure so that's a liquid

1114
00:42:41,990 --> 00:42:40,079
face okay your water here so the proton

1115
00:42:44,309 --> 00:42:42,000
have to come right here

1116
00:42:45,510 --> 00:42:44,319
and drive this and turbine making this

1117
00:42:48,069 --> 00:42:45,520
same more

1118
00:42:50,069 --> 00:42:48,079
and you drive atp making okay

1119
00:42:51,990 --> 00:42:50,079
where the proton is that getting you see

1120
00:42:53,349 --> 00:42:52,000
that's your electric face remember the

1121
00:42:55,349 --> 00:42:53,359
local proton is

1122
00:42:57,030 --> 00:42:55,359
right within this layer

1123
00:42:58,470 --> 00:42:57,040
and there are so more vibration remember

1124
00:43:00,390 --> 00:42:58,480
you have a kt right

1125
00:43:01,750 --> 00:43:00,400
if there's here of course the protons

1126
00:43:03,109 --> 00:43:01,760
lateral they don't have eye they bump

1127
00:43:04,309 --> 00:43:03,119
you in and out

1128
00:43:06,710 --> 00:43:04,319
but if you're there they're going to hit

1129
00:43:08,950 --> 00:43:06,720
the thing right and hit it they will

1130
00:43:10,829 --> 00:43:08,960
turn them up turn these uh molecular

1131
00:43:12,390 --> 00:43:10,839
turbines make atd

1132
00:43:14,230 --> 00:43:12,400
okay

1133
00:43:17,349 --> 00:43:14,240
and then so that can summarize this

1134
00:43:21,349 --> 00:43:17,359
that's how that heat is utilized okay

1135
00:43:24,470 --> 00:43:21,359
so itbcl uh which is a newly formulated

1136
00:43:27,750 --> 00:43:24,480
proton multiforce the equation cannot

1137
00:43:29,270 --> 00:43:27,760
fully enunciate energetic is false

1138
00:43:31,190 --> 00:43:29,280

so-called oxidative phosphorus in

1139
00:43:33,190 --> 00:43:31,200
mitochondria okay you know for the whole

1140
00:43:35,829 --> 00:43:33,200
membrane potential

1141
00:43:39,670 --> 00:43:35,839
this study has not revealed mitochondria

1142
00:43:42,870 --> 00:43:39,680
can isothermal utilize heat energy

1143
00:43:44,069 --> 00:43:42,880
with ambient temperature in the x37c

1144
00:43:46,069 --> 00:43:44,079
okay

1145
00:43:47,990 --> 00:43:46,079
of um

1146
00:43:48,790 --> 00:43:48,000
the thermokinetic energy of the proton

1147
00:43:50,950 --> 00:43:48,800
okay

1148
00:43:51,829 --> 00:43:50,960
of the local proton to perform useful

1149
00:43:54,550 --> 00:43:51,839
work

1150
00:43:56,550 --> 00:43:54,560
driver censuses atp converter heat

1151
00:43:58,470 --> 00:43:56,560
energy card heater of course some of the

1152
00:43:59,910 --> 00:43:58,480
energy came from chemical okay chemical

1153
00:44:01,990 --> 00:43:59,920
energy as well

1154
00:44:05,109 --> 00:44:02,000
so low cloud proton motion will dominate

1155
00:44:06,630 --> 00:44:05,119
the tmf and mitochondria epitome as much

1156
00:44:08,470 --> 00:44:06,640
as 70

1157
00:44:10,950 --> 00:44:08,480
of the free energy from

1158
00:44:12,630 --> 00:44:10,960
this process

1159
00:44:14,150 --> 00:44:12,640
so mitochondria are part of the

1160
00:44:16,069 --> 00:44:14,160
including us

1161
00:44:18,150 --> 00:44:16,079
are not only chemical remember we need

1162
00:44:20,390 --> 00:44:18,160
food we are camel traffic okay

1163
00:44:21,510 --> 00:44:20,400

but we also have a thermo traffic

1164
00:44:24,470 --> 00:44:21,520
feature

1165
00:44:25,750 --> 00:44:24,480
iso ceremony utilizer environment heat

1166
00:44:27,829 --> 00:44:25,760
energy okay

1167
00:44:30,390 --> 00:44:27,839
to help atp making

1168
00:44:33,589 --> 00:44:30,400
and here is my take home messages okay

1169
00:44:35,190 --> 00:44:33,599
i'm going to probably stop here

1170
00:44:37,109 --> 00:44:35,200
because the time okay

1171
00:44:41,109 --> 00:44:37,119
i can let you through this okay

1172
00:44:43,190 --> 00:44:41,119
so basically what this thing here is

1173
00:44:44,230 --> 00:44:43,200
uh the key message is that

1174
00:44:47,829 --> 00:44:44,240
this

1175
00:44:50,309 --> 00:44:47,839
