Ask An Astrobiologist

Episode 51: August 25th, 2022

Dr. Alex Lockwood

NASA Astrobiology Program

1
00:00:01,120 --> 00:00:30,310
[Music]

2
00:00:35,270 --> 00:00:33,030
greetings friends fellow earthlings and

3
00:00:37,750 --> 00:00:35,280
most likely fans of all of the

4
00:00:39,030 --> 00:00:37,760
incredible data the images and

5
00:00:40,549 --> 00:00:39,040
information that we're getting from the

6
00:00:42,869 --> 00:00:40,559
james webb space telescope being

7
00:00:45,270 --> 00:00:42,879
released right now welcome to ask an

8
00:00:46,310 --> 00:00:45,280
astrobiologist the show that celebrates

9
00:00:48,389 --> 00:00:46,320
science

10
00:00:50,549 --> 00:00:48,399
and celebrates the scientists involved

11
00:00:52,069 --> 00:00:50,559
in our quest to understand the nature of

12
00:00:54,630 --> 00:00:52,079
life in the universe

13
00:00:57,029 --> 00:00:54,640

i am dr graham lau also known online as

14
00:00:59,430 --> 00:00:57,039
the cosmobiologist and we're brought to

15
00:01:01,990 --> 00:00:59,440
you by the nasa astrobiology program and

16
00:01:03,750 --> 00:01:02,000
megannet.org as always we want to say a

17
00:01:05,990 --> 00:01:03,760
huge thank you to all of you out there

18
00:01:08,070 --> 00:01:06,000
who are tuning in for the live stream or

19
00:01:10,230 --> 00:01:08,080
watching the recorded version later on

20
00:01:12,590 --> 00:01:10,240
who ask questions in the chat who ask

21
00:01:15,429 --> 00:01:12,600
questions on twitter using

22
00:01:17,670 --> 00:01:15,439
askastrobio and all of you out there who

23
00:01:19,910 --> 00:01:17,680
share about the show whenever you get a

24
00:01:21,910 --> 00:01:19,920
newsletter from nasa astrobiology or

25
00:01:24,310 --> 00:01:21,920
from saginet or you see our post on

26
00:01:26,390 --> 00:01:24,320
twitter if you share that information

27
00:01:28,149 --> 00:01:26,400
we'll give you a shout out on the show

28
00:01:30,789 --> 00:01:28,159
especially the profiles that do it the

29
00:01:32,550 --> 00:01:30,799
most uh and so this month we want to say

30
00:01:35,670 --> 00:01:32,560
a special thanks to the space telescope

31
00:01:37,670 --> 00:01:35,680
science institute uh stsci for

32
00:01:39,510 --> 00:01:37,680
retweeting sharing liking and commenting

33
00:01:41,510 --> 00:01:39,520
and all that awesome stuff on social

34
00:01:43,670 --> 00:01:41,520
media for us it helps to have an

35
00:01:45,510 --> 00:01:43,680
audience who cares about what our guests

36
00:01:47,030 --> 00:01:45,520
are doing and about what we're doing so

37
00:01:50,069 --> 00:01:47,040
thank you very much

38
00:01:52,469 --> 00:01:50,079

now this month's guest i met before in

39
00:01:54,950 --> 00:01:52,479
2014 when she emceed a trivia

40
00:01:57,670 --> 00:01:54,960
competition and emceed the fame lab usa

41
00:01:59,990 --> 00:01:57,680
competition i took part in at grad con

42
00:02:03,429 --> 00:02:00,000
she's also a former project scientist in

43
00:02:05,510 --> 00:02:03,439
communications and outreach for jwst

44
00:02:07,429 --> 00:02:05,520
dr alex lockwood has earned degrees from

45
00:02:09,190 --> 00:02:07,439
the university of maryland and cal tech

46
00:02:11,190 --> 00:02:09,200
and her previous research focused on

47
00:02:13,910 --> 00:02:11,200
understanding planetary systems and

48
00:02:16,550 --> 00:02:13,920
characterizing exoplanets before joining

49
00:02:19,190 --> 00:02:16,560
the web team she worked on the noaa nasa

50
00:02:20,710 --> 00:02:19,200
joint polar satellite system and at the

51
00:02:21,750 --> 00:02:20,720
king abdullah

52
00:02:23,270 --> 00:02:21,760
sorry

53
00:02:25,990 --> 00:02:23,280
the king abdullah university of science

54
00:02:28,710 --> 00:02:26,000
and technology in saudi arabia she also

55
00:02:31,110 --> 00:02:28,720
starred in the film edit sequel the phd

56
00:02:32,869 --> 00:02:31,120
movie and she loves running yoga and

57
00:02:34,470 --> 00:02:32,879
laughing with her kids so dr alex

58
00:02:37,670 --> 00:02:34,480
lockwood thank you very much for joining

59
00:02:40,710 --> 00:02:37,680
us and welcome to ask an astrobiologist

60
00:02:42,390 --> 00:02:40,720
hi nice to nice to see you graham

61
00:02:43,910 --> 00:02:42,400
yeah i mean it's so great for me to see

62
00:02:46,390 --> 00:02:43,920
you again and you know we first met in

63
00:02:47,910 --> 00:02:46,400

2014 it's a long time ago and you know i

64
00:02:49,430 --> 00:02:47,920
was a graduate student back then i think

65
00:02:50,869 --> 00:02:49,440
you had just finished grad school maybe

66
00:02:52,790 --> 00:02:50,879
around that time

67
00:02:54,070 --> 00:02:52,800
yeah um and so you know we've both kind

68
00:02:56,229 --> 00:02:54,080
of gone different directions in our

69
00:02:58,149 --> 00:02:56,239
careers now we're both now more in the

70
00:03:00,390 --> 00:02:58,159
realm of science communication and

71
00:03:01,990 --> 00:03:00,400
sharing science uh and so i'd love to

72
00:03:03,350 --> 00:03:02,000
talk about that i'd love to talk about

73
00:03:05,990 --> 00:03:03,360
the work that you've done for the james

74
00:03:07,430 --> 00:03:06,000
webb space telescope but the one thing i

75
00:03:08,869 --> 00:03:07,440
love to start with with all of our

76
00:03:11,190 --> 00:03:08,879
guests on this show

77
00:03:13,910 --> 00:03:11,200
is really to discuss your origin story

78
00:03:16,470 --> 00:03:13,920
that got you interested in science and

79
00:03:17,910 --> 00:03:16,480
space in life in the universe and really

80
00:03:20,229 --> 00:03:17,920
kind of drove your career forward to

81
00:03:23,110 --> 00:03:20,239
where you are now would you mind sharing

82
00:03:25,830 --> 00:03:23,120
your origin story with us

83
00:03:28,470 --> 00:03:25,840
yeah sure um you know i think the reason

84
00:03:29,509 --> 00:03:28,480
that i got into astronomy overall was

85
00:03:31,990 --> 00:03:29,519
because

86
00:03:33,750 --> 00:03:32,000
i was always looking up and you know

87
00:03:36,229 --> 00:03:33,760
it's actually very

88
00:03:37,910 --> 00:03:36,239

unnatural for humans to look up from

89
00:03:39,589 --> 00:03:37,920
from history from evolution you know we

90
00:03:41,430 --> 00:03:39,599
look around us or we look down because

91
00:03:43,830 --> 00:03:41,440
that's where our predators and our prey

92
00:03:45,670 --> 00:03:43,840
are so it's actually you know it's it's

93
00:03:47,509 --> 00:03:45,680
not a natural movement to look up i was

94
00:03:49,350 --> 00:03:47,519
always looking up

95
00:03:51,270 --> 00:03:49,360
and then in high school i got to take an

96
00:03:52,869 --> 00:03:51,280
elective astronomy course

97
00:03:54,869 --> 00:03:52,879
and i just you know the the

98
00:03:56,470 --> 00:03:54,879
possibilities

99
00:03:59,110 --> 00:03:56,480
you know my mind couldn't stop racing

100
00:04:01,270 --> 00:03:59,120
with with how cool it was

101
00:04:02,789 --> 00:04:01,280
and i wasn't sure i could do astronomy

102
00:04:05,990 --> 00:04:02,799
because i wasn't sure of how strong i

103
00:04:06,869 --> 00:04:06,000
was in physics um but then

104
00:04:11,030 --> 00:04:06,879
i

105
00:04:13,990 --> 00:04:11,040
school and

106
00:04:16,789 --> 00:04:14,000
um once i had a strong foundation i i

107
00:04:18,870 --> 00:04:16,799
then pursued astronomy um

108
00:04:20,390 --> 00:04:18,880
another sort of critical moment for me

109
00:04:21,990 --> 00:04:20,400
was the first time i went to the

110
00:04:23,909 --> 00:04:22,000
southern hemisphere

111
00:04:25,270 --> 00:04:23,919
and seeing the southern cross and you

112
00:04:27,189 --> 00:04:25,280
know the entire different sky of

113
00:04:29,749 --> 00:04:27,199

constellations

114
00:04:30,629 --> 00:04:29,759
that was kind of a magical moment for me

115
00:04:33,030 --> 00:04:30,639
because

116
00:04:34,150 --> 00:04:33,040
we you know in you grow up and you see

117
00:04:35,749 --> 00:04:34,160
the constellations and they change

118
00:04:37,990 --> 00:04:35,759
throughout the year but you have your

119
00:04:39,270 --> 00:04:38,000
set of constellations and then to be in

120
00:04:40,550 --> 00:04:39,280
a different part of the earth and have

121
00:04:42,550 --> 00:04:40,560
access to a whole another part of the

122
00:04:44,070 --> 00:04:42,560
sky and just realize what those

123
00:04:46,870 --> 00:04:44,080
constellations have meant to other

124
00:04:48,870 --> 00:04:46,880
people for years and years

125
00:04:51,110 --> 00:04:48,880
that that was pretty amazing seeing the

126
00:04:53,110 --> 00:04:51,120
southern cross for the first time

127
00:04:55,030 --> 00:04:53,120
oh that's so striking and i will say

128
00:04:56,950 --> 00:04:55,040
with this show every single guest i have

129
00:04:58,629 --> 00:04:56,960
one always says at least one thing if

130
00:05:00,469 --> 00:04:58,639
not you know 20 or 30 things that really

131
00:05:01,430 --> 00:05:00,479
surprises me and i admittedly never

132
00:05:03,189 --> 00:05:01,440
thought about that the fact that we

133
00:05:04,870 --> 00:05:03,199
don't really look up like evolutionarily

134
00:05:06,150 --> 00:05:04,880
we don't have a reason to look up it

135
00:05:07,909 --> 00:05:06,160
makes me wonder if there's like some

136
00:05:08,710 --> 00:05:07,919
intelligent species of flounder out

137
00:05:10,550 --> 00:05:08,720
there

138
00:05:12,870 --> 00:05:10,560

that doesn't look down you know because

139
00:05:14,310 --> 00:05:12,880
they're always looking up um that's

140
00:05:15,510 --> 00:05:14,320
really cool though and i think i think a

141
00:05:16,870 --> 00:05:15,520
lot of our audience can connect with

142
00:05:18,310 --> 00:05:16,880
that and connect with us you know just

143
00:05:20,150 --> 00:05:18,320
the fact that we do look up and we see

144
00:05:22,310 --> 00:05:20,160
the stars and it connects us to the

145
00:05:24,070 --> 00:05:22,320
heavens and makes us want to know more

146
00:05:25,909 --> 00:05:24,080
uh you eventually earned bachelor's

147
00:05:28,310 --> 00:05:25,919
degrees in astronomy and physics from

148
00:05:30,310 --> 00:05:28,320
umd and then went on to caltech to study

149
00:05:32,469 --> 00:05:30,320
planetary sciences for your masters and

150
00:05:34,070 --> 00:05:32,479
phd i wonder if you can explain a little

151
00:05:35,350 --> 00:05:34,080
bit for our audience what your research

152
00:05:36,830 --> 00:05:35,360
was like when you were a graduate

153
00:05:40,629 --> 00:05:36,840
student and what you were

154
00:05:43,510 --> 00:05:40,639
pursuing absolutely yeah um so

155
00:05:45,749 --> 00:05:43,520
i am through the course of my phd was

156
00:05:48,950 --> 00:05:45,759
able to study a few different things um

157
00:05:51,189 --> 00:05:48,960
all sort of based in infrared astronomy

158
00:05:53,350 --> 00:05:51,199
um which really dovetailed nicely into

159
00:05:55,350 --> 00:05:53,360
my work with james webb

160
00:05:57,350 --> 00:05:55,360
but in graduate school i started off

161
00:05:59,909 --> 00:05:57,360
studying protoplanetary disks and the

162
00:06:01,189 --> 00:05:59,919
molecular compositions and modeling what

163
00:06:03,830 --> 00:06:01,199

what is in

164
00:06:05,350 --> 00:06:03,840
the nebula around a young star out of

165
00:06:06,950 --> 00:06:05,360
which planets form

166
00:06:08,950 --> 00:06:06,960
and then later on in grad school i

167
00:06:11,350 --> 00:06:08,960
actually went to studying exoplanets

168
00:06:13,510 --> 00:06:11,360
themselves very similar techniques using

169
00:06:15,430 --> 00:06:13,520
near-infrared spectroscopy but now

170
00:06:18,469 --> 00:06:15,440
looking at the end state of this planet

171
00:06:20,950 --> 00:06:18,479
formation and looking at a specific

172
00:06:22,230 --> 00:06:20,960
exoplanet where we we discovered um

173
00:06:23,749 --> 00:06:22,240
water and

174
00:06:25,430 --> 00:06:23,759
yeah

175
00:06:26,950 --> 00:06:25,440
and so i actually i wanted to also talk

176
00:06:29,990 --> 00:06:26,960
about that just for a moment because

177
00:06:31,189 --> 00:06:30,000
that has a funny name of an exoplanet i

178
00:06:33,590 --> 00:06:31,199
wonder if you can share that with our

179
00:06:36,469 --> 00:06:33,600
audience um and maybe maybe discuss the

180
00:06:39,749 --> 00:06:36,479
importance also of that detection

181
00:06:43,590 --> 00:06:39,759
sure um so the planet that that i that i

182
00:06:45,749 --> 00:06:43,600
um studied was called talboo b

183
00:06:47,749 --> 00:06:45,759
it is the touth star that was discovered

184
00:06:50,150 --> 00:06:47,759
in the buddhist constellation and

185
00:06:53,029 --> 00:06:50,160
because it's a planet it is b

186
00:06:54,140 --> 00:06:53,039
so um i had to say booby so many times

187
00:06:56,230 --> 00:06:54,150
during my thesis defense

188
00:06:57,749 --> 00:06:56,240

[Laughter]

