# Ask An Astrobiologist

## Episode 28: January 21st, 2020

# Dr. Daniel Angerhausen

NASA Astrobiology Program

1
00:00:00,690 --> 00:00:30,460
[Music]

2
00:00:36,790 --> 00:00:33,820
greetings friends of astrobiology and

3
00:00:38,890 --> 00:00:36,800
welcome to ask an astrobiologist the

4
00:00:41,410 --> 00:00:38,900
show that celebrates the science and the

5
00:00:43,870 --> 00:00:41,420
scientists in the quest to understand

6
00:00:46,210 --> 00:00:43,880
the nature of life I'm Graham Lau your

7
00:00:48,460 --> 00:00:46,220
host for this month I also go by the

8
00:00:50,890 --> 00:00:48,470
Cosmo biologist on Twitter and on

9
00:00:52,780 --> 00:00:50,900
Instagram you can find me online and our

10
00:00:55,060 --> 00:00:52,790
show is brought to you by second network

11
00:00:56,860 --> 00:00:55,070
and the NASA Astrobiology program as

12
00:00:59,410 --> 00:00:56,870
usual we're really excited to have you

13
00:01:01,900 --> 00:00:59,420

here to ask questions that you have

14
00:01:04,240 --> 00:01:01,910
about astrobiology about careers about

15
00:01:06,760 --> 00:01:04,250
research and about the lives of

16
00:01:07,990 --> 00:01:06,770
scientists involved in astrobiology I'm

17
00:01:09,670 --> 00:01:08,000
really excited for the guests we're

18
00:01:11,770 --> 00:01:09,680
gonna have on for this episode but we

19
00:01:14,590 --> 00:01:11,780
have a few our housekeeping things here

20
00:01:16,899 --> 00:01:14,600
to do first first off as many of our

21
00:01:19,480 --> 00:01:16,909
longtime viewers know we have our

22
00:01:21,250 --> 00:01:19,490
monthly background quiz where every

23
00:01:23,710 --> 00:01:21,260
month there is a really awesome picture

24
00:01:25,360 --> 00:01:23,720
behind me and it's your job before the

25
00:01:27,969 --> 00:01:25,370
next episode within one day before the

26
00:01:30,940 --> 00:01:27,979
next episode we announced on Twitter on

27
00:01:33,340 --> 00:01:30,950
second net that second or the background

28
00:01:37,380 --> 00:01:33,350
quiz so you can guess what this image is

29
00:01:40,330 --> 00:01:37,390
the we're always gets a few of our NASA

30
00:01:42,430 --> 00:01:40,340
Astrobiology graphic histories created

31
00:01:44,890 --> 00:01:42,440
by the artist and scientist Aaron

32
00:01:48,130 --> 00:01:44,900
Gronstal who was a past guest on our

33
00:01:50,350 --> 00:01:48,140
show you also get some NASA stickers so

34
00:01:52,900 --> 00:01:50,360
this past month the image is coming up

35
00:01:56,110 --> 00:01:52,910
now this picture is an image that was

36
00:01:58,600 --> 00:01:56,120
taken from CERN located in Switzerland

37
00:02:01,390 --> 00:01:58,610
between Switzerland and France at the

38
00:02:03,100 --> 00:02:01,400

Large Hadron Collider now I have some

39
00:02:05,050 --> 00:02:03,110
folks are wondering how what does the

40
00:02:08,169 --> 00:02:05,060
Large Hadron Collider or to CERN had to

41
00:02:10,180 --> 00:02:08,179
do with astrobiology but remember

42
00:02:12,970 --> 00:02:10,190
there's more to astrobiology than just

43
00:02:16,089 --> 00:02:12,980
biology just studying life on Earth or

44
00:02:17,680 --> 00:02:16,099
listening for messages from et there's a

45
00:02:20,380 --> 00:02:17,690
lot more including understanding

46
00:02:22,360 --> 00:02:20,390
consciousness what is the self what is

47
00:02:24,820 --> 00:02:22,370
the universe what is matter where do we

48
00:02:27,110 --> 00:02:24,830
come from and those questions they touch

49
00:02:30,509 --> 00:02:27,120
in all realms of scientific others

50
00:02:31,619 --> 00:02:30,519
included in cosmology and as I'll tell

51
00:02:35,610 --> 00:02:31,629
you here in a minute that background

52
00:02:36,869 --> 00:02:35,620
also have to do with this essence right

53
00:02:40,110 --> 00:02:36,879
now let's just say that our winner for

54
00:02:42,750 --> 00:02:40,120
this past month was Denise at AKB LT

55
00:02:44,729 --> 00:02:42,760
underscore d NZ on Twitter Denise will

56
00:02:46,649 --> 00:02:44,739
win our prizes so congratulations for

57
00:02:49,920 --> 00:02:46,659
guessing the correct background there

58
00:02:51,690 --> 00:02:49,930
with a Large Hadron Collider also as you

59
00:02:54,599 --> 00:02:51,700
know every month we announced an

60
00:02:57,000 --> 00:02:54,609
ambassador of the month some person or

61
00:02:59,640 --> 00:02:57,010
group who through Twitter and Instagram

62
00:03:02,580 --> 00:02:59,650
Facebook LinkedIn and reddit that all

63
00:03:04,559 --> 00:03:02,590

the various social media channels is out

64
00:03:06,780 --> 00:03:04,569
there promoting our show talking to

65
00:03:08,909 --> 00:03:06,790
their friends sharing information about

66
00:03:11,819 --> 00:03:08,919
our guests asking questions before the

67
00:03:13,679 --> 00:03:11,829
show and this month our ambassador of

68
00:03:16,740 --> 00:03:13,689
the month is a group that I'm actually a

69
00:03:18,240 --> 00:03:16,750
part of called the explainable the

70
00:03:20,159 --> 00:03:18,250
explainable z' is a science

71
00:03:22,649 --> 00:03:20,169
communication and tech communication

72
00:03:25,379 --> 00:03:22,659
startup group that was actually founded

73
00:03:27,059 --> 00:03:25,389
by this month's guests and I'm proud now

74
00:03:29,729 --> 00:03:27,069
to be an associate of the explainable

75
00:03:32,129 --> 00:03:29,739
trying to find the better richard ways

76
00:03:34,409 --> 00:03:32,139
to communicate our science communicate

77
00:03:36,449 --> 00:03:34,419
our knowledge with the larger world and

78
00:03:38,330 --> 00:03:36,459
to teach other scientists and other

79
00:03:41,399 --> 00:03:38,340
researchers how to communicate as well

80
00:03:44,250 --> 00:03:41,409
so with that it's a good segue into this

81
00:03:45,719 --> 00:03:44,260
month's guests so just like the Large

82
00:03:46,289 --> 00:03:45,729
Hadron Collider is located in

83
00:03:48,509 --> 00:03:46,299
Switzerland

84
00:03:51,569 --> 00:03:48,519
this month's guest is coming to us from

85
00:03:53,849 --> 00:03:51,579
Switzerland from Bern his name is Daniel

86
00:03:55,500 --> 00:03:53,859
Angerer Heusen he's a longtime friend of

87
00:03:57,539 --> 00:03:55,510
mine and like I said a founder they

88
00:03:59,849 --> 00:03:57,549

splatter balls he's been a mentor of the

89
00:04:01,409 --> 00:03:59,859
NASA frontier development lab and I was

90
00:04:02,789 --> 00:04:01,419
gonna find out he has a lot of really

91
00:04:05,129 --> 00:04:02,799
awesome background in astrobiology

92
00:04:07,319 --> 00:04:05,139
except Assad so Daniel thanks for

93
00:04:09,750 --> 00:04:07,329
joining us for asking astrobiologists hi

94
00:04:12,629 --> 00:04:09,760
everyone and good evening from space

95
00:04:13,860 --> 00:04:12,639
today yeah so it's kind of always fun

96
00:04:15,059 --> 00:04:13,870
having you know a little bit of time

97
00:04:16,949 --> 00:04:15,069
change you know since we're talking

98
00:04:19,439 --> 00:04:16,959
across the planet it's so cool that we

99
00:04:20,800 --> 00:04:19,449
can do that you know I have known each

100
00:04:23,110 --> 00:04:20,810
other for some time

101
00:04:23,920 --> 00:04:23,120
through science communication and I

102
00:04:25,570 --> 00:04:23,930
definitely want to talk about

103
00:04:28,870 --> 00:04:25,580
explainable as without communicating

104
00:04:31,120 --> 00:04:28,880
science but this is astrobiologist and

105
00:04:32,680 --> 00:04:31,130
so to prepare all of our audience for

106
00:04:34,810 --> 00:04:32,690
asking questions of you about your

107
00:04:36,730 --> 00:04:34,820
research i wonder if you can start off

108
00:04:39,160 --> 00:04:36,740
by giving us some of your background and

109
00:04:42,990 --> 00:04:39,170
maybe even tell us what inspired you to

110
00:04:46,390 --> 00:04:43,000
get involved in astrobiology yes so I'm

111
00:04:49,150 --> 00:04:46,400
by training an astrophysicist so I did

112
00:04:53,680 --> 00:04:49,160
my undergrad in physics in Germany back

113
00:04:57,220 --> 00:04:53,690

in Cologne Germany and when I've you

114
00:04:59,470 --> 00:04:57,230
know finished my studies I had to choose

115
00:05:01,720 --> 00:04:59,480
a special topic so we either do

116
00:05:03,730 --> 00:05:01,730
astrophysics or nuclear physics or

117
00:05:06,070 --> 00:05:03,740
thematical physics and I figured that if

118
00:05:07,870 --> 00:05:06,080
I do see Medical Physics I see standing

119
00:05:10,120 --> 00:05:07,880
and a blackboard for the rest of my life

120
00:05:12,970 --> 00:05:10,130
if I do look like physics I'd probably

121
00:05:14,950 --> 00:05:12,980
be sitting in the basement of a reactor

122
00:05:17,260 --> 00:05:14,960
for the rest of my life but as an

123
00:05:19,450 --> 00:05:17,270
astrophysicist you might at least once

124
00:05:21,700 --> 00:05:19,460
in awhile you know go to Chile or go to

125
00:05:24,040 --> 00:05:21,710
Hawaii to see the great telescopes and

126
00:05:27,100 --> 00:05:24,050
observe with them so so actually one of

127
00:05:28,980 --> 00:05:27,110
the reasons to then specialize in

128
00:05:31,780 --> 00:05:28,990
hospital physics rather than another

129
00:05:34,750 --> 00:05:31,790
sort of physics was actually to travel

130
00:05:37,150 --> 00:05:34,760
and then my topic so exoplanets looking

131
00:05:40,420 --> 00:05:37,160
for stars extrasolar planets looking for

132
00:05:42,159 --> 00:05:40,430
planets around other stars was actually

133
00:05:43,780 --> 00:05:42,169
chosen because I lost the bet so maybe

134
00:05:46,420 --> 00:05:43,790
we can you know get to the star little

135
00:05:49,030 --> 00:05:46,430
bit later but then I chose exoplanets at

136
00:05:51,340 --> 00:05:49,040
my topic as my topic and that was

137
00:05:52,900 --> 00:05:51,350
immediate connection to us to biology so

138
00:05:54,780 --> 00:05:52,910

as you probably effort in the show a

139
00:05:57,070 --> 00:05:54,790
couple of times they're this big two

140
00:05:57,940 --> 00:05:57,080
approaches is looking for life in our

141
00:06:00,340 --> 00:05:57,950
solar system

142
00:06:02,770 --> 00:06:00,350
you know this probes and robots we might

143
00:06:04,930 --> 00:06:02,780
even be able to get on these bodies in

144
00:06:07,180 --> 00:06:04,940
our solar system and the other you're

145
00:06:09,700 --> 00:06:07,190
somewhat competing way to find life in

146
00:06:11,530 --> 00:06:09,710
space is on planets around other systems

147
00:06:14,020 --> 00:06:11,540
and that's where my backbone comes from

148
00:06:16,719 --> 00:06:14,030
and I really love to be involved in the

149
00:06:19,020 --> 00:06:16,729
astrobiology community because it's much

150
00:06:22,380 --> 00:06:19,030
cooler community than the astronomers

151
00:06:25,140 --> 00:06:22,390
say that on the show so yes that's how I

152
00:06:26,250 --> 00:06:25,150
got into it that's great and we're

153
00:06:30,900 --> 00:06:26,260
totally happy to have you call

154
00:06:33,720 --> 00:06:30,910
astrobiologists the coolest I do wanna

155
00:06:35,190 --> 00:06:33,730
hear about that but before we get there

156
00:06:36,990 --> 00:06:35,200
I wonder if you could just tell the

157
00:06:38,670 --> 00:06:37,000
audience what do you do in your day to

158
00:06:41,310 --> 00:06:38,680
day research then for trying to

159
00:06:42,810 --> 00:06:41,320
understand exoplanets and how that

160
00:06:47,390 --> 00:06:42,820
really comes into into the realm of

161
00:06:51,270 --> 00:06:47,400
astrobiology so in the past I was

162
00:06:52,920 --> 00:06:51,280
involved a lot in observing so in even

163
00:06:55,050 --> 00:06:52,930

anger great I already started to do

164
00:06:56,610 --> 00:06:55,060
excellent observation some of you might

165
00:06:58,590 --> 00:06:56,620
have heard about transit observations

166
00:07:00,600 --> 00:06:58,600
the observation that kept us and the

167
00:07:03,060 --> 00:07:00,610
Spitzer Space Telescope to us from the

168
00:07:05,730 --> 00:07:03,070
ground so I was via business as a young

169
00:07:08,280 --> 00:07:05,740
student trying to do these amazing

170
00:07:10,410 --> 00:07:08,290
observations we got from space also from

171
00:07:12,720 --> 00:07:10,420
the ground so I was quite lucky to move

172
00:07:15,800 --> 00:07:12,730
in time at the very large telescope in

173
00:07:18,450 --> 00:07:15,810
Chile and the Keck telescope in Hawaii

174
00:07:20,940 --> 00:07:18,460
to try these observations also formed

175
00:07:24,180 --> 00:07:20,950
from ground-based telescopes and it

176
00:07:25,950 --> 00:07:24,190
didn't work out so which the lesson that

177
00:07:28,740 --> 00:07:25,960
we learned was that that kind of stuff

178
00:07:30,630 --> 00:07:28,750
doesn't really work from the ground so

179
00:07:33,180 --> 00:07:30,640
then the next step was to go on the

180
00:07:35,850 --> 00:07:33,190
plane and we might talk about so figure

181
00:07:38,040 --> 00:07:35,860
later also how you can do observations

182
00:07:40,620 --> 00:07:38,050
actually from a plane which is somewhere

183
00:07:42,900 --> 00:07:40,630
between the ground and space so that was