study review as a sumo track feature

1176
00:44:52,390 --> 00:44:50,319
the biological membrane system can

1177
00:44:53,990 --> 00:44:52,400
isothermally utilize

1178
00:44:56,550 --> 00:44:54,000
environment heat energy

1179
00:44:57,910 --> 00:44:56,560
associated with ambient temperature

1180
00:45:00,309 --> 00:44:57,920
thermal

1181
00:45:02,630 --> 00:45:00,319
motion kinetic energy of

1182
00:45:04,870 --> 00:45:02,640
low-cost proton to perform useful work

1183
00:45:07,670 --> 00:45:04,880
dry atp making

1184
00:45:10,710 --> 00:45:07,680
and the local proton platonic free

1185
00:45:13,510 --> 00:45:10,720
energy from isothermal environment heat

1186
00:45:15,829 --> 00:45:13,520
utilization with the telp is expected in

1187
00:45:19,109 --> 00:45:15,839
this equation i showed earlier

1188
00:45:21,990 --> 00:45:19,119

it's not quite clear there are two

1189
00:45:22,950 --> 00:45:22,000
thermodynamic distinct type of energetic

1190
00:45:25,349 --> 00:45:22,960
process

1191
00:45:28,150 --> 00:45:25,359
naturally occurring on earth

1192
00:45:31,510 --> 00:45:28,160
type of a's everybody for many ways

1193
00:45:33,030 --> 00:45:31,520
taba b as example in my talk here

1194
00:45:34,550 --> 00:45:33,040
does not necessarily have to be

1195
00:45:36,470 --> 00:45:34,560
contained

1196
00:45:39,270 --> 00:45:36,480
by the second law

1197
00:45:41,829 --> 00:45:39,280
or into its special thermodynamic and

1198
00:45:43,270 --> 00:45:41,839
spatial asymmetric function as i show in

1199
00:45:45,109 --> 00:45:43,280
the membrane

1200
00:45:51,750 --> 00:45:45,119
associated with the natural entropy

1201
00:45:57,910 --> 00:45:54,470
okay thank you james

1202
00:46:03,190 --> 00:45:57,920
so um let's begin with questions um i'm

1203
00:46:03,200 --> 00:46:06,230
participants

1204
00:46:06,240 --> 00:46:09,589
okay there are a few hands

1205
00:46:09,599 --> 00:46:15,589
i think

1206
00:46:26,390 --> 00:46:16,630
okay

1207
00:46:28,470 --> 00:46:26,400
question is this is great results

1208
00:46:30,390 --> 00:46:28,480
and uh as you said why haven't people

1209
00:46:33,030 --> 00:46:30,400
discovered it before i'd like to get

1210
00:46:35,109 --> 00:46:33,040
your opinion as to why this happens uh

1211
00:46:36,950 --> 00:46:35,119
you know what what goes on in your mind

1212
00:46:38,790 --> 00:46:36,960
it might not be going on in their minds

1213
00:46:40,790 --> 00:46:38,800

or constraints that they have that you

1214
00:46:43,109 --> 00:46:40,800
don't have but at any rate my main

1215
00:46:44,950 --> 00:46:43,119
question is has any of this been applied

1216
00:46:47,670 --> 00:46:44,960
by the neuro people

1217
00:46:50,069 --> 00:46:47,680
to create better models of neural

1218
00:46:52,230 --> 00:46:50,079
transmission and stuff like that because

1219
00:46:54,790 --> 00:46:52,240
our our my neuro group in this area has

1220
00:46:57,190 --> 00:46:54,800
found it to be incredibly incorrect in

1221
00:46:59,190 --> 00:46:57,200
lackluster and old-time

1222
00:47:00,710 --> 00:46:59,200
ways of looking at

1223
00:47:01,910 --> 00:47:00,720
neural structures they don't even get

1224
00:47:03,990 --> 00:47:01,920
into the

1225
00:47:05,510 --> 00:47:04,000
the sodium potassium calcium magnesium

1226
00:47:07,670 --> 00:47:05,520
they don't get into any of that stuff as

1227
00:47:09,589 --> 00:47:07,680
well as they should i was wondering at

1228
00:47:11,430 --> 00:47:09,599
your level uh you have a lot of stuff

1229
00:47:13,109 --> 00:47:11,440
there that could be used in under better

1230
00:47:15,510 --> 00:47:13,119
understanding neural firings and

1231
00:47:17,910 --> 00:47:15,520
transmission and do you or any of your

1232
00:47:19,589 --> 00:47:17,920
colleagues or follow-on people have used

1233
00:47:21,349 --> 00:47:19,599
this in their model

1234
00:47:23,589 --> 00:47:21,359
yes thank you a lot for your question