189
00:07:01,189 --> 00:06:57,759
uh yeah

190
00:07:02,870 --> 00:07:01,199
um but um it was actually so so so we

191
00:07:04,790 --> 00:07:02,880
detected water in the atmosphere of this

192
00:07:05,990 --> 00:07:04,800
planet um which was cool in and of

193
00:07:08,230 --> 00:07:06,000
itself i mean and this was you know

194
00:07:10,469 --> 00:07:08,240
almost a decade ago so so

195
00:07:11,990 --> 00:07:10,479
um we were really you know this was

196
00:07:14,550 --> 00:07:12,000
before a lot of the kepler findings came

197
00:07:16,390 --> 00:07:14,560
out and whatnot um

198
00:07:17,909 --> 00:07:16,400
but um

199
00:07:19,670 --> 00:07:17,919
but i think what was cooler was that it

200
00:07:21,990 --> 00:07:19,680
was kind of a novel technique and

201
00:07:25,270 --> 00:07:22,000
actually since then it's been

202
00:07:27,990 --> 00:07:25,280
uh you know it's been prodded and poked

203
00:07:29,430 --> 00:07:28,000
um as we do in the scientific process of

204
00:07:30,790 --> 00:07:29,440
you know is this the most rigorous

205
00:07:32,150 --> 00:07:30,800
technique you know everything with

206
00:07:33,990 --> 00:07:32,160
exoplanets for the past couple of

207
00:07:35,270 --> 00:07:34,000
decades has been cutting edge and

208
00:07:37,110 --> 00:07:35,280
there's always somebody to come in and

209
00:07:38,469 --> 00:07:37,120
say oh my model's better or oh i think

210
00:07:41,990 --> 00:07:38,479
you need to do the analysis a little bit

211
00:07:44,390 --> 00:07:42,000
differently um so it's been very cool to

212
00:07:46,070 --> 00:07:44,400
witness what has happened with those um

213
00:07:48,710 --> 00:07:46,080

that technique especially over the past

214
00:07:49,749 --> 00:07:48,720
several years that's awesome uh and one

215
00:07:51,909 --> 00:07:49,759
thing then while you're doing this

216
00:07:55,110 --> 00:07:51,919
research in graduate school you also

217
00:07:57,670 --> 00:07:55,120
then were lured in drawn in asked to be

218
00:07:59,749 --> 00:07:57,680
part of the phd movie i think a lot of

219
00:08:02,230 --> 00:07:59,759
people who watch ask an astrobiologist

220
00:08:03,909 --> 00:08:02,240
have probably probably read phd comics

221
00:08:05,350 --> 00:08:03,919
um how did you get involved in that

222
00:08:07,670 --> 00:08:05,360
movie and what was that like kind of

223
00:08:10,230 --> 00:08:07,680
transitioning into doing an acting role

224
00:08:12,950 --> 00:08:10,240
as a graduate student

225
00:08:15,589 --> 00:08:12,960
yeah now that was um not something i

226
00:08:17,189 --> 00:08:15,599
planned um for sure

227
00:08:19,749 --> 00:08:17,199
um so

228
00:08:21,990 --> 00:08:19,759
i as a graduate student loved phd comics

229
00:08:24,869 --> 00:08:22,000
i had them all over my door in my office

230
00:08:28,230 --> 00:08:24,879
in grad school always relating to them

231
00:08:30,070 --> 00:08:28,240
um and at one point jorge chan the the

232
00:08:31,909 --> 00:08:30,080
author of phd comics

233
00:08:33,589 --> 00:08:31,919
lived down the street from caltech and

234
00:08:35,269 --> 00:08:33,599
he came to caltech because he found out

235
00:08:36,949 --> 00:08:35,279
we had a theater department

236
00:08:37,990 --> 00:08:36,959
and people had always been asking him if

237
00:08:40,230 --> 00:08:38,000
he would take

238
00:08:42,070 --> 00:08:40,240

make a live action of some of his comics

239
00:08:44,389 --> 00:08:42,080
and so we came to caltech just kind of

240
00:08:45,910 --> 00:08:44,399
on a you know what could we do together

241
00:08:47,750 --> 00:08:45,920
maybe thing and it wasn't going to be a

242
00:08:49,110 --> 00:08:47,760
movie originally it only evolved into a

243
00:08:51,910 --> 00:08:49,120
movie later on

244
00:08:54,550 --> 00:08:51,920
um so yeah just kind of on a whim i went

245
00:08:55,829 --> 00:08:54,560
and sat you know in front of a camera

246
00:08:57,190 --> 00:08:55,839
talking to him in kind of a little

247
00:08:58,150 --> 00:08:57,200
interview style

248
00:08:59,829 --> 00:08:58,160
um

249
00:09:01,750 --> 00:08:59,839
and uh

250
00:09:03,190 --> 00:09:01,760
long story short he he offered me the

251
00:09:06,310 --> 00:09:03,200
main role

252
00:09:07,590 --> 00:09:06,320
um i did not tell my graduate thesis

253
00:09:10,389 --> 00:09:07,600
advisor

254
00:09:13,829 --> 00:09:10,399
at first because um

255
00:09:15,670 --> 00:09:13,839
we were only filming on weekends and um

256
00:09:17,509 --> 00:09:15,680
only one of the two weekend days so i

257
00:09:19,509 --> 00:09:17,519
figured as long as i was working six

258
00:09:21,829 --> 00:09:19,519
days a week i could take the other

259
00:09:24,550 --> 00:09:21,839
weekend day to to do what i wanted right

260
00:09:27,190 --> 00:09:24,560
to make this movie um but my advisor's

261
00:09:29,110 --> 00:09:27,200
wife saw me one day filming on campus

262
00:09:31,190 --> 00:09:29,120
and i got pulled into his office you

263
00:09:33,350 --> 00:09:31,200

know just um asking about my

264
00:09:34,949 --> 00:09:33,360
extracurricular activities he was fully

265
00:09:37,110 --> 00:09:34,959
supportive and you know we have a

266
00:09:39,350 --> 00:09:37,120
wonderful relationship to this day but

267
00:09:41,509 --> 00:09:39,360
uh i can definitely say that i was i was

268
00:09:43,590 --> 00:09:41,519
caught with a little bit of um

269
00:09:45,670 --> 00:09:43,600
pie on my face telling my

270
00:09:47,030 --> 00:09:45,680
thesis advisor that i was also doing a

271
00:09:49,430 --> 00:09:47,040
movie

272
00:09:50,790 --> 00:09:49,440
i love that so much um i will say so

273
00:09:52,550 --> 00:09:50,800
like for all of our younger people out

274
00:09:53,910 --> 00:09:52,560
there who are interested in graduate

275
00:09:56,150 --> 00:09:53,920
studies but you're not quite sure the

276
00:09:57,750 --> 00:09:56,160
direction your career might take um for

277
00:09:58,870 --> 00:09:57,760
myself as well i was during graduate

278
00:10:00,710 --> 00:09:58,880
school i was doing a lot of science

279
00:10:03,030 --> 00:10:00,720
communication and volunteering at a

280
00:10:04,949 --> 00:10:03,040
museum and giving public talks all over

281
00:10:06,710 --> 00:10:04,959
the place and luckily my graduate

282
00:10:08,310 --> 00:10:06,720
advisor was very supportive of that that

283
00:10:10,949 --> 00:10:08,320
as long as i was doing my research i

284
00:10:12,389 --> 00:10:10,959
could also do my communication work

285
00:10:14,470 --> 00:10:12,399
which eventually led into my career that

286
00:10:16,069 --> 00:10:14,480
i have now and so it's important when

287
00:10:17,670 --> 00:10:16,079
looking for your own graduate advisors

288
00:10:20,230 --> 00:10:17,680

for mentors that you find people that

289
00:10:21,829 --> 00:10:20,240
you not only jive with for the questions

290
00:10:23,750 --> 00:10:21,839
you're asking the research you're doing

291
00:10:24,949 --> 00:10:23,760
but also for the other interests that

292
00:10:26,630 --> 00:10:24,959
you have

293
00:10:28,550 --> 00:10:26,640
and so i wonder just kind of go off my

294
00:10:30,069 --> 00:10:28,560
own script here a little bit alex if you

295
00:10:32,470 --> 00:10:30,079
could just talk to the importance of

296
00:10:33,829 --> 00:10:32,480
mentorship in general in your own life

297
00:10:35,509 --> 00:10:33,839
and how that's helped you advance your

298
00:10:38,550 --> 00:10:35,519
career

299
00:10:40,150 --> 00:10:38,560
oh absolutely um you know and that's i

300
00:10:41,590 --> 00:10:40,160
think we're both great examples graham

301
00:10:43,430 --> 00:10:41,600
of how

302
00:10:44,949 --> 00:10:43,440
if you're interested in science i

303
00:10:46,710 --> 00:10:44,959
wholeheartedly think somebody should

304
00:10:49,750 --> 00:10:46,720
study science you know do the undergrad

305
00:10:51,750 --> 00:10:49,760
do the masters do the phd um and as much

306
00:10:54,710 --> 00:10:51,760
as it can you know lead you down one

307
00:10:56,550 --> 00:10:54,720
specific path more examples of how by

308
00:10:58,630 --> 00:10:56,560
also following your other passions you

309
00:10:59,829 --> 00:10:58,640
can do all sorts of stuff and knowing

310
00:11:02,470 --> 00:10:59,839
science you know having the background

311
00:11:05,829 --> 00:11:02,480
in science will only ever help you

312
00:11:07,590 --> 00:11:05,839
um for me my

313
00:11:10,230 --> 00:11:07,600

i actually switched advisors during grad

314
00:11:11,350 --> 00:11:10,240
school my second year of grad school um

315
00:11:13,670 --> 00:11:11,360
which was the best thing i could have

316
00:11:14,949 --> 00:11:13,680
ever done for for my mental health for

317
00:11:16,310 --> 00:11:14,959
my career

318
00:11:18,870 --> 00:11:16,320
um

319
00:11:20,470 --> 00:11:18,880
and uh found somebody who

320
00:11:23,110 --> 00:11:20,480
i just thought was a really good person

321
00:11:25,350 --> 00:11:23,120
in addition to having good research

322
00:11:27,430 --> 00:11:25,360
um and uh

323
00:11:29,829 --> 00:11:27,440
the fact that

324
00:11:32,230 --> 00:11:29,839
you know he didn't push me meant i

325
00:11:34,310 --> 00:11:32,240
pushed myself um which is really you

326
00:11:36,310 --> 00:11:34,320
know a an opportunity for growth but he

327
00:11:38,550 --> 00:11:36,320
was always there to answer questions

328
00:11:40,710 --> 00:11:38,560
um and you know i actually started a

329
00:11:42,790 --> 00:11:40,720
collaboration with another uh professor

330
00:11:44,630 --> 00:11:42,800
during grad school that was prolific in

331
00:11:46,389 --> 00:11:44,640
terms of what it led to but it was also

332
00:11:48,310 --> 00:11:46,399
just because my my advisor trusted me

333
00:11:49,910 --> 00:11:48,320
and said go you know

334
00:11:51,509 --> 00:11:49,920
explore what you want

335
00:11:53,670 --> 00:11:51,519
and since then

336
00:11:55,110 --> 00:11:53,680
i have had um

337
00:11:57,990 --> 00:11:55,120
you know i've had some incredible

338
00:12:00,150 --> 00:11:58,000

mentors also in in communications in in

339
00:12:02,790 --> 00:12:00,160
in strategic communications

340
00:12:05,829 --> 00:12:02,800
um in business and um

341
00:12:11,350 --> 00:12:07,829
as long as you know what you are

342
00:12:14,870 --> 00:12:11,360
offering to your mentor you know and and

343
00:12:16,389 --> 00:12:14,880
you're willing to support someone else

344
00:12:19,430 --> 00:12:16,399
receiving receiving somebody else's

345
00:12:21,350 --> 00:12:19,440
support and guidance um and and trust

346
00:12:23,750 --> 00:12:21,360
is uh is incredible

347
00:12:26,470 --> 00:12:23,760
um i don't know if that's all i love

348
00:12:28,389 --> 00:12:26,480
that so much that's great um i say my

349
00:12:29,750 --> 00:12:28,399
own background i had a student uh from

350
00:12:31,670 --> 00:12:29,760
two years ago just reached out to me

351
00:12:32,790 --> 00:12:31,680
recently she's applying uh for a

352
00:12:35,110 --> 00:12:32,800
position now that she's finishing

353
00:12:36,629 --> 00:12:35,120
undergrad to do communications work and

354
00:12:37,910 --> 00:12:36,639
doing science communication because she

355
00:12:39,829 --> 00:12:37,920
found out while working for me that

356
00:12:41,990 --> 00:12:39,839
she's also really interested in that

357
00:12:44,230 --> 00:12:42,000
realm too and so i'm really hopeful for

358
00:12:45,910 --> 00:12:44,240
her and kind of exploring that realm too

359
00:12:47,430 --> 00:12:45,920
and so since you know finishing graduate

360
00:12:48,949 --> 00:12:47,440
school you worked on the joint polar

361
00:12:51,509 --> 00:12:48,959
satellite system

362
00:12:52,870 --> 00:12:51,519
but you also went to saudi arabia and

363
00:12:54,870 --> 00:12:52,880

worked at the king abdullah university

364
00:12:56,710 --> 00:12:54,880
of science and technology

365
00:12:59,110 --> 00:12:56,720
as a managing editor for a research

366
00:13:01,430 --> 00:12:59,120
publication sharing the the work that

367
00:13:03,110 --> 00:13:01,440
was going on at this university i wonder

368
00:13:04,790 --> 00:13:03,120
can you just explain for us one you know

369
00:13:06,870 --> 00:13:04,800
what that experience was what you were

370
00:13:08,470 --> 00:13:06,880
doing there uh and then two how that

371
00:13:11,030 --> 00:13:08,480
kind of also then was part of your

372
00:13:13,829 --> 00:13:11,040
career transition to be doing more the

373
00:13:16,230 --> 00:13:13,839
communications side of science

374
00:13:17,590 --> 00:13:16,240
yeah absolutely i mean that was again

375
00:13:19,750 --> 00:13:17,600
you know it

376
00:13:21,670 --> 00:13:19,760
i never in my life thought i would move

377
00:13:24,069 --> 00:13:21,680
to saudi arabia i didn't even think i

378
00:13:26,550 --> 00:13:24,079
would visit the middle east

379
00:13:30,949 --> 00:13:29,190
what happened was that the president of

380
00:13:32,150 --> 00:13:30,959
caltech when i was a graduate student he

381
00:13:33,829 --> 00:13:32,160
left

382
00:13:35,829 --> 00:13:33,839
caltech to become the president of a

383
00:13:38,069 --> 00:13:35,839
university in saudi arabia

384
00:13:39,990 --> 00:13:38,079
and um

385
00:13:41,910 --> 00:13:40,000
when i was close to graduating

386
00:13:43,750 --> 00:13:41,920
i um

387
00:13:45,829 --> 00:13:43,760
kind of wrote him on a whim

388
00:13:48,230 --> 00:13:45,839

saying hey you know we might have some

389
00:13:50,470 --> 00:13:48,240
opportunities through my phd comics work

390
00:13:51,829 --> 00:13:50,480
to showcase your university

391
00:13:54,710 --> 00:13:51,839
are you interested

392
00:13:57,430 --> 00:13:54,720
that led to some discussions and

393
00:13:58,710 --> 00:13:57,440
um he just offered me a job

394
00:14:00,069 --> 00:13:58,720
to to

395
00:14:03,350 --> 00:14:00,079
do the communications and outreach for

396
00:14:04,710 --> 00:14:03,360
this university um you know he said

397
00:14:06,550 --> 00:14:04,720
you've got a good head on your shoulders

398
00:14:09,030 --> 00:14:06,560
you've got a phd from caltech you can

399
00:14:10,629 --> 00:14:09,040
probably figure this out um but he'd

400
00:14:12,870 --> 00:14:10,639
also seen all of the extracurricular

401
00:14:14,550 --> 00:14:12,880
work i did during grad school we did a

402
00:14:16,870 --> 00:14:14,560