184
00:07:44,610 --> 00:07:42,910
mostly the observation electrons so

185
00:07:46,470 --> 00:07:44,620
trying to find new methods trying to

186
00:07:48,090 --> 00:07:46,480
find new telescopes no instruments that

187
00:07:51,360 --> 00:07:48,100
one could use to observe these

188
00:07:53,880 --> 00:07:51,370

exoplanets and then I got more and more

189
00:07:56,130 --> 00:07:53,890
involved in astrobiology also looking at

190
00:08:00,000 --> 00:07:56,140
what these spectral signatures these

191
00:08:01,830 --> 00:08:00,010
so-called biomarkers that be one day

192
00:08:03,360 --> 00:08:01,840
want to observe in these expressed and

193
00:08:05,160 --> 00:08:03,370
also looking at what kind of missions

194
00:08:07,140 --> 00:08:05,170
what kind of satellites maybe even a

195
00:08:09,900 --> 00:08:07,150
telescope on a balloon on the plane we

196
00:08:12,030 --> 00:08:09,910
could build to observe these exoplanets

197
00:08:15,150 --> 00:08:12,040
yeah so this is my main background

198
00:08:17,130 --> 00:08:15,160
thinking about new methods and new

199
00:08:19,320 --> 00:08:17,140
instruments new missions how we can

200
00:08:22,650 --> 00:08:19,330
observe these biomarkers hopefully

201
00:08:24,090 --> 00:08:22,660
within my lifetime some awesome before

202
00:08:25,350 --> 00:08:24,100
we talk about Sofia I definitely talk

203
00:08:27,570 --> 00:08:25,360
about therapy and what it's like

204
00:08:29,969 --> 00:08:27,580
flying on the airplane with a giant door

205
00:08:32,759 --> 00:08:29,979
hanging opens a telescope just before we

206
00:08:34,769 --> 00:08:32,769
get to that I myself a very large array

207
00:08:37,230 --> 00:08:34,779
in Socorro New Mexico and I've traveled

208
00:08:38,730 --> 00:08:37,240
a bit as I seen Mauna Kea as a tourist

209
00:08:41,909 --> 00:08:38,740
you know I had a chance not to use the

210
00:08:43,500 --> 00:08:41,919
telescopes but the see Keck I wonder if

211
00:08:44,970 --> 00:08:43,510
you can explain and for the audience

212
00:08:50,120 --> 00:08:44,980
what it's like for you as a scientist

213
00:08:56,160 --> 00:08:54,269

observing installations on the planet so

214
00:08:59,069 --> 00:08:56,170
for me it was first of all a very

215
00:09:00,720 --> 00:08:59,079
personal experience so that was as I

216
00:09:02,670 --> 00:09:00,730
mentioned really early I think I just

217
00:09:05,880 --> 00:09:02,680
finished my undergrad or finished up my

218
00:09:07,620 --> 00:09:05,890
mind diploma thesis in back in Germany

219
00:09:09,180 --> 00:09:07,630
and it was really the first time I used

220
00:09:12,120 --> 00:09:09,190
the telescope is kind of crazy my first

221
00:09:15,180 --> 00:09:12,130
telescope was a 10 meter 10 meter K

222
00:09:16,620 --> 00:09:15,190
telescope so and then you drive up the

223
00:09:18,840 --> 00:09:16,630
mountain it's really surreal because

224
00:09:22,199 --> 00:09:18,850
people who've been to big R in Hawaii

225
00:09:24,990 --> 00:09:22,209
maybe know that there's like all the

226
00:09:28,410 --> 00:09:25,000
climate zones of the earth somewhere on

227
00:09:30,660 --> 00:09:28,420
it might be a little bit exaggerated but

228
00:09:33,360 --> 00:09:30,670
there's really you know diversity of you

229
00:09:34,949 --> 00:09:33,370
know desert and and and you know

230
00:09:37,199 --> 00:09:34,959
completely rainforest and then you drive

231
00:09:39,240 --> 00:09:37,209
up the mountain and then you eventually

232
00:09:41,730 --> 00:09:39,250
are in the snow and then standing on top

233
00:09:44,130 --> 00:09:41,740
of Mauna Kea around you just ocean

234
00:09:45,389 --> 00:09:44,140
you're above the clouds it was really

235
00:09:47,939 --> 00:09:45,399
like a moment for me where I realized

236
00:09:50,009 --> 00:09:47,949
okay this is why I you know spent like

237
00:09:51,870 --> 00:09:50,019
the last three years in the library you

238
00:09:53,400 --> 00:09:51,880

know learning for my exam so this was

239
00:09:56,819 --> 00:09:53,410
really like a rewarding moment for me

240
00:09:58,530 --> 00:09:56,829
and it's also very holy place so maybe

241
00:10:01,620 --> 00:09:58,540
in the rest of the show he might also

242
00:10:04,710 --> 00:10:01,630
come to this you know big discussion

243
00:10:06,780 --> 00:10:04,720
nowadays you know is it right place to

244
00:10:09,889 --> 00:10:06,790
put a telescope so I was also very Vale

245
00:10:13,019 --> 00:10:09,899
that that it was a holy place for the

246
00:10:14,400 --> 00:10:13,029
First Nations of Hawaii so yeah it was a

247
00:10:16,139 --> 00:10:14,410
very expiring

248
00:10:18,900 --> 00:10:16,149
moment and it expired a place for me

249
00:10:20,340 --> 00:10:18,910
still is that's wonderful and you're

250
00:10:22,410 --> 00:10:20,350
welcome to talk about

251
00:10:24,690 --> 00:10:22,420
that's going on right now with with TMT

252
00:10:26,760 --> 00:10:24,700
if you'd like to explain to the audience

253
00:10:28,680 --> 00:10:26,770
what's happening I'm sure some members

254
00:10:29,730 --> 00:10:28,690
of the audience do know what's going on

255
00:10:31,230 --> 00:10:29,740
right now if you'd like to give us a

256
00:10:35,070 --> 00:10:31,240
quick background I'm not sure they'd

257
00:10:38,520 --> 00:10:35,080
love to hear you so the short story is

258
00:10:41,010 --> 00:10:38,530
that the Mauna Kea is one of the most

259
00:10:43,800 --> 00:10:41,020
holy places for the First Nations of

260
00:10:46,110 --> 00:10:43,810
Hawaii and there's a big discussion

261
00:10:48,630 --> 00:10:46,120
about building the next big telescope

262
00:10:53,130 --> 00:10:48,640
they are the thirty meter telescope and

263
00:10:56,340 --> 00:10:53,140

there's a protest where locals were

264
00:11:01,500 --> 00:10:56,350
integrating people to go up there and do

265
00:11:03,600 --> 00:11:01,510
the observations and in this discussion

266
00:11:06,030 --> 00:11:03,610
I mean it was just look up on hashtag

267
00:11:08,220 --> 00:11:06,040
TMT on Twitter to get a picture of it

268
00:11:10,580 --> 00:11:08,230
there's very extreme positions there

269
00:11:14,310 --> 00:11:10,590
some you know moderate positions and

270
00:11:17,580 --> 00:11:14,320
it's it's a long story and I think it's

271
00:11:19,470 --> 00:11:17,590
also something that we need the social

272
00:11:21,930 --> 00:11:19,480
sciences forms I think this is also one

273
00:11:24,540 --> 00:11:21,940
of the questions that I saw on on

274
00:11:27,330 --> 00:11:24,550
Twitter you know where we're making

275
00:11:30,480 --> 00:11:27,340
social sciences a bus topology astronomy

276
00:11:34,140 --> 00:11:30,490
I think this is exactly one of these one

277
00:11:35,640 --> 00:11:34,150
of these fields one of these discussions

278
00:11:37,590 --> 00:11:35,650
where we really need input from the

279
00:11:39,150 --> 00:11:37,600
social sciences how to communicate with

280
00:11:41,970 --> 00:11:39,160
better with each other to communicate

281
00:11:46,380 --> 00:11:41,980
with the communities to solve these

282
00:11:47,610 --> 00:11:46,390
problems absolutely agree with that and

283
00:11:48,870 --> 00:11:47,620
I know the exact question you're

284
00:11:51,540 --> 00:11:48,880
thinking of them and we'll get to that

285
00:11:53,910 --> 00:11:51,550
question then that comes from from the

286
00:11:57,210 --> 00:11:53,920
president/ceo of the astro sociology

287
00:11:58,380 --> 00:11:57,220
sociology Research Institute and is

288
00:12:00,450 --> 00:11:58,390

important to consider the social

289
00:12:03,870 --> 00:12:00,460
sciences how they impact our research

290
00:12:05,730 --> 00:12:03,880
our observing so let's go to Vietnam for

291
00:12:08,340 --> 00:12:05,740
a little bit I'm sure many of our

292
00:12:10,340 --> 00:12:08,350
audience of her Sofia this giant

293
00:12:11,810 --> 00:12:10,350
modified 747 or the

294
00:12:14,030 --> 00:12:11,820
telescope was taking out a giant door

295
00:12:15,860 --> 00:12:14,040
but you've actually flown in several

296
00:12:17,660 --> 00:12:15,870
times on Sofia have used that telescope

297
00:12:19,190 --> 00:12:17,670
for observation for doing your research

298
00:12:21,590 --> 00:12:19,200
I wondered you can speak to the

299
00:12:23,870 --> 00:12:21,600
experience and to all of the research

300
00:12:27,860 --> 00:12:23,880
going on using this giant telescope on a

301
00:12:29,870 --> 00:12:27,870
jet yes so Sofia stands for I mean we

302
00:12:32,270 --> 00:12:29,880
love our acronyms so Sofia stands for

303
00:12:36,230 --> 00:12:32,280
stratospheric Observatory for infrared

304
00:12:38,930 --> 00:12:36,240
astronomy so pretty smart room but it's

305
00:12:42,260 --> 00:12:38,940
even better it also works in German so

306
00:12:45,350 --> 00:12:42,270
if stratospheric observatory on few info

307
00:12:47,480 --> 00:12:45,360
as Ptolemy so and this is because it's a

308
00:12:49,700 --> 00:12:47,490
collaboration of NASA and the German

309
00:12:52,010 --> 00:12:49,710
Space Agency so it's an 80/20 deal

310
00:12:54,950 --> 00:12:52,020
between these two space space agencies

311
00:12:58,310 --> 00:12:54,960
that bridge that telescope about 10-15

312
00:13:01,610 --> 00:12:58,320
years ago it's as the name says an

313
00:13:04,580 --> 00:13:01,620

infrared telescope so the main reason we

314
00:13:06,260 --> 00:13:04,590
need to get high as I'd call it in some

315
00:13:08,300 --> 00:13:06,270
of my outreach talks as astronomers

316
00:13:12,790 --> 00:13:08,310
having build telescopes on mountains or

317
00:13:15,020 --> 00:13:12,800
even telescopes on on satellites is that

318
00:13:16,600 --> 00:13:15,030
some of the like you want to observe

319
00:13:21,400 --> 00:13:16,610
doesn't really penetrate the atmosphere

320
00:13:23,630 --> 00:13:21,410
right to the ground so the only really

321
00:13:25,130 --> 00:13:23,640
part of the spectrum that we can see

322
00:13:26,750 --> 00:13:25,140
from the ground is the optical eyes in

323
00:13:28,340 --> 00:13:26,760
the radio this is where we have optical

324
00:13:30,800 --> 00:13:28,350
telescopes and when you telescope this

325
00:13:32,960 --> 00:13:30,810
is by our eyes and our phones work in

326
00:13:35,300 --> 00:13:32,970
the radio and the optical everything

327
00:13:38,060 --> 00:13:35,310
else gets absorbed somewhere in the

328
00:13:41,090 --> 00:13:38,070
atmospheres most of you might know the

329
00:13:44,510 --> 00:13:41,100
UV layer the ozone layer is absorbing

330
00:13:46,220 --> 00:13:44,520
the UV light so if I'm a UV astronomer I

331
00:13:49,610 --> 00:13:46,230
really have to build a satellite that

332
00:13:51,560 --> 00:13:49,620
goes above the ozone layer and there are

333
00:13:55,040 --> 00:13:51,570
certain things in the infrared

334
00:13:57,230 --> 00:13:55,050
who penetrate the atmosphere about the

335
00:13:59,510 --> 00:13:57,240
height of the stratosphere so if you go

336
00:14:01,610 --> 00:13:59,520
above most of the water which is below

337
00:14:03,290 --> 00:14:01,620
the stratosphere below the tropopause if

338
00:14:04,970 --> 00:14:03,300

you fly high enough you know slightly

339
00:14:07,940 --> 00:14:04,980
higher than Commercial Airplanes

340
00:14:10,790 --> 00:14:07,950
you're basically in an environment which

341
00:14:13,190 --> 00:14:10,800
is similar to space in terms of you know

342
00:14:14,530 --> 00:14:13,200
the infrared radiation that you get and

343
00:14:16,330 --> 00:14:14,540
this is

344
00:14:17,770 --> 00:14:16,340
the reason my Sofia was billed so you

345
00:14:20,950 --> 00:14:17,780
better tell us don't wanna play and go

346
00:14:22,600 --> 00:14:20,960
as far up in the atmosphere to the place

347
00:14:24,220 --> 00:14:22,610
where you can see the infrared light and

348
00:14:31,300 --> 00:14:24,230
then basically we have a Space Telescope

349
00:14:33,850 --> 00:14:31,310
that comes home every morning right

350
00:14:37,420 --> 00:14:33,860
because it costs a lot of money to put

351
00:14:38,800 --> 00:14:37,430
telescopes into space and then the idea

352
00:14:40,540 --> 00:14:38,810
of service in the I mean the Hubble was

353
00:14:42,760 --> 00:14:40,550
serviceable we serviced to have a level

354
00:14:45,160 --> 00:14:42,770
four times but newer telescopes like the

355
00:14:47,230 --> 00:14:45,170
James Webb Space Telescope they won't be

356
00:14:54,880 --> 00:14:47,240
serviceable and so we built these

357
00:14:56,710 --> 00:14:54,890
multimillion-dollar happy medium in

358
00:14:59,320 --> 00:14:56,720
between we get to fly high above all

359
00:15:01,120 --> 00:14:59,330
that water not spending multi billions

360
00:15:02,440 --> 00:15:01,130
of dollars on so they can't face it a

361
00:15:04,960 --> 00:15:02,450
grace

362
00:15:07,300 --> 00:15:04,970
I mean Sophia wasn't like super cheap so

363
00:15:09,820 --> 00:15:07,310

I think if you break it down and costs

364
00:15:11,920 --> 00:15:09,830
per observation hours it's in the same

365
00:15:13,930 --> 00:15:11,930
ballpark as the great telescope as

366
00:15:16,120 --> 00:15:13,940