1235
00:47:25,270 --> 00:47:23,599
yes indeed i already have a publication

1236
00:47:27,510 --> 00:47:25,280
or applies this

1237
00:47:29,270 --> 00:47:27,520
funding to the neuron

1238
00:47:32,470 --> 00:47:29,280

actually it's a friend elbow drinking

1239
00:47:35,750 --> 00:47:32,480
water okay water protonic conductor

1240
00:47:38,309 --> 00:47:35,760
uh robert the signal from brain

1241
00:47:39,750 --> 00:47:38,319
to your leg is one neuron inside the

1242
00:47:41,589 --> 00:47:39,760
liquid

1243
00:47:44,069 --> 00:47:41,599
in our brain your body there's no

1244
00:47:46,470 --> 00:47:44,079
electronic circuit

1245
00:47:49,109 --> 00:47:46,480
because the shortest the longer circuit

1246
00:47:51,750 --> 00:47:49,119
is a much like that you know like 13

1247
00:47:54,630 --> 00:47:51,760
nanometer cannot form a circuit what

1248
00:47:56,309 --> 00:47:54,640
happened so apply this on here

1249
00:47:59,270 --> 00:47:56,319
is the

1250
00:48:01,430 --> 00:47:59,280
the water in the you know no longer uh

1251
00:48:03,510 --> 00:48:01,440
axon are very long right so like more

1252
00:48:04,549 --> 00:48:03,520
than meter from your head

1253
00:48:07,430 --> 00:48:04,559
um

1254
00:48:09,270 --> 00:48:07,440
is protonic signals so i actually have

1255
00:48:11,430 --> 00:48:09,280
already have publication just published

1256
00:48:13,670 --> 00:48:11,440
about a year ago in

1257
00:48:15,510 --> 00:48:13,680
neurophysiology actually i already uh

1258
00:48:17,349 --> 00:48:15,520
robert i can send the article for if you

1259
00:48:19,589 --> 00:48:17,359
can send me an email

1260
00:48:21,030 --> 00:48:19,599
email so i will able to forward my

1261
00:48:24,069 --> 00:48:21,040
article yes

1262
00:48:25,190 --> 00:48:24,079
in fact from my work i was not covered

1263
00:48:27,829 --> 00:48:25,200

here

1264
00:48:29,430 --> 00:48:27,839
our brain actually working on a protonic

1265
00:48:31,030 --> 00:48:29,440
circuit you know as a neuron all the

1266
00:48:32,950 --> 00:48:31,040
neural together right

1267
00:48:35,190 --> 00:48:32,960
is that the action potential is actually

1268
00:48:36,870 --> 00:48:35,200
platonic signal

1269
00:48:39,190 --> 00:48:36,880
because it's the membrane potential

1270
00:48:41,670 --> 00:48:39,200
remember is from

1271
00:48:44,470 --> 00:48:41,680
uh it's from um

1272
00:48:47,109 --> 00:48:44,480
the protonic you know capacitance signal

1273
00:48:50,309 --> 00:48:47,119
right the proton capacitor right okay so

1274
00:48:52,870 --> 00:48:50,319
in a sense we now understand our brain

1275
00:48:54,470 --> 00:48:52,880
and our neural system yes all the

1276
00:48:56,309 --> 00:48:54,480
neurotherapy because they always talk

1277
00:48:57,589 --> 00:48:56,319
about sodium diffusion they cannot

1278
00:48:59,829 --> 00:48:57,599
explain

1279
00:49:01,910 --> 00:48:59,839
hard conduction of a signal they're too

1280
00:49:04,549 --> 00:49:01,920
slow your division too slow you know

1281
00:49:06,790 --> 00:49:04,559
diffusion of sodium is like very slow i

1282
00:49:08,630 --> 00:49:06,800
cannot explain you know how ah

1283
00:49:09,510 --> 00:49:08,640
you know our pest cell in the heart

1284
00:49:11,510 --> 00:49:09,520
works

1285
00:49:12,950 --> 00:49:11,520
and cannot explain i'm talking very fast

1286
00:49:14,950 --> 00:49:12,960
you know i'm gonna say no to my hand

1287
00:49:16,950 --> 00:49:14,960
that's my muscles okay all right but the

1288
00:49:19,030 --> 00:49:16,960

fish diffusion no way but protonic

1289
00:49:21,990 --> 00:49:19,040
conduction is very fast

1290
00:49:24,790 --> 00:49:22,000
that's why yes this hair uh lava this

1291
00:49:25,910 --> 00:49:24,800
has already applied into

1292
00:49:29,349 --> 00:49:25,920
um

1293
00:49:31,030 --> 00:49:29,359
a normal physical physiology so i have a

1294
00:49:31,910 --> 00:49:31,040
you know already published that yeah

1295