youtube series called phd tours and all

403
00:14:20,550 --> 00:14:16,880
of this other stuff um

404
00:14:22,870 --> 00:14:20,560
so yeah so i i did a complete uh 90

405
00:14:24,550 --> 00:14:22,880
degree you know turn in my life and my

406
00:14:25,829 --> 00:14:24,560
career moved to the middle east to a

407
00:14:28,230 --> 00:14:25,839
different culture

408
00:14:30,710 --> 00:14:28,240
um to uh

409
00:14:33,670 --> 00:14:30,720
and a different career um

410
00:14:36,550 --> 00:14:33,680
fortunately i had his support and um

411
00:14:39,189 --> 00:14:36,560
another um boss who was

412
00:14:40,150 --> 00:14:39,199
very tough but taught me so so so so

413
00:14:41,430 --> 00:14:40,160

much

414
00:14:43,350 --> 00:14:41,440
um

415
00:14:44,550 --> 00:14:43,360
i'm incredibly grateful for for all that

416
00:14:45,430 --> 00:14:44,560
she taught me

417
00:14:47,509 --> 00:14:45,440
um

418
00:14:50,470 --> 00:14:47,519
and then i lived in saudi arabia for two

419
00:14:53,189 --> 00:14:50,480
and a half years um which was incredible

420
00:14:55,509 --> 00:14:53,199
uh to learn about how you know it's one

421
00:14:58,870 --> 00:14:55,519
thing to go into a different job in a

422
00:15:00,870 --> 00:14:58,880
different organization um but to go to a

423
00:15:02,870 --> 00:15:00,880
completely different culture

424
00:15:04,629 --> 00:15:02,880
is just a whole another layer of

425
00:15:06,870 --> 00:15:04,639
learning how to deal with people and how

426
00:15:11,030 --> 00:15:06,880
to make the most of situations and how

427
00:15:14,230 --> 00:15:11,040
to really you know navigate things um

428
00:15:15,670 --> 00:15:14,240
carefully but intentionally um but it

429
00:15:16,470 --> 00:15:15,680
was so cool too

430
00:15:18,069 --> 00:15:16,480
uh

431
00:15:20,230 --> 00:15:18,079
up until a few years ago nobody could

432
00:15:23,110 --> 00:15:20,240
you couldn't just visit saudi arabia you

433
00:15:25,030 --> 00:15:23,120
had to have either a work visa or a um

434
00:15:27,189 --> 00:15:25,040
religious travel visa

435
00:15:29,110 --> 00:15:27,199
and so being there when a time that

436
00:15:30,550 --> 00:15:29,120
almost nobody else could ever go to that

437
00:15:34,069 --> 00:15:30,560
country and seeing some of these

438
00:15:36,790 --> 00:15:34,079

incredible like hidden gems um nabateen

439
00:15:38,150 --> 00:15:36,800
ruins which are um

440
00:15:45,110 --> 00:15:38,160
they're

441
00:15:47,189 --> 00:15:45,120
into the side of stones and there's two

442
00:15:48,389 --> 00:15:47,199
famous sites for them one is petra

443
00:15:50,870 --> 00:15:48,399
jordan which a lot of people have

444
00:15:53,110 --> 00:15:50,880
visited which was highlighted in um

445
00:15:54,870 --> 00:15:53,120
the indiana jones movies but then the

446
00:15:58,069 --> 00:15:54,880
other set of nebatean tombs is in saudi

447
00:16:00,069 --> 00:15:58,079
arabia and almost nobody i mean has ever

448
00:16:01,590 --> 00:16:00,079
millions of people exit petra and where

449
00:16:02,949 --> 00:16:01,600
and only thousands of people have ever

450
00:16:05,110 --> 00:16:02,959
seen the ones in saudi arabia so i got

451
00:16:07,189 --> 00:16:05,120
to go see those and

452
00:16:08,949 --> 00:16:07,199
just travel all around

453
00:16:11,110 --> 00:16:08,959
and meet people from all of these

454
00:16:13,509 --> 00:16:11,120
different cultures it was

455
00:16:15,670 --> 00:16:13,519
fantastic um

456
00:16:17,269 --> 00:16:15,680
that's so incredible i love how like our

457
00:16:18,629 --> 00:16:17,279
conversation so far like it sounds like

458
00:16:20,949 --> 00:16:18,639
your career there's little pieces that

459
00:16:22,710 --> 00:16:20,959
kind of tie everything together along

460
00:16:24,310 --> 00:16:22,720
the way you know the phd comics helped

461
00:16:25,590 --> 00:16:24,320
with going to saudi arabia and that kind

462
00:16:27,509 --> 00:16:25,600
of helped them too in the transition

463
00:16:29,110 --> 00:16:27,519

your career in communications but you

464
00:16:31,189 --> 00:16:29,120
also have a strong background in the

465
00:16:32,949 --> 00:16:31,199
sciences and having done research with

466
00:16:34,710 --> 00:16:32,959
infrared astronomy and trying to

467
00:16:36,230 --> 00:16:34,720
understand you know what we're using and

468
00:16:38,470 --> 00:16:36,240
looking out there with something like

469
00:16:40,470 --> 00:16:38,480
the james webb space telescope

470
00:16:42,470 --> 00:16:40,480
i know a lot of our audience wants me to

471
00:16:43,509 --> 00:16:42,480
jump to jwst as soon as possible so we

472
00:16:45,189 --> 00:16:43,519
can do that

473
00:16:47,829 --> 00:16:45,199
you were the project scientist for

474
00:16:50,069 --> 00:16:47,839
communications and outreach um before we

475
00:16:51,910 --> 00:16:50,079
talk about the data from jwst what it's

476
00:16:53,030 --> 00:16:51,920
doing now maybe some of the stuff for

477
00:16:54,790 --> 00:16:53,040
the future

478
00:16:57,110 --> 00:16:54,800
i wonder if you should explain what the

479
00:16:59,110 --> 00:16:57,120
job is of a project scientist in

480
00:17:00,710 --> 00:16:59,120
communications and outreach and the work

481
00:17:02,470 --> 00:17:00,720
that you are doing for the web space

482
00:17:04,870 --> 00:17:02,480
telescope

483
00:17:07,429 --> 00:17:04,880
yeah um so

484
00:17:09,429 --> 00:17:07,439
that's a good question um you know

485
00:17:10,789 --> 00:17:09,439
i think there's a lot of different

486
00:17:13,590 --> 00:17:10,799
project scientists can meet a lot of

487
00:17:15,590 --> 00:17:13,600
different things um in missions um but

488
00:17:17,909 --> 00:17:15,600

it's seeming to me that more and more

489
00:17:19,110 --> 00:17:17,919
nasa missions are

490
00:17:20,870 --> 00:17:19,120
having

491
00:17:23,350 --> 00:17:20,880
project scientists for communications

492
00:17:24,549 --> 00:17:23,360
because they just it's so critical not

493
00:17:26,549 --> 00:17:24,559
just to

494
00:17:28,309 --> 00:17:26,559
do the communications but to make sure

495
00:17:30,230 --> 00:17:28,319
that there is a very strong connection

496
00:17:31,909 --> 00:17:30,240
to the science and so having somebody

497
00:17:33,590 --> 00:17:31,919
with a science background who's then

498
00:17:35,029 --> 00:17:33,600
dedicated to doing the communications

499
00:17:37,270 --> 00:17:35,039
means that they can work with the

500
00:17:39,430 --> 00:17:37,280
scientific staff to ensure accuracy but

501
00:17:41,750 --> 00:17:39,440
also with the communications folks to

502
00:17:44,710 --> 00:17:41,760
you know to ensure that

503
00:17:46,070 --> 00:17:44,720
things are distributed strategically and

504
00:17:47,590 --> 00:17:46,080
meeting all of the different audiences

505
00:17:50,870 --> 00:17:47,600
that we have nowadays

506
00:17:54,390 --> 00:17:50,880
so um that was kind of my job was to

507
00:17:56,390 --> 00:17:54,400
help make the the connection between

508
00:18:00,470 --> 00:17:56,400
the science that james webb will do and

509
00:18:02,390 --> 00:18:00,480
now has done so excited for that um

510
00:18:03,830 --> 00:18:02,400
and um and all of the different methods

511
00:18:06,789 --> 00:18:03,840
that we can share that with the public

512
00:18:09,430 --> 00:18:06,799
from you know public exhibits to social

513
00:18:10,710 --> 00:18:09,440

media to news stories

514
00:18:13,029 --> 00:18:10,720
um

515
00:18:14,870 --> 00:18:13,039
really telling that scientific story

516
00:18:16,950 --> 00:18:14,880
and just making sure that it's really

517
00:18:19,909 --> 00:18:16,960
really based in the science

518
00:18:20,870 --> 00:18:19,919
um that is that is the most relevant and

519
00:18:23,190 --> 00:18:20,880
and

520
00:18:24,710 --> 00:18:23,200
um connects to the audience

521
00:18:26,710 --> 00:18:24,720
that's incredible and i love this idea

522
00:18:28,470 --> 00:18:26,720
too of having a strong science

523
00:18:30,150 --> 00:18:28,480
background it makes you a stronger

524
00:18:31,830 --> 00:18:30,160
communicator when you're communicating

525
00:18:33,990 --> 00:18:31,840
science about something like a nasa

526
00:18:35,990 --> 00:18:34,000
mission that's super critical um to have

527
00:18:38,390 --> 00:18:36,000
that background and i will say now uh

528
00:18:40,789 --> 00:18:38,400
our producer and director mike toyon um

529
00:18:42,870 --> 00:18:40,799
has asked that we we ask you to give us

530
00:18:44,549 --> 00:18:42,880
a rundown basically of the images that

531
00:18:47,110 --> 00:18:44,559
were released so far

532
00:18:49,029 --> 00:18:47,120
from jwst since you were so involved in

533
00:18:51,270 --> 00:18:49,039
those releases and bringing those data

534
00:18:52,630 --> 00:18:51,280
to the public for us to understand

535
00:18:54,710 --> 00:18:52,640
the first image he's going to show to

536
00:18:56,870 --> 00:18:54,720
our audience here is the famous the

537
00:18:59,510 --> 00:18:56,880
first image the deep field image of

538
00:19:01,669 --> 00:18:59,520

smacks zero seven two three um what are

539
00:19:04,470 --> 00:19:01,679
we seeing in that image

540
00:19:06,070 --> 00:19:04,480
so the this max0723 is actually the

541
00:19:07,270 --> 00:19:06,080
galaxy cluster at the center of the

542
00:19:10,630 --> 00:19:07,280
image

543
00:19:12,630 --> 00:19:10,640
we use galaxy clusters as gravitational

544
00:19:14,390 --> 00:19:12,640
lenses to actually see further back into

545
00:19:15,510 --> 00:19:14,400
space and time

546
00:19:16,950 --> 00:19:15,520
and so

547
00:19:18,630 --> 00:19:16,960
this um

548
00:19:20,549 --> 00:19:18,640
you see here it's you see all of the

549
00:19:22,390 --> 00:19:20,559
background galaxies which you see in any

550
00:19:24,070 --> 00:19:22,400
image in web you can't not see galaxies

551
00:19:26,070 --> 00:19:24,080
in a web image it is so sensitive and

552
00:19:28,070 --> 00:19:26,080
there's so many galaxies out there

553
00:19:30,950 --> 00:19:28,080
um but it's centered on the center star

554
00:19:33,190 --> 00:19:30,960
cluster to help um bend and focus light

555
00:19:35,270 --> 00:19:33,200
from distant galaxies um and in this

556
00:19:37,590 --> 00:19:35,280
image there's actually a handful of

557
00:19:38,470 --> 00:19:37,600
galaxies that are older than 13 billion

558
00:19:40,390 --> 00:19:38,480
years

559
00:19:42,549 --> 00:19:40,400
um and this was taken in just a matter

560
00:19:44,789 --> 00:19:42,559
of few hours of a few hours as opposed

561
00:19:46,630 --> 00:19:44,799
to hubble deep fields which have taken

562
00:19:47,909 --> 00:19:46,640
on the order of hundreds you know 100

563
00:19:49,830 --> 00:19:47,919

plus hours

564
00:19:52,390 --> 00:19:49,840
so um you know this is really just

565
00:19:55,270 --> 00:19:52,400
scratching the surface of how deep into

566
00:19:56,470 --> 00:19:55,280
the universe web will and can look you

567
00:19:57,990 --> 00:19:56,480
know i love that yeah it's the drop in

568
00:20:00,150 --> 00:19:58,000
the bucket of how far we're going to go

569
00:20:02,549 --> 00:20:00,160
here and looking to the earliest moments

570
00:20:05,029 --> 00:20:02,559
of time that we know of um the next

571
00:20:07,190 --> 00:20:05,039
image coming up is the karina nebula i

572
00:20:09,750 --> 00:20:07,200
think this one is and now being used as

573
00:20:11,990 --> 00:20:09,760
the most wallpapers for people's desktop

574
00:20:13,029 --> 00:20:12,000
computers and laptops and i had some

575
00:20:14,950 --> 00:20:13,039
students on a recent trip for

576
00:20:17,510 --> 00:20:14,960
smithsonian and a bunch of them had as a

577
00:20:19,830 --> 00:20:17,520
wallpaper on their smartphones now um so

578
00:20:21,830 --> 00:20:19,840
what are we seeing in that karina image

579
00:20:23,909 --> 00:20:21,840
oh my god let me just tell you that i

580
00:20:25,669 --> 00:20:23,919
was in the room like the morning that

581
00:20:28,789 --> 00:20:25,679
this data first started coming down we

582
00:20:30,310 --> 00:20:28,799
downloaded the first raw fits file

583
00:20:33,110 --> 00:20:30,320
single filter

584
00:20:34,470 --> 00:20:33,120
completely unprocessed out you know just

585
00:20:36,950 --> 00:20:34,480
down from the telescope through the

586
00:20:38,630 --> 00:20:36,960
pipeline put it up on the screen and i

587
00:20:40,630 --> 00:20:38,640
had a tear in my eye

588
00:20:44,230 --> 00:20:40,640

it this this data has been gorgeous from

589
00:20:45,430 --> 00:20:44,240
the beginning and i'm so so incredibly

590
00:20:47,350 --> 00:20:45,440
you know uh

591
00:20:48,950 --> 00:20:47,360
amazed by by

592
00:20:51,350 --> 00:20:48,960
this image um

593
00:20:53,110 --> 00:20:51,360
this is a star-forming region so within

594
00:20:55,029 --> 00:20:53,120
this cloud there are

595
00:20:58,230 --> 00:20:55,039
thousands of little stars that are

596
00:20:59,990 --> 00:20:58,240
forming um and they create all sorts of

597
00:21:02,870 --> 00:21:00,000
crazy shapes that you can see if you

598
00:21:04,870 --> 00:21:02,880
explore the detail in the image um

599
00:21:07,029 --> 00:21:04,880
and actually one really fun little thing

600
00:21:09,190 --> 00:21:07,039
that if you look really closely sort of

601
00:21:11,430 --> 00:21:09,200
at the right where the nebula meets the

602
00:21:13,270 --> 00:21:11,440
rest of open space

603
00:21:16,630 --> 00:21:13,280
sort of towards the center

604
00:21:18,950 --> 00:21:16,640
there is a you can see

605
00:21:22,149 --> 00:21:18,960
where a star is embedded and the jets

606
00:21:23,190 --> 00:21:22,159
from the star that are um

607
00:21:25,350 --> 00:21:23,200
that are

608
00:21:27,029 --> 00:21:25,360
propagating both into the nebula but

609
00:21:28,870 --> 00:21:27,039
also you can see they've broken through

610
00:21:30,549 --> 00:21:28,880
the nebula and you can actually see

611
00:21:32,230 --> 00:21:30,559
ejected material

612
00:21:34,470 --> 00:21:32,240
all the way up at the top of the image

613
00:21:35,990 --> 00:21:34,480

if you follow the line so this is a

614
00:21:38,230 --> 00:21:36,000
little uh you know a little scavenger

615
00:21:40,390 --> 00:21:38,240
hunt for for the listeners out there to

616
00:21:42,470 --> 00:21:40,400
go find that because it's so cool we can

617