Harper or James Webb but it's a really

367
00:15:18,840 --> 00:15:16,130
unique wavelength region so it covers

368
00:15:21,070 --> 00:15:18,850
really the mid infrared and then and

369
00:15:22,870 --> 00:15:21,080
parts of the radio spectrum that you

370
00:15:24,130 --> 00:15:22,880
can't really get from any other platform

371
00:15:27,490 --> 00:15:24,140
so that's that's why it's really unique

372
00:15:30,190 --> 00:15:27,500
and as you said it's really it's really

373
00:15:31,810 --> 00:15:30,200
about the the the servicing right so so

374
00:15:34,030 --> 00:15:31,820
you mentioned these super dangerous and

375
00:15:36,610 --> 00:15:34,040
expensive missions for example to

376
00:15:39,840 --> 00:15:36,620
replace instruments in the Space

377
00:15:42,150 --> 00:15:39,850
Telescope and one has to keep in mind if

378
00:15:45,460 --> 00:15:42,160
telescopes like James where are flying

379
00:15:48,550 --> 00:15:45,470
the instruments onboard are 10 15 year

380
00:15:50,440 --> 00:15:48,560
or technology right so then when James

381
00:15:53,140 --> 00:15:50,450
Webb launches in two years fingers

382
00:15:55,060 --> 00:15:53,150
crossed or in a year it will be a bit of

383
00:15:57,640 --> 00:15:55,070
cameras in space that are technology

384
00:15:59,620 --> 00:15:57,650
from a decade ago whereas Sofia has a

385
00:16:02,320 --> 00:15:59,630
call for new instruments every other

386
00:16:03,790 --> 00:16:02,330
year maybe two years so that you can

387
00:16:06,040 --> 00:16:03,800
really put your newest camera your

388
00:16:08,320 --> 00:16:06,050

coolest newest infrared detector that

389
00:16:09,460 --> 00:16:08,330
just kind of the leg on Sofia and bring

390
00:16:12,160 --> 00:16:09,470
it immediately in a space-based

391
00:16:15,520 --> 00:16:12,170
environment so this is really the main

392
00:16:17,140 --> 00:16:15,530
advantage of Sofia to have this super

393
00:16:20,460 --> 00:16:17,150
creature all of instruments in that

394
00:16:23,639 --> 00:16:21,900
I wasn't aware that actually cost about

395
00:16:25,410 --> 00:16:23,649
the same for about surfing but yeah I'm

396
00:16:26,460 --> 00:16:25,420
each district services servicing it and

397
00:16:28,050 --> 00:16:26,470
adding new instruments is really

398
00:16:29,550 --> 00:16:28,060
incredible and I'm glad you pointed out

399
00:16:32,100 --> 00:16:29,560
to everyone you know sometimes we forget

400
00:16:34,740 --> 00:16:32,110
that getting things into space is not

401
00:16:36,480 --> 00:16:34,750
easy space is hard and to get things

402
00:16:37,889 --> 00:16:36,490
that are flight worthy it can take time

403
00:16:40,319 --> 00:16:37,899
and so these telescopes when they go up

404
00:16:42,900 --> 00:16:40,329
they're using old Hardware old software

405
00:16:45,300 --> 00:16:42,910
and the Galileo spacecraft when it went

406
00:16:47,040 --> 00:16:45,310
to the Jovian system had very old

407
00:16:49,019 --> 00:16:47,050
cameras on it they had so much extra

408
00:16:50,460 --> 00:16:49,029
film just for this cameras because they

409
00:16:52,579 --> 00:16:50,470
weren't used to some more digital

410
00:16:54,720 --> 00:16:52,589
cameras at that point on spacecraft yet

411
00:16:56,790 --> 00:16:54,730
before we go into the next topic I'd

412
00:16:58,410 --> 00:16:56,800
love to talk about with you Daniel I do

413
00:17:00,119 --> 00:16:58,420

want to remind our audience that you can

414
00:17:03,179 --> 00:17:00,129
always ask questions for Daniel right

415
00:17:05,549 --> 00:17:03,189
now on second net org in the chat in the

416
00:17:08,189 --> 00:17:05,559
main room or on the NASA Astrobiology

417
00:17:09,510 --> 00:17:08,199
Facebook page in the chat those

418
00:17:11,399 --> 00:17:09,520
questions will go to the queue for

419
00:17:13,649 --> 00:17:11,409
meetings and to then ask Daniel during

420
00:17:16,770 --> 00:17:13,659
the show also if you are on Twitter

421
00:17:18,210 --> 00:17:16,780
using hashtag ask Astro bio we'll catch

422
00:17:20,579 --> 00:17:18,220
those as well we can add those to the

423
00:17:23,189 --> 00:17:20,589
queue to ask your questions about

424
00:17:25,789 --> 00:17:23,199
everything Daniels done in exoplanets

425
00:17:28,289 --> 00:17:25,799
and using observatories and using Sofia

426
00:17:31,140 --> 00:17:28,299
and and some of these next topics we're

427
00:17:33,090 --> 00:17:31,150
going to discuss so for instance Daniel

428
00:17:35,399 --> 00:17:33,100
I'd love to talk about the NASA frontier

429
00:17:36,870 --> 00:17:35,409
development lab how you got involved

430
00:17:38,510 --> 00:17:36,880
with that in the first place I mean

431
00:17:40,529 --> 00:17:38,520
maybe just tell our audience what it is

432
00:17:45,210 --> 00:17:40,539
and then what you've been doing these

433
00:17:47,610 --> 00:17:45,220
past few years with them yes so NASA FTL

434
00:17:51,270 --> 00:17:47,620
in short of frontier development lab is

435
00:17:55,260 --> 00:17:51,280
a artificial intelligence machine

436
00:17:57,450 --> 00:17:55,270
learning incubator where NASA defines

437
00:18:00,330 --> 00:17:57,460
certain challenges within the portfolio

438
00:18:02,490 --> 00:18:00,340

where they think machine learning could

439
00:18:04,169 --> 00:18:02,500
help to deal with these huge amounts of

440
00:18:07,409 --> 00:18:04,179
data we mentioned all these planetary

441
00:18:11,190 --> 00:18:07,419
data exponent spectra whatever big data

442
00:18:13,020 --> 00:18:11,200
sets they had a lattice data and then

443
00:18:16,200 --> 00:18:13,030
works together with partners from the

444
00:18:19,260 --> 00:18:16,210
industry like Google Nvidia IBM Intel

445
00:18:21,240 --> 00:18:19,270
big players in the industry define this

446
00:18:23,850 --> 00:18:21,250
challenge come together for eight weeks

447
00:18:24,680 --> 00:18:23,860
the setting in situ at NASA Ames and

448
00:18:26,389 --> 00:18:24,690
then

449
00:18:28,789 --> 00:18:26,399
these challenges and the unique thing is

450
00:18:31,789 --> 00:18:28,799
like not just this eight weeks and this

451
00:18:34,219 --> 00:18:31,799
is kind of like sprint or hackathon in

452
00:18:37,339 --> 00:18:34,229
style it's also that usually the teams

453
00:18:38,979 --> 00:18:37,349
for each challenge are half disciplined

454
00:18:42,259 --> 00:18:38,989
scientists really people who know

455
00:18:45,259 --> 00:18:42,269
exoplanets or as topology or he do

456
00:18:48,109 --> 00:18:45,269
physics or also astronaut health was a

457
00:18:49,580 --> 00:18:48,119
topic lunar medic was a topic so half of

458
00:18:53,570 --> 00:18:49,590
them are domain experts and the other

459
00:18:55,940 --> 00:18:53,580
half are computer scientists artificial

460
00:18:58,039 --> 00:18:55,950
intelligent experts and then they lock

461
00:18:59,599 --> 00:18:58,049
them up for eight weeks basically at the

462
00:19:01,070 --> 00:18:59,609
SETI Institute and don't let them out

463
00:19:04,519 --> 00:19:01,080

before they solve these big challenges

464
00:19:08,029 --> 00:19:04,529
so this is roughly how it works and it's

465
00:19:09,649 --> 00:19:08,039
really a unique quick turnaround also in

466
00:19:11,629 --> 00:19:09,659
this you know Silicon Valley mindset

467
00:19:13,549 --> 00:19:11,639
have a lot of prototypes fail quickly

468
00:19:16,940 --> 00:19:13,559
and then just go with that one idea that

469
00:19:18,440 --> 00:19:16,950
you think can we can really get this

470
00:19:20,389 --> 00:19:18,450
moonshot done that some of these

471
00:19:22,609 --> 00:19:20,399
challenges are and it's an amazing

472
00:19:25,729 --> 00:19:22,619
experience just because these

473
00:19:27,499 --> 00:19:25,739
interdisciplinary teams are just amazing

474
00:19:29,779 --> 00:19:27,509
they invite like these smartest people

475
00:19:31,669 --> 00:19:29,789
from all over the world from both domain

476
00:19:33,019 --> 00:19:31,679
signs and computer science and just to

477
00:19:35,960 --> 00:19:33,029
work with these folks for eight weeks

478
00:19:38,419 --> 00:19:35,970
it's just I mean the privilege really to

479
00:19:41,899 --> 00:19:38,429
have these amazing people around you for

480
00:19:45,769 --> 00:19:41,909
eight weeks and yeah and it's a really

481
00:19:47,749 --> 00:19:45,779
noble way to do these kind of projects I

482
00:19:49,639 --> 00:19:47,759
mean it's the third or fourth year so

483
00:19:51,139 --> 00:19:49,649
they're obviously still a couple of

484
00:19:53,269 --> 00:19:51,149
things that we have to figure out how to

485
00:19:55,450 --> 00:19:53,279
do better but it's really an amazing

486
00:19:57,529 --> 00:19:55,460
project program and I can we just

487
00:20:01,310 --> 00:19:57,539
recommend people especially if you are a

488
00:20:04,729 --> 00:20:01,320

grad student or a postdoc in one of our

489
00:20:07,759 --> 00:20:04,739
challenge areas or in computer science

490
00:20:11,049 --> 00:20:07,769
so really check check the webpage of

491
00:20:12,950 --> 00:20:11,059
NASA STL there right now basically

492
00:20:15,289 --> 00:20:12,960
getting abdicating put in applications

493
00:20:18,680 --> 00:20:15,299
for for the next spin this summer yeah

494
00:20:21,499 --> 00:20:18,690
and you've been a science mentor for FDR

495
00:20:24,229 --> 00:20:21,509
helping these teams to advance their

496
00:20:26,030 --> 00:20:24,239
projects I wonder how you feel about the

497
00:20:28,550 --> 00:20:26,040
future of using machine learning

498
00:20:31,010 --> 00:20:28,560
artificial intelligence to solve some of

499
00:20:32,750 --> 00:20:31,020
our larger problems as a planet when we

500
00:20:34,190 --> 00:20:32,760
as astrobiologists obviously we have our

501
00:20:36,290 --> 00:20:34,200
own interest in trying to understand

502
00:20:37,760 --> 00:20:36,300
life and looking for signs of life on

503
00:20:40,340 --> 00:20:37,770
exoplanets maybe even looking for

504
00:20:41,960 --> 00:20:40,350
messages from access to your life but we

505
00:20:43,160 --> 00:20:41,970
also have many issues in our world like

506
00:20:46,250 --> 00:20:43,170
global climate change ocean

507
00:20:48,430 --> 00:20:46,260
acidification deforestation the rises in

508
00:20:51,200 --> 00:20:48,440
population causing a lot of urban issues

509
00:20:53,660 --> 00:20:51,210
refugee crisis I wonder if you could

510
00:20:55,010 --> 00:20:53,670
speak to your own thoughts on what

511
00:20:56,210 --> 00:20:55,020
machine learning and our artificial

512
00:20:59,810 --> 00:20:56,220
intelligence will be doing in the future

513
00:21:01,250 --> 00:20:59,820

to help us solve all those problems so

514
00:21:03,560 --> 00:21:01,260
first of all some of the FTAIA

515
00:21:06,070 --> 00:21:03,570
challenges actually were in that in

516
00:21:09,410 --> 00:21:06,080
these areas so we had a flood prediction

517
00:21:12,620 --> 00:21:09,420
challenge last year where the teams

518
00:21:14,300 --> 00:21:12,630
looked at satellite data versus

519
00:21:17,260 --> 00:21:14,310
observation data to predict where flux

520
00:21:21,130 --> 00:21:17,270
occur and when floods occur there were

521
00:21:25,100 --> 00:21:21,140
challenges in FDA Europe who looked at

522
00:21:28,490 --> 00:21:25,110
IED settlements undocumented settlements

523
00:21:31,100 --> 00:21:28,500
or they evolve we had challenges that

524
00:21:32,450 --> 00:21:31,110
looked at prediction of forest fires for

525
00:21:34,970 --> 00:21:32,460
example some people were thinking about

526
00:21:37,130 --> 00:21:34,980
maybe doing earthquakes and other you

527
00:21:39,470 --> 00:21:37,140
know hurricane prediction maybe to help

528
00:21:44,840 --> 00:21:39,480
that so there's a lot of also like you

529
00:21:46,670 --> 00:21:44,850
know more direct impact challenges but I

530
00:21:48,860 --> 00:21:46,680
think even even if it's not direct

531
00:21:50,330 --> 00:21:48,870
impact on climate change if we for

532
00:21:54,440 --> 00:21:50,340
example study exoplanet atmospheres

533
00:21:57,200 --> 00:21:54,450
there's so much exchange with people

534
00:22:00,350 --> 00:21:57,210
from from the atmosphere sciences and do

535
00:22:03,680 --> 00:22:00,360
climate science you know to work against

536
00:22:06,320 --> 00:22:03,690
climate change also you have to keep in

537
00:22:08,810 --> 00:22:06,330
mind if we do this research 90% of the

538
00:22:10,670 --> 00:22:08,820

people eventually move on out of

539
00:22:13,570 --> 00:22:10,680
academia into the industry into jobs

540
00:22:15,860 --> 00:22:13,580
there so if we teach someone in

541
00:22:18,140 --> 00:22:15,870
calculating the atmospheres of

542
00:22:20,030 --> 00:22:18,150
exoplanets then he or she might be going

543
00:22:22,250 --> 00:22:20,040
to the industry or to some you know

544
00:22:25,390 --> 00:22:22,260
company that fights climate change after

545
00:22:30,230 --> 00:22:25,400
their education so I don't think that is

546
00:22:33,020 --> 00:22:30,240
exclusive at all these topics yeah

547
00:22:33,940 --> 00:22:33,030
interesting it's important message to is

548
00:22:36,160 --> 00:22:33,950
that

549