00:49:34,150 --> 00:49:31,920
thank you

1296
00:49:36,150 --> 00:49:34,160
okay let's let's move on just a real

1297
00:49:37,910 --> 00:49:36,160
just a real quick comment back if i may

1298
00:49:39,829 --> 00:49:37,920
okay very quickly what we're getting at

1299
00:49:42,630 --> 00:49:39,839
what we what also is ignored is the fact

1300
00:49:43,510 --> 00:49:42,640
that the water molecules are rotating so

1301
00:49:45,190 --> 00:49:43,520
you get

1302
00:49:46,710 --> 00:49:45,200
rotating water molecules you obviously

1303
00:49:48,710 --> 00:49:46,720
get magnetic moments and all sorts of

1304
00:49:50,870 --> 00:49:48,720
coupling effects and whatever and our

1305
00:49:53,430 --> 00:49:50,880
work has shown that when you have high

1306
00:49:56,710 --> 00:49:53,440
sodium content in a human being

1307
00:49:58,470 --> 00:49:56,720
a very high sodium content via a salty

1308
00:50:00,309 --> 00:49:58,480
diet or whatever that this definitely

1309
00:50:02,230 --> 00:50:00,319
affects the nature of the rotating water

1310
00:50:04,390 --> 00:50:02,240
molecules and it has impact on

1311
00:50:06,470 --> 00:50:04,400
neurological function but more of that

1312
00:50:07,589 --> 00:50:06,480
perhaps some other time

1313
00:50:12,230 --> 00:50:07,599

thank you thank you

1314
00:50:17,670 --> 00:50:14,069
hi um

1315
00:50:20,150 --> 00:50:17,680
uh james yeah my question in regards to

1316
00:50:22,309 --> 00:50:20,160
you were indicating that there's a uh

1317
00:50:24,470 --> 00:50:22,319
there's pulling of heat

1318
00:50:26,630 --> 00:50:24,480
from the environment

1319
00:50:29,270 --> 00:50:26,640
um so you know i don't know if that's an

1320
00:50:31,270 --> 00:50:29,280
assumption or if you you've had

1321
00:50:33,750 --> 00:50:31,280
measurements of that of actually seeing

1322
00:50:36,870 --> 00:50:33,760
the heat coming in from the environment

1323
00:50:38,630 --> 00:50:36,880
as this process is happening

1324
00:50:41,670 --> 00:50:38,640
so um

1325
00:50:43,349 --> 00:50:41,680
so the heat is right here justin you see

1326
00:50:45,990 --> 00:50:43,359
the rt right

1327
00:50:46,870 --> 00:50:46,000
as upon r is the

1328
00:50:50,549 --> 00:50:46,880
uh

1329
00:50:52,470 --> 00:50:50,559
is the kt bozeman comes on kt times your

1330
00:50:55,270 --> 00:50:52,480
avogadro's number

1331
00:50:57,190 --> 00:50:55,280
in a right so it's right there exactly

1332
00:50:59,510 --> 00:50:57,200
explicitly tell you that that's the

1333
00:51:01,750 --> 00:50:59,520
energy you get from environment it's the

1334
00:51:03,270 --> 00:51:01,760
is the kt is well known as the kinetic

1335
00:51:05,589 --> 00:51:03,280
energy of the

1336
00:51:07,990 --> 00:51:05,599
of the you know of in this case proton

1337
00:51:11,030 --> 00:51:08,000
you know thermal uh latim

1338
00:51:12,950 --> 00:51:11,040

chaotic thermal motion but when you

1339
00:51:14,630 --> 00:51:12,960
that that the proton dancing around the

1340
00:51:16,150 --> 00:51:14,640
mouth of that atp sense that you're

1341
00:51:18,710 --> 00:51:16,160
gonna hit the things

1342
00:51:21,190 --> 00:51:18,720
harvested

1343
00:51:22,470 --> 00:51:21,200
yes so you know there's a question of

1344
00:51:24,950 --> 00:51:22,480
whether it's

1345
00:51:27,670 --> 00:51:24,960
um you know as was mentioned by thomas

1346
00:51:30,309 --> 00:51:27,680
malone earlier yes is that energy coming

1347
00:51:32,950 --> 00:51:30,319
from zero point or is it coming from

1348
00:51:34,309 --> 00:51:32,960
external and uh you know heat from the

1349
00:51:35,829 --> 00:51:34,319
environment so

1350
00:51:38,069 --> 00:51:35,839
you're you're showing that there there's

1351
00:51:40,710 --> 00:51:38,079
something that's occurring here and it

1352
00:51:42,470 --> 00:51:40,720
matches the patterns that are you know

1353
00:51:45,430 --> 00:51:42,480
actually seen in the cells you know from

1354