00:21:44,950 --> 00:21:42,480
we can really study the medium

618
00:21:47,750 --> 00:21:44,960
and the material by study you know

619
00:21:49,270 --> 00:21:47,760
seeing this physical process in action i

620
00:21:51,029 --> 00:21:49,280
love that now i have to do something

621
00:21:53,510 --> 00:21:51,039
after the show too

622
00:21:54,789 --> 00:21:53,520
um so uh so now we're seeing you know

623
00:21:57,110 --> 00:21:54,799
the earliest moments in time we're

624
00:21:58,789 --> 00:21:57,120
seeing star birth and formation uh the

625
00:22:00,710 --> 00:21:58,799
next image coming up is the southern

626
00:22:02,950 --> 00:22:00,720
ring nebula image there's two of those

627
00:22:04,230 --> 00:22:02,960
side by side um what are their they're

628
00:22:07,110 --> 00:22:04,240
showing us

629
00:22:09,110 --> 00:22:07,120
yeah yeah i call those the eyes um so

630
00:22:11,029 --> 00:22:09,120
this is two side by side uh near

631
00:22:12,549 --> 00:22:11,039
infrared and mid infrared images of the

632
00:22:13,909 --> 00:22:12,559
same object both of these images were

633
00:22:15,350 --> 00:22:13,919
taken by james webb because it has

634
00:22:16,789 --> 00:22:15,360
capabilities at both of these different

635
00:22:19,350 --> 00:22:16,799
wavelength ranges

636
00:22:21,270 --> 00:22:19,360
um and this is a dying star so this is a

637
00:22:23,750 --> 00:22:21,280
planetary nebula so it's a star that's

638
00:22:26,310 --> 00:22:23,760

not super massive maybe like our sun

639
00:22:29,029 --> 00:22:26,320
um and it has died and in the process of

640
00:22:31,590 --> 00:22:29,039
dying it has expelled its outer layers

641
00:22:34,630 --> 00:22:31,600
of gas and those outer layers of gas

642
00:22:36,310 --> 00:22:34,640
have created new molecules i mean it's

643
00:22:39,029 --> 00:22:36,320
this very uh

644
00:22:40,950 --> 00:22:39,039
intense environment uh that really you

645
00:22:42,789 --> 00:22:40,960
know when when carl sagan said we are

646
00:22:44,549 --> 00:22:42,799
made of star stuff this is what he meant

647
00:22:46,710 --> 00:22:44,559
dying stars create all of the the

648
00:22:48,710 --> 00:22:46,720
molecules and and um

649
00:22:50,789 --> 00:22:48,720
building blocks of life and as we know

650
00:22:52,710 --> 00:22:50,799
it so um so that's what we're seeing

651
00:22:54,710 --> 00:22:52,720
here and it looks really cool you can

652
00:22:57,830 --> 00:22:54,720
just see so i mean you can see all of

653
00:22:59,990 --> 00:22:57,840
the like physics going on it's crazy i

654
00:23:02,549 --> 00:23:00,000
love that so much uh there's also an

655
00:23:04,870 --> 00:23:02,559
image called stefan's quintet showing uh

656
00:23:06,310 --> 00:23:04,880
kind of like a globular like material of

657
00:23:09,190 --> 00:23:06,320
galaxies kind of around each other

658
00:23:12,470 --> 00:23:09,200
what's that showing us so that is a set

659
00:23:13,990 --> 00:23:12,480
of interacting galaxies um and in fact

660
00:23:15,590 --> 00:23:14,000
it's kind of hard to tell but there's

661
00:23:17,430 --> 00:23:15,600
there's there's five galaxies there but

662
00:23:19,750 --> 00:23:17,440
four of them are interacting and then

663
00:23:21,750 --> 00:23:19,760

there's one kind of off to the left side

664
00:23:23,990 --> 00:23:21,760
if you're looking at the image and that

665
00:23:25,190 --> 00:23:24,000
is a near-ground foreground galaxy but

666
00:23:26,710 --> 00:23:25,200
the five of them looked together so

667
00:23:28,310 --> 00:23:26,720
they're called stefan's quintet and you

668
00:23:29,909 --> 00:23:28,320
can just i mean you can see the

669
00:23:31,990 --> 00:23:29,919
interactions of the galaxies you can see

670
00:23:34,549 --> 00:23:32,000
the dust being ripped apart as these

671
00:23:36,470 --> 00:23:34,559
galaxies at the top have been um have

672
00:23:38,789 --> 00:23:36,480
been moving through each other

673
00:23:40,710 --> 00:23:38,799
and you can also really see great detail

674
00:23:43,830 --> 00:23:40,720
in the the single galaxy on the side by

675
00:23:45,190 --> 00:23:43,840
itself um infrared wavelengths bring out

676
00:23:46,549 --> 00:23:45,200
dust features

677
00:23:48,070 --> 00:23:46,559
which is really complementary to what

678
00:23:49,909 --> 00:23:48,080
you can see with hubble image because

679
00:23:52,710 --> 00:23:49,919
hubble really brings out stellar

680
00:23:55,029 --> 00:23:52,720
features and hot gas so together you get

681
00:23:56,470 --> 00:23:55,039
a much better uh picture of

682
00:23:58,789 --> 00:23:56,480
the the full extent of what's going on

683
00:24:00,789 --> 00:23:58,799
in the galaxy oh fantastic so we have

684
00:24:02,870 --> 00:24:00,799
the birth of time as we know it the

685
00:24:05,190 --> 00:24:02,880
birth of stars and planets the end of

686
00:24:07,909 --> 00:24:05,200
solar systems we have interactions of

687
00:24:10,630 --> 00:24:07,919
galaxies um and now one that came out

688
00:24:12,230 --> 00:24:10,640

fairly recently that has been shared on

689
00:24:14,549 --> 00:24:12,240
twitter and instagram and across the

690
00:24:16,950 --> 00:24:14,559
internet literally millions and millions

691
00:24:19,350 --> 00:24:16,960
of times now is the image of jupiter

692
00:24:21,110 --> 00:24:19,360
that just came out um that's a really

693
00:24:22,789 --> 00:24:21,120
stunning image what are we seeing in

694
00:24:24,789 --> 00:24:22,799
that image we don't normally see with

695
00:24:25,590 --> 00:24:24,799
visible light

696
00:24:30,230 --> 00:24:25,600
um

697
00:24:32,549 --> 00:24:30,240
again at infrared wavelengths you're

698
00:24:34,390 --> 00:24:32,559
studying certain molecules so we're

699
00:24:37,110 --> 00:24:34,400
seeing molecular signatures in the

700
00:24:39,029 --> 00:24:37,120
atmosphere of jupiter just like we do we

701
00:24:42,390 --> 00:24:39,039
we study with web for exoplanets we are

702
00:24:44,549 --> 00:24:42,400
studying um and so you're seeing those

703
00:24:45,750 --> 00:24:44,559
uh the banding the at the structure of

704
00:24:47,430 --> 00:24:45,760
the atmosphere from those different

705
00:24:49,590 --> 00:24:47,440
molecular signatures

706
00:24:51,029 --> 00:24:49,600
um it's a really cool image and i know

707
00:24:54,070 --> 00:24:51,039
people were really excited to see

708
00:24:55,669 --> 00:24:54,080
something so close um our good old buddy

709
00:24:57,269 --> 00:24:55,679
jupiter

710
00:24:59,830 --> 00:24:57,279
just the fact that this telescope has

711
00:25:02,390 --> 00:24:59,840
that resolving power too to see things

712
00:25:04,470 --> 00:25:02,400
so well in our own solar system in solar

713
00:25:07,269 --> 00:25:04,480

systems nearby and to the beginning of

714
00:25:09,269 --> 00:25:07,279
time is incredible um we did through the

715
00:25:13,190 --> 00:25:09,279
nasa astrobio twitter account which is

716
00:25:16,390 --> 00:25:13,200
at nasa astro bio we asked our audience

717
00:25:18,230 --> 00:25:16,400
of all the things that jwst can teach us

718
00:25:19,190 --> 00:25:18,240
what do they find most exciting now to

719
00:25:20,470 --> 00:25:19,200
be fair

720
00:25:23,350 --> 00:25:20,480
these are people who do follow an

721
00:25:25,190 --> 00:25:23,360
account called nasa astrobiology

722
00:25:28,070 --> 00:25:25,200
but we gave them some possible answers

723
00:25:30,070 --> 00:25:28,080
exoplanet atmospheres the early universe

724
00:25:31,830 --> 00:25:30,080
galaxy formation or stellar and

725
00:25:34,149 --> 00:25:31,840
planetary birth

726
00:25:36,470 --> 00:25:34,159
of all those possible answers over 60

727
00:25:38,950 --> 00:25:36,480
percent of the respondents

728
00:25:41,909 --> 00:25:38,960
from 193 votes said exoplanet

729
00:25:43,909 --> 00:25:41,919
atmospheres and as an astrobiologist

730
00:25:46,310 --> 00:25:43,919
like okay it's hot all the images are

731
00:25:48,630 --> 00:25:46,320
beautiful karina is beautiful

732
00:25:50,630 --> 00:25:48,640
it's stunning but as an astrobiologist

733
00:25:52,070 --> 00:25:50,640
and someone who wants to know

734
00:25:54,470 --> 00:25:52,080
if there's life out there in other

735
00:25:56,470 --> 00:25:54,480
worlds these exoplanet atmospheric data

736
00:25:57,990 --> 00:25:56,480
are kind of the coolest thing and

737
00:26:00,549 --> 00:25:58,000
there's there's some data were released

738
00:26:02,630 --> 00:26:00,559

right away uh which showed us water in

739
00:26:04,710 --> 00:26:02,640
an atmosphere of an exoplanet and then

740
00:26:06,870 --> 00:26:04,720
just today we found some new data

741
00:26:09,110 --> 00:26:06,880
showing us something also very awesome

742
00:26:11,510 --> 00:26:09,120
um would you mind telling us what we

743
00:26:13,269 --> 00:26:11,520
released today uh and maybe what we're

744
00:26:15,750 --> 00:26:13,279
going to see in the future for exoplanet

745
00:26:16,789 --> 00:26:15,760
atmospheres from jwst

746
00:26:21,350 --> 00:26:16,799
yes

747
00:26:24,310 --> 00:26:21,360
we saw co2 for the first time ever

748
00:26:28,310 --> 00:26:24,320
um so just this morning you know how uh

749
00:26:33,590 --> 00:26:31,029
just this morning was the first

750
00:26:35,029 --> 00:26:33,600
science peer-reviewed publication based

751
00:26:38,149 --> 00:26:35,039
on web data

752
00:26:42,230 --> 00:26:38,159
it's a paper in nature led by a whole

753
00:26:45,750 --> 00:26:42,240
well a a whole team of of exoplaneteers

754
00:26:47,269 --> 00:26:45,760
um and it is the first ever discovery

755
00:26:49,430 --> 00:26:47,279
at the first ever

756
00:26:51,909 --> 00:26:49,440
confirmed signature of co2 in an

757
00:26:54,310 --> 00:26:51,919
exoplanet atmosphere it is the first

758
00:26:56,630 --> 00:26:54,320
science result from james webb

759
00:26:57,909 --> 00:26:56,640
it is uh the undertaking of a

760
00:27:00,710 --> 00:26:57,919
collaboration

761
00:27:03,110 --> 00:27:00,720
of it's almost like a hundred i think

762
00:27:05,909 --> 00:27:03,120
different people who came together to

763
00:27:08,070 --> 00:27:05,919

propose time together on james webb and

764
00:27:10,470 --> 00:27:08,080
make that make that data immediately

765
00:27:13,590 --> 00:27:10,480
publicly available because they were all

766
00:27:15,830 --> 00:27:13,600
so passionate about forwarding exoplanet

767
00:27:17,350 --> 00:27:15,840
science that they didn't bother

768
00:27:18,710 --> 00:27:17,360
bickering over who was going to be first

769
00:27:21,590 --> 00:27:18,720
and this is my day or whatever they all

770
00:27:24,149 --> 00:27:21,600
got together and they said these are our

771
00:27:26,710 --> 00:27:24,159
priorities for what we want to study so

772
00:27:29,190 --> 00:27:26,720
that the science can just start flowing

773
00:27:30,230 --> 00:27:29,200
and that is exactly what they did it is

774
00:27:32,070 --> 00:27:30,240
i mean i

775
00:27:33,990 --> 00:27:32,080
i am fortunate to know a lot of the

776
00:27:35,669 --> 00:27:34,000
people on that team um through my

777
00:27:36,549 --> 00:27:35,679
previous uh work

778
00:27:38,389 --> 00:27:36,559
um

779
00:27:40,710 --> 00:27:38,399
and and and not only they're cool people

780
00:27:42,070 --> 00:27:40,720
but i mean they've just proven what

781
00:27:44,470 --> 00:27:42,080
they're you know how great their science

782
00:27:47,269 --> 00:27:44,480
is how great this observatory is

783
00:27:49,110 --> 00:27:47,279
i i couldn't be more excited i love it

784
00:27:50,870 --> 00:27:49,120
it's so great i love this collaboration

785
00:27:53,510 --> 00:27:50,880
too working together to bring the

786
00:27:54,950 --> 00:27:53,520
science forward so quickly too for all

787
00:27:56,950 --> 00:27:54,960
of us i mean these are results coming

788
00:27:59,029 --> 00:27:56,960

out really fast after observations have

789
00:28:00,870 --> 00:27:59,039
begun so there's there's a lot more

790
00:28:02,789 --> 00:28:00,880
ahead of us as well

791
00:28:03,990 --> 00:28:02,799
um and i know so there's a bunch of

792
00:28:05,590 --> 00:28:04,000
questions rolling in from the audience

793
00:28:07,110 --> 00:28:05,600
right now i promise to our audience on

794
00:28:08,230 --> 00:28:07,120
youtube i will get to your questions as

795
00:28:11,430 --> 00:28:08,240
soon as we can

796
00:28:12,950 --> 00:28:11,440
um but one thing from me then um is what

797
00:28:17,110 --> 00:28:12,960
are you looking forward to for the

798
00:28:20,310 --> 00:28:17,120
future of jwst observations

799
00:28:23,110 --> 00:28:20,320
um you know i think that

800
00:28:24,870 --> 00:28:23,120
the exoplanet possibilities um

801
00:28:26,789 --> 00:28:24,880
and really

802
00:28:28,710 --> 00:28:26,799
with james webb we have the opportunity

803
00:28:31,830 --> 00:28:28,720
to study and detail these exoplanet

804
00:28:35,110 --> 00:28:31,840
atmospheres and also study in detail

805
00:28:37,190 --> 00:28:35,120
where planets were formed and so we have

806
00:28:39,990 --> 00:28:37,200
one tool that can help us study the

807
00:28:42,070 --> 00:28:40,000
entire life cycle of planetary systems

808
00:28:43,510 --> 00:28:42,080
and put pieces together because it's not

809
00:28:46,070 --> 00:28:43,520
just what's you know what do we see in

810
00:28:47,750 --> 00:28:46,080
exoplanets it's how did it get there why

811
00:28:50,230 --> 00:28:47,760
how why do we see this diversity of

812
00:28:52,389 --> 00:28:50,240
exoplanet systems you know how do we

813
00:28:54,950 --> 00:28:52,399

explain our own solar system that now

814
00:28:57,830 --> 00:28:54,960
seems like an anomaly from what we found

815
00:28:59,269 --> 00:28:57,840
um you know and being able to to start

816
00:29:01,669 --> 00:28:59,279
from the beginning and say this is the

817
00:29:03,350 --> 00:29:01,679
raw nascent material from which the star

818
00:29:04,310 --> 00:29:03,360
and the planets formed

819
00:29:09,029 --> 00:29:04,320
and

820
00:29:10,950 --> 00:29:09,039
way to fully formed systems um

821
00:29:13,190 --> 00:29:10,960
jdbt just has such incredible

822
00:29:17,190 --> 00:29:13,200
capabilities such incredible resolving

823
00:29:20,149 --> 00:29:17,200
power and insensitivity to to study the

824
00:29:22,230 --> 00:29:20,159
entire evolution of planetary systems

825
00:29:24,549 --> 00:29:22,240
yeah absolutely there's so much more