00:22:39,160 --> 00:22:36,170
now our researching exoplanets and other

550
00:22:40,510 --> 00:22:39,170
worlds can come back home and likewise

551
00:22:42,460 --> 00:22:40,520
it can go the other way to people doing

552
00:22:44,440 --> 00:22:42,470
research here on various topics can then

553
00:22:47,350 --> 00:22:44,450
use those to help us understand other

554
00:22:49,900 --> 00:22:47,360
worlds for instance I helped to manage

555
00:22:51,310 --> 00:22:49,910
this event every year in Utah from the

556
00:22:53,650 --> 00:22:51,320
Mars Society called the University of

557
00:22:54,910 --> 00:22:53,660
River challenge and the students who is

558
00:22:56,260 --> 00:22:54,920
undergraduate students who build these

559
00:22:58,780 --> 00:22:56,270
Mars rivers and bring them out to the

560
00:22:59,950 --> 00:22:58,790
desert MP it's always interesting

561
00:23:01,480 --> 00:22:59,960
there's a lot of students won't be

562
00:23:03,130 --> 00:23:01,490
working on Mars rivers in the future

563
00:23:05,590 --> 00:23:03,140

they wanted to be working in the

564
00:23:08,290 --> 00:23:05,600
aerospace sector but it's cool to see

565
00:23:10,450 --> 00:23:08,300
them cut their teeth on an idea about

566
00:23:12,850 --> 00:23:10,460
how we build a robot for Mars and then

567
00:23:13,840 --> 00:23:12,860
using that later in industry so it's

568
00:23:17,170 --> 00:23:13,850
always interesting to see where there's

569
00:23:18,460 --> 00:23:17,180
tie-ins kind of start coming together so

570
00:23:20,380 --> 00:23:18,470
I'm very curious to hear a lot more

571
00:23:22,420 --> 00:23:20,390
about NASA FDL in the future and to see

572
00:23:24,220 --> 00:23:22,430
some of the cool projects coming out of

573
00:23:26,830 --> 00:23:24,230
it this summer and future summers as

574
00:23:29,950 --> 00:23:26,840
well I want to change gears now just a

575
00:23:31,510 --> 00:23:29,960
little bit I mentioned as I was starting

576
00:23:33,910 --> 00:23:31,520
that I'm now associate of the

577
00:23:37,000 --> 00:23:33,920
explainable an organization that you

578
00:23:39,520 --> 00:23:37,010
actually are founder of and I love for

579
00:23:41,260 --> 00:23:39,530
you to chat a little bit about science

580
00:23:43,450 --> 00:23:41,270
communication and what has really driven

581
00:23:46,000 --> 00:23:43,460
you you're a great speaker you've given

582
00:23:47,980 --> 00:23:46,010
a lot of talks I've shared some videos

583
00:23:50,740 --> 00:23:47,990
through our Twitter and Facebook these

584
00:23:52,090 --> 00:23:50,750
past few days of some of your talks for

585
00:23:54,640 --> 00:23:52,100
astronomy on tap and some of these

586
00:23:56,470 --> 00:23:54,650
things you compete it as a science

587
00:23:58,240 --> 00:23:56,480
communicator I'd love for you to talk

588
00:23:59,970 --> 00:23:58,250

just for a while about science

589
00:24:03,610 --> 00:23:59,980
communication and what it means to them

590
00:24:05,980 --> 00:24:03,620
yes so the experiments are actually sort

591
00:24:07,480 --> 00:24:05,990
of a baby of same name so also like the

592
00:24:09,760 --> 00:24:07,490
event where the two of us met for the

593
00:24:12,070 --> 00:24:09,770
first time is for some of you who might

594
00:24:13,810 --> 00:24:12,080
know it I think it was organized by also

595
00:24:15,640 --> 00:24:13,820
by the NASA Astrobiology Institute for

596
00:24:17,470 --> 00:24:15,650
wise so it's a science communication

597
00:24:19,930 --> 00:24:17,480
competition you get three minutes

598
00:24:22,120 --> 00:24:19,940
onstage is a little bit like American

599
00:24:23,920 --> 00:24:22,130
Idol for scientists you know you get

600
00:24:25,270 --> 00:24:23,930
there there's a jury and there are

601
00:24:27,280 --> 00:24:25,280
winners and losers and local

602
00:24:28,750 --> 00:24:27,290
championships and national championships

603
00:24:31,810 --> 00:24:28,760
and then international championships so

604
00:24:35,230 --> 00:24:31,820
this is where we met I think in at RPI

605
00:24:38,470 --> 00:24:35,240
doing a network on ten years ago

606
00:24:39,970 --> 00:24:38,480
and yes I was always interested not

607
00:24:42,010 --> 00:24:39,980
necessarily in the competition but

608
00:24:45,039 --> 00:24:42,020
really in that communicating science

609
00:24:46,870 --> 00:24:45,049
just going out like I think a second

610
00:24:48,760 --> 00:24:46,880
said you know if you're in love you want

611
00:24:51,820 --> 00:24:48,770
to tell the world about it and this is

612
00:24:53,649 --> 00:24:51,830
really I just love my work and the

613
00:24:54,820 --> 00:24:53,659

research we are doing and the courses we

614
00:24:58,090 --> 00:24:54,830
have working for that I really want to

615
00:25:00,330 --> 00:24:58,100
get out with it and you know I figure

616
00:25:03,130 --> 00:25:00,340
I'm you know maybe like an average

617
00:25:05,260 --> 00:25:03,140
researcher or scientist but I'm pretty

618
00:25:08,980 --> 00:25:05,270
good at the communication part and then

619
00:25:11,200 --> 00:25:08,990
I just thought how I can you know help

620
00:25:13,450 --> 00:25:11,210
others to get better at communication

621
00:25:15,159 --> 00:25:13,460
how to maybe motivate others to design

622
00:25:18,360 --> 00:25:15,169
their own formats to improve their own

623
00:25:20,590 --> 00:25:18,370
presentation skills and it was really

624
00:25:22,330 --> 00:25:20,600
triggered by some of these workshops I

625
00:25:24,370 --> 00:25:22,340
did so there are workshops or there were

626
00:25:26,769 --> 00:25:24,380
workshops communication for scientists

627
00:25:28,810 --> 00:25:26,779
but then I usually done by you know

628
00:25:30,789 --> 00:25:28,820
coaches people who don't really vent

629
00:25:33,070 --> 00:25:30,799
through all the experiences that we had

630
00:25:34,600 --> 00:25:33,080
as you know grad students you know on

631
00:25:36,820 --> 00:25:34,610
posters and all the stuff that we Hank

632
00:25:38,710 --> 00:25:36,830
if there's like an old it or like like a

633
00:25:40,870 --> 00:25:38,720
retired theater coach coaching

634
00:25:42,610 --> 00:25:40,880
scientists how to communicate they might

635
00:25:44,740 --> 00:25:42,620
not have this connection and this is

636
00:25:47,789 --> 00:25:44,750
kind of like this niche that we wanted

637
00:25:49,960 --> 00:25:47,799
to get in this Expendables so being

638
00:25:51,880 --> 00:25:49,970

communicating scientists and explain

639
00:25:53,500 --> 00:25:51,890
other nerds how to communicate better

640
00:25:55,330 --> 00:25:53,510
basically so especially in these

641
00:25:57,820 --> 00:25:55,340
interdisciplinary teams as we have in

642
00:26:00,370 --> 00:25:57,830
astrology always has to find a common

643
00:26:02,320 --> 00:26:00,380
language with a geologist so even beyond

644
00:26:03,760 --> 00:26:02,330
outreach so often people if they hear

645
00:26:05,260 --> 00:26:03,770
science communication they're saying

646
00:26:07,330 --> 00:26:05,270
yeah that's you're always talk but it's

647
00:26:09,100 --> 00:26:07,340
really if you write a proposal if you do

648
00:26:10,930 --> 00:26:09,110
policymaking even if you know how a

649
00:26:13,360 --> 00:26:10,940
geologist talks to atmospheric

650
00:26:15,130 --> 00:26:13,370
physicists about exoplanets it's science

651
00:26:17,169 --> 00:26:15,140
communication so it's really everywhere

652
00:26:20,789 --> 00:26:17,179
where scientists communicate we just try

653
00:26:24,070 --> 00:26:20,799
to help that's what the experiments do I

654
00:26:26,470 --> 00:26:24,080
love that idea too about language and

655
00:26:28,659 --> 00:26:26,480
communication I'm a member of many

656
00:26:29,370 --> 00:26:28,669
science education groups and one thing

657
00:26:30,919 --> 00:26:29,380
I've noticed

658
00:26:33,870 --> 00:26:30,929
is that people seem to think that

659
00:26:35,960 --> 00:26:33,880
science communication is almost only

660
00:26:38,549 --> 00:26:35,970
synonymous with science journalism

661
00:26:40,049 --> 00:26:38,559
there's only one very small branch of

662
00:26:42,029 --> 00:26:40,059
science communication as you pointed out

663
00:26:43,470 --> 00:26:42,039

even one scientist talking to a

664
00:26:45,870 --> 00:26:43,480
scientist one other discipline is

665
00:26:47,400 --> 00:26:45,880
communicating science and we have to

666
00:26:49,140 --> 00:26:47,410
find that common language just one

667
00:26:51,750 --> 00:26:49,150
reason I think astrobiology is so great

668
00:26:52,950 --> 00:26:51,760
astrobiology teaches us to have a more

669
00:26:55,260 --> 00:26:52,960
common language across so many

670
00:26:58,620 --> 00:26:55,270
disciplines we can share some of these

671
00:27:01,740 --> 00:26:58,630
ideas so I highly think our audience to

672
00:27:03,149 --> 00:27:01,750
go onto YouTube and find you and

673
00:27:06,270 --> 00:27:03,159
watching your talks they're really

674
00:27:07,890 --> 00:27:06,280
awesome totally worth the watch I do

675
00:27:09,539 --> 00:27:07,900
mind telling you it's more time you can

676
00:27:12,090 --> 00:27:09,549
always ask questions on Twitter using

677
00:27:14,430 --> 00:27:12,100
hashtag ask Astro bio you can ask

678
00:27:17,460 --> 00:27:14,440
questions on second net not on the NASA

679
00:27:19,529 --> 00:27:17,470
Astrobiology Facebook page for dr. anger

680
00:27:21,600 --> 00:27:19,539
housing and read chat a little bit

681
00:27:23,279 --> 00:27:21,610
longer and then I promise I'll come to

682
00:27:25,890 --> 00:27:23,289
your questions here soon

683
00:27:28,169 --> 00:27:25,900
so Daniel one thing that you shared with

684
00:27:31,080 --> 00:27:28,179
us before we started advertising for

685
00:27:32,520 --> 00:27:31,090
this episode is that outside of your

686
00:27:35,669 --> 00:27:32,530
interest in science the science

687
00:27:37,200 --> 00:27:35,679
communication you also play in a sport

688
00:27:48,049 --> 00:27:37,210

that I probably pronounced terribly

689
00:27:54,600 --> 00:27:49,820
incredible

690
00:27:58,470 --> 00:27:54,610
yes really popular in Southeast Asia

691
00:28:01,680 --> 00:27:58,480
especially leisure and the name actually

692
00:28:04,830 --> 00:28:01,690
is set back means kicking in maligne

693
00:28:07,049 --> 00:28:04,840
language and takraw means ball in ball

694
00:28:09,330 --> 00:28:07,059
in Thai language and it's like a foot

695
00:28:11,370 --> 00:28:09,340
what if I game so Mike whatever but with

696
00:28:13,860 --> 00:28:11,380
a net with your feet you play over net

697
00:28:16,350 --> 00:28:13,870
you got three players on each side you

698
00:28:18,180 --> 00:28:16,360
can touch the ball three times on your

699
00:28:21,090 --> 00:28:18,190
side and as soon as the ball touches the

700
00:28:25,169 --> 00:28:21,100
ground it's a point for the other team

701
00:28:27,000 --> 00:28:25,179
and the ball is like around this size of

702
00:28:28,560 --> 00:28:27,010
a fear of a fist or a bit bigger than a

703
00:28:31,080 --> 00:28:28,570
fist and it's made originally made from

704
00:28:32,240 --> 00:28:31,090
rotten but now it made from plastic so

705
00:28:34,159 --> 00:28:32,250
it's pretty hard has

706
00:28:36,080 --> 00:28:34,169
little bit like a big paper ball in

707
00:28:38,360 --> 00:28:36,090
terms of you know consistency and and

708
00:28:42,260 --> 00:28:38,370
you know how it gets reflected and stuff

709
00:28:43,760 --> 00:28:42,270
yeah and I eventually ended up being on

710
00:28:45,289 --> 00:28:43,770
the German national team but mostly

711
00:28:47,480 --> 00:28:45,299
because they're not obviously not that

712
00:28:49,310 --> 00:28:47,490
many people playing in Jubilee so it was

713
00:28:51,830 --> 00:28:49,320

whoever had enough money to travel to

714
00:28:54,799 --> 00:28:51,840
the World Cup was the national player so

715
00:28:56,870 --> 00:28:54,809
but yes I saw that when I was travelling

716
00:28:59,120 --> 00:28:56,880
Thailand about 20 years ago and then

717
00:29:00,620 --> 00:28:59,130
went back to Cologne and was the

718
00:29:02,600 --> 00:29:00,630
university life of the group playing it

719
00:29:04,940 --> 00:29:02,610
and then eventually we got invited to

720
00:29:07,669 --> 00:29:04,950
play in Thailand and then we really

721
00:29:09,590 --> 00:29:07,679
started a little group in Europe and now

722
00:29:11,960 --> 00:29:09,600
we have a European series for almost 20

723
00:29:14,510 --> 00:29:11,970
years now well other teams from Europe

724
00:29:16,490 --> 00:29:14,520
France Switzerland also flying to these

725
00:29:19,130 --> 00:29:16,500
World Cups regularly so yeah

726
00:29:21,440 --> 00:29:19,140
that's the crazy sport that I'm doing

727
00:29:23,330 --> 00:29:21,450
but not not that often anymore because I

728
00:29:26,899 --> 00:29:23,340
got a little bit o it and my bones are

729
00:29:33,680 --> 00:29:26,909
not as flexible anymore as they were

730
00:29:35,870 --> 00:29:33,690
like ten years ago martial arts my

731
00:29:37,669 --> 00:29:35,880
entire life and it reminds me of like

732