00:51:47,190 --> 00:51:45,440
this capacitor perspective so so you see

1355
00:51:48,829 --> 00:51:47,200
there were some you know really solid

1356
00:51:51,190 --> 00:51:48,839
stuff that seemed like you actually had

1357
00:51:52,309 --> 00:51:51,200
experimental data behind it but the

1358
00:51:54,390 --> 00:51:52,319
question is

1359
00:51:56,309 --> 00:51:54,400
do you have something experimentally

1360
00:51:59,589 --> 00:51:56,319
that's actually showing that there's

1361
00:52:02,470 --> 00:51:59,599
some heat drop from the environment

1362
00:52:06,390 --> 00:52:04,069
now it could be you're just talking

1363
00:52:08,549 --> 00:52:06,400

about just normal diffusion of heat from

1364
00:52:11,109 --> 00:52:08,559
the environment and yeah

1365
00:52:13,910 --> 00:52:11,119
yeah so very good question so this i'll

1366
00:52:17,349 --> 00:52:13,920
go back to the when i was student uh you

1367
00:52:20,150 --> 00:52:17,359
see the year of 79.82

1368
00:52:23,750 --> 00:52:20,160
um at that time you know this means

1369
00:52:26,470 --> 00:52:23,760
it's 40 years ago when i was student

1370
00:52:29,190 --> 00:52:26,480
i i have idea i want to explore whether

1371
00:52:32,230 --> 00:52:29,200
you know the thermo traffic

1372
00:52:35,589 --> 00:52:32,240
type of metabolism possible so we

1373
00:52:39,430 --> 00:52:35,599
actually experiment with the heat uh

1374
00:52:41,990 --> 00:52:39,440
absorption of um somophilic um

1375
00:52:43,349 --> 00:52:42,000
bacteria in this case actually is this

1376
00:52:46,150 --> 00:52:43,359
bacteria

1377
00:52:47,910 --> 00:52:46,160
this methanol gene okay we enrich it you

1378
00:52:49,670 --> 00:52:47,920
know that's like we've done 40 years ago

1379
00:52:51,829 --> 00:52:49,680
students that's self is a great

1380
00:52:53,430 --> 00:52:51,839
achievement and then we put this in a

1381
00:52:56,309 --> 00:52:53,440
reactor

1382
00:52:59,109 --> 00:52:56,319
we measure like this your culture with

1383
00:53:01,990 --> 00:52:59,119
its acetate medium they fermented to

1384
00:53:04,790 --> 00:53:02,000
um so the organism okay

1385
00:53:07,109 --> 00:53:04,800
and they uh metabolize making methods

1386
00:53:09,190 --> 00:53:07,119
they actually theoretically absorb heat

1387
00:53:11,030 --> 00:53:09,200
okay so but we're going to test it make

1388
00:53:13,349 --> 00:53:11,040

sure they are really it's true as you

1389
00:53:14,630 --> 00:53:13,359
said okay we predict they do so this is

1390
00:53:16,549 --> 00:53:14,640
control

1391
00:53:18,309 --> 00:53:16,559
so this slam is done so this like a

1392
00:53:19,670 --> 00:53:18,319
system you have a reactor here your

1393
00:53:21,589 --> 00:53:19,680
control you compare the temperature

1394
00:53:23,990 --> 00:53:21,599
difference so this whole sign is in a

1395
00:53:25,750 --> 00:53:24,000
thermal box okay all right

1396
00:53:28,549 --> 00:53:25,760
so you can show it actually we measured

1397
00:53:30,150 --> 00:53:28,559
the heat uh difference yes

1398
00:53:32,069 --> 00:53:30,160
they are temperature gradients so this

1399
00:53:33,990 --> 00:53:32,079
in chinese so just

1400
00:53:35,990 --> 00:53:34,000
this temperature uh difference yeah they

1401
00:53:37,349 --> 00:53:36,000
are absorbed heat so the temperature on

1402
00:53:39,990 --> 00:53:37,359
your treatment

1403
00:53:43,190 --> 00:53:40,000
is slightly lower 0.1

1404
00:53:46,549 --> 00:53:43,200
0.1 c centigrade lower then you can show

1405
00:53:49,190 --> 00:53:46,559
consistently we repeat four times

1406
00:53:52,150 --> 00:53:49,200
so we do observe the

1407
00:53:55,270 --> 00:53:52,160
the organism in this case in

1408
00:53:57,030 --> 00:53:55,280
the total system actually absorb heat

1409
00:53:57,990 --> 00:53:57,040
from the environment so thank you

1410
00:53:58,700 --> 00:53:58,000
jessica

1411
00:54:00,069 --> 00:53:58,710
okay

1412
00:54:02,870 --> 00:54:00,079
[Music]