826
00:29:27,110 --> 00:29:24,559
ahead um i will say just for time's sake

827
00:29:29,750 --> 00:29:27,120
i want to jump to our next segment um

828
00:29:31,590 --> 00:29:29,760
which are our our faster than light uh

829
00:29:33,510 --> 00:29:31,600
questions our rapid fire questions

830
00:29:35,190 --> 00:29:33,520
segment um just a few questions if you

831
00:29:37,990 --> 00:29:35,200
can give us an answer in like 30 seconds

832
00:29:40,389 --> 00:29:38,000
to a minute um just a few things to poke

833
00:29:42,149 --> 00:29:40,399
and prod about your your interest in the

834
00:29:42,950 --> 00:29:42,159
universe and space and other things like

835
00:29:45,029 --> 00:29:42,960
that

836
00:29:47,350 --> 00:29:45,039
um so the first question is um with

837
00:29:49,430 --> 00:29:47,360
regard to aliens uh what's your favorite

838
00:29:51,029 --> 00:29:49,440

answer to fermi's question where are

839
00:29:53,510 --> 00:29:51,039
they

840
00:29:55,750 --> 00:29:53,520
um i would say it just hasn't been

841
00:29:57,990 --> 00:29:55,760
enough time i mean you know

842
00:29:59,669 --> 00:29:58,000
100 years of trying to communicate as a

843
00:30:00,389 --> 00:29:59,679
drop in the bucket

844
00:30:01,590 --> 00:30:00,399
so

845
00:30:03,350 --> 00:30:01,600
they're there

846
00:30:05,669 --> 00:30:03,360
okay and then for me i love reading

847
00:30:08,310 --> 00:30:05,679
books i also play a bunch of video games

848
00:30:10,630 --> 00:30:08,320
um what kinds of stories have inspired

849
00:30:13,510 --> 00:30:10,640
you to want to explore more about life

850
00:30:15,510 --> 00:30:13,520
and the universe or space

851
00:30:18,149 --> 00:30:15,520
um so

852
00:30:20,950 --> 00:30:18,159
definitely ray bradbury

853
00:30:22,870 --> 00:30:20,960
and also contact

854
00:30:24,710 --> 00:30:22,880
i was i was you know in middle school

855
00:30:27,830 --> 00:30:24,720
when that movie came out and and jody

856
00:30:30,070 --> 00:30:27,840
foster oh that was incredible

857
00:30:32,310 --> 00:30:30,080
absolutely i contacted so

858
00:30:34,549 --> 00:30:32,320
um so here's the career one if you could

859
00:30:36,230 --> 00:30:34,559
go back in time and visit yourself at

860
00:30:38,470 --> 00:30:36,240
the beginning of your career whenever

861
00:30:41,750 --> 00:30:38,480
you consider that to be uh what advice

862
00:30:44,070 --> 00:30:41,760
would you give alex back then

863
00:30:45,990 --> 00:30:44,080

um well two pieces of advice

864
00:30:49,190 --> 00:30:46,000
one is

865
00:30:50,710 --> 00:30:49,200
just keep doing it you're gonna be fine

866
00:30:52,630 --> 00:30:50,720
um

867
00:30:54,630 --> 00:30:52,640
and the other would be

868
00:30:56,389 --> 00:30:54,640
uh study atmospheric science because i

869
00:30:57,669 --> 00:30:56,399
think climate change is really important

870
00:30:59,750 --> 00:30:57,679
and i wish i

871
00:31:02,310 --> 00:30:59,760
could be contributing to that

872
00:31:04,710 --> 00:31:02,320
yeah yeah and it's kind of then ties

873
00:31:06,470 --> 00:31:04,720
into this next question in some ways

874
00:31:09,029 --> 00:31:06,480
if you could ask a question of humans

875
00:31:10,870 --> 00:31:09,039
100 years from now what would you ask

876
00:31:12,950 --> 00:31:10,880
them

877
00:31:14,470 --> 00:31:12,960
um

878
00:31:17,190 --> 00:31:14,480
well i guess that they're alive so that

879
00:31:20,950 --> 00:31:17,200
answer is one of my questions

880
00:31:23,029 --> 00:31:20,960
i i would say uh you know well i guess

881
00:31:25,350 --> 00:31:23,039
at this point

882
00:31:27,029 --> 00:31:25,360
do you wish that

883
00:31:28,789 --> 00:31:27,039
you had taken more risks

884
00:31:31,190 --> 00:31:28,799
maybe

885
00:31:32,549 --> 00:31:31,200
i like that one um and so then what is

886
00:31:34,389 --> 00:31:32,559
something that excites you about the

887
00:31:36,070 --> 00:31:34,399
future

888
00:31:37,909 --> 00:31:36,080

i'm gonna go personal on this one i just

889
00:31:39,590 --> 00:31:37,919
started my family and i'm really excited

890
00:31:41,190 --> 00:31:39,600
to watch my kids grow up

891
00:31:43,190 --> 00:31:41,200
oh i love that that touches my heart i

892
00:31:45,110 --> 00:31:43,200
have a three-year-old now and it's just

893
00:31:47,509 --> 00:31:45,120
it's just fun watching his brain develop

894
00:31:49,990 --> 00:31:47,519
and watching him learn and being part of

895
00:31:52,149 --> 00:31:50,000
that process for him is incredible um i

896
00:31:54,549 --> 00:31:52,159
love that um so our final question and

897
00:31:56,549 --> 00:31:54,559
this is kind of a fun one what's maybe

898
00:31:59,029 --> 00:31:56,559
an unbelievable science fact that still

899
00:32:00,389 --> 00:31:59,039
blows your mind

900
00:32:01,590 --> 00:32:00,399
um

901
00:32:04,149 --> 00:32:01,600
that

902
00:32:05,830 --> 00:32:04,159
there are three thousand galaxies and

903
00:32:10,310 --> 00:32:05,840
there is three thousand galaxies and

904
00:32:13,110 --> 00:32:10,320
anywhere you point

905
00:32:16,310 --> 00:32:13,120
you're pointing at thousands of galaxies

906
00:32:18,789 --> 00:32:16,320
no i love that yeah we are not alone

907
00:32:20,470 --> 00:32:18,799
when it comes to the amount of stubborns

908
00:32:22,310 --> 00:32:20,480
and galaxies out there in the universe

909
00:32:24,389 --> 00:32:22,320
and it makes a lot of us wonder for the

910
00:32:27,190 --> 00:32:24,399
possibilities for alien life out there

911
00:32:28,389 --> 00:32:27,200
hence astrobiology um so i do want to

912
00:32:30,549 --> 00:32:28,399
get to the audience q a now because i

913
00:32:31,750 --> 00:32:30,559

see a bunch of questions rolling in uh

914
00:32:33,830 --> 00:32:31,760
so thank you to our production

915
00:32:35,430 --> 00:32:33,840
assistants maryam nassim and honorable

916
00:32:37,750 --> 00:32:35,440
honty for bringing those questions to us

917
00:32:39,669 --> 00:32:37,760
from youtube and twitter um so the first

918
00:32:41,590 --> 00:32:39,679
question comes and this came just before

919
00:32:44,230 --> 00:32:41,600
we even started talking in our episode

920
00:32:46,310 --> 00:32:44,240
uh from john rosenfield from youtube

921
00:32:48,870 --> 00:32:46,320
john wants to know uh using spectroscopy

922
00:32:51,590 --> 00:32:48,880
with jwst which atmospheric chemical

923
00:32:53,110 --> 00:32:51,600
signatures of life are we looking for

924
00:32:54,549 --> 00:32:53,120
that's a good question

925
00:32:55,350 --> 00:32:54,559
and

926
00:32:58,149 --> 00:32:55,360
so

927
00:33:00,870 --> 00:32:58,159
we are looking for co2 we are looking

928
00:33:03,509 --> 00:33:00,880
for water we are looking for methane

929
00:33:04,389 --> 00:33:03,519
um we're looking for nitrogen

930
00:33:13,509 --> 00:33:04,399
um

931
00:33:15,190 --> 00:33:13,519
further into mid-infrared wavelengths at

932
00:33:17,029 --> 00:33:15,200
around nine microns there's actually a

933
00:33:18,950 --> 00:33:17,039
signature from ozone

934
00:33:20,870 --> 00:33:18,960
um so that's also a very interesting one

935
00:33:22,870 --> 00:33:20,880
that we can get with jwst

936
00:33:24,470 --> 00:33:22,880
that's very cool yes there's so much

937
00:33:26,389 --> 00:33:24,480
that you know friends of ours over the

938
00:33:28,149 --> 00:33:26,399

years have been doing in compiling you

939
00:33:29,669 --> 00:33:28,159
know these databases of what bio

940
00:33:32,230 --> 00:33:29,679
signatures could we look for will we

941
00:33:33,350 --> 00:33:32,240
look for will we find what is an a bio

942
00:33:35,909 --> 00:33:33,360
signature

943
00:33:37,669 --> 00:33:35,919
so there's a lot of great research there

944
00:33:39,909 --> 00:33:37,679
our next question comes from andy oates

945
00:33:41,110 --> 00:33:39,919
from youtube and it's intriguing for me

946
00:33:43,430 --> 00:33:41,120
since i don't actually know webb's

947
00:33:46,549 --> 00:33:43,440
resolution for for moons in our own

948
00:33:48,389 --> 00:33:46,559
solar system uh andy has asked uh could

949
00:33:50,310 --> 00:33:48,399
webs telescope instruments offer any

950
00:33:52,870 --> 00:33:50,320
help in looking for life in our own

951
00:33:55,430 --> 00:33:52,880
solar system such as looking at moons

952
00:33:56,789 --> 00:33:55,440
like enceladus

953
00:33:58,950 --> 00:33:56,799
um so

954
00:34:00,230 --> 00:33:58,960
yes we can look at moons in our own

955
00:34:01,990 --> 00:34:00,240
solar system

956
00:34:04,149 --> 00:34:02,000
and there's a lot of programs that are

957
00:34:06,070 --> 00:34:04,159
that are weird towards that

958
00:34:09,190 --> 00:34:06,080
i can't off the top of my head recall

959
00:34:11,990 --> 00:34:09,200
the resolution um but you can easily

960
00:34:14,069 --> 00:34:12,000
find online the plans and um it is to

961
00:34:16,470 --> 00:34:14,079
study the the surfaces and atmospheres

962
00:34:18,710 --> 00:34:16,480
of moons atmospheres

963
00:34:21,270 --> 00:34:18,720

lately i mean where they are

964
00:34:24,069 --> 00:34:21,280
very cool um our next question comes

965
00:34:26,069 --> 00:34:24,079
from jim pass from twitter uh jim runs

966
00:34:28,629 --> 00:34:26,079
the astro sociology research institute

967
00:34:30,869 --> 00:34:28,639
he has questions for our guests for

968
00:34:33,510 --> 00:34:30,879
astrobiologists that uh consider the

969
00:34:35,909 --> 00:34:33,520
human factor um the sociology side of

970
00:34:38,710 --> 00:34:35,919
things and so his question is how will

971
00:34:41,349 --> 00:34:38,720
jwst discoveries impact on human

972
00:34:45,030 --> 00:34:41,359
societies um perhaps surpassing the

973
00:34:50,550 --> 00:34:46,310
um

974
00:34:52,629 --> 00:34:50,560
you know one is

975
00:34:55,030 --> 00:34:52,639
seeing the earliest galaxies really

976
00:34:58,230 --> 00:34:55,040
helping us understand you know

977
00:34:59,910 --> 00:34:58,240
the closest that we can to the big bang

978
00:35:02,950 --> 00:34:59,920
except for the cmd which is just like

979
00:35:05,510 --> 00:35:02,960
kind of a blob in my opinion um but you

980
00:35:08,230 --> 00:35:05,520
know really understanding the

981
00:35:09,910 --> 00:35:08,240
the origins of humanity um and then the

982
00:35:11,190 --> 00:35:09,920
origins of our solar system as i talked

983
00:35:12,230 --> 00:35:11,200
about before

984
00:35:13,190 --> 00:35:12,240
um

985
00:35:15,349 --> 00:35:13,200
you know i

986
00:35:16,710 --> 00:35:15,359
people want that they want

987
00:35:18,870 --> 00:35:16,720
to be

988
00:35:20,150 --> 00:35:18,880

kind of validated that either they're

989
00:35:22,870 --> 00:35:20,160
really special or that they're really

990
00:35:24,710 --> 00:35:22,880
not special and both of those answers

991
00:35:26,230 --> 00:35:24,720
seem to seem to drive with people but

992
00:35:27,270 --> 00:35:26,240
they won't they want to know

993
00:35:29,829 --> 00:35:27,280
um

994
00:35:32,710 --> 00:35:29,839
and then i'll also say uh just in the

995
00:35:34,790 --> 00:35:32,720
past six weeks since you know webb first

996
00:35:35,750 --> 00:35:34,800
got its first images

997
00:35:37,990 --> 00:35:35,760
the

998
00:35:40,630 --> 00:35:38,000
number of articles that i've read from

999
00:35:42,710 --> 00:35:40,640
you know very uh curmudgeonly

1000
00:35:44,710 --> 00:35:42,720
journalists who were questioning webb

1001
00:35:47,990 --> 00:35:44,720
for for years and years and years

1002
00:35:49,589 --> 00:35:48,000
now having you know a renewed

1003
00:35:52,390 --> 00:35:49,599
appreciation for

1004
00:35:54,390 --> 00:35:52,400
for nasa for astronomy for you know the

1005
00:35:56,790 --> 00:35:54,400
cosmos for science

1006
00:36:00,710 --> 00:35:56,800
um i think i think that that is the

1007
00:36:02,150 --> 00:36:00,720
value of astronomy um first and foremost

1008
00:36:03,910 --> 00:36:02,160
is the wonder that it gives people the

1009
00:36:04,790 --> 00:36:03,920
inspiration the hope

1010
00:36:05,990 --> 00:36:04,800
um

1011
00:36:08,150 --> 00:36:06,000
you know we

1012
00:36:09,349 --> 00:36:08,160
for example climate change we need to be

1013
00:36:10,470 --> 00:36:09,359

pushing the boundaries of what's

1014
00:36:12,790 --> 00:36:10,480
possible

1015
00:36:13,910 --> 00:36:12,800
to solve those problems and with things

1016
00:36:16,069 --> 00:36:13,920
like web

1017
00:36:18,470 --> 00:36:16,079
we renew the public's

1018
00:36:21,190 --> 00:36:18,480
and the scientists desire to push those

1019
00:36:23,190 --> 00:36:21,200
boundaries to find solutions

1020
00:36:25,510 --> 00:36:23,200
um you know to break technological

1021
00:36:26,870 --> 00:36:25,520
barriers that were previously in our way

1022
00:36:28,790 --> 00:36:26,880
so

1023
00:36:30,390 --> 00:36:28,800
we have to keep thinking big we have to

1024
00:36:32,550 --> 00:36:30,400
keep um

1025
00:36:33,510 --> 00:36:32,560
pushing ourselves and

1026
00:36:35,349 --> 00:36:33,520
um

1027
00:36:37,109 --> 00:36:35,359
it's mind-blowing what we can do and

1028
00:36:39,270 --> 00:36:37,119
what's out there

1029
00:36:41,190 --> 00:36:39,280
oh indeed and you know it's inspiring

1030
00:36:43,030 --> 00:36:41,200
for the coming generations as well for

1031
00:36:44,950 --> 00:36:43,040
younger people and they are the ones who

1032
00:36:47,589 --> 00:36:44,960
are going to need that that work the the

1033
00:36:49,190 --> 00:36:47,599
inspiration the curiosity the drive to

1034
00:36:51,190 --> 00:36:49,200
unfortunately fix a lot of the problems

1035
00:36:53,430 --> 00:36:51,200
that they are inheriting from previous

1036
00:36:55,990 --> 00:36:53,440
generations uh and with that said we

1037
00:36:57,910 --> 00:36:56,000
actually have someone from a younger uh

1038
00:37:01,510 --> 00:36:57,920

age group joining us here today in the

1039
00:37:03,910 --> 00:37:01,520
chat uh so shayach farooqi uh is asking

1040
00:37:06,150 --> 00:37:03,920
on behalf of a six-year-old named uh

1041
00:37:08,630 --> 00:37:06,160
zunaira um apologies if i pronounce that

1042
00:37:10,230 --> 00:37:08,640
wrong i believe it zunira there are two

1043
00:37:11,190 --> 00:37:10,240
questions i'm going to answer one and

1044
00:37:13,430 --> 00:37:11,200
then we have one that i'd like you to

1045
00:37:16,390 --> 00:37:13,440
