2017 Astrobiology Graduate Conference

CHARLOTTESVILLE, VA

1
00:00:00,790 --> 00:00:07,750
[Music]

2
00:00:13,669 --> 00:00:09,950
thanks for the organizer for letting me

3
00:00:14,959 --> 00:00:13,679
give you talk to a sir yesterday so I

4
00:00:17,029 --> 00:00:14,969
think all to the a couple times the

5
00:00:20,210 --> 00:00:17,039
steady guy so that kind of tells me that

6
00:00:22,759 --> 00:00:20,220
I cannot give you any details

7
00:00:26,150 --> 00:00:22,769
so put any specifics that you have I can

8
00:00:29,450 --> 00:00:26,160
have the answer for you the question

9
00:00:32,179 --> 00:00:29,460
session or later all right so I'm

10
00:00:35,020 --> 00:00:32,189
finishing my PhD in the Netherlands and

11
00:00:36,950 --> 00:00:35,030
I'm moving to Berkeley to my postdoc

12
00:00:40,299 --> 00:00:36,960
part of this group their breakthrough

13
00:00:43,520 --> 00:00:40,309

Singh group so we tell you today about

14
00:00:46,639 --> 00:00:43,530
the search for interest for intelligent

15
00:00:51,470 --> 00:00:46,649
life outside the earth if we actually

16
00:00:54,080 --> 00:00:51,480
have here some always so this is my kind

17
00:00:55,459 --> 00:00:54,090
of introduction I had three parts for

18
00:00:59,209 --> 00:00:55,469
this talk so I'm going to give you some

19
00:01:01,010 --> 00:00:59,219
introduction of Seti a I'll tell you

20
00:01:02,660 --> 00:01:01,020
about the regulation program part off

21
00:01:03,860 --> 00:01:02,670
and also I want to tell you about a

22
00:01:06,730 --> 00:01:03,870
little bit of other things that I'm

23
00:01:10,490 --> 00:01:06,740
interested on which are also part of

24
00:01:13,550 --> 00:01:10,500
astrobiology which kind of ties into

25
00:01:16,100 --> 00:01:13,560
with our stuff as well ok so what is

26
00:01:19,130 --> 00:01:16,110
setting SETI stands for search for

27
00:01:21,289 --> 00:01:19,140
terrestrial intelligence and kind of way

28
00:01:24,410 --> 00:01:21,299
to think about it is so you have slowly

29
00:01:27,020 --> 00:01:24,420
here you have communication technology

30
00:01:30,620 --> 00:01:27,030
of many kinds and kind of series kind of

31
00:01:32,319 --> 00:01:30,630
somewhere there and I like to start this

32
00:01:35,660 --> 00:01:32,329
introduction by asking a question and

33
00:01:39,440 --> 00:01:35,670
this is how common is intelligent life

34
00:01:42,410 --> 00:01:39,450
in our galaxy cuz nobody knows the

35
00:01:43,850 --> 00:01:42,420
answer to that but you probably have

36
00:01:47,539 --> 00:01:43,860
seen this before this is the Drake

37
00:01:50,359 --> 00:01:47,549
Equation and instead of an equation is

38
00:01:53,020 --> 00:01:50,369

more of a guide to help you think about

39
00:01:55,460 --> 00:01:53,030
this question so what kind of

40
00:01:59,539 --> 00:01:55,470
ingredients you need or what were the

41
00:02:01,160 --> 00:01:59,549
requirements to have in daily in life

42
00:02:06,260 --> 00:02:01,170
somewhere else that we can actually

43
00:02:08,210 --> 00:02:06,270
detect so you have is going to go into

44
00:02:12,199 --> 00:02:08,220
the next slide so the first two

45
00:02:13,400 --> 00:02:12,209
parameters we have here it's the how

46
00:02:16,610 --> 00:02:13,410
many of the

47
00:02:18,140 --> 00:02:16,620
stars from our Milky Way how many of

48
00:02:20,780 --> 00:02:18,150
those what is a fraction of those I have

49
00:02:23,780 --> 00:02:20,790
planets and of those what is the

50
00:02:26,420 --> 00:02:23,790
fraction that you have a planet in what

51
00:02:28,160 --> 00:02:26,430