1413
00:54:05,349 --> 00:54:02,880

any any other questions this actually is

1414
00:54:07,430 --> 00:54:05,359
this early expo uh exploration actually

1415
00:54:09,030 --> 00:54:07,440
when this the big curve came out about

1416
00:54:11,349 --> 00:54:09,040
the chemical energy

1417
00:54:13,589 --> 00:54:11,359
that's in my bell you know the sign i'm

1418
00:54:15,829 --> 00:54:13,599
looking for 40 years ago said that james

1419
00:54:17,829 --> 00:54:15,839
you're saying it's right in front of you

1420
00:54:20,790 --> 00:54:17,839
why don't you recognize it

1421
00:54:23,109 --> 00:54:20,800
and then oh my gosh this i'm looking for

1422
00:54:24,870 --> 00:54:23,119
like 40 years ago finally came to me i

1423
00:54:27,670 --> 00:54:24,880
select it

1424
00:54:29,190 --> 00:54:27,680
from the data okay thank you thank you

1425
00:54:32,630 --> 00:54:29,200
garrett

1426
00:54:36,710 --> 00:54:32,640
um so this question is really perhaps

1427
00:54:39,670 --> 00:54:36,720
more due to my ignorance of of

1428
00:54:42,390 --> 00:54:39,680
these types of chemical processes

1429
00:54:44,950 --> 00:54:42,400
but i see that your reaction takes more

1430
00:54:47,829 --> 00:54:44,960
than a thermal energy that yeah really

1431
00:54:50,870 --> 00:54:47,839
proved quite clearly

1432
00:54:53,670 --> 00:54:50,880
my question is where does that energy

1433
00:54:55,910 --> 00:54:53,680
come from because in a

1434
00:54:58,630 --> 00:54:55,920
this chemical soup there are many

1435
00:55:02,069 --> 00:54:58,640
sources for the energy so can it can the

1436
00:55:03,750 --> 00:55:02,079
energy be transferred from some other

1437
00:55:07,349 --> 00:55:03,760
uh chemical

1438
00:55:08,630 --> 00:55:07,359

in the process to the the particular

1439
00:55:11,829 --> 00:55:08,640
uh uh

1440
00:55:13,589 --> 00:55:11,839
chemical that you're measuring yes

1441
00:55:15,270 --> 00:55:13,599
so uh uh

1442
00:55:17,190 --> 00:55:15,280
professor mao there are a very good

1443
00:55:18,870 --> 00:55:17,200
question so in these bacterial

1444
00:55:20,630 --> 00:55:18,880
metabolism that

1445
00:55:21,589 --> 00:55:20,640
actually is absorbed heat but in our

1446
00:55:23,670 --> 00:55:21,599
body

1447
00:55:25,430 --> 00:55:23,680
we have other process you know like one

1448
00:55:28,069 --> 00:55:25,440
eat a lot of food we have oxygen right

1449
00:55:29,990 --> 00:55:28,079
so this one does not use oxygen okay so

1450
00:55:32,069 --> 00:55:30,000
they are you know the fermentation well

1451
00:55:34,950 --> 00:55:32,079
then it is less heat energy so the total

1452
00:55:37,430 --> 00:55:34,960
actually is absorbing but in our body we

1453
00:55:39,510 --> 00:55:37,440
actually so that we still camouflage we

1454
00:55:42,630 --> 00:55:39,520
eat food we oxide we also you know

1455
00:55:46,069 --> 00:55:42,640
pumping protons we release a lot of heat

1456
00:55:47,750 --> 00:55:46,079
so so so there's a mix of the chemical

1457
00:55:50,710 --> 00:55:47,760
don't forget cable jump we have we are

1458
00:55:52,630 --> 00:55:50,720
not so much of pure super job okay

1459
00:55:55,109 --> 00:55:52,640
we are a mixture of

1460
00:55:56,789 --> 00:55:55,119
the temperature of really this heat

1461
00:55:58,390 --> 00:55:56,799
but in the last step of the proton on

1462
00:55:59,829 --> 00:55:58,400
the surface grab a significant engine