00:29:40,070 --> 00:29:37,679
growing up and doing some sodon't a

733
00:29:42,010 --> 00:29:40,080
condo and and watching all the trick

734
00:29:44,390 --> 00:29:42,020
kicking and trying to do just spinning

735
00:29:49,220 --> 00:29:44,400
360 roundhouse kicks and all kinds of

736
00:29:58,909 --> 00:29:49,230
weird things like videos of these jump

737
00:30:03,409 --> 00:29:58,919
kicks these guys are doing I mean I was

738
00:30:07,010 --> 00:30:03,419

able to get one of these cakes done some

739
00:30:09,200 --> 00:30:07,020
also anymore but yeah I mean it's

740
00:30:10,880 --> 00:30:09,210
actually I mean it's a mixture of a she

741
00:30:14,990 --> 00:30:10,890
said martial arts and volleyball and

742
00:30:17,630 --> 00:30:15,000
football so but yeah it's all about

743
00:30:18,860 --> 00:30:17,640
flexibility and and if you just stretch

744
00:30:22,520 --> 00:30:18,870
often enough

745
00:30:24,950 --> 00:30:22,530
it's it's amazing of value and it's just

746
00:30:26,810 --> 00:30:24,960
I just also love to watch it so people

747
00:30:28,480 --> 00:30:26,820
who watch football like you know real

748
00:30:30,710 --> 00:30:28,490
football soccer I see called India's

749
00:30:32,840 --> 00:30:30,720
that's like if there's a bicycle kick

750
00:30:35,690 --> 00:30:32,850
like every 10th game everyone freaks out

751
00:30:37,909 --> 00:30:35,700
but in sepak takraw every singer every

752
00:30:39,890 --> 00:30:37,919
single ball basically has a bicycle kick

753
00:30:40,649 --> 00:30:39,900
or some sort of acrobatic key in the end

754
00:30:43,049 --> 00:30:40,659
so you don't

755
00:30:44,849 --> 00:30:43,059
debate for ibrahimovic to do one of

756
00:30:47,879 --> 00:30:44,859
these goats once every five games

757
00:30:49,259 --> 00:30:47,889
there's one every ball so really highly

758
00:30:52,109 --> 00:30:49,269
recommend to check out spectacular

759
00:30:56,789 --> 00:30:52,119
videos on YouTube and maybe you try this

760
00:30:59,039 --> 00:30:56,799
board over that's great yeah that'd be

761
00:31:01,619 --> 00:30:59,049
pretty cool I don't actually even try it

762
00:31:03,779 --> 00:31:01,629
even though I'm also getting a little

763
00:31:12,330 --> 00:31:03,789

older now I'm starting to slow down a

764
00:31:14,729 --> 00:31:12,340
little bit of my jump kicks audience

765
00:31:16,739 --> 00:31:14,739
questions I wonder if you could go back

766
00:31:20,450 --> 00:31:16,749
to the beginning and tell us about that

767
00:31:26,129 --> 00:31:20,460
bet that you lost studying exoplanets

768
00:31:27,749 --> 00:31:26,139
yes the first transiting exoplanet was

769
00:31:30,899 --> 00:31:27,759
detected or the first trend that of an

770
00:31:32,729 --> 00:31:30,909
exoplanet was detected so by that time

771
00:31:34,909 --> 00:31:32,739
of course as I mentioned at the end of

772
00:31:38,639 --> 00:31:34,919
my underwear I think and had to find

773
00:31:40,769 --> 00:31:38,649
topic or think about a topic and I went

774
00:31:42,479 --> 00:31:40,779
on a road trip I think to Amsterdam with

775
00:31:44,489 --> 00:31:42,489
a couple of friends and then one of my

776
00:31:47,159 --> 00:31:44,499
friends was like oh you know that font

777
00:31:50,070 --> 00:31:47,169
this exoplanet via transit so the light

778
00:31:52,200 --> 00:31:50,080
of the star got a bit fainter when the

779
00:31:54,479 --> 00:31:52,210
planet moved in front of it and for some

780
00:31:56,249 --> 00:31:54,489
reason I had missed the news so it was

781
00:31:58,019 --> 00:31:56,259
maybe like a big after the press release

782
00:31:59,580 --> 00:31:58,029
and I was busy other things you know at

783
00:32:02,999 --> 00:31:59,590
that age you don't check the archives

784
00:32:04,739 --> 00:32:03,009
every day so I had no idea that that

785
00:32:06,269 --> 00:32:04,749
happened so I was like oh no I would

786
00:32:08,070 --> 00:32:06,279
have heard about it I know about where

787
00:32:09,899 --> 00:32:08,080
you lost the planes that were detected a

788
00:32:11,639 --> 00:32:09,909

couple of years before that but I would

789
00:32:13,919 --> 00:32:11,649
have heard if there's a trend that's bet

790
00:32:16,619 --> 00:32:13,929
so I bet a box of beer that this trend

791
00:32:18,899 --> 00:32:16,629
is she read something wrong also because

792
00:32:20,489 --> 00:32:18,909
that guy wasn't really an expert or

793
00:32:22,739 --> 00:32:20,499
physicist so anything's rewriting in

794
00:32:24,389 --> 00:32:22,749
some popular magazine I guess so I was

795
00:32:26,279 --> 00:32:24,399
like super convinced that I would have

796
00:32:28,229 --> 00:32:26,289
heard about this first trend observation

797
00:32:30,930 --> 00:32:28,239
and actually that guy was right and I

798
00:32:33,749 --> 00:32:30,940
had to give him a box of beer box of

799
00:32:35,190 --> 00:32:33,759
food giant beer but it also defined my

800
00:32:37,889 --> 00:32:35,200
career so after that I was like oh maybe

801
00:32:39,960 --> 00:32:37,899
I should then go and study transiting

802
00:32:43,200 --> 00:32:39,970
exoplanets then Here I am 20 years later

803
00:32:47,620 --> 00:32:43,210
making that our Korea markets aware that

804
00:32:51,140 --> 00:32:47,630
was it years or

805
00:32:53,210 --> 00:32:51,150
the tank of message kids is just because

806
00:32:58,460 --> 00:32:53,220
he blues it's not bad it might because

807
00:33:00,590 --> 00:32:58,470
of the best part of your life to our

808
00:33:02,450 --> 00:33:00,600
audience questions reminder for the

809
00:33:04,370 --> 00:33:02,460
audience more time to ask questions up

810
00:33:06,320 --> 00:33:04,380
doctor anger house and you can use hash

811
00:33:07,820 --> 00:33:06,330
tag ask aster bio on Twitter or ask

812
00:33:09,890 --> 00:33:07,830
questions in the chat right now while

813
00:33:13,310 --> 00:33:09,900

you're watching so our first question

814
00:33:16,040 --> 00:33:13,320
you actually mentioned already comes

815
00:33:17,810 --> 00:33:16,050
from dr. Jim past the CEO and president

816
00:33:20,750 --> 00:33:17,820
of the Astra sociology Research

817
00:33:23,060 --> 00:33:20,760
Institute or AR I he's a longtime friend

818
00:33:25,220 --> 00:33:23,070
of the show and often one wants to

819
00:33:26,990 --> 00:33:25,230
consider the social sciences and their

820
00:33:30,650 --> 00:33:27,000
implications for our astrobiology

821
00:33:32,560 --> 00:33:30,660
research so dr. Paz says hello dr. anger

822
00:33:34,580 --> 00:33:32,570
house and I'd like to ask

823
00:33:36,140 --> 00:33:34,590
astrobiologists these questions that

824
00:33:38,660 --> 00:33:36,150
relates to increasing convergence

825
00:33:41,060 --> 00:33:38,670
between the two branches or cultures of

826
00:33:43,910 --> 00:33:41,070
science so it's question is how can the

827
00:33:46,090 --> 00:33:43,920
social sciences and humanities increase

828
00:33:50,180 --> 00:33:46,100
their contributions to addressing

829
00:33:52,340 --> 00:33:50,190
astrobiology and study issues yes so

830
00:33:54,890 --> 00:33:52,350
first of all I think there's already a

831
00:33:57,110 --> 00:33:54,900
lot of great progress in this area so if

832
00:33:59,990 --> 00:33:57,120
for those who heard about the apps icon

833
00:34:02,480 --> 00:34:00,000
conference their obsessions about astro

834
00:34:05,240 --> 00:34:02,490
sociology and oh you know the humanities

835
00:34:07,070 --> 00:34:05,250
and and aster Balaji can can work

836
00:34:09,680 --> 00:34:07,080
together more and better so I think we

837
00:34:12,050 --> 00:34:09,690
are a community that maybe is a bit

838
00:34:15,230 --> 00:34:12,060

ahead of other communities in that

839
00:34:17,389 --> 00:34:15,240
regard so there are these obvious

840
00:34:19,790 --> 00:34:17,399
questions of you know how do we

841
00:34:22,310 --> 00:34:19,800
communicate if we find life you know

842
00:34:24,470 --> 00:34:22,320
what is the you know protocol to inform

843
00:34:26,540 --> 00:34:24,480
people also like the different levels of

844
00:34:28,610 --> 00:34:26,550
certainty we have was one thing we

845
00:34:30,770 --> 00:34:28,620
discussed in the past if we are 80% sure

846
00:34:33,530 --> 00:34:30,780
we found life if we are 90% sure of the

847
00:34:35,750 --> 00:34:33,540
99% sure how do we communicate that and

848
00:34:37,850 --> 00:34:35,760
there's a lot of you know controversy

849
00:34:40,940 --> 00:34:37,860
how or to communicate that and people

850
00:34:42,980 --> 00:34:40,950
you know over exaggerate and people and

851
00:34:44,200 --> 00:34:42,990
magazines you know clickbait and make

852
00:34:46,690 --> 00:34:44,210
mines bigger

853
00:34:48,159 --> 00:34:46,700
they are so this is a big possible back

854
00:34:50,889 --> 00:34:48,169
to the so communication issue where

855
00:34:52,300 --> 00:34:50,899
social science come in but then also and

856
00:34:55,020 --> 00:34:52,310
that's what I already mentioned this the

857
00:34:57,910 --> 00:34:55,030
TMT discussions they are real-world

858
00:35:00,640 --> 00:34:57,920
problems so as astronomers as apologist

859
00:35:02,620 --> 00:35:00,650
we are not in some you know isolated

860
00:35:05,740 --> 00:35:02,630
spheres would be basically intact and

861
00:35:08,740 --> 00:35:05,750
have to you know neat apparently need

862
00:35:11,250 --> 00:35:08,750
some help from social scientists in in

863
00:35:13,180 --> 00:35:11,260

this case one other example is also big

864
00:35:14,530 --> 00:35:13,190
discussion at the moment is this whole

865
00:35:17,260 --> 00:35:14,540
Starling so people might have heard

866
00:35:20,440 --> 00:35:17,270
about this they got constellation of

867
00:35:24,820 --> 00:35:20,450
small satellites that SpaceX launch

868
00:35:26,829 --> 00:35:24,830
which may really pollute our food our

869
00:35:29,349 --> 00:35:26,839
sky with more light sources and then

870
00:35:31,329 --> 00:35:29,359
really make ground-based astronomical

871
00:35:34,240 --> 00:35:31,339
observations much much more challenging

872
00:35:36,609 --> 00:35:34,250
so this is also one thing I think where

873
00:35:38,890 --> 00:35:36,619
Social Sciences and humanity have to

874
00:35:42,760 --> 00:35:38,900
help us to get this communication going

875
00:35:44,859 --> 00:35:42,770
to define as a society who own space is

876
00:35:46,810 --> 00:35:44,869
it you know the astronomers isn't the

877
00:35:50,109 --> 00:35:46,820
billionaires is that all of us so so I

878
00:35:52,180 --> 00:35:50,119
think these are really and topics if you

879
00:35:54,670 --> 00:35:52,190
go to the moon soon enough for zoning

880
00:35:57,370 --> 00:35:54,680
the moon who gets the mining right so

881
00:35:59,410 --> 00:35:57,380
these are really really topics that we

882
00:36:01,060 --> 00:35:59,420
have to face right now and so as a

883
00:36:04,510 --> 00:36:01,070
society and this is very amenities

884
00:36:06,370 --> 00:36:04,520
hopefully help us it's a great point

885
00:36:08,290 --> 00:36:06,380
yeah and startling especially that's a

886
00:36:10,140 --> 00:36:08,300
really good example of where those two

887
00:36:12,280 --> 00:36:10,150
can converge can actually work together

888
00:36:13,540 --> 00:36:12,290

since we don't actually have any law was

889
00:36:15,490 --> 00:36:13,550
saying that you can't launch a

890
00:36:17,050 --> 00:36:15,500
constellation of tens of thousands of

891
00:36:19,690 --> 00:36:17,060
satellites and block out light from

892
00:36:21,910 --> 00:36:19,700
observatories right now it's a very good

893
00:36:24,820 --> 00:36:21,920
point well taken

894
00:36:27,670 --> 00:36:24,830
our next question comes from user

895
00:36:30,040 --> 00:36:27,680
organism 1974 on Twitter

896
00:36:32,210 --> 00:36:30,050
yes 1974 is a longtime friend of the

897
00:36:35,530 --> 00:36:32,220
show's well they

898
00:36:38,960 --> 00:36:35,540
if the recent discoveries of exoplanets

899
00:36:40,490 --> 00:36:38,970
anyway changed the Drake Equation and

900
00:36:42,080 --> 00:36:40,500
trying to understand whether or not

901
00:36:46,089 --> 00:36:42,090
there could be intelligent aliens out

902
00:36:48,800 --> 00:36:46,099
there communicating via radio yes so it

903
00:36:51,650 --> 00:36:48,810
definitely increased our understanding

904
00:36:53,420 --> 00:36:51,660
of the factors or some of the factors in

905
00:36:55,520 --> 00:36:53,430
the in the Drake Equation so the

906
00:36:57,320 --> 00:36:55,530
equation obviously stays the same but

907
00:37:00,020 --> 00:36:57,330
some of these factors the fraction of

908
00:37:02,390 --> 00:37:00,030
stars that have planets so this all

909
00:37:04,099 --> 00:37:02,400
these detections from Kepler we know

910
00:37:09,290 --> 00:37:04,109
pretty good we have a pretty good idea

911
00:37:11,570 --> 00:37:09,300
at least for the sample of stars what

912
00:37:13,400 --> 00:37:11,580
fraction of stars do have planets and we

913
00:37:17,750 --> 00:37:13,410

also slowly but surely get into that

914
00:37:19,880 --> 00:37:17,760
next that the next term in this in this

915
00:37:22,400 --> 00:37:19,890