is called a habitable zone so that you

52
00:02:31,640 --> 00:02:28,170
can actually have like that

53
00:02:34,190 --> 00:02:31,650
so from Kepler we know that basically

54
00:02:36,200 --> 00:02:34,200
every star up there when you look at the

55
00:02:40,040 --> 00:02:36,210
night sky every star you see has a

56
00:02:42,140 --> 00:02:40,050
planet much likely and we also see that

57
00:02:45,140 --> 00:02:42,150
there are lots of them that have planets

58
00:02:47,300 --> 00:02:45,150
in the habitable zone so you have your

59
00:02:50,120 --> 00:02:47,310
start here you have red area which is

60
00:02:52,070 --> 00:02:50,130
too warm to be the blue area to be which

61
00:02:54,890 --> 00:02:52,080
is too cold and you know the green where

62
00:02:58,520 --> 00:02:54,900
it's a perfect to have liquid water

63
00:03:01,610 --> 00:02:58,530

basically so then we can see that these

64
00:03:03,470 --> 00:03:01,620
two terms are are hinting to have are

65
00:03:05,810 --> 00:03:03,480
telling us that all these these two are

66
00:03:08,060 --> 00:03:05,820
common but about the what about the

67
00:03:10,400 --> 00:03:08,070
other parameters in this equation so you

68
00:03:13,280 --> 00:03:10,410
have all of the fraction of planets that

69
00:03:16,010 --> 00:03:13,290
you have around that are in a habitable

70
00:03:19,430 --> 00:03:16,020
zone how many of those actually have

71
00:03:21,500 --> 00:03:19,440
life how many of those will create

72
00:03:24,530 --> 00:03:21,510
intelligent life how many of those

73
00:03:26,780 --> 00:03:24,540
actually create a civilization and L

74
00:03:29,600 --> 00:03:26,790
stands for the length of that

75
00:03:31,730 --> 00:03:29,610
civilization so let's start to think a

76
00:03:33,170 --> 00:03:31,740
little bit about that so I'm glad that I

77
00:03:34,520 --> 00:03:33,180
actually gave a talk today not yesterday

78
00:03:39,199 --> 00:03:34,530
because well we have covered a little

79
00:03:43,310 --> 00:03:39,209
bit of this today and so there are some

80
00:03:44,900 --> 00:03:43,320
hints that maybe life well I guess the

81
00:03:48,890 --> 00:03:44,910
building blocks of life might be out

82
00:03:51,590 --> 00:03:48,900
there everywhere we also know that life

83
00:03:54,350 --> 00:03:51,600
seems to be resilient here on earth and

84
00:03:56,330 --> 00:03:54,360
giving cosmological times we can think

85
00:04:00,250 --> 00:03:56,340
well we have prolly enough time to

86
00:04:02,630 --> 00:04:00,260
evolve into something that isn't alien

87
00:04:04,820 --> 00:04:02,640
but at the end we don't really have any

88
00:04:06,890 --> 00:04:04,830

constraints on this we don't really know

89
00:04:09,110 --> 00:04:06,900
so what you can say is that at the end

90
00:04:12,199 --> 00:04:09,120
of the a is equally likely completely

91
00:04:14,570 --> 00:04:12,209
equally likely that we are the only

92
00:04:18,920 --> 00:04:14,580
civilization in the galaxy or there are

93
00:04:20,930 --> 00:04:18,930
thousands of them we use a known but as

94
00:04:23,480 --> 00:04:20,940
scroll second set and we don't really

95
00:04:27,020 --> 00:04:23,490
have models to do this right so the only

96
00:04:31,700 --> 00:04:27,030
way that we can fear this out is by

97
00:04:33,520 --> 00:04:31,710
making an experiment so in SETI when

98
00:04:36,770 --> 00:04:33,530
you're looking for intelligent life

99
00:04:39,890 --> 00:04:36,780
you're not looking for pretty smart

100
00:04:42,830 --> 00:04:39,900
dolphins or chimpanzees what you're

101
00:04:44,510 --> 00:04:42,840