1463
00:56:02,150 --> 00:55:59,839

back

1464
00:56:04,150 --> 00:56:02,160
so that's the reason why you know for

1465
00:56:05,990 --> 00:56:04,160
one audience say why people did not

1466
00:56:07,990 --> 00:56:06,000
discover because it's difficult because

1467
00:56:10,630 --> 00:56:08,000
it's a mixture

1468
00:56:12,309 --> 00:56:10,640
you have you have a chemical chemical

1469
00:56:14,390 --> 00:56:12,319
you there is a lot of heat that's why i

1470
00:56:16,630 --> 00:56:14,400
maintain our daily temperature 37 right

1471
00:56:19,109 --> 00:56:16,640
of course we are close sometimes

1472
00:56:20,549 --> 00:56:19,119
we try to taking hot shower

1473
00:56:22,710 --> 00:56:20,559
make warm

1474
00:56:25,270 --> 00:56:22,720
but in overload actually the chemical

1475
00:56:27,510 --> 00:56:25,280
energy from oxidation food we still

1476
00:56:28,710 --> 00:56:27,520
release a lot of heat energy but we grab

1477
00:56:32,069 --> 00:56:28,720
them back

1478
00:56:33,910 --> 00:56:32,079
that's why um our efficiency our body's

1479
00:56:36,470 --> 00:56:33,920
metabolism is so high

1480
00:56:38,309 --> 00:56:36,480
it's imaginative the equation of why we

1481
00:56:40,390 --> 00:56:38,319
are 37

1482
00:56:42,710 --> 00:56:40,400
why we are so difficult to lose weight

1483
00:56:44,710 --> 00:56:42,720
because the anti fish is just not like

1484
00:56:47,270 --> 00:56:44,720
the second part you know like even sixty

1485
00:56:49,589 --> 00:56:47,280
percent or fifty percent efficiency yes

1486
00:56:51,829 --> 00:56:49,599
the chemical part yes but the last part

1487
00:56:53,670 --> 00:56:51,839
whatever can you come back so the total

1488
00:56:55,510 --> 00:56:53,680

energy is like closer to like a ninety

1489
00:56:57,910 --> 00:56:55,520
percent or something you know what i'm

1490
00:56:59,910 --> 00:56:57,920
saying so but still is you still produce

1491
00:57:01,510 --> 00:56:59,920
heat so we are actually human we because

1492
00:57:02,710 --> 00:57:01,520
we are oxidative we are we are high

1493
00:57:05,829 --> 00:57:02,720
organisms

1494
00:57:08,230 --> 00:57:05,839
we make our body hot we actually is have

1495
00:57:09,990 --> 00:57:08,240
a lot of heat thought from our oxidative

1496
00:57:12,630 --> 00:57:10,000
process you know like when we pumping

1497
00:57:14,549 --> 00:57:12,640
protons but electron moles

1498
00:57:16,789 --> 00:57:14,559
and also the chemical reaction you know

1499
00:57:19,270 --> 00:57:16,799
provide vibrations you know like in the

1500
00:57:22,069 --> 00:57:19,280
in the medium we produce heat

1501
00:57:23,990 --> 00:57:22,079
so is that's why this is this is uh

1502
00:57:26,069 --> 00:57:24,000
that's why people you know

1503
00:57:28,549 --> 00:57:26,079
i was wondering why biological systems

1504
00:57:31,109 --> 00:57:28,559
sometimes have a such a high efficiency

1505
00:57:34,789 --> 00:57:31,119
but we try to still explain by the

1506
00:57:36,710 --> 00:57:34,799
classic uh way of expecting

1507
00:57:38,470 --> 00:57:36,720
you know but that's why the debate you

1508
00:57:41,510 --> 00:57:38,480
know so now we understand oh wow you

1509
00:57:44,150 --> 00:57:41,520
actually have two cents going on okay

1510
00:57:46,950 --> 00:57:44,160
yes thank you right well

1511
00:57:47,829 --> 00:57:46,960
james to follow up on that if

1512
00:57:49,589 --> 00:57:47,839