equation which describes what fraction

916
00:37:25,490 --> 00:37:22,410
of these planets actually are in the

917
00:37:27,500 --> 00:37:25,500
right Goldilocks only habitable zone in

918
00:37:31,849 --> 00:37:27,510
this right size and temperature area to

919
00:37:33,620 --> 00:37:31,859
be potentially suitable for life so yeah

920
00:37:36,140 --> 00:37:33,630
we are slowly but surely moving deeper

921
00:37:38,900 --> 00:37:36,150
and deeper from factor to factor over

922
00:37:40,730 --> 00:37:38,910
the next couple of decades so and

923
00:37:43,490 --> 00:37:40,740
actually what's interesting is that

924
00:37:46,160 --> 00:37:43,500
Kepler was really designed to do that so

925
00:37:50,599 --> 00:37:46,170
so Kepler was designed to stare at one

926
00:37:52,220 --> 00:37:50,609
area of the sky find all the all the

927
00:37:54,050 --> 00:37:52,230
planets that are in this area that are

928
00:37:57,020 --> 00:37:54,060
in this sample of stars to really do

929
00:37:58,400 --> 00:37:57,030
that kind of statistics so test the a

930
00:38:00,109 --> 00:37:58,410
permission that was recently announced

931
00:38:01,880 --> 00:38:00,119
it does a similar job of finding it

932
00:38:04,250 --> 00:38:01,890
really it's just out there to find the

933
00:38:06,020 --> 00:38:04,260
closest one whereas Kepler was really

934
00:38:09,079 --> 00:38:06,030
also in addition to that a statistical

935
00:38:11,240 --> 00:38:09,089
Mac machine so a mission that really was

936
00:38:13,790 --> 00:38:11,250
supposed to get this eight hours we call

937
00:38:16,430 --> 00:38:13,800
it so the fraction of stars that have

938
00:38:19,130 --> 00:38:16,440

earth-like planets so yeah so this

939
00:38:20,930 --> 00:38:19,140
mission was actually designed to exactly

940
00:38:25,220 --> 00:38:20,940
pin down this one factor and the Drake

941
00:38:26,630 --> 00:38:25,230
Equation so awesome so we know it's

942
00:38:28,040 --> 00:38:26,640
better remind our viewers you know we've

943
00:38:30,720 --> 00:38:28,050
had you know capillaries looking at one

944
00:38:33,210 --> 00:38:30,730
very small place in the

945
00:38:35,790 --> 00:38:33,220
and the planets that discovered are all

946
00:38:37,380 --> 00:38:35,800
very close to the earth you relatively

947
00:38:39,050 --> 00:38:37,390
know the same thing for tests the

948
00:38:41,160 --> 00:38:39,060
transiting exoplanet survey satellite

949
00:38:43,890 --> 00:38:41,170
it's mostly looking for things that are

950
00:38:45,770 --> 00:38:43,900
fairly close by I wonder for you as an

951
00:38:49,829 --> 00:38:45,780
astronomer who studies exoplanets

952
00:38:52,950 --> 00:38:49,839
looking for right now we have really me

953
00:38:55,440 --> 00:38:52,960
is gonna be launched here soon like

954
00:38:57,000 --> 00:38:55,450
James Webb these next generation of

955
00:38:58,079 --> 00:38:57,010
space telescopes we have Sofia and

956
00:39:00,599 --> 00:38:58,089
observations we have ground-based

957
00:39:02,160 --> 00:39:00,609
observations I wonder so if you could

958
00:39:04,770 --> 00:39:02,170
just tell us what you think the future

959
00:39:08,960 --> 00:39:04,780
is right now maybe in the next 20 years

960
00:39:12,510 --> 00:39:08,970
or so or 30 years for exoplanet research

961
00:39:15,030 --> 00:39:12,520
so I think with the next missions like

962
00:39:17,700 --> 00:39:15,040
James Beth and also Ariel is a mission

963
00:39:21,030 --> 00:39:17,710

that's build in Europe which also does

964
00:39:24,569 --> 00:39:21,040
this spectroscopy and chemical analysis

965
00:39:27,569 --> 00:39:24,579
of expand atmospheres we first of all

966
00:39:30,150 --> 00:39:27,579
will get a much much better idea about

967
00:39:33,780 --> 00:39:30,160
how planets form so right now there's a

968
00:39:36,290 --> 00:39:33,790
lot of open questions maybe some

969
00:39:38,460 --> 00:39:36,300
remember before the first exoplanet was

970
00:39:40,380 --> 00:39:38,470
detected everyone thought all the

971
00:39:42,900 --> 00:39:40,390
systems look like our solar system this

972
00:39:45,030 --> 00:39:42,910
is you know rocky planets inside and the

973
00:39:46,589 --> 00:39:45,040
gaseous planets outside and then

974
00:39:48,630 --> 00:39:46,599
everyone was surprised that we suddenly

975
00:39:51,089 --> 00:39:48,640
find these useful Jupiter's you know

976
00:39:53,819 --> 00:39:51,099
jupiter-sized planets closer in than

977
00:39:56,010 --> 00:39:53,829
mercury and it's still not really

978
00:39:58,950 --> 00:39:56,020
explained how these I mean there's some

979
00:40:00,780 --> 00:39:58,960
ideas about migration and certain ways

980
00:40:03,059 --> 00:40:00,790
that they maybe get scattered within the

981
00:40:04,950 --> 00:40:03,069
system but that's the first big thing

982
00:40:09,089 --> 00:40:04,960
that I think within the next ten years

983
00:40:12,270 --> 00:40:09,099
special miss James Webb will be answered

984
00:40:14,640 --> 00:40:12,280
the second warning is this transition

985
00:40:17,250 --> 00:40:14,650
between but because super earth and mini

986
00:40:18,960 --> 00:40:17,260
Neptune's so this is a Kepler space

987
00:40:21,240 --> 00:40:18,970
telescope actually one of the biggest

988
00:40:22,620 --> 00:40:21,250

group of all the largest group of

989
00:40:24,870 --> 00:40:22,630
planets that we found are these

990
00:40:26,250 --> 00:40:24,880
intermediate sized planets so they are

991
00:40:27,870 --> 00:40:26,260
bigger than Earth's and smaller than

992
00:40:30,809 --> 00:40:27,880
Neptune of which we don't have any

993
00:40:33,150 --> 00:40:30,819
analog in our solar system so there's

994
00:40:34,950 --> 00:40:33,160
this intermediate size you know big

995
00:40:37,140 --> 00:40:34,960
group of planets which we don't have any

996
00:40:39,450 --> 00:40:37,150
idea if they are just you know big rocks

997
00:40:41,280 --> 00:40:39,460
like Earth's or small gas and

998
00:40:44,730 --> 00:40:41,290
James like and this is you know Venice

999
00:40:46,590 --> 00:40:44,740
super Earths mini Neptune where it comes

1000
00:40:49,260 --> 00:40:46,600
from and I think but what we also gonna

1001
00:40:50,940 --> 00:40:49,270
be picking down hopefully relatively

1002
00:40:52,470 --> 00:40:50,950
soon also this is the key of stethoscope

1003
00:40:54,600 --> 00:40:52,480
for example is this transition region

1004
00:40:56,970 --> 00:40:54,610
you know what are the densities are

1005
00:40:59,370 --> 00:40:56,980
these four as a transition region which

1006
00:41:02,760 --> 00:40:59,380
radius at which mass the planet becomes

1007
00:41:05,700 --> 00:41:02,770
a gas giant so these are the short term

1008
00:41:08,460 --> 00:41:05,710
questions and then midterm we will

1009
00:41:11,430 --> 00:41:08,470
probably get into this whole question of

1010
00:41:13,400 --> 00:41:11,440
fact ability so how big does a rocky

1011
00:41:16,080 --> 00:41:13,410
planet have to be to hold an atmosphere

1012
00:41:17,220 --> 00:41:16,090
what is the temperature to maybe or what

1013
00:41:20,730 --> 00:41:17,230

are the areas where we might even be

1014
00:41:22,410 --> 00:41:20,740
able to find water but and this might be

1015
00:41:25,680 --> 00:41:22,420
a little bit of a bummer but I think to

1016
00:41:28,050 --> 00:41:25,690
really pin down biomarkers and get a

1017
00:41:30,510 --> 00:41:28,060
definite detection of life I mean we

1018
00:41:32,040 --> 00:41:30,520
might get lucky so I'm not betting on

1019
00:41:34,260 --> 00:41:32,050
this because I'm not good at betting

1020
00:41:36,420 --> 00:41:34,270
apparently but I think realistically

1021
00:41:39,200 --> 00:41:36,430
also to do some sort of comparative

1022
00:41:41,850 --> 00:41:39,210
exobiology you know maybe you find a

1023
00:41:43,490 --> 00:41:41,860
couple of candidates miss life we really

1024
00:41:47,820 --> 00:41:43,500
need the next generation of telescopes

1025
00:41:51,330 --> 00:41:47,830
Louvois bexlife the couple of current

1026
00:41:54,570 --> 00:41:51,340
mission designs that might fly in 20-30

1027
00:41:56,850 --> 00:41:54,580
years so that's my quick summary of the

1028
00:42:06,600 --> 00:41:56,860
next metric predictions you know no

1029
00:42:08,100 --> 00:42:06,610
bells for the next 30 years that's

1030
00:42:09,200 --> 00:42:08,110
really really interesting you one was

1031
00:42:13,290 --> 00:42:09,210
coming here in the future

1032
00:42:15,510 --> 00:42:13,300
our next question to the user I

1033
00:42:18,120 --> 00:42:15,520
mispronounce your name here I believe

1034
00:42:20,700 --> 00:42:18,130
the user's name is panky a rope they

1035
00:42:25,130 --> 00:42:20,710
wanna know what is the difficulties of

1036
00:42:30,000 --> 00:42:28,200
yes so first of all people always ask me

1037
00:42:32,400 --> 00:42:30,010
how it is to fly and I'm always joking

1038
00:42:35,100 --> 00:42:32,410

that it combines two of the most boring

1039
00:42:37,200 --> 00:42:35,110
things so all the observers all the

1040
00:42:38,970 --> 00:42:37,210
observational astronomers after a while

1041
00:42:41,400 --> 00:42:38,980
it's just really boring to spend your

1042
00:42:42,910 --> 00:42:41,410
night at the telescope and observing so

1043
00:42:44,500 --> 00:42:42,920
this is a really boring task and then

1044
00:42:46,660 --> 00:42:44,510
all of you who fly once in a while do

1045
00:42:49,780 --> 00:42:46,670
black 10-hour 24 flights know how boring

1046
00:42:52,030 --> 00:42:49,790
that is so first order the observation

1047
00:42:54,220 --> 00:42:52,040
fiber Sophia just combines two very very

1048
00:42:55,599 --> 00:42:54,230
boring cigs and then in the end they

1049
00:42:58,059 --> 00:42:55,609
become actually that's boring

1050
00:43:00,120 --> 00:42:58,069
so obviously Sophia as the flying

1051
00:43:02,410 --> 00:43:00,130
platform has a couple of different

1052
00:43:05,589 --> 00:43:02,420
problems than a brown base or space

1053
00:43:08,680 --> 00:43:05,599
space telescope so most first of all is

1054
00:43:11,230 --> 00:43:08,690
the vibrations so you can imagine you

1055
00:43:12,789 --> 00:43:11,240
know you all know these turbulences you

1056
00:43:15,609 --> 00:43:12,799
get on a plane and you still want to

1057
00:43:18,339 --> 00:43:15,619
keep keep pointed at your star so this

1058
00:43:21,390 --> 00:43:18,349
is the main technical challenge that's a

1059
00:43:24,490 --> 00:43:21,400
fee I to solve and basically start with

1060
00:43:26,980 --> 00:43:24,500
simple inertia so the telescope is on

1061
00:43:29,230 --> 00:43:26,990
one side and on the other side of this

1062
00:43:30,970 --> 00:43:29,240
bike head is a counterweight for the

1063
00:43:32,829 --> 00:43:30,980

instruments and some counterweight so

1064
00:43:35,349 --> 00:43:32,839
first order the telescope is really

1065
00:43:36,970 --> 00:43:35,359
swimming on a film of oil in this bike

1066
00:43:38,980 --> 00:43:36,980
head so you can really use your pinky

1067
00:43:40,329 --> 00:43:38,990
and move the whole 1622 scope it's

1068
00:43:43,299 --> 00:43:40,339
amazing so first of all I actually

1069
00:43:44,950 --> 00:43:43,309
inertia keeps the telescope always

1070
00:43:46,870 --> 00:43:44,960
pointed understand there might also be

1071
00:43:48,490 --> 00:43:46,880
videos on YouTube a can see that where

1072
00:43:50,230 --> 00:43:48,500
the telescope moves and shakes during

1073
00:43:52,270 --> 00:43:50,240
your flight but it's actually the plane

1074
00:43:54,220 --> 00:43:52,280
moving around the telescope by the

1075
00:44:00,640 --> 00:43:54,230
telescope is pointing within one arc

1076
00:44:04,059 --> 00:44:00,650
second on that that on that target

1077
00:44:05,380 --> 00:44:04,069
and there's also passive and active

1078
00:44:06,640 --> 00:44:05,390
tempting but first orders really

1079
00:44:09,970 --> 00:44:06,650
durscher that keeps the telescope

1080
00:44:11,559 --> 00:44:09,980
pointed another one of the problems that

1081
00:44:14,530 --> 00:44:11,569
be encountered bonney's

1082
00:44:17,470 --> 00:44:14,540
was that the telescope cavity was behind

1083
00:44:19,240 --> 00:44:17,480
the engine so sometimes at very low

1084
00:44:22,210 --> 00:44:19,250
elevations you could actually see

1085
00:44:23,559 --> 00:44:22,220
reflections of the exhausts free in the

1086
00:44:27,730 --> 00:44:23,569
telescope so that was one of the

1087
00:44:29,549 --> 00:44:27,740
technical difficulties me that sometimes

1088
00:44:31,870 --> 00:44:29,559

you just have to avoid better I mean

1089
00:44:34,180 --> 00:44:31,880
even if you pass the clouds you still

1090
00:44:37,150 --> 00:44:34,190
have to avoid certain certain other

1091
00:44:38,890 --> 00:44:37,160
better phenomena once we even had a

1092
00:44:43,220 --> 00:44:38,900
government shutdown that

1093
00:44:45,290 --> 00:44:43,230
so they're they're very variety of other

1094
00:44:49,580 --> 00:44:45,300
problems that keep you from observing

1095
00:44:51,460 --> 00:44:49,590
one on on Sofia yeah technical

1096
00:44:54,430 --> 00:44:51,470
adjustable issues than it sounds like I

1097