looking for is for technology and we're

102
00:04:47,030 --> 00:04:44,520
using technology as a proxy for

103
00:04:50,270 --> 00:04:47,040
intelligence so in this case these are

104
00:04:53,690 --> 00:04:50,280
examples of that so in specific in

105
00:04:55,820 --> 00:04:53,700
technology I mean using what we use for

106
00:04:58,340 --> 00:04:55,830
communication which is the

107
00:05:01,730 --> 00:04:58,350
electromagnetic spectrum so we have

108
00:05:04,070 --> 00:05:01,740
radio radio antennas or radars and but

109
00:05:06,620 --> 00:05:04,080
also we have lasers right and so all

110
00:05:09,430 --> 00:05:06,630
these are possibilities that that you

111
00:05:14,930 --> 00:05:09,440
can basically communicate through space

112
00:05:17,270 --> 00:05:14,940
and from the surface of the air so this

113
00:05:20,870 --> 00:05:17,280

upload right here shows basically

114
00:05:22,370 --> 00:05:20,880
wavelength the opacity or the atmosphere

115
00:05:26,240 --> 00:05:22,380
so you can see there are some windows

116
00:05:29,120 --> 00:05:26,250
here where we actually can observe what

117
00:05:31,340 --> 00:05:29,130
is out there so this is the optical when

118
00:05:35,719 --> 00:05:31,350
we can see the stars with your eyes we

119
00:05:40,010 --> 00:05:35,729
also have radio and infrared so at this

120
00:05:41,600 --> 00:05:40,020
moment most of the SETI work has been

121
00:05:44,659 --> 00:05:41,610
done in the radio but there are actually

122
00:05:47,480 --> 00:05:44,669
a few that has been done special in

123
00:05:51,680 --> 00:05:47,490
optical and a few that are starting to

124
00:05:55,550 --> 00:05:51,690
do in in the infrared so he's going to

125
00:06:00,080 --> 00:05:55,560
show you a little bit video here to help

126
00:06:03,020 --> 00:06:00,090
us think about these three ideas and how

127
00:06:04,460 --> 00:06:03,030
to find a civilization other so in my

128
00:06:06,860 --> 00:06:04,470
name is ISA galaxy this is a milky way

129
00:06:12,800 --> 00:06:06,870
so in mind you have a planet somewhere

130
00:06:16,760 --> 00:06:12,810
which is in the right spot you have

131
00:06:21,050 --> 00:06:16,770
there it has life it creates intelligent

132
00:06:27,140 --> 00:06:21,060
life it creates technology and it starts

133
00:06:32,930 --> 00:06:27,150
sending radio signals then at some point

134
00:06:34,640 --> 00:06:32,940
in my years I off well you will see then

135
00:06:37,490 --> 00:06:34,650
the galaxy is that you have these

136
00:06:40,430 --> 00:06:37,500
bubbles of radiation of electromagnetic

137
00:06:40,750 --> 00:06:40,440
radiation and here on earth that's where

138
00:06:47,890 --> 00:06:40,760

we

139
00:06:49,780 --> 00:06:47,900
and at some point you will start

140
00:06:55,270 --> 00:06:49,790
receiving the signal from all these

141
00:06:57,280 --> 00:06:55,280
bubbles out there and I is going back to

142
00:06:57,850 --> 00:06:57,290
this picture you can see that the

143
00:07:00,940 --> 00:06:57,860
technics

144
00:07:04,150 --> 00:07:00,950
the thickness of these bubbles basically

145
00:07:06,550 --> 00:07:04,160
reflect the length of this civilization

146
00:07:09,550 --> 00:07:06,560
for how long they have live and

147
00:07:11,350 --> 00:07:09,560
basically this tells you that at some

148
00:07:15,090 --> 00:07:11,360
point they became extinct so I think

149
00:07:19,390 --> 00:07:15,100
this is very relevant currently for our

150
00:07:21,790 --> 00:07:19,400
state of our own civilization it's

151
00:07:23,170 --> 00:07:21,800
something to keep in mind right and I