answer as well one question is why are

1046
00:37:18,390 --> 00:37:16,400
there holes on mars um so naira i'm

1047
00:37:20,870 --> 00:37:18,400
going to guess that you mean the big

1048
00:37:22,950 --> 00:37:20,880
craters they kind of look like bowls on

1049
00:37:24,069 --> 00:37:22,960
the surface of mars like we have on our

1050
00:37:26,870 --> 00:37:24,079
moon

1051
00:37:29,030 --> 00:37:26,880
and on mercury and actually on earth too

1052
00:37:31,670 --> 00:37:29,040
and all throughout our solar system

1053
00:37:34,950 --> 00:37:31,680
those are big holes that form when big

1054
00:37:37,109 --> 00:37:34,960
rocks from space fall onto a planet

1055
00:37:38,470 --> 00:37:37,119
they excavate they dig a bunch of

1056
00:37:39,670 --> 00:37:38,480
material and they pick it up and they

1057
00:37:42,069 --> 00:37:39,680
blow it out

1058
00:37:44,150 --> 00:37:42,079
and they make a big hole uh in the

1059
00:37:46,390 --> 00:37:44,160
surface of that world and it's actually

1060
00:37:50,230 --> 00:37:46,400
those holes that let us figure out how

1061
00:37:52,470 --> 00:37:50,240
old the surface of mars is um the more

1062
00:37:54,150 --> 00:37:52,480
holes there are the older

1063
00:37:57,030 --> 00:37:54,160

that the area is that we're looking at

1064
00:37:58,790 --> 00:37:57,040
on mars um but yeah so we have craters

1065
00:38:01,030 --> 00:37:58,800
on mars there's also some other kinds of

1066
00:38:04,230 --> 00:38:01,040
holes like there's a big crack called

1067
00:38:05,190 --> 00:38:04,240
valles marineris it's a big canyon on

1068
00:38:07,030 --> 00:38:05,200
mars

1069
00:38:08,870 --> 00:38:07,040
and it's really really deep it's as far

1070
00:38:11,670 --> 00:38:08,880
across as the united states is from one

1071
00:38:13,270 --> 00:38:11,680
side to the other so it's really big

1072
00:38:16,069 --> 00:38:13,280
and there's also some other holes that

1073
00:38:18,069 --> 00:38:16,079
are made in something called lava tubes

1074
00:38:20,069 --> 00:38:18,079
these are caves if you've ever seen a

1075
00:38:21,910 --> 00:38:20,079
cave it's a big hole in the ground uh

1076
00:38:24,790 --> 00:38:21,920
the lava tubes on mars form from

1077
00:38:27,910 --> 00:38:24,800
volcanoes which is pretty cool um now

1078
00:38:30,390 --> 00:38:27,920
alex zunira's other question um is also

1079
00:38:34,790 --> 00:38:30,400
a really fun one they want to know why

1080
00:38:34,800 --> 00:38:41,589
uh that is a good question and um

1081
00:38:47,030 --> 00:38:43,510
to stay none

1082
00:38:53,430 --> 00:38:49,829
i think that the answer is that

1083
00:38:56,310 --> 00:38:53,440
the nearest star is so far away

1084
00:38:58,069 --> 00:38:56,320
that even if there were very very

1085
00:38:59,349 --> 00:38:58,079
advanced aliens even more advanced than

1086
00:39:01,430 --> 00:38:59,359
the human race

1087
00:39:03,990 --> 00:39:01,440
and even if they started trying to get

1088
00:39:05,349 --> 00:39:04,000

to us a thousand years ago

1089
00:39:06,470 --> 00:39:05,359
they probably still wouldn't have gotten

1090
00:39:07,510 --> 00:39:06,480
to us

1091
00:39:10,790 --> 00:39:07,520
so

1092
00:39:12,230 --> 00:39:10,800
space is just really really really big

1093
00:39:13,190 --> 00:39:12,240
and

1094
00:39:15,829 --> 00:39:13,200
so

1095
00:39:16,710 --> 00:39:15,839
that's why we use light as astronomers

1096
00:39:20,710 --> 00:39:16,720
to

1097
00:39:23,589 --> 00:39:20,720
universe because light travels much

1098
00:39:24,950 --> 00:39:23,599
faster than humans or probably aliens

1099
00:39:27,190 --> 00:39:24,960
could ever

1100
00:39:29,349 --> 00:39:27,200
oh yeah yeah space is vast it's

1101
00:39:30,069 --> 00:39:29,359
mind-bogglingly big as sometimes called

1102
00:39:31,430 --> 00:39:30,079
it

1103
00:39:32,630 --> 00:39:31,440
we have a question coming in from

1104
00:39:34,550 --> 00:39:32,640
twitter

1105
00:39:37,109 --> 00:39:34,560
from at my stupid town it's an

1106
00:39:38,470 --> 00:39:37,119
interesting name um they are the travis

1107
00:39:40,310 --> 00:39:38,480
decoster

1108
00:39:41,990 --> 00:39:40,320
i'm not quite sure what travis is

1109
00:39:44,069 --> 00:39:42,000
referencing here

1110
00:39:45,430 --> 00:39:44,079
travis asks does this discovery in any

1111
00:39:48,470 --> 00:39:45,440
way change our understanding of this

1112
00:39:50,710 --> 00:39:48,480
particular planet or reveal anything new

1113
00:39:53,030 --> 00:39:50,720

i'm going to guess that travis is asking

1114
00:39:55,750 --> 00:39:53,040
about the co2 data released today would

1115
00:39:59,589 --> 00:39:55,760
be my assumption

1116
00:40:01,190 --> 00:39:59,599
that is a good question um i mean so

1117
00:40:03,990 --> 00:40:01,200
i haven't fully read the paper because

1118
00:40:06,550 --> 00:40:04,000
it just came out today um but co2 does

1119
00:40:09,430 --> 00:40:06,560
tell us about the history of the planet

1120
00:40:11,670 --> 00:40:09,440
um it traces the the solid material and

1121
00:40:13,270 --> 00:40:11,680
and the gaseous material

1122
00:40:15,349 --> 00:40:13,280
from the planet's history

1123
00:40:17,829 --> 00:40:15,359
so so yes it will tell us more about the

1124
00:40:20,150 --> 00:40:17,839
history of the planet um and

1125
00:40:22,470 --> 00:40:20,160
uh i'm sure that scientists are working

1126
00:40:24,150 --> 00:40:22,480
right now to figure out the exact

1127
00:40:25,829 --> 00:40:24,160
structure of the atmosphere given this

1128
00:40:27,910 --> 00:40:25,839
new data

1129
00:40:30,230 --> 00:40:27,920
very cool and then i guess a follow on

1130
00:40:32,390 --> 00:40:30,240
then from us um and maybe travis also is

1131
00:40:33,990 --> 00:40:32,400
referencing this um for the jupiter

1132
00:40:36,390 --> 00:40:34,000
image that was just released are we

1133
00:40:37,990 --> 00:40:36,400
learning anything really new maybe about

1134
00:40:39,589 --> 00:40:38,000
jupiter that we didn't know before or is

1135
00:40:41,349 --> 00:40:39,599
it just confirming some things that we

1136
00:40:43,670 --> 00:40:41,359
knew using jwst

1137
00:40:45,349 --> 00:40:43,680
particular observations

1138
00:40:46,790 --> 00:40:45,359

that is also a good question and there

1139
00:40:49,750 --> 00:40:46,800
hasn't been any science that's been

1140
00:40:51,670 --> 00:40:49,760
published that was just the image

1141
00:40:54,470 --> 00:40:51,680
and so um

1142
00:40:57,270 --> 00:40:54,480
so you know we will be learning about uh

1143
00:40:59,670 --> 00:40:57,280
the atmosphere the the storms on jupiter

1144
00:41:01,829 --> 00:40:59,680
um the magnetic fields all of that stuff

1145
00:41:04,550 --> 00:41:01,839
from from james webb data but the image

1146
00:41:06,069 --> 00:41:04,560
that came out just this past week um

1147
00:41:08,309 --> 00:41:06,079
it there's no scientific results

1148
00:41:09,510 --> 00:41:08,319
published yet it's just the image so

1149
00:41:10,550 --> 00:41:09,520
stay tuned

1150
00:41:12,470 --> 00:41:10,560
awesome and there there are still a

1151
00:41:14,390 --> 00:41:12,480
bunch of questions rolling in um to our

1152
00:41:15,910 --> 00:41:14,400
audience asking questions in the chat uh

1153
00:41:17,670 --> 00:41:15,920
thank you so much i'm trying my best to

1154
00:41:18,950 --> 00:41:17,680
get to them um alex is doing an

1155
00:41:20,390 --> 00:41:18,960
incredible job answering them it's

1156
00:41:22,630 --> 00:41:20,400
making me super excited

1157
00:41:25,510 --> 00:41:22,640
um so our next question comes from son

1158
00:41:27,430 --> 00:41:25,520
of overbrook on youtube um they want to

1159
00:41:31,589 --> 00:41:27,440
know they say dr lockwood what was your

1160
00:41:34,230 --> 00:41:31,599
first telescope and how old were you

1161
00:41:36,710 --> 00:41:34,240
that's a good question and unlike

1162
00:41:39,510 --> 00:41:36,720
probably most people in astronomy i did

1163
00:41:41,990 --> 00:41:39,520

not have my own telescope growing up

1164
00:41:44,470 --> 00:41:42,000
so the first time i really got to use a

1165
00:41:46,309 --> 00:41:44,480
telescope was an undergrad

1166
00:41:48,309 --> 00:41:46,319
and the university of maryland has a

1167
00:41:49,990 --> 00:41:48,319
little observatory with a few i think

1168
00:41:54,630 --> 00:41:50,000
they're

1169
00:41:56,870 --> 00:41:54,640
and

1170
00:41:58,390 --> 00:41:56,880
uh we had to do a thing in for astronomy

1171
00:41:59,990 --> 00:41:58,400
where we went out to the observatory in

1172
00:42:03,109 --> 00:42:00,000
the middle freezing of the night you

1173
00:42:05,990 --> 00:42:03,119
know and um and i saw the ring nebula

1174
00:42:07,109 --> 00:42:06,000
for the first time and was just floored

1175
00:42:10,630 --> 00:42:07,119
that

1176
00:42:12,950 --> 00:42:10,640
i was standing here and just directly

1177
00:42:14,230 --> 00:42:12,960
witnessing something in deep space

1178
00:42:17,589 --> 00:42:14,240
um

1179
00:42:19,109 --> 00:42:17,599
so yeah very cool yeah i was the same

1180
00:42:21,589 --> 00:42:19,119
way as a young child i never had my own

1181
00:42:23,510 --> 00:42:21,599
telescope unfortunately i was 12 when my

1182
00:42:24,870 --> 00:42:23,520
cousin let me use his telescope and i

1183
00:42:27,030 --> 00:42:24,880
saw the rings of saturn for the first

1184
00:42:28,630 --> 00:42:27,040
time um you know there's lots of ways to

1185
00:42:30,069 --> 00:42:28,640
get intrigued in astronomy and learn

1186
00:42:31,910 --> 00:42:30,079
about the stars and it can happen at any

1187
00:42:34,630 --> 00:42:31,920
age uh really

1188
00:42:37,670 --> 00:42:34,640

um we have a question from elisa ms on

1189
00:42:39,510 --> 00:42:37,680
youtube uh elisa asks this is a really

1190
00:42:43,190 --> 00:42:39,520
really really fun one how can they

1191
00:42:47,109 --> 00:42:46,150
that is that is that is a good one um

1192
00:42:49,430 --> 00:42:47,119
you know

1193
00:42:53,829 --> 00:42:51,030
communication

1194
00:42:55,190 --> 00:42:53,839
is about the message received not the

1195
00:42:56,630 --> 00:42:55,200
message sent

1196
00:42:59,510 --> 00:42:56,640
so the best way to improve your

1197
00:43:01,510 --> 00:42:59,520
communication skills is to try

1198
00:43:03,190 --> 00:43:01,520
to tell something someone you know have

1199
00:43:05,670 --> 00:43:03,200
a message in your head try to get it out

1200
00:43:08,630 --> 00:43:05,680
to someone but then ask that person what

1201
00:43:10,069 --> 00:43:08,640
they heard what they took away you know

1202
00:43:12,790 --> 00:43:10,079
um and don't don't do it immediately

1203
00:43:14,550 --> 00:43:12,800
give it an hour or a day or a week

1204
00:43:16,790 --> 00:43:14,560
and see see what they hold on to see

1205
00:43:17,750 --> 00:43:16,800
what they take away and then you will

1206
00:43:19,910 --> 00:43:17,760
learn

1207
00:43:21,270 --> 00:43:19,920
what it is you're transmitting

1208
00:43:23,349 --> 00:43:21,280
um

1209
00:43:25,349 --> 00:43:23,359
and you know you'll

1210
00:43:27,510 --> 00:43:25,359
you'll start to learn things like the

1211
00:43:30,390 --> 00:43:27,520
story that you used to tell the anecdote

1212
00:43:32,550 --> 00:43:30,400
the tone of voice the specific details

1213
00:43:35,349 --> 00:43:32,560

or the high level picture

1214
00:43:36,230 --> 00:43:35,359
how all of those things really play into

1215
00:43:38,710 --> 00:43:36,240
what

1216
00:43:40,470 --> 00:43:38,720
your listener is

1217
00:43:41,349 --> 00:43:40,480
is receiving which is the most important

1218
00:43:43,670 --> 00:43:41,359
thing

1219
00:43:45,270 --> 00:43:43,680
so ask people ask people what they heard

1220
00:43:46,710 --> 00:43:45,280
you say

1221
00:43:48,470 --> 00:43:46,720
i love that yeah that's a good idea for

1222
00:43:50,309 --> 00:43:48,480
me too as a communicator is to ask my

1223
00:43:52,950 --> 00:43:50,319
audience you know like what they hear

1224
00:43:54,309 --> 00:43:52,960
from me um i love that so much i guess

1225
00:43:56,069 --> 00:43:54,319
that i'm going to ask my own question

1226
00:43:58,069 --> 00:43:56,079
i'm so sorry for our audience watching

1227
00:43:59,750 --> 00:43:58,079
but that gets me intrigued i'm part of

1228
00:44:02,069 --> 00:43:59,760
several different groups who are

1229
00:44:04,230 --> 00:44:02,079
interested in sending messages into

1230
00:44:06,470 --> 00:44:04,240
space via radio or other communication

1231
00:44:09,109 --> 00:44:06,480
methods um or like the voyager golden

1232
00:44:11,750 --> 00:44:09,119
records sending you know actual physical

1233
00:44:13,030 --> 00:44:11,760
devices into space with a record of who

1234
00:44:16,630 --> 00:44:13,040
and what we are

1235
00:44:18,470 --> 00:44:16,640
um if you could choose anything um from

1236
00:44:20,470 --> 00:44:18,480
your life or from humanity what we've

1237
00:44:23,190 --> 00:44:20,480
done on the planet our history that

1238
00:44:25,109 --> 00:44:23,200

would go in a message via radio or a new

1239
00:44:27,030 --> 00:44:25,119
voyager golden record what do you think

1240
00:44:31,589 --> 00:44:27,040
you would want to choose to to put on

1241
00:44:39,990 --> 00:44:33,349
for some reason my head just wants to

1242
00:44:45,349 --> 00:44:42,790
that's a really good question and

1243
00:44:47,750 --> 00:44:45,359
um you know i would

1244
00:44:51,349 --> 00:44:47,760
i would probably say some like the

1245
00:44:53,510 --> 00:44:51,359
sounds of water running maybe um because

1246
00:44:54,390 --> 00:44:53,520
it's just so inherent to what we know is

1247
00:44:56,790 --> 00:44:54,400
life

1248
00:44:59,670 --> 00:44:56,800
and um

1249
00:45:01,109 --> 00:44:59,680
you know and sound i just

1250
00:45:03,030 --> 00:45:01,119
there's something beautiful about that

1251
00:45:05,030 --> 00:45:03,040
it wouldn't be aggressive

1252
00:45:07,030 --> 00:45:05,040
you know it would be welcoming

1253
00:45:09,670 --> 00:45:07,040
it would give us an opportunity to open

1254
00:45:10,950 --> 00:45:09,680
the conversation maybe i don't know

1255
00:45:12,069 --> 00:45:10,960
interesting yeah i love that idea

1256
00:45:13,990 --> 00:45:12,079
running water

1257
00:45:16,950 --> 00:45:14,000
cool um we have another question from

1258
00:45:19,030 --> 00:45:16,960
youtube marina ripan asks

1259
00:45:23,349 --> 00:45:19,040