00:44:56,480 --> 00:44:54,440
have to find a video of this telescope

1098
00:44:59,270 --> 00:44:56,490
rocking while the plane is flying

1099
00:45:02,180 --> 00:44:59,280
I was just had a fascination with how we

1100
00:45:04,340 --> 00:45:02,190
can take such you know a huge masses

1101
00:45:06,340 --> 00:45:04,350
like that and allow them to move just

1102
00:45:10,490 --> 00:45:06,350
using some very simple laws of physics

1103
00:45:12,320 --> 00:45:10,500
very smart ways our next question for

1104
00:45:15,380 --> 00:45:12,330
you dr. anger housing comes from a

1105
00:45:17,840 --> 00:45:15,390
second net from user Julia she wants to

1106
00:45:20,690 --> 00:45:17,850
know what are your next scientific

1107
00:45:22,730 --> 00:45:20,700
endeavors and what advice do you have

1108
00:45:26,540 --> 00:45:22,740
the next generation of scientist in

1109
00:45:29,840 --> 00:45:26,550
astrobiology so should I start with the

1110
00:45:32,990 --> 00:45:29,850
second one so I think a pretty smart so

1111
00:45:35,270 --> 00:45:33,000
if you want to if you want to do a

1112
00:45:39,230 --> 00:45:35,280
career and astronomy astrobiology I

1113
00:45:41,750 --> 00:45:39,240

think always bias idea is to connect

1114
00:45:45,020 --> 00:45:41,760
yourself to missions so look at the

1115
00:45:47,930 --> 00:45:45,030
timetable when which mission scheduled

1116
00:45:50,900 --> 00:45:47,940
at NASA at the European Space Agency

1117
00:45:53,030 --> 00:45:50,910
that you can tie your career to so this

1118
00:45:54,920 --> 00:45:53,040
is usually good move you know for

1119
00:45:56,450 --> 00:45:54,930
example right now you might be little

1120
00:45:58,760 --> 00:45:56,460
bit too late to start working on James

1121
00:46:00,650 --> 00:45:58,770
Webb because many people already know

1122
00:46:02,240 --> 00:46:00,660
what they're going to do it might be

1123
00:46:03,890 --> 00:46:02,250
worse to look into the mission that

1124
00:46:06,170 --> 00:46:03,900
flies after that

1125
00:46:08,330 --> 00:46:06,180
for example the Dragonfly mission was

1126
00:46:11,360 --> 00:46:08,340
just selected so if I was an undergrad

1127
00:46:12,380 --> 00:46:11,370
interested that might be something to

1128
00:46:15,080 --> 00:46:12,390
look into

1129
00:46:17,780 --> 00:46:15,090
so that's usually good advice too to

1130
00:46:19,820 --> 00:46:17,790
look at you know at what age is that in

1131
00:46:21,440 --> 00:46:19,830
my career is that mission going to fly

1132
00:46:23,300 --> 00:46:21,450
and there's also you really append as a

1133
00:46:24,980 --> 00:46:23,310
mission there's money I mean in the end

1134
00:46:29,890 --> 00:46:24,990
you also have to look for funding and

1135
00:46:32,510 --> 00:46:29,900
this is maybe my first order tip is to

1136
00:46:36,470 --> 00:46:32,520
look at the mission timelines and see

1137
00:46:39,470 --> 00:46:36,480
how that fits your career and then my

1138
00:46:41,780 --> 00:46:39,480

personal next steps are so I actually be

1139
00:46:44,390 --> 00:46:41,790
moving Institute's so I'm right now at

1140
00:46:45,380 --> 00:46:44,400
the Center for space and habitability at

1141
00:46:48,450 --> 00:46:45,390
the university of

1142
00:46:49,920 --> 00:46:48,460
but I'm moving to ETH in Zurich so just

1143
00:46:52,500 --> 00:46:49,930
want our familles oh not far

1144
00:46:54,390 --> 00:46:52,510
and I'll be working actually on one of

1145
00:46:57,329 --> 00:46:54,400
these super future missions it's called

1146
00:46:58,319 --> 00:46:57,339
life the large interferometer for

1147
00:47:01,319 --> 00:46:58,329
excellence

1148
00:47:03,390 --> 00:47:01,329
so it's insurance the mission that

1149
00:47:05,250 --> 00:47:03,400
combines a couple of telescopes in space

1150
00:47:08,690 --> 00:47:05,260
so it's like an array of space

1151
00:47:11,849 --> 00:47:08,700
telescopes that will get us hopefully

1152
00:47:14,849 --> 00:47:11,859
then that data that we need to find

1153
00:47:16,170 --> 00:47:14,859
these biomarkers so and this is a

1154
00:47:18,150 --> 00:47:16,180
mission obviously that's not going to

1155
00:47:20,549 --> 00:47:18,160
fly tomorrow so I mean if we are lucky

1156
00:47:21,000 --> 00:47:20,559
it will be flying by the end of my

1157
00:47:22,620 --> 00:47:21,010
career

1158
00:47:24,690 --> 00:47:22,630
so I didn't really take my last advice

1159
00:47:27,450 --> 00:47:24,700
that nicely so maybe but if I'm a

1160
00:47:29,250 --> 00:47:27,460
retired person somehow I see my see my

1161
00:47:32,640 --> 00:47:29,260
admission flyer that would be nice too

1162
00:47:34,140 --> 00:47:32,650
so that's one of my main projects I have

1163
00:47:37,559 --> 00:47:34,150

a couple of crazy

1164
00:47:40,170 --> 00:47:37,569
stretchy side projects I have a machine

1165
00:47:42,349 --> 00:47:40,180
learning project that we look for

1166
00:47:45,140 --> 00:47:42,359
anomalies on the lunar surface

1167
00:47:47,880 --> 00:47:45,150
we are currently thinking about looking

1168
00:47:50,430 --> 00:47:47,890
at some radio signals from from

1169
00:47:54,089 --> 00:47:50,440
beetlejuice so there's a couple of

1170
00:47:55,799 --> 00:47:54,099
things and yeah I'm also a big spending

1171
00:47:58,349 --> 00:47:55,809
really on this science communication

1172
00:48:01,620 --> 00:47:58,359
inside so high up so called science

1173
00:48:03,510 --> 00:48:01,630
limbs so in Europe it's the thing I

1174
00:48:05,309 --> 00:48:03,520
don't think it's pretty popular yet in

1175
00:48:06,240 --> 00:48:05,319
the US so if I say it's a science land

1176
00:48:08,279 --> 00:48:06,250
people always think it's like a

1177
00:48:10,620 --> 00:48:08,289
breakfast at Denny's or something but

1178
00:48:13,650 --> 00:48:10,630
it's actually like a poetry slam for

1179
00:48:15,329 --> 00:48:13,660
scientists so similar to family or maybe

1180
00:48:17,700 --> 00:48:15,339
some of you know kind of science or

1181
00:48:19,680 --> 00:48:17,710
Estonian tip it's like a science like a

1182
00:48:22,890 --> 00:48:19,690
coffee stand for scientists so 10 minute

1183
00:48:24,359 --> 00:48:22,900
talks for the public audience in you

1184
00:48:27,539 --> 00:48:24,369
know bar setting or something and that

1185
00:48:30,720 --> 00:48:27,549
so I'd really even want to focus even

1186
00:48:33,120 --> 00:48:30,730
more on the communicating side in the

1187
00:48:36,430 --> 00:48:33,130
next year or two you know those are my

1188
00:48:40,870 --> 00:48:39,250

into our next question as well our next

1189
00:48:42,010 --> 00:48:40,880
question comes from user Mike on

1190
00:48:43,780 --> 00:48:42,020
Facebook

1191
00:48:46,120 --> 00:48:43,790
Mike wants to know why you're

1192
00:48:49,120 --> 00:48:46,130
communicating science what's your

1193
00:48:52,240 --> 00:48:49,130
favorite age group just speak to Google

1194
00:48:57,220 --> 00:48:52,250
and who are the most fun to have in your

1195
00:49:00,370 --> 00:48:57,230
audience oh I'd love to talk to everyone

1196
00:49:02,560 --> 00:49:00,380
I mean I'd love to talk to my little ten

1197
00:49:04,150 --> 00:49:02,570
your nephew I love to talk to him senior

1198
00:49:07,300 --> 00:49:04,160
citizens that sometimes come to these

1199
00:49:10,720 --> 00:49:07,310
signs limbs so I'm very exhausting when

1200
00:49:14,610 --> 00:49:10,730
it comes to to and I think your meaning

1201
00:49:17,920 --> 00:49:14,620
it really ibh purpose has their own

1202
00:49:20,470 --> 00:49:17,930
their own nice thing about them so

1203
00:49:22,390 --> 00:49:20,480
please ask the most you know creative

1204
00:49:24,460 --> 00:49:22,400
questions sometimes like any people

1205
00:49:26,470 --> 00:49:24,470
really I to the details so they can you

1206
00:49:28,120 --> 00:49:26,480
know talk to you about the details for

1207
00:49:31,080 --> 00:49:28,130
hours so I think I don't really have

1208
00:49:33,910 --> 00:49:31,090
like a favorite a favorite group

1209
00:49:36,340 --> 00:49:33,920
what I do want to say so and what what

1210
00:49:39,640 --> 00:49:36,350
is my advice for other science

1211
00:49:42,400 --> 00:49:39,650
communicators try to teach people how to

1212
00:49:44,410 --> 00:49:42,410
think like a scientist and don't preach

1213
00:49:45,850 --> 00:49:44,420

to people so this is really I mean you

1214
00:49:49,420 --> 00:49:45,860
can't emphasize that enough especially

1215
00:49:51,130 --> 00:49:49,430
in the times we live in right now so

1216
00:49:52,600 --> 00:49:51,140
really science communication is not

1217
00:49:55,030 --> 00:49:52,610
about standing on the stage and tell

1218
00:49:57,220 --> 00:49:55,040
people walking through this but make

1219
00:49:58,960 --> 00:49:57,230
people think like a scientist you know

1220
00:50:00,400 --> 00:49:58,970
ask them questions put likes you know

1221
00:50:02,140 --> 00:50:00,410
some riddles on the screen where they

1222
00:50:04,180 --> 00:50:02,150
have to go through the thought process

1223
00:50:06,520 --> 00:50:04,190
of a scientist this is what I think is

1224
00:50:08,110 --> 00:50:06,530
one of the important tasks we emphasize

1225
00:50:09,760 --> 00:50:08,120
communicators to make people think like

1226
00:50:11,920 --> 00:50:09,770
a scientist and not stand up there like

1227
00:50:14,710 --> 00:50:11,930
them ago to tell them you know believe

1228
00:50:16,900 --> 00:50:14,720
our story so this is this is maybe you

1229
00:50:18,370 --> 00:50:16,910
don't mind my biggest advice for our

1230
00:50:20,050 --> 00:50:18,380
communicators you know try try to

1231
00:50:27,070 --> 00:50:20,060
communicate as people try to make them

1232
00:50:28,300 --> 00:50:27,080
think like a scientist sometimes even

1233
00:50:30,880 --> 00:50:28,310
those of us who trained in science

1234
00:50:32,530 --> 00:50:30,890
communication can sometimes forget to

1235
00:50:35,410 --> 00:50:32,540
ask important questions and I'll allow

1236
00:50:37,210 --> 00:50:35,420
the audience to discover themselves as

1237
00:50:39,220 --> 00:50:37,220
no you get lost a little bit

1238
00:50:41,859 --> 00:50:39,230

sharing the story did not realize that

1239
00:50:43,510 --> 00:50:41,869
the fun of it is really going along on

1240
00:50:47,320 --> 00:50:43,520
the journey in the story with the

1241
00:50:50,530 --> 00:50:47,330
audience so our next question here comes

1242
00:50:53,710 --> 00:50:50,540
from Sam on second met Sam wants to know

1243
00:50:55,720 --> 00:50:53,720
how you balance your time in doing

1244
00:50:59,440 --> 00:50:55,730
research and in communicating science

1245
00:51:01,660 --> 00:50:59,450
how you find the time to do move yeah

1246
00:51:05,349 --> 00:51:01,670
that's that's a really good question and

1247
00:51:07,150 --> 00:51:05,359
I'm also writing an open letter at the

1248
00:51:08,830 --> 00:51:07,160
moment about this topic so first of all

1249
00:51:10,720 --> 00:51:08,840
I'm really really lucky since I had a

1250
00:51:13,750 --> 00:51:10,730
fellowship for the past three years so

1251
00:51:15,670 --> 00:51:13,760
when a fellowship really allows you to

1252
00:51:18,670 --> 00:51:15,680
basically do what I want so this really

1253
00:51:22,120 --> 00:51:18,680
allowed me to set a certain amount of my

1254
00:51:24,790 --> 00:51:22,130
personal research time for communication

1255
00:51:26,349 --> 00:51:24,800
which is a luxury which not everyone in

1256
00:51:31,150 --> 00:51:26,359
academia has so if you're a grad student

1257
00:51:34,270 --> 00:51:31,160
you are 100% you know paid by your value

1258
00:51:36,339 --> 00:51:34,280
advisor and if they don't they don't

1259
00:51:39,760 --> 00:51:36,349
like communication there's no way to do

1260
00:51:41,890 --> 00:51:39,770
it so I was really really lucky and to

1261
00:51:44,560 --> 00:51:41,900
have this fellowship to make that part

1262
00:51:46,660 --> 00:51:44,570
of it there was also people who told me

1263
00:51:49,150 --> 00:51:46,670

that senior scientists who told me I'm

1264
00:51:52,390 --> 00:51:49,160
wasting my time and it's not good for my

1265
00:51:54,550 --> 00:51:52,400
career so I know what that I just hope

1266
00:51:56,349 --> 00:51:54,560
that it turns out good in the end and I

1267
00:51:57,940 --> 00:51:56,359
just enjoyed it too much but it's it's

1268
00:52:01,510 --> 00:51:57,950
really a problem and one thing that that

1269
00:52:03,820 --> 00:52:01,520
really makes me met at the moment and

1270
00:52:05,470 --> 00:52:03,830
what I want to write these this open

1271
00:52:08,589 --> 00:52:05,480
letter about is that there actually is

1272
00:52:10,780 --> 00:52:08,599
money for science communication so there

1273
00:52:12,550 --> 00:52:10,790
it's not that there is no money but it's

1274
00:52:15,099 --> 00:52:12,560
usually not tied to the contracts of the

1275
00:52:17,710 --> 00:52:15,109
X and week researchers so the extra

1276
00:52:20,290 --> 00:52:17,720
scientists who communicate that money

1277
00:52:22,660 --> 00:52:20,300
just doesn't end up at these peoples in

1278
00:52:25,150 --> 00:52:22,670
their peak you know big nonprofits