152
00:07:25,660 --> 00:07:23,180
guess the other thing that I want to

153
00:07:27,580 --> 00:07:25,670
show here is that so earth should be is

154
00:07:29,800 --> 00:07:27,590
over there you may you can see that it's

155
00:07:33,130 --> 00:07:29,810
like a point or maybe the laser so that

156
00:07:35,380 --> 00:07:33,140
will tell you the extent for which we

157
00:07:38,470 --> 00:07:35,390
have conducted set experiments so we

158
00:07:41,680 --> 00:07:38,480
have only search stars which will be

159
00:07:46,120 --> 00:07:41,690
around that laser so there's lots of

160
00:07:50,080 --> 00:07:46,130
stars to to search for so what kind of

161
00:07:54,070 --> 00:07:50,090
signals are we looking for so this is

162
00:07:56,710 --> 00:07:54,080
actually a real signal artificial signal

163
00:08:02,020 --> 00:07:56,720

that is coming from outside the solar

164
00:08:03,970 --> 00:08:02,030
system I know that is artificial because

165
00:08:06,070 --> 00:08:03,980
you have frequency here this is radio

166
00:08:09,550 --> 00:08:06,080
and you have these very strong lines

167
00:08:13,510 --> 00:08:09,560
here it's artificial because they are

168
00:08:16,060 --> 00:08:13,520
very narrow the nature doesn't know how

169
00:08:18,160 --> 00:08:16,070
to produce these kind of lines measures

170
00:08:20,350 --> 00:08:18,170
are the narrows kind of things that

171
00:08:22,570 --> 00:08:20,360
nature could produce and those are tough

172
00:08:26,590 --> 00:08:22,580
so sometimes where that is so I know

173
00:08:29,920 --> 00:08:26,600
that this is artificial unfortunately I

174
00:08:33,100 --> 00:08:29,930
know - that is the Voyager 1 spacecraft

175
00:08:36,040 --> 00:08:33,110
so it's terrestrial I mean man-made I

176
00:08:38,140 --> 00:08:36,050
guess and but this kind of gives you an

177
00:08:41,830 --> 00:08:38,150
example of what kind of signatures are

178
00:08:44,230 --> 00:08:41,840
we looking for in our data we're doing

179
00:08:49,720 --> 00:08:44,240
this well I should give you an example

180
00:08:52,650 --> 00:08:49,730
so how sensitive we are Voyager has a 4

181
00:08:54,590 --> 00:08:52,660
watt transmitter 40 watt sorry so

182
00:08:56,300 --> 00:08:54,600
basically the

183
00:09:00,040 --> 00:08:56,310
say you know the light bulb in your

184
00:09:02,150 --> 00:09:00,050
fridge and we're able to detect that

185
00:09:05,300 --> 00:09:02,160
even though it's outside the solar

186
00:09:06,740 --> 00:09:05,310
system now very strongly with this

187
00:09:08,180 --> 00:09:06,750
telescope which is actually very close

188
00:09:10,280 --> 00:09:08,190

from here is the Green Bank telescope

189
00:09:12,530 --> 00:09:10,290
and some of the some of you this weekend

190
00:09:14,540 --> 00:09:12,540
probably saw it and you know just for

191
00:09:16,670 --> 00:09:14,550
reference you can see that they the size

192
00:09:21,470 --> 00:09:16,680
of the trees nearby it's pretty large

193
00:09:24,259 --> 00:09:21,480
largest of this kind so kind of looking

194
00:09:26,090 --> 00:09:24,269
at the future land so here this is plug

195
00:09:28,610 --> 00:09:26,100
you have okay wavelength or frequency

196
00:09:32,329 --> 00:09:28,620
where you want and this basically tells

197
00:09:34,970 --> 00:09:32,339
you the sensitivity and the green line

198
00:09:38,509 --> 00:09:34,980
here tells you about gbt the ribbon

199
00:09:41,329 --> 00:09:38,519
telescope and these are basically our

200
00:09:43,519 --> 00:09:41,339
telescopes this line right here the

201
00:09:46,430 --> 00:09:43,529