what inspires you the most about the

1260
00:45:27,750 --> 00:45:25,510
um

1261
00:45:29,990 --> 00:45:27,760
the capabilities of juventus inspire me

1262
00:45:31,670 --> 00:45:30,000
the most which is totally a backwards

1263
00:45:33,510 --> 00:45:31,680

answer but um

1264
00:45:34,790 --> 00:45:33,520
the fact that we did it that's what

1265
00:45:36,150 --> 00:45:34,800
inspires me

1266
00:45:38,230 --> 00:45:36,160
the fact that

1267
00:45:39,750 --> 00:45:38,240
people said i have this outrageous

1268
00:45:42,150 --> 00:45:39,760
scientific goal

1269
00:45:44,950 --> 00:45:42,160
and it's never been done before and we

1270
00:45:46,230 --> 00:45:44,960
have to build a foldable rocket and we

1271
00:45:48,309 --> 00:45:46,240
have to invent all of these new

1272
00:45:50,710 --> 00:45:48,319
technologies and

1273
00:45:55,190 --> 00:45:52,950
and and then they said well whatever it

1274
00:45:57,670 --> 00:45:55,200
takes we're gonna do it we're gonna you

1275
00:46:00,790 --> 00:45:57,680
know it's worth it that's what inspires

1276
00:46:04,550 --> 00:46:00,800
me is that we never stopped we just

1277
00:46:05,990 --> 00:46:04,560
said yes and to to to every challenge

1278
00:46:07,430 --> 00:46:06,000
i love that yeah

1279
00:46:10,150 --> 00:46:07,440
just moving forward

1280
00:46:13,349 --> 00:46:10,160
um another question from cp studio on

1281
00:46:15,030 --> 00:46:13,359
youtube um what exoplanet planetary data

1282
00:46:17,270 --> 00:46:15,040
have been gathered so far

1283
00:46:19,109 --> 00:46:17,280
um and when searching for alien life on

1284
00:46:22,230 --> 00:46:19,119
known and nearby earth-like planets we

1285
00:46:24,470 --> 00:46:22,240
performed um i guess i guess i think

1286
00:46:26,630 --> 00:46:24,480
they want to know if you know

1287
00:46:29,270 --> 00:46:26,640
um what time has been spent on places

1288
00:46:31,190 --> 00:46:29,280

like trappist-1 and prox b and some of

1289
00:46:33,750 --> 00:46:31,200
those places already i'm not sure if

1290
00:46:36,069 --> 00:46:33,760
you're able to share that with us or not

1291
00:46:39,109 --> 00:46:36,079
um but i guess their question is

1292
00:46:41,349 --> 00:46:39,119
are we doing these searches right now

1293
00:46:42,630 --> 00:46:41,359
yeah um so

1294
00:46:44,790 --> 00:46:42,640
the

1295
00:46:48,390 --> 00:46:44,800
if you go and look you can find out what

1296
00:46:51,190 --> 00:46:48,400
up jwst is observing um as of uh

1297
00:46:51,990 --> 00:46:51,200
10 a.m july 13th july 12th

1298
00:46:53,829 --> 00:46:52,000
um

1299
00:46:55,750 --> 00:46:53,839
everything that jwst has been doing has

1300
00:46:57,589 --> 00:46:55,760
been made public so you can go online

1301
00:47:00,069 --> 00:46:57,599
and you can see exactly what james i was

1302
00:47:03,270 --> 00:47:00,079
studying um and so yes we have looked at

1303
00:47:04,870 --> 00:47:03,280
a lot of exoplanet systems so far um

1304
00:47:07,430 --> 00:47:04,880
obviously the two boss planets that

1305
00:47:10,230 --> 00:47:07,440
we've already um had results from

1306
00:47:12,870 --> 00:47:10,240
um but yes there have been um a lot of

1307
00:47:15,349 --> 00:47:12,880
exoplanets uh including some some

1308
00:47:17,670 --> 00:47:15,359
potentially rocky worlds studied so far

1309
00:47:19,589 --> 00:47:17,680
so we're we're well on our way

1310
00:47:21,030 --> 00:47:19,599
yeah uh sweet we had natalie natalia on

1311
00:47:23,270 --> 00:47:21,040
the show for instance she talked about

1312
00:47:24,470 --> 00:47:23,280
how some of our very first worlds we

1313
00:47:25,910 --> 00:47:24,480

were planning on looking at could

1314
00:47:28,309 --> 00:47:25,920
include trappist-1 and these other

1315
00:47:29,829 --> 00:47:28,319
systems that are are very intriguing and

1316
00:47:32,950 --> 00:47:29,839
so i think it is important for the

1317
00:47:34,710 --> 00:47:32,960
public to remember that it takes time um

1318
00:47:36,309 --> 00:47:34,720
so we you know this telescope's doing

1319
00:47:38,870 --> 00:47:36,319
incredible things and and the data we've

1320
00:47:40,470 --> 00:47:38,880
seen so far are very short observations

1321
00:47:43,109 --> 00:47:40,480
some of these observations take more

1322
00:47:45,430 --> 00:47:43,119
time but then also analyzing the data

1323
00:47:46,950 --> 00:47:45,440
and understanding it and interpreting it

1324
00:47:48,790 --> 00:47:46,960
and doing it a very good job

1325
00:47:51,109 --> 00:47:48,800
scientifically before you release those

1326
00:47:52,790 --> 00:47:51,119
data are super important so alex i

1327
00:47:55,670 --> 00:47:52,800
wonder if you just just speak to that

1328
00:47:57,430 --> 00:47:55,680
importance of of the process maybe of

1329
00:47:59,910 --> 00:47:57,440
why it's taking a bit more time for some

1330
00:48:02,069 --> 00:47:59,920
of those other data to come out

1331
00:48:03,910 --> 00:48:02,079
oh for sure i mean and you know it is i

1332
00:48:06,790 --> 00:48:03,920
think 43 days

1333
00:48:09,589 --> 00:48:06,800
since natalie battaglia and her team uh

1334
00:48:10,870 --> 00:48:09,599
got got that exoplanet data um maybe

1335
00:48:12,710 --> 00:48:10,880
maybe less i'm not sure exactly what was

1336
00:48:14,230 --> 00:48:12,720
taken but in most 43 days and the fact

1337
00:48:16,390 --> 00:48:14,240
that they have peer reviewed results is

1338
00:48:17,430 --> 00:48:16,400

incredible i mean it

1339
00:48:19,589 --> 00:48:17,440
um

1340
00:48:21,109 --> 00:48:19,599
you know what happens is you get some

1341
00:48:23,270 --> 00:48:21,119
data but

1342
00:48:24,710 --> 00:48:23,280
that data is

1343
00:48:26,150 --> 00:48:24,720
you know especially with exoplanet data

1344
00:48:27,990 --> 00:48:26,160
it's data from the exoplanet but also

1345
00:48:30,790 --> 00:48:28,000
from the star from transmission

1346
00:48:32,950 --> 00:48:30,800
spectroscopy you have to figure out what

1347
00:48:34,390 --> 00:48:32,960
is what and that is very model dependent

1348
00:48:37,190 --> 00:48:34,400
on what you know what you think is in

1349
00:48:38,069 --> 00:48:37,200
the atmosphere of the star to subtract

1350
00:48:38,950 --> 00:48:38,079
that

1351
00:48:39,990 --> 00:48:38,960
um

1352
00:48:41,990 --> 00:48:40,000
and then

1353
00:48:43,829 --> 00:48:42,000
you know and and

1354
00:48:45,430 --> 00:48:43,839
what we do in astronomy and i mean i

1355
00:48:47,670 --> 00:48:45,440
believe in science but i can only speak

1356
00:48:50,150 --> 00:48:47,680
mostly for astronomy is that you have

1357
00:48:52,630 --> 00:48:50,160
models and you have data and what you do

1358
00:48:54,950 --> 00:48:52,640
is you use the models to try to match

1359
00:48:58,309 --> 00:48:54,960
the data but then you use the data to

1360
00:49:00,230 --> 00:48:58,319
better create your models and so

1361
00:49:01,829 --> 00:49:00,240
scientists take time to kind of go back

1362
00:49:03,750 --> 00:49:01,839
and forth they don't you know that you

1363
00:49:04,790 --> 00:49:03,760

can't just look at something that you

1364
00:49:06,390 --> 00:49:04,800
think is

1365
00:49:08,069 --> 00:49:06,400
you know at this wavelength and say it's

1366
00:49:09,910 --> 00:49:08,079
that feature because you have a lot of

1367
00:49:11,430 --> 00:49:09,920
other things to check is it moving is it

1368
00:49:14,790 --> 00:49:11,440
something else you know does that make

1369
00:49:16,870 --> 00:49:14,800
scientific sense is it consistent um

1370
00:49:18,790 --> 00:49:16,880
so there's just a lot of checks um and

1371
00:49:21,030 --> 00:49:18,800
then there's the process of writing a

1372
00:49:23,430 --> 00:49:21,040
scientific paper submitting it having it

1373
00:49:25,589 --> 00:49:23,440
be sent off to other scientists to

1374
00:49:28,390 --> 00:49:25,599
review the accuracy and rigor of your

1375
00:49:29,990 --> 00:49:28,400
work um and i mean really that's just

1376
00:49:31,750 --> 00:49:30,000
that in and of itself is going to take

1377
00:49:33,589 --> 00:49:31,760
days weeks

1378
00:49:35,750 --> 00:49:33,599
because we don't just

1379
00:49:37,510 --> 00:49:35,760
make a decision as a scientist with data

1380
00:49:38,309 --> 00:49:37,520
and say this is what it is

1381
00:49:40,790 --> 00:49:38,319
we

1382
00:49:42,150 --> 00:49:40,800
have other people try to disprove our

1383
00:49:43,589 --> 00:49:42,160
theories first

1384
00:49:45,430 --> 00:49:43,599
before we say

1385
00:49:47,430 --> 00:49:45,440
okay this sounds like it could be the

1386
00:49:49,510 --> 00:49:47,440
truth yeah and that's some of the beauty

1387
00:49:51,750 --> 00:49:49,520
of the tool of science and why it's been

1388
00:49:53,430 --> 00:49:51,760

such a powerful tool for us to

1389
00:49:55,910 --> 00:49:53,440
understand our place in the universe and

1390
00:49:58,150 --> 00:49:55,920
ask questions about what life is and

1391
00:50:00,549 --> 00:49:58,160
how stars are born and and what might be

1392
00:50:03,670 --> 00:50:00,559
in the atmosphere of an exoplanet

1393
00:50:05,430 --> 00:50:03,680
um so we have a joint question now um

1394
00:50:06,870 --> 00:50:05,440
that's been kind of combined here so

1395
00:50:09,990 --> 00:50:06,880
karen s y

1396
00:50:11,670 --> 00:50:10,000
and niall gagwad um on youtube they have

1397
00:50:13,109 --> 00:50:11,680
two questions kind of similar so we have

1398
00:50:15,109 --> 00:50:13,119
them together

1399
00:50:17,109 --> 00:50:15,119
are there any important bio signatures

1400
00:50:19,190 --> 00:50:17,119
perhaps that jwst

1401
00:50:21,030 --> 00:50:19,200
can't detect

1402
00:50:21,990 --> 00:50:21,040
and then maybe with that as well is what

1403
00:50:24,870 --> 00:50:22,000
would you say are some of the

1404
00:50:26,630 --> 00:50:24,880
shortcomings of jwst

1405
00:50:31,430 --> 00:50:26,640
that maybe we would want to improve in

1406
00:50:36,230 --> 00:50:32,710
so i

1407
00:50:37,589 --> 00:50:36,240
bio signatures that jwst can't detect

1408
00:50:39,349 --> 00:50:37,599
um

1409
00:50:40,790 --> 00:50:39,359
i don't

1410
00:50:41,829 --> 00:50:40,800
i mean

1411
00:50:43,510 --> 00:50:41,839
trying to

1412
00:50:45,349 --> 00:50:43,520
you know you'd have to tell me what the

1413
00:50:46,790 --> 00:50:45,359

complete list of my signatures was and

1414
00:50:48,950 --> 00:50:46,800
that's

1415
00:50:50,549 --> 00:50:48,960
so i i i'm going to kind of punt that

1416
00:50:52,069 --> 00:50:50,559
one um

1417
00:50:55,510 --> 00:50:52,079
jwst's

1418
00:51:00,390 --> 00:50:57,750
you know it

1419
00:51:01,910 --> 00:51:00,400
jbst was was thought of 20 years ago so

1420
00:51:04,230 --> 00:51:01,920
some of the

1421
00:51:05,430 --> 00:51:04,240
instrumentation and whatnot is you know

1422
00:51:07,349 --> 00:51:05,440
a little bit

1423
00:51:09,510 --> 00:51:07,359
is not as advanced as it could it could

1424
00:51:11,670 --> 00:51:09,520
have been if it was built today

1425
00:51:13,030 --> 00:51:11,680
so we could have higher resolution

1426
00:51:14,549 --> 00:51:13,040
spectrometers

1427
00:51:16,630 --> 00:51:14,559
um

1428
00:51:18,309 --> 00:51:16,640
we could have a more sensitive

1429
00:51:19,510 --> 00:51:18,319
chronograph instrument

1430
00:51:21,190 --> 00:51:19,520
and all of these things are improvements

1431
00:51:24,390 --> 00:51:21,200
that we're making in the future

1432
00:51:26,790 --> 00:51:24,400
um you know jwt has the ability for the

1433
00:51:30,309 --> 00:51:26,800
first time to really start studying the

1434
00:51:31,990 --> 00:51:30,319
atmospheres of smaller rocky exoplanets

1435
00:51:35,109 --> 00:51:32,000
but

1436
00:51:37,030 --> 00:51:35,119
it it's it's going to foray into that

1437
00:51:38,870 --> 00:51:37,040
area of exoplanet science but it's not

1438
00:51:41,030 --> 00:51:38,880

going to fully characterize them

1439
00:51:42,150 --> 00:51:41,040
um

1440
00:51:47,910 --> 00:51:42,160
and

1441
00:51:52,390 --> 00:51:47,920
jbst is a huge leap in technology

1442
00:51:56,549 --> 00:51:53,829
the beauty of science is that there's

1443
00:51:59,190 --> 00:51:56,559
there's more to do um so

1444
00:52:02,150 --> 00:51:59,200
um it's weird to get a question about

1445
00:52:04,470 --> 00:52:02,160
the the the drawbacks of of such an

1446
00:52:05,670 --> 00:52:04,480
incredible machine um but

1447
00:52:09,349 --> 00:52:05,680
you know it

1448
00:52:13,270 --> 00:52:09,359
it is a machine um and it was uh

1449
00:52:16,309 --> 00:52:13,280
initially designed um 20 years ago so

1450
00:52:20,549 --> 00:52:17,910
you've everyone's involved in the past

1451
00:52:23,510 --> 00:52:20,559
20 years um and so is technology so it's

1452
00:52:28,710 --> 00:52:26,069
yeah yeah things change um you know and

1453
00:52:30,549 --> 00:52:28,720
there are some other concept designs

1454
00:52:32,790 --> 00:52:30,559
yeah um there's there's things that

1455
00:52:35,589 --> 00:52:32,800
might happen like levoir this large uv

1456
00:52:37,109 --> 00:52:35,599
optical infrared kind of mixture for a

1457
00:52:39,349 --> 00:52:37,119
telescope there's there's you know been

1458
00:52:41,030 --> 00:52:39,359
concepts like habex and some others um

1459
00:52:41,750 --> 00:52:41,040
there's also been things like proposals

1460
00:52:43,430 --> 00:52:41,760
to

1461
00:52:45,430 --> 00:52:43,440
build you know a satellite or a

1462
00:52:47,190 --> 00:52:45,440
telescope that would basically travel

1463
00:52:49,270 --> 00:52:47,200

kind of like a light year away from our

1464
00:52:51,109 --> 00:52:49,280
solar system and then look back and use

1465
00:52:53,430 --> 00:52:51,119
our sun as a gravitational lens to try

1466
00:52:54,950 --> 00:52:53,440
to image the surfaces of other worlds so

1467
00:52:56,790 --> 00:52:54,960
there's there's a lot of things that are

1468
00:52:58,870 --> 00:52:56,800
possible and who knows what might be

1469
00:53:00,390 --> 00:52:58,880
probable maybe we have some young

1470
00:53:01,109 --> 00:53:00,400
undergraduate or graduate students or

1471
00:53:02,630 --> 00:53:01,119
even

1472
00:53:04,069 --> 00:53:02,640
maybe our six-year-old student who's

1473
00:53:06,230 --> 00:53:04,079
watching right now

1474
00:53:08,710 --> 00:53:06,240
maybe in your future you'll be part of

1475
00:53:10,630 --> 00:53:08,720
some next great telescope