1279
00:52:27,130 --> 00:52:25,160
organizations foundations who organize

1280
00:52:29,530 --> 00:52:27,140
science communicating events maybe you

1281
00:52:30,380 --> 00:52:29,540
know take an entrance fee and you know

1282
00:52:32,450 --> 00:52:30,390
they pay in the bank

1283
00:52:33,890 --> 00:52:32,460
it's playing on the event and they pay

1284
00:52:35,509 --> 00:52:33,900
the people who serve the food on there

1285
00:52:37,670 --> 00:52:35,519
but then the keynote speaker with the

1286
00:52:39,920 --> 00:52:37,680
scientists is supposed to do that for

1287
00:52:42,500 --> 00:52:39,930
free and I think this is really really

1288
00:52:44,539 --> 00:52:42,510

something like a sort process that we as

1289
00:52:46,819 --> 00:52:44,549
a community have to change in people

1290
00:52:48,109 --> 00:52:46,829
that this is not something to take for

1291
00:52:49,400 --> 00:52:48,119
granted it's a biggie of this this

1292
00:52:49,849 --> 00:52:49,410
example of you know my friend is the

1293
00:52:51,289 --> 00:52:49,859
designer

1294
00:52:53,180 --> 00:52:51,299
can't you make a logo for me for free

1295
00:52:55,400 --> 00:52:53,190
it's good advertisement or doesn't your

1296
00:52:57,380 --> 00:52:55,410
band want to play for free my bar so I

1297
00:52:58,910 --> 00:52:57,390
think we have to have the same change of

1298
00:53:00,620 --> 00:52:58,920
attitude towards communicating

1299
00:53:03,890 --> 00:53:00,630
scientists and people you know pay you a

1300
00:53:05,450 --> 00:53:03,900
decent honorary or you know I mean pay

1301
00:53:07,490 --> 00:53:05,460
more than just a train ticket to get

1302
00:53:09,289 --> 00:53:07,500
there so this is something I mean maybe

1303
00:53:11,210 --> 00:53:09,299
we should have built a union or science

1304
00:53:12,559 --> 00:53:11,220
communicators or something than to push

1305
00:53:14,569 --> 00:53:12,569
alright so but this is something that

1306
00:53:16,490 --> 00:53:14,579
I'm really you see how educated I get so

1307
00:53:18,680 --> 00:53:16,500
this is really something that I want to

1308
00:53:20,809 --> 00:53:18,690
change in the next year's that this game

1309
00:53:24,500 --> 00:53:20,819
more appreciated on the academic side

1310
00:53:26,480 --> 00:53:24,510
but also in society it's awesome I'd

1311
00:53:29,000 --> 00:53:26,490
love to be a part of that myself I've

1312
00:53:30,680 --> 00:53:29,010
thought a lot about how science

1313
00:53:33,200 --> 00:53:30,690

educators who are speakers can become

1314
00:53:34,999 --> 00:53:33,210
paid speakers and communicating science

1315
00:53:37,789 --> 00:53:35,009
because that's a huge run right now

1316
00:53:40,009 --> 00:53:37,799
because you spend years studying how to

1317
00:53:41,420 --> 00:53:40,019
speak well and how to share your

1318
00:53:43,670 --> 00:53:41,430
knowledge and so it's important I think

1319
00:53:45,009 --> 00:53:43,680
that you have some reward for that same

1320
00:53:47,930 --> 00:53:45,019
way I don't think it's fair for us to

1321
00:53:50,480 --> 00:53:47,940
ever think that an artist should sell

1322
00:53:52,160 --> 00:53:50,490
their work for free or for nothing when

1323
00:53:55,130 --> 00:53:52,170
they've spent you know years decades

1324
00:53:56,749 --> 00:53:55,140
their lives learning that they're still

1325
00:53:58,549 --> 00:53:56,759
and learning the talent so I love that

1326
00:54:01,640 --> 00:53:58,559
what dr. Houseman for showing their

1327
00:54:04,460 --> 00:54:01,650
being also don't be shy to ask for it so

1328
00:54:06,470 --> 00:54:04,470
this is also what I tell so that

1329
00:54:08,630 --> 00:54:06,480
surprised me too so once I started to

1330
00:54:10,190 --> 00:54:08,640
actually ask people in the beginning

1331
00:54:11,960 --> 00:54:10,200
days to go yeah he's doing it for free

1332
00:54:13,400 --> 00:54:11,970
because that's what scientists do but

1333
00:54:15,499 --> 00:54:13,410
then when I told them you know you see

1334
00:54:17,660 --> 00:54:15,509
if you take a day off from my work or

1335
00:54:20,569 --> 00:54:17,670
this is a day that I can do you know my

1336
00:54:22,190 --> 00:54:20,579
other job or you know just pay me what I

1337
00:54:24,319 --> 00:54:22,200
would earn another job and then people

1338
00:54:25,940 --> 00:54:24,329

realize so often we click these people

1339
00:54:28,249 --> 00:54:25,950
soon sometimes it's me even just you

1340
00:54:30,200 --> 00:54:28,259
know you know stepping out of yourself

1341
00:54:31,549 --> 00:54:30,210
and saying actually asking for for

1342
00:54:33,650 --> 00:54:31,559
something for it so this is also

1343
00:54:34,999 --> 00:54:33,660
something be on how not just wait for

1344
00:54:38,120 --> 00:54:35,009
the others to offer something so really

1345
00:54:38,930 --> 00:54:38,130
just also ask for it from our side great

1346
00:54:41,059 --> 00:54:38,940
point

1347
00:54:42,319 --> 00:54:41,069
so we were kind of short on time here so

1348
00:54:44,450 --> 00:54:42,329
I have one more question I like to ask

1349
00:54:46,609 --> 00:54:44,460
for you and then we're going to finish

1350
00:54:50,270 --> 00:54:46,619
of our show here this last question

1351
00:54:51,980 --> 00:54:50,280
comes from flora dude do draw you've

1352
00:54:53,990 --> 00:54:51,990
spoken to this already a little bit and

1353
00:54:56,059 --> 00:54:54,000
so curious about your take on it

1354
00:54:59,599 --> 00:54:56,069
flora is a doctoral student in

1355
00:55:02,180 --> 00:54:59,609
anthropology they'd like to write their

1356
00:55:04,549 --> 00:55:02,190
thesis on the approach of astrobiology

1357
00:55:08,809 --> 00:55:04,559
to the humanities and then they wonder

1358
00:55:15,319 --> 00:55:11,990
I mean first order it's always good to

1359
00:55:17,120 --> 00:55:15,329
connect to new things or to make a

1360
00:55:18,289 --> 00:55:17,130
connection as to biology that's off the

1361
00:55:23,690 --> 00:55:18,299
beaten path

1362
00:55:26,089 --> 00:55:23,700
I think it's then important to be not

1363
00:55:27,680 --> 00:55:26,099

too general so we need to focus on one

1364
00:55:29,720 --> 00:55:27,690
or two problems maybe some of them that

1365
00:55:31,130 --> 00:55:29,730
we mentioned or maybe there are similar

1366
00:55:33,020 --> 00:55:31,140
problems in you know more

1367
00:55:36,589 --> 00:55:33,030
anthropological topics within us

1368
00:55:39,859 --> 00:55:36,599
topology so I think especially at at

1369
00:55:41,240 --> 00:55:39,869
that level when you graduate in many

1370
00:55:43,700 --> 00:55:41,250
when you about to graduate when you do

1371
00:55:45,559 --> 00:55:43,710
your PhD s is really the time your

1372
00:55:48,109 --> 00:55:45,569
career value of the most focused so

1373
00:55:49,609 --> 00:55:48,119
careers like like like an hourglass so

1374
00:55:51,260 --> 00:55:49,619
you're the most focused when you write

1375
00:55:54,620 --> 00:55:51,270
your PhD and then after that you get

1376
00:55:56,779 --> 00:55:54,630
proud again so so I think you know you

1377
00:55:58,250 --> 00:55:56,789
start with a broad idea I want to be in

1378
00:56:01,430 --> 00:55:58,260
science and I want to be in astrobiology

1379
00:56:03,170 --> 00:56:01,440
and I want to be in field geology and

1380
00:56:05,750 --> 00:56:03,180
then you solve this bond topic and then

1381
00:56:08,000 --> 00:56:05,760
after that you diverge again and you

1382
00:56:11,660 --> 00:56:08,010
know maybe help aiding a code for an

1383
00:56:13,400 --> 00:56:11,670
expert atmosphere or bitter mission but

1384
00:56:15,349 --> 00:56:13,410
I think at the point of view and this is

1385
00:56:17,720 --> 00:56:15,359
a generative at the point of you PhD

1386
00:56:22,150 --> 00:56:17,730
really focus on one particular question

1387
00:56:25,880 --> 00:56:22,160
if that had said oh yeah what else flora

1388
00:56:27,540 --> 00:56:25,890

so before we leave we don't mention so

1389
00:56:31,230 --> 00:56:27,550
today is the day that

1390
00:56:33,600 --> 00:56:31,240
is opening up the voting for the name of

1391
00:56:36,810 --> 00:56:33,610
the river competition so for those who

1392
00:56:39,060 --> 00:56:36,820
don't know the Mars 2020 Rover has been

1393
00:56:41,370 --> 00:56:39,070
called Mars 2020 for some time now and

1394
00:56:43,770 --> 00:56:41,380
now we're going to give you a real name

1395
00:56:46,710 --> 00:56:43,780
a good proper name like we had spirit

1396
00:56:48,870 --> 00:56:46,720
and opportunity and curiosity and so I

1397
00:56:50,940 --> 00:56:48,880
was one of the first round judges in the

1398
00:56:52,590 --> 00:56:50,950
name of the river competition which is

1399
00:56:55,320 --> 00:56:52,600
run through future engineers a

1400
00:56:58,140 --> 00:56:55,330
non-profit as well as their NASA and I

1401
00:56:59,580 --> 00:56:58,150
was I was blown away by the kindergarten

1402
00:57:01,980 --> 00:56:59,590
through twelfth grade students who

1403
00:57:05,100 --> 00:57:01,990
submitted their essays and their ideas

1404
00:57:08,040 --> 00:57:05,110
for names we now have a list of 155

1405
00:57:10,410 --> 00:57:08,050
names our director and producer mike is

1406
00:57:13,140 --> 00:57:10,420
going to bring up on the screen a link

1407
00:57:14,760 --> 00:57:13,150
to how to go find all of those things

1408
00:57:16,680 --> 00:57:14,770
right now in the list and what's the

1409
00:57:19,530 --> 00:57:16,690
voting is open that'll tell you where to

1410
00:57:22,890 --> 00:57:19,540
vote as well so for you doctor hangar

1411
00:57:27,470 --> 00:57:22,900
house and I'm curious what would you

1412
00:57:29,670 --> 00:57:27,480
choose as a name for the next Mars rover

1413
00:57:31,380 --> 00:57:29,680

and maybe even better for you would be

1414
00:57:36,690 --> 00:57:31,390
what would you choose for the name for

1415
00:57:37,920 --> 00:57:36,700
the next large telescope so in to talk

1416
00:57:40,890 --> 00:57:37,930
about the show you told me I shouldn't

1417
00:57:42,660 --> 00:57:40,900
say rover make no more face that would

1418
00:57:44,640 --> 00:57:42,670
be my first guess we'll make Rover face

1419
00:57:47,580 --> 00:57:44,650
no I really think like something like

1420
00:57:50,280 --> 00:57:47,590
humanity or humankind's really you know

1421
00:57:53,850 --> 00:57:50,290
that expresses that this Rover is sky

1422
00:57:56,280 --> 00:57:53,860
like an ambassador or someone we as

1423
00:57:58,050 --> 00:57:56,290
humanity sent there so some name that

1424
00:57:59,940 --> 00:57:58,060
goes into this direction I have all of

1425
00:58:02,280 --> 00:57:59,950
that you know maybe someone can office

1426
00:58:03,900 --> 00:58:02,290
with some songs matter it's not a way to

1427
00:58:07,170 --> 00:58:03,910
express that but something that really

1428
00:58:11,640 --> 00:58:07,180
shows that this is someone someone be

1429
00:58:15,690 --> 00:58:11,650
sent there so and for the next for the

1430
00:58:19,200 --> 00:58:15,700
next big telescope I mean maybe they

1431
00:58:20,970 --> 00:58:19,210
should stop calling them after old men

1432
00:58:23,640 --> 00:58:20,980
and maybe it's time to you know name a

1433
00:58:25,440 --> 00:58:23,650
telescope after a female or maybe just

1434
00:58:27,630 --> 00:58:25,450
stop naming them after people at all and

1435
00:58:31,770 --> 00:58:27,640
just you know call them like the Mars

1436
00:58:33,680 --> 00:58:31,780
rover so I mean sometimes acronyms are

1437
00:58:38,230 --> 00:58:33,690
pretty neat too so I'm

1438
00:58:40,690 --> 00:58:38,240

I like afternoon so yeah awesome

1439
00:58:43,130 --> 00:58:40,700
I'm being told right now about by Mike

1440
00:58:44,540 --> 00:58:43,140
that the voting is open for everyone

1441
00:58:47,000 --> 00:58:44,550
watching so you actually can go online

1442
00:58:53,360 --> 00:58:47,010
right now and vote to name the next Mars

1443
00:58:54,890 --> 00:58:53,370
rover there there's one I'm curious

1444
00:58:56,510 --> 00:58:54,900
myself after the show check and see what

1445
00:58:59,090 --> 00:58:56,520
the actual final options are for voting

1446
00:59:00,530 --> 00:58:59,100
now finally so dr. Daniel anchor house

1447
00:59:02,240 --> 00:59:00,540
and thank you so much for joining us for

1448
00:59:03,200 --> 00:59:02,250
ask an astrobiology it's been great

1449
00:59:06,680 --> 00:59:03,210
having you on the show

1450
00:59:07,640 --> 00:59:06,690
yes thanks it was a pleasure to be on

1451
00:59:10,040 --> 00:59:07,650
the show Thanks

1452
00:59:11,690 --> 00:59:10,050
yes thank you that's into our audience

1453
00:59:14,150 --> 00:59:11,700
as always thank you so much for joining

1454
00:59:15,530 --> 00:59:14,160
us for ask an astrobiologist remember

1455
00:59:18,260 --> 00:59:15,540
you can always follow our show a line

1456
00:59:21,050 --> 00:59:18,270
always ask questions using hashtag ask a

1457
00:59:24,410 --> 00:59:21,060
stir by on and we'll announce our next

1458
00:59:26,980 --> 00:59:24,420
episode very soon so until then we'll

1459
01:00:08,049 --> 00:59:26,990
see you around and remember stay curious