dollar line that represents the

202
00:09:48,949 --> 00:09:46,440
strongest transmitter radio transmitter

203
00:09:51,829 --> 00:09:48,959
that we have currently which is the

204
00:09:55,970 --> 00:09:51,839
Arecibo planetary radar so if you put

205
00:10:00,050 --> 00:09:55,980
that at a distance of 50 light-years you

206
00:10:03,379 --> 00:10:00,060
can detect it now in the future with the

207
00:10:06,949 --> 00:10:03,389
SK the Square Kilometre Array you were

208
00:10:12,439 --> 00:10:06,959
able to detect much fainter signals like

209
00:10:14,389 --> 00:10:12,449
a basically radar from a airport it's

210
00:10:16,040 --> 00:10:14,399
kind of a video here I'll just skip

211
00:10:19,819 --> 00:10:16,050
through so this is the sky kilometer

212
00:10:22,429 --> 00:10:19,829
array and basically idea here is that

213
00:10:25,579 --> 00:10:22,439

once in a couple of years once this is

214
00:10:30,350 --> 00:10:25,589
finished building we will be able we

215
00:10:34,400 --> 00:10:30,360
will be sensitive enough to have a for

216
00:10:36,620 --> 00:10:34,410
the first time enough sensitivity to

217
00:10:38,329 --> 00:10:36,630
look of a large volume of stars and to

218
00:10:42,230 --> 00:10:38,339
start to answer in this question in a

219
00:10:44,600 --> 00:10:42,240
very sadistic 'el way so I'm very

220
00:10:46,579 --> 00:10:44,610
excited about that and stay tuned for

221
00:10:49,009 --> 00:10:46,589
that it's kind of finishing my

222
00:10:50,960 --> 00:10:49,019
introduction here so as I was saying

223
00:10:54,019 --> 00:10:50,970
before SETI is a search for strategy

224
00:10:55,699 --> 00:10:54,029
structure level intelligence and usually

225
00:10:57,679 --> 00:10:55,709
people confuse set it with the SETI

226
00:11:00,620 --> 00:10:57,689
Institute which is very famous but it's

227
00:11:02,809 --> 00:11:00,630
not at I'm part of what is called the

228
00:11:06,189 --> 00:11:02,819
Berkeley series Research Center at UC

229
00:11:08,500 --> 00:11:06,199
Berkeley and there are other SETI

230
00:11:12,050 --> 00:11:08,510
institutions are they're much smaller

231
00:11:14,420 --> 00:11:12,060
but well we're so much people in general

232
00:11:17,120 --> 00:11:14,430
is a small field this is a group in

233
00:11:20,060 --> 00:11:17,130
Berkeley something that you can see

234
00:11:22,940 --> 00:11:20,070
right away is that one wheat half of the

235
00:11:27,470 --> 00:11:22,950
population that is not contributing to

236
00:11:30,130 --> 00:11:27,480
this work so please come and join us men

237
00:11:33,200 --> 00:11:30,140
cannot do it by itself okay

238
00:11:34,880 --> 00:11:33,210

so now I'm going to tell you about the

239
00:11:38,180 --> 00:11:34,890
breakthrough listen this is a project I

240
00:11:39,500 --> 00:11:38,190
saw a couple years ago by the

241
00:11:42,170 --> 00:11:39,510
contribution of one hundred million

242
00:11:43,880 --> 00:11:42,180
dollars for spread of ten years this is

243
00:11:46,310 --> 00:11:43,890
the largest project ever

244
00:11:47,930 --> 00:11:46,320
this is yuri milner he was one the

245
00:11:50,540 --> 00:11:47,940
contributor for this and you can see

246
00:11:53,000 --> 00:11:50,550
some famous people here this is Frank

247
00:11:55,670 --> 00:11:53,010
Drake actually which from the Drake

248
00:11:58,310 --> 00:11:55,680
Equation and you can see how large this

249
00:12:00,620 --> 00:11:58,320
project is just by looking at the number

250
00:12:05,090 --> 00:12:00,630
of people in the world Advisors this all

251
00:12:06,740 --> 00:12:05,100