i mean

1513
00:57:50,390 --> 00:57:49,599

i would assume metabolic studies have

1514
00:57:51,829 --> 00:57:50,400
been

1515
00:57:54,309 --> 00:57:51,839
pretty rigorous over the last hundred

1516
00:57:57,030 --> 00:57:54,319
years to try to balance

1517
00:57:58,230 --> 00:57:57,040
heat production waste production

1518
00:58:00,390 --> 00:57:58,240
co2

1519
00:58:02,069 --> 00:58:00,400
water production by organisms human

1520
00:58:05,430 --> 00:58:02,079
beings and other animals

1521
00:58:06,789 --> 00:58:05,440
against the intake of energy and if 70

1522
00:58:09,349 --> 00:58:06,799
of energy is

1523
00:58:11,910 --> 00:58:09,359
actually coming from the thermal bath

1524
00:58:13,270 --> 00:58:11,920
how does that square in your mind with

1525
00:58:15,109 --> 00:58:13,280
the metabolic studies that have been

1526
00:58:17,750 --> 00:58:15,119
done over the last century

1527
00:58:19,349 --> 00:58:17,760
now if you measure the total as

1528
00:58:21,750 --> 00:58:19,359
uh gradually just

1529
00:58:24,470 --> 00:58:21,760
location is if you try to make the total

1530
00:58:26,789 --> 00:58:24,480
you still have uh the total price has

1531
00:58:28,470 --> 00:58:26,799
still released heat so that because look

1532
00:58:29,910 --> 00:58:28,480
the second law is overload like a myth

1533
00:58:31,430 --> 00:58:29,920
again if you don't know it i was

1534
00:58:33,750 --> 00:58:31,440
thinking that second law still applies

1535
00:58:35,910 --> 00:58:33,760
very well okay right so what happened

1536
00:58:37,910 --> 00:58:35,920
was the heat that it is processed

1537
00:58:40,309 --> 00:58:37,920
actually you know the thermal efficiency

1538
00:58:42,870 --> 00:58:40,319

uh the energy efficiency is like about

1539
00:58:44,470 --> 00:58:42,880
50 or 60 even like 30 you know percent

1540
00:58:46,309 --> 00:58:44,480
you know depending on status okay

1541
00:58:48,630 --> 00:58:46,319
depending on what step is

1542
00:58:52,150 --> 00:58:48,640
but that proton sense fetch a lot of

1543
00:58:53,750 --> 00:58:52,160
come back so your total still is not

1544
00:58:56,150 --> 00:58:53,760
like this bacteria this is that this

1545
00:58:57,190 --> 00:58:56,160
special okay because they are endologic

1546
00:58:58,789 --> 00:58:57,200
okay

1547
00:59:01,190 --> 00:58:58,799
and that's why in this bacteria you can

1548
00:59:01,990 --> 00:59:01,200
measure they are the net heat absorb

1549
00:59:04,150 --> 00:59:02,000
okay

1550
00:59:05,430 --> 00:59:04,160
but in human we are not heather

1551
00:59:08,549 --> 00:59:05,440
releasing

1552
00:59:09,430 --> 00:59:08,559
so that's why this thing is not apparent

1553
00:59:10,789 --> 00:59:09,440
okay

1554
00:59:12,150 --> 00:59:10,799
you got it right yeah

1555
00:59:14,150 --> 00:59:12,160
thank you

1556
00:59:16,150 --> 00:59:14,160
okay i think we're i'm just about out of

1557
00:59:16,829 --> 00:59:16,160
time so

1558
00:59:18,230 --> 00:59:16,839
um

1559
00:59:20,470 --> 00:59:18,240
again uh

1560
00:59:21,270 --> 00:59:20,480
uh james thanks very much for a

1561
00:59:23,589 --> 00:59:21,280
really

1562
00:59:24,870 --> 00:59:23,599
provocative and interesting talk um at

1563
00:59:27,270 --> 00:59:24,880

this point i'm going to turn it back

1564
00:59:28,710 --> 00:59:27,280
over to garrett for the next speaker i

1565
00:59:30,390 --> 00:59:28,720
believe