1476
00:53:12,710 --> 00:53:10,640
or next great project that we

1477
00:53:14,470 --> 00:53:12,720
collaborate on together and we do

1478
00:53:16,710 --> 00:53:14,480
something incredible to learn more about

1479
00:53:18,549 --> 00:53:16,720
our place in the universe and so we are

1480
00:53:21,430 --> 00:53:18,559
always changing we are always kind of

1481
00:53:22,390 --> 00:53:21,440
evolving and building more on the past

1482
00:53:23,990 --> 00:53:22,400
um

1483
00:53:25,829 --> 00:53:24,000
so from that alex uh we have a question

1484
00:53:26,710 --> 00:53:25,839
from andreas hess

1485
00:53:27,990 --> 00:53:26,720
um

1486
00:53:29,990 --> 00:53:28,000
and i'm having a hard time reading the

1487
00:53:32,390 --> 00:53:30,000
question it says how often can we expect

1488
00:53:34,549 --> 00:53:32,400

news oh i see um how often should we

1489
00:53:37,270 --> 00:53:34,559
expect these data releases i guess is

1490
00:53:39,190 --> 00:53:37,280
the question that we have from andreas

1491
00:53:41,109 --> 00:53:39,200
um that's that's a good question and i

1492
00:53:43,750 --> 00:53:41,119
know a lot of people since the first

1493
00:53:45,190 --> 00:53:43,760
images have been just salivating for for

1494
00:53:46,950 --> 00:53:45,200
new news um

1495
00:53:48,790 --> 00:53:46,960
as we just said

1496
00:53:50,790 --> 00:53:48,800
scientific process takes a while so the

1497
00:53:53,670 --> 00:53:50,800
fact that we got the first scientific

1498
00:53:54,710 --> 00:53:53,680
results today is kind of incredible um

1499
00:53:56,549 --> 00:53:54,720
but

1500
00:53:58,950 --> 00:53:56,559
you know knowing how much data james

1501
00:54:00,309 --> 00:53:58,960
webb is taking um

1502
00:54:03,750 --> 00:54:00,319
i think that

1503
00:54:05,430 --> 00:54:03,760
it is reasonable to say that you know

1504
00:54:07,829 --> 00:54:05,440
in september there'll be more news in

1505
00:54:10,150 --> 00:54:07,839
october there'll be more news um and you

1506
00:54:12,790 --> 00:54:10,160
know by the end of this year it'll be

1507
00:54:14,549 --> 00:54:12,800
it'll be flowing in very consistently

1508
00:54:15,510 --> 00:54:14,559
so that's my best guess

1509
00:54:16,950 --> 00:54:15,520
very cool

1510
00:54:18,230 --> 00:54:16,960
um

1511
00:54:19,750 --> 00:54:18,240
i really like

1512
00:54:21,670 --> 00:54:19,760
um it comes from one of my production

1513
00:54:22,630 --> 00:54:21,680

assistants uh andrew mohanty asked this

1514
00:54:24,790 --> 00:54:22,640
for us

1515
00:54:27,030 --> 00:54:24,800
um i will say so anna rupa is a young

1516
00:54:29,349 --> 00:54:27,040
man from india um he reached out to me

1517
00:54:31,430 --> 00:54:29,359
years ago through social media and he

1518
00:54:33,030 --> 00:54:31,440
was interested in astrobiology and just

1519
00:54:35,349 --> 00:54:33,040
started a conversation with me about

1520
00:54:37,270 --> 00:54:35,359
possible ways to advance his own career

1521
00:54:38,950 --> 00:54:37,280
and learn more about biology and

1522
00:54:42,069 --> 00:54:38,960
chemistry and geology and those kinds of

1523
00:54:44,390 --> 00:54:42,079
things um he was part of a rover team

1524
00:54:45,750 --> 00:54:44,400
that built a mars rover that competed in

1525
00:54:48,630 --> 00:54:45,760
in a competition that i helped to manage

1526
00:54:50,470 --> 00:54:48,640
called the university river challenge um

1527
00:54:52,549 --> 00:54:50,480
sometime after that amaroop applied to

1528
00:54:54,470 --> 00:54:52,559
work with me as an intern and he got in

1529
00:54:56,150 --> 00:54:54,480
and he worked with me and then became a

1530
00:54:57,670 --> 00:54:56,160
visiting scholar in my company working

1531
00:55:00,230 --> 00:54:57,680
with me and now he's a production

1532
00:55:01,510 --> 00:55:00,240
assistant for ask an astrobiologist so

1533
00:55:02,950 --> 00:55:01,520
for those out there who are wondering

1534
00:55:04,069 --> 00:55:02,960
about building your careers moving

1535
00:55:05,670 --> 00:55:04,079
forward

1536
00:55:07,030 --> 00:55:05,680
reach out to people who you are

1537
00:55:09,589 --> 00:55:07,040
interested in getting to know more about

1538
00:55:11,990 --> 00:55:09,599

what they do and how they do it um many

1539
00:55:13,910 --> 00:55:12,000
of us are happy when when we can

1540
00:55:15,910 --> 00:55:13,920
um to try to answer your emails and your

1541
00:55:17,670 --> 00:55:15,920
messages and don't be disheartened if we

1542
00:55:19,349 --> 00:55:17,680
don't answer but we we love answering

1543
00:55:22,069 --> 00:55:19,359
you and trying to help you find your own

1544
00:55:24,069 --> 00:55:22,079
career moving forward and so anaroop is

1545
00:55:25,990 --> 00:55:24,079
still discovering his career right now

1546
00:55:27,270 --> 00:55:26,000
and so alex for you he has a question

1547
00:55:28,950 --> 00:55:27,280
about this

1548
00:55:31,030 --> 00:55:28,960
he says when we think about science

1549
00:55:32,710 --> 00:55:31,040
communication we tend to think about

1550
00:55:34,549 --> 00:55:32,720
people talking to the public about

1551
00:55:36,710 --> 00:55:34,559
science the sage on the stage the person

1552
00:55:38,230 --> 00:55:36,720
just sharing the knowledge but there's

1553
00:55:40,390 --> 00:55:38,240
certainly more

1554
00:55:43,109 --> 00:55:40,400
can you share what else you do in

1555
00:55:45,510 --> 00:55:43,119
communications and maybe what skills

1556
00:55:46,829 --> 00:55:45,520
someone can gain to work in a field like

1557
00:55:50,390 --> 00:55:46,839
communications for

1558
00:55:52,309 --> 00:55:50,400
science that's a really good question um

1559
00:55:53,990 --> 00:55:52,319
yeah and and so what you were saying

1560
00:55:55,910 --> 00:55:54,000
graham you know we

1561
00:55:57,589 --> 00:55:55,920
those of us who've

1562
00:56:00,630 --> 00:55:57,599
you know further our career a bit in

1563
00:56:03,349 --> 00:56:00,640

this um you know and having having had

1564
00:56:04,870 --> 00:56:03,359
great mentors you know i for one always

1565
00:56:06,950 --> 00:56:04,880
look for opportunities with someone

1566
00:56:08,630 --> 00:56:06,960
reaches out like i i love to mentor

1567
00:56:10,630 --> 00:56:08,640
other people and help them and give any

1568
00:56:13,910 --> 00:56:10,640
you know support or you know guidance

1569
00:56:18,950 --> 00:56:16,950
there there are so many ways that you

1570
00:56:20,470 --> 00:56:18,960
can take a science career and move more

1571
00:56:21,589 --> 00:56:20,480
into communications there's tech

1572
00:56:24,470 --> 00:56:21,599
transfer

1573
00:56:27,430 --> 00:56:24,480
i don't do that specifically but helping

1574
00:56:30,309 --> 00:56:27,440
take science and turn it into

1575
00:56:31,990 --> 00:56:30,319
technology or vice versa or new tools

1576
00:56:33,829 --> 00:56:32,000
you know things

1577
00:56:37,109 --> 00:56:33,839
for the benefit of society tangible

1578
00:56:40,470 --> 00:56:37,119
things um that's a huge uh hugely

1579
00:56:42,069 --> 00:56:40,480
important area um and one of the reasons

1580
00:56:44,069 --> 00:56:42,079
we do research is for the benefit of

1581
00:56:45,030 --> 00:56:44,079
humanity to you know for tangible

1582
00:56:45,990 --> 00:56:45,040
outputs

1583
00:56:47,910 --> 00:56:46,000
um

1584
00:56:50,230 --> 00:56:47,920
and in terms of communication a lot of

1585
00:56:52,309 --> 00:56:50,240
what i do is working is is coordinating

1586
00:56:53,670 --> 00:56:52,319
with other people making sure that you

1587
00:56:55,910 --> 00:56:53,680
know not just talking to the public but

1588
00:56:58,950 --> 00:56:55,920

making sure that people internally are

1589
00:57:00,390 --> 00:56:58,960
talking and saying the same things um

1590
00:57:02,470 --> 00:57:00,400
making sure that

1591
00:57:03,750 --> 00:57:02,480
you know if if we're trying to get from

1592
00:57:05,910 --> 00:57:03,760
a to d

1593
00:57:08,549 --> 00:57:05,920
you know we go through bc and we don't

1594
00:57:09,510 --> 00:57:08,559
have 25 pit stops along the way

1595
00:57:15,430 --> 00:57:09,520
um

1596
00:57:16,309 --> 00:57:15,440
clear or you know organizational skills

1597
00:57:18,150 --> 00:57:16,319
um

1598
00:57:20,870 --> 00:57:18,160
being able to see the big picture and

1599
00:57:22,710 --> 00:57:20,880
then break it down step by step uh is is

1600
00:57:23,910 --> 00:57:22,720
a hugely important skill and and one

1601
00:57:26,789 --> 00:57:23,920
that is

1602
00:57:28,390 --> 00:57:26,799
not as as ubiquitous as you would think

1603
00:57:30,549 --> 00:57:28,400
um

1604
00:57:32,150 --> 00:57:30,559
and uh you know and listening to people

1605
00:57:33,349 --> 00:57:32,160
talking about communications listening

1606
00:57:35,589 --> 00:57:33,359
to people

1607
00:57:36,710 --> 00:57:35,599
um

1608
00:57:38,789 --> 00:57:36,720
you know and then there's a lot of

1609
00:57:40,470 --> 00:57:38,799
people who just write they just you know

1610
00:57:42,390 --> 00:57:40,480
they don't you don't have to deal with

1611
00:57:43,270 --> 00:57:42,400
people people day to day you just write

1612
00:57:45,270 --> 00:57:43,280
and then

1613
00:57:47,430 --> 00:57:45,280

that is your main form of communication

1614
00:57:48,950 --> 00:57:47,440
you know you can reach a lot of people

1615
00:57:50,950 --> 00:57:48,960
um but you don't have to worry about

1616
00:57:52,630 --> 00:57:50,960
stage presence or any of that

1617
00:57:54,710 --> 00:57:52,640
um

1618
00:57:56,549 --> 00:57:54,720
written word goes so far you know and

1619
00:57:59,030 --> 00:57:56,559
and if nothing else is has the most

1620
00:58:02,870 --> 00:57:59,040
longevity and so being skilled at that

1621
00:58:04,069 --> 00:58:02,880
and being able to to use words to um

1622
00:58:05,589 --> 00:58:04,079
to tell

1623
00:58:07,750 --> 00:58:05,599
tell the science in different ways is

1624
00:58:09,750 --> 00:58:07,760
really important so there's a lot of

1625
00:58:11,190 --> 00:58:09,760
different opportunities out there

1626
00:58:12,549 --> 00:58:11,200
you know i love that so much that's so

1627
00:58:14,549 --> 00:58:12,559
powerful and i i think we're gonna have

1628
00:58:16,069 --> 00:58:14,559
to end there unfortunately um we are

1629
00:58:17,589 --> 00:58:16,079
coming to the top of the hour now so

1630
00:58:19,990 --> 00:58:17,599
thank you to everyone for all of your

1631
00:58:21,670 --> 00:58:20,000
wonderful questions uh for jumping in on

1632
00:58:23,670 --> 00:58:21,680
youtube and on twitter

1633
00:58:25,510 --> 00:58:23,680
for asking questions of dr alex lockwood

1634
00:58:27,349 --> 00:58:25,520
here today for ask an astrobiologist i

1635
00:58:28,309 --> 00:58:27,359
know we had a few more questions that we

1636
00:58:31,109 --> 00:58:28,319
just don't have time to get to

1637
00:58:32,549 --> 00:58:31,119
unfortunately um is there any last

1638
00:58:34,390 --> 00:58:32,559

message you might want to say to our

1639
00:58:37,030 --> 00:58:34,400
audience alex

1640
00:58:39,589 --> 00:58:37,040
about your career about jwst or what you

1641
00:58:41,990 --> 00:58:39,599
think the future holds for us

1642
00:58:45,109 --> 00:58:42,000
yeah i mean i would say especially for

1643
00:58:47,270 --> 00:58:45,119
an astrobiology audience there's so much

1644
00:58:50,549 --> 00:58:47,280
potential out there because astrobiology

1645
00:58:53,109 --> 00:58:50,559
is um it's an interdisciplinary area

1646
00:58:55,190 --> 00:58:53,119
which means that the science from both

1647
00:58:57,829 --> 00:58:55,200
astro and biology but also you know

1648
00:58:59,750 --> 00:58:57,839
physics chemistry all sorts of stuff um

1649
00:59:01,349 --> 00:58:59,760
those are all critical pieces to fit

1650
00:59:03,510 --> 00:59:01,359
together

1651
00:59:05,270 --> 00:59:03,520
and the communication between those

1652
00:59:08,230 --> 00:59:05,280
different different groups is going to

1653
00:59:12,150 --> 00:59:08,240
be critical to really um be able to

1654
00:59:14,870 --> 00:59:12,160
maximize the output of the science um so

1655
00:59:16,870 --> 00:59:14,880
i you know i think that there's so many

1656
00:59:18,549 --> 00:59:16,880
opportunities

1657
00:59:19,589 --> 00:59:18,559
in in this field and that if people want

1658
00:59:20,789 --> 00:59:19,599
to do the science they want to do

1659
00:59:23,990 --> 00:59:20,799
communications they want to do some of

1660
00:59:26,710 --> 00:59:24,000
both um you guys are are primed to

1661
00:59:27,910 --> 00:59:26,720
really um inspire the next generation so

1662
00:59:30,470 --> 00:59:27,920
that's awesome

1663
00:59:31,910 --> 00:59:30,480

oh i love that so much uh alex thank you

1664
00:59:33,030 --> 00:59:31,920
so much for joining us for the show

1665
00:59:34,789 --> 00:59:33,040
today

1666
00:59:36,630 --> 00:59:34,799
thank you it's been great to see you

1667
00:59:39,750 --> 00:59:36,640
graham and hope everybody out there is

1668
00:59:41,990 --> 00:59:39,760
uh enjoying all this cool web stuff yay

1669
00:59:44,309 --> 00:59:42,000
i know there's so much coolness already

1670
00:59:45,589 --> 00:59:44,319
and so much more to come um so for those

1671
00:59:47,190 --> 00:59:45,599
who are watching if you want to stay in

1672
00:59:49,589 --> 00:59:47,200
the loop for upcoming episodes of ask an

1673
00:59:52,230 --> 00:59:49,599
astrobiologist or just get more news

1674
00:59:54,549 --> 00:59:52,240
from nasa astrobiology about cool things

1675
00:59:55,510 --> 00:59:54,559
including maybe opportunities for young

1676
00:59:57,430 --> 00:59:55,520
students

1677
00:59:59,910 --> 00:59:57,440
in the room of astrobiology you can sign

1678
01:00:01,990 --> 00:59:59,920
up for the nasa astrobiology newsletter

1679
01:00:03,670 --> 01:00:02,000
um they send out all kinds of emails

1680
01:00:05,430 --> 01:00:03,680
about current things going on throughout

1681
01:00:07,910 --> 01:00:05,440
our community through the science the

1682
01:00:10,710 --> 01:00:07,920
missions opportunities events and more

1683
01:00:12,710 --> 01:00:10,720
uh so to dr alex lockwood to all of our

1684
01:00:15,349 --> 01:00:12,720
audience out there watching

1685
01:00:17,349 --> 01:00:15,359
live and the recorded version later on

1686
01:00:20,760 --> 01:00:17,359
thank you so much for joining us and as