were well-known scientist so very

252
00:12:08,660 --> 00:12:06,750
basically I can tell you is that we're

253
00:12:10,220 --> 00:12:08,670
using the most sensitive radio

254
00:12:12,230 --> 00:12:10,230
telescopes in there in the world at the

255
00:12:13,910 --> 00:12:12,240
moment so the Green Man telescope for

256
00:12:16,700 --> 00:12:13,920
the Northern Hemisphere and the Parkes

257
00:12:19,040 --> 00:12:16,710
telescope for science fear at the moment

258
00:12:22,370 --> 00:12:19,050
we're hopefully adding more telescopes

259
00:12:24,970 --> 00:12:22,380
in the future but stay tuned quickly I

260
00:12:28,070 --> 00:12:24,980
will tell you that so this project has

261
00:12:32,770 --> 00:12:28,080
lost two projects between in the middle

262
00:12:36,770 --> 00:12:32,780
I guess a word in the future we want to

263
00:12:39,860 --> 00:12:36,780

observe nearby galaxies as well as say

264
00:12:44,180 --> 00:12:39,870
the the plane of the Milky Way

265
00:12:46,910 --> 00:12:44,190
for now we're concentrating and at a set

266
00:12:50,960 --> 00:12:46,920
of targets of the closest stars so for

267
00:12:52,610 --> 00:12:50,970
that we use submit a paper months ago on

268
00:12:55,580 --> 00:12:52,620
the first observations for the first

269
00:12:57,440 --> 00:12:55,590
year where we concentrate on a subset of

270
00:13:01,700 --> 00:12:57,450
frequencies here within one and two

271
00:13:05,810 --> 00:13:01,710
gigahertz where we were looking at 700

272
00:13:07,130 --> 00:13:05,820
stars all of them are nearby they are

273
00:13:10,070 --> 00:13:07,140
spread all over the northern hemisphere

274
00:13:12,740 --> 00:13:10,080
and I guess one difference from our work

275
00:13:14,650 --> 00:13:12,750
and other study earlier cell experiments

276
00:13:17,120 --> 00:13:14,660
is that they were concentrating

277
00:13:19,550 --> 00:13:17,130
concentrate their force earlier on only

278
00:13:22,460 --> 00:13:19,560
solar-type stars because we didn't know

279
00:13:24,590 --> 00:13:22,470
better but now we know that

280
00:13:27,440 --> 00:13:24,600
- basically can exist in all kinds of

281
00:13:32,210 --> 00:13:27,450
stars and they all have an a habitable

282
00:13:34,010 --> 00:13:32,220
zone so trying to remove the interpose

283
00:13:38,590 --> 00:13:34,020
center point of view as much as possible

284
00:13:40,580 --> 00:13:38,600
we're then observing all kinds of stars

285
00:13:43,550 --> 00:13:40,590
very quickly I'll tell you that we have

286
00:13:44,720 --> 00:13:43,560
a lot of data we constructed a lot these

287
00:13:48,520 --> 00:13:44,730
are hundreds of computers that were

288
00:13:54,410 --> 00:13:48,530

using here in a green bag servitor II

289
00:13:56,390 --> 00:13:54,420
and without going much the results we

290
00:13:58,670 --> 00:13:56,400
basically found some interesting

291
00:14:00,350 --> 00:13:58,680
candidates but at the end we realize we

292
00:14:05,750 --> 00:14:00,360
fear out those were from nearby

293
00:14:08,050 --> 00:14:05,760
satellites so but if you don't like my

294
00:14:11,330 --> 00:14:08,060
conclusion that we didn't find it t

295
00:14:13,820 --> 00:14:11,340
there are lots of other conclusions that

296
00:14:15,710 --> 00:14:13,830
you can find online from this is

297
00:14:21,110 --> 00:14:15,720
worthless you guys doing and you

298
00:14:24,290 --> 00:14:21,120
actually finally choose your best you

299
00:14:26,810 --> 00:14:24,300
prefer option you kind enough to

300
00:14:27,320 --> 00:14:26,820
finalize some other way that you can use

301
00:14:29,630 --> 00:14:27,330
these data

302
00:14:35,600 --> 00:14:29,640
I mean we're observing bunch of stars

303
00:14:37,970 --> 00:14:35,610
and stars tend to do crazy things so

304
00:14:43,430 --> 00:14:37,980
this is the Sun here this is a what is

305
00:14:45,620 --> 00:14:43,440
called aa but basically a flare up from

306
00:14:47,720 --> 00:14:45,630
the star from from the Sun you can see

307
00:14:49,670 --> 00:14:47,730
this is the wide circle represents the

308
00:14:53,180 --> 00:14:49,680
sides of the Sun so you can see how much

309
00:14:55,580 --> 00:14:53,190
bigger this is these also emits in the

310
00:14:58,430 --> 00:14:55,590
radio and we can detect that also

311
00:15:02,320 --> 00:14:58,440
Jupiter here has Aurora which also emits

312
00:15:05,840 --> 00:15:02,330
in the radio and we can detect that some

313
00:15:07,970 --> 00:15:05,850

work now it's been detecting radio

314
00:15:10,700 --> 00:15:07,980
emission from other stars and branders

315
00:15:14,360 --> 00:15:10,710
as well so the reason why this is

316
00:15:15,950 --> 00:15:14,370
important is because so we know as I was

317
00:15:17,780 --> 00:15:15,960
saying earlier this is a habitable zone

318
00:15:19,850 --> 00:15:17,790
this green here

319
00:15:22,010 --> 00:15:19,860
shape and depending on the size of the

320
00:15:24,710 --> 00:15:22,020
planet I mean of the star the larger

321
00:15:27,710 --> 00:15:24,720
star the more bright you are and the

322
00:15:32,630 --> 00:15:27,720
more the harder you are so they have it

323
00:15:33,740 --> 00:15:32,640
also on campus away from that star but

324
00:15:34,890 --> 00:15:33,750
this is not the end of the story right

325
00:15:39,780 --> 00:15:34,900
so

326
00:15:41,880 --> 00:15:39,790
earth it seems that you need a magnetic

327
00:15:45,019 --> 00:15:41,890
field surrounding your planet to protect

328
00:15:48,390 --> 00:15:45,029
you from crazy things coming from your

329
00:15:51,510 --> 00:15:48,400
host star so that's something that we

330
00:15:52,890 --> 00:15:51,520
also want to do with this data in the

331
00:15:55,050 --> 00:15:52,900
future so maybe next year I'll tell you

332
00:15:56,370 --> 00:15:55,060
more about this there are a lot of

333
00:15:59,400 --> 00:15:56,380
things that I didn't tell you about from

334
00:16:01,740 --> 00:15:59,410
the break listened initiative we have an

335
00:16:05,030 --> 00:16:01,750
REU program so you have any undergrads

336
00:16:07,829 --> 00:16:05,040
interested on this please let me know

337
00:16:10,079 --> 00:16:07,839
yeah many other things but you can all

338
00:16:13,079 --> 00:16:10,089

the obvious questions or you can also go

339
00:16:16,290 --> 00:16:13,089
to our website and we actually have a

340
00:16:18,000 --> 00:16:16,300
monthly collaborative meeting where we

341
00:16:21,269 --> 00:16:18,010
basically gathering a lot of a lot of

342
00:16:25,320 --> 00:16:21,279
people it's happening tonight at 2:00

343
00:16:27,240 --> 00:16:25,330
a.m. we're kind of shifting schedule so

344
00:16:32,160 --> 00:16:27,250
like everyone from the world can join

345
00:16:35,370 --> 00:16:32,170
but yeah you're awake and not too

346
00:16:44,310 --> 00:16:35,380
intoxicated maybe you want to join yeah

347
00:16:52,110 --> 00:16:44,320
thanks all right got time for one

348
00:16:54,269 --> 00:16:52,120
question hi I was wondering if you could

349
00:16:56,880 --> 00:16:54,279
give some feedback of what Europe you

350
00:17:00,560 --> 00:16:56,890
might be about the WoW signal some

351
00:17:02,340 --> 00:17:00,570
decades ago and also tabi star right

352
00:17:07,319 --> 00:17:02,350
yeah very interesting

353
00:17:08,880 --> 00:17:07,329
Thanks ah so the WoW signal I haven't

354
00:17:10,980 --> 00:17:08,890
looked very deep on it but what I can

355
00:17:12,929 --> 00:17:10,990
tell you is that most of the SETI

356
00:17:13,890 --> 00:17:12,939
community at the moment on belief that

357
00:17:16,049 --> 00:17:13,900
is absurd

358
00:17:19,530 --> 00:17:16,059
that is muscle ascetic community don't

359
00:17:22,290 --> 00:17:19,540
believe that is a real signal the reason

360
00:17:27,569 --> 00:17:22,300
was that we are going too much into

361
00:17:28,559 --> 00:17:27,579
details you were observing - I don't

362
00:17:30,419 --> 00:17:28,569
know if this I don't know if you're

363
00:17:33,510 --> 00:17:30,429

ready astronomer or not if this will

364
00:17:36,180 --> 00:17:33,520
make sense or not basically the signal

365
00:17:37,549 --> 00:17:36,190
even though appear once they never saw

366
00:17:40,590 --> 00:17:37,559
it again

367
00:17:44,070 --> 00:17:40,600
not even in a following observation

368
00:17:48,310 --> 00:17:44,080
basically a few minutes later so there

369
00:17:51,159 --> 00:17:48,320
is a lot of once you find a signal

370
00:17:53,919 --> 00:17:51,169
you really want to find it again and

371
00:17:56,169 --> 00:17:53,929
again and I just one telescope with

372
00:17:58,720 --> 00:17:56,179
multiple telescopes and then you can

373
00:18:01,269 --> 00:17:58,730
start believing that this comes from

374
00:18:03,730 --> 00:18:01,279
actually that location otherwise there

375
00:18:05,440 --> 00:18:03,740
are so many our we call a radio

376
00:18:09,370 --> 00:18:05,450
frequency interference coming from earth

377
00:18:11,440 --> 00:18:09,380
that is very hard to remove otherwise

378
00:18:13,779 --> 00:18:11,450
about Taavi star we actually have been

379
00:18:16,539 --> 00:18:13,789
doing observations of that so but also

380
00:18:19,149 --> 00:18:16,549
know don't know what TV star is so this

381
00:18:21,119 --> 00:18:19,159
is a very interesting star which I wish

382
00:18:26,230 --> 00:18:21,129
I have time to talk to you about it

383
00:18:29,549 --> 00:18:26,240
which the source of all talk but it has

384
00:18:35,980 --> 00:18:29,559
a was the score by Kepler and has very

385
00:18:38,440 --> 00:18:35,990
strong tips on their entrepreneur's and

386
00:18:41,379 --> 00:18:38,450
usually these tips are related to

387
00:18:42,850 --> 00:18:41,389
planets going in front of the stars or

388
00:18:45,100 --> 00:18:42,860

in this case these tips are very large

389
00:18:48,129 --> 00:18:45,110
and they're very weird they're not the

390
00:18:50,080 --> 00:18:48,139
usual type so astronomers have been

391
00:18:52,240 --> 00:18:50,090
stretching their heads for more than a

392
00:18:55,659 --> 00:18:52,250
year really trying to figure out why

393
00:19:00,519 --> 00:18:55,669
this is coming from still under heavy

394
00:19:03,430 --> 00:19:00,529
debate there has been a very recent

395
00:19:06,129 --> 00:19:03,440
event another dip happening basically

396
00:19:09,310 --> 00:19:06,139
two weeks well last weekend the weekend

397
00:19:11,200 --> 00:19:09,320
before that so it is very very nice very

398
00:19:12,700 --> 00:19:11,210
hot topic a lot of telescopes were

399
00:19:15,249 --> 00:19:12,710
you're see rectly looking at it so I

400
00:19:21,669 --> 00:19:15,259
suspect many news in the next following

401
00:19:23,550 --> 00:19:21,679
weeks on this so yeah alright let's