
WE LANDED ON
MARS
NASA
SCIENCE LIVE
VIRTUAL EDITION

1
00:00:05,260 --> 00:00:23,750
[Music]

2
00:00:27,029 --> 00:00:25,750
we are starting to straighten up and fly

3
00:00:32,630 --> 00:00:27,039
right maneuver

4
00:00:36,630 --> 00:00:34,870
the navigation has confirmed that the

5
00:00:42,950 --> 00:00:36,640
parachute has deployed and we are seeing

6
00:00:42,960 --> 00:00:48,869
skytrain maneuver has started

7
00:00:58,700 --> 00:00:52,470
about 20 meters off the surface

8
00:01:11,590 --> 00:01:01,050
[Music]

9
00:01:14,640 --> 00:01:13,109
it looks life we're getting the first

10
00:01:16,070 --> 00:01:14,650
image

11
00:01:17,910 --> 00:01:16,080
[Applause]

12
00:01:20,149 --> 00:01:17,920
this is the most amazing thing this is

13
00:01:27,190 --> 00:01:20,159

what nasa does this is what we can do as

14
00:01:32,870 --> 00:01:30,069
hello and welcome to another episode of

15
00:01:35,510 --> 00:01:32,880
nasa science live i'm your host dr

16
00:01:37,270 --> 00:01:35,520
mujigay cooper and we are so excited you

17
00:01:39,590 --> 00:01:37,280
could join us today

18
00:01:41,109 --> 00:01:39,600
a new chapter of mars exploration has

19
00:01:43,350 --> 00:01:41,119
officially begun

20
00:01:45,910 --> 00:01:43,360
yesterday nasa's perseverance rover

21
00:01:47,990 --> 00:01:45,920
successfully landed on mars over the

22
00:01:50,550 --> 00:01:48,000
past seven months perseverance has been

23
00:01:53,190 --> 00:01:50,560
in route to the red planet and now it is

24
00:01:55,830 --> 00:01:53,200
preparing to explore jezreel crater a

25
00:01:58,389 --> 00:01:55,840
28-mile crater once home to a river

26
00:02:00,230 --> 00:01:58,399
delta in search of microbial life that

27
00:02:01,910 --> 00:02:00,240
could help us determine if there was

28
00:02:04,389 --> 00:02:01,920
ever life on mars

29
00:02:07,030 --> 00:02:04,399
and if you think that's cool

30
00:02:09,109 --> 00:02:07,040
just wait there's more

31
00:02:11,750 --> 00:02:09,119
in fact we've already received some

32
00:02:14,150 --> 00:02:11,760
incredible images from perseverance

33
00:02:16,470 --> 00:02:14,160
in this photo that you see here that's

34
00:02:18,390 --> 00:02:16,480
the view looking down from the sky crane

35
00:02:19,670 --> 00:02:18,400
lowering the rover onto the surface of

36
00:02:21,910 --> 00:02:19,680
mars

37
00:02:24,630 --> 00:02:21,920
in this next photo you can see

38
00:02:27,110 --> 00:02:24,640

perseverance's front right wheel on the

39
00:02:28,949 --> 00:02:27,120
mars surface the scientists are filled

40
00:02:31,670 --> 00:02:28,959
with such excitement as they discuss the

41
00:02:33,830 --> 00:02:31,680
rocks right nearby the wheels

42
00:02:36,869 --> 00:02:33,840
in the next picture you can see there's

43
00:02:39,270 --> 00:02:36,879
an image captured from orbit around mars

44
00:02:42,229 --> 00:02:39,280
from the perseverance's parachute as it

45
00:02:44,229 --> 00:02:42,239
is deployed and as it descends onto the

46
00:02:47,270 --> 00:02:44,239
red planet

47
00:02:49,670 --> 00:02:47,280
that is pretty cool

48
00:02:51,750 --> 00:02:49,680
this is personally very exciting for me

49
00:02:53,830 --> 00:02:51,760
because when i was in fifth grade what

50
00:02:55,350 --> 00:02:53,840
inspired me to work for nasa is the

51
00:02:57,270 --> 00:02:55,360
search for answering whether or not

52
00:02:59,750 --> 00:02:57,280
we're alone in the universe and it's

53
00:03:01,190 --> 00:02:59,760
been truly an honor to be part of a team

54
00:03:02,869 --> 00:03:01,200
that's venturing to answer these

55
00:03:05,430 --> 00:03:02,879
questions

56
00:03:07,110 --> 00:03:05,440
i'm joined today by gregorio vallar

57
00:03:08,869 --> 00:03:07,120
entry descents and landing operations

58
00:03:11,750 --> 00:03:08,879
lead at nasa jpl

59
00:03:15,270 --> 00:03:11,760
and dr kelsey moore perseverance science

60
00:03:17,030 --> 00:03:15,280
team member nasa jpl abc lab congrats

61
00:03:22,869 --> 00:03:17,040
you two on an exciting and successful

62
00:03:27,750 --> 00:03:24,630
so this question is for both of you but

63
00:03:30,789 --> 00:03:27,760

let's start with kelsey how does it feel

64
00:03:32,550 --> 00:03:30,799
to land a rover on a planet millions of

65
00:03:35,430 --> 00:03:32,560
miles away

66
00:03:37,589 --> 00:03:35,440
this is incredible i have watched past

67
00:03:39,589 --> 00:03:37,599
uh rovers and and experiences kind of

68
00:03:41,750 --> 00:03:39,599
from the sidelines this is my first time

69
00:03:43,589 --> 00:03:41,760
being a part of the mission and the team

70
00:03:45,190 --> 00:03:43,599
and it's a new level of

71
00:03:47,509 --> 00:03:45,200
excitement and i cannot believe that

72
00:03:49,509 --> 00:03:47,519
we're at this moment now

73
00:03:51,509 --> 00:03:49,519
awesome gregorio how do you feel you're

74
00:03:53,509 --> 00:03:51,519
a veteran you've done this before what's

75
00:03:56,470 --> 00:03:53,519
going through your mind

76
00:03:58,869 --> 00:03:56,480
no i've done this once but we had never

77
00:04:00,710 --> 00:03:58,879
had images like the one you just saw

78
00:04:02,550 --> 00:04:00,720
how cool is that

79
00:04:04,390 --> 00:04:02,560
i was i've been so used to just watching

80
00:04:07,589 --> 00:04:04,400
animations and just seeing that picture

81
00:04:09,190 --> 00:04:07,599
is just so surreal and it just really

82
00:04:10,470 --> 00:04:09,200
shows all the hard work that we all put

83
00:04:12,149 --> 00:04:10,480
into this mission

84
00:04:13,350 --> 00:04:12,159
can be a success if we just work

85
00:04:14,850 --> 00:04:13,360
together

86
00:04:19,349 --> 00:04:14,860
if we just persevere

87
00:04:24,070 --> 00:04:21,590
so gregorio can you tell us what is the

88
00:04:25,749 --> 00:04:24,080

rover doing right now

89
00:04:27,830 --> 00:04:25,759
yes i can do that so

90
00:04:29,430 --> 00:04:27,840
when you go through a long road trip

91
00:04:31,670 --> 00:04:29,440
right you're kind of cramped up in a car

92
00:04:33,990 --> 00:04:31,680
and our rover has been cramped up in its

93
00:04:35,430 --> 00:04:34,000
spacecraft for months

94
00:04:37,110 --> 00:04:35,440
and so the first thing we want to do is

95
00:04:40,070 --> 00:04:37,120
really kind of like stretch our limbs

96
00:04:41,590 --> 00:04:40,080
make sure our joints are okay and that's

97
00:04:42,870 --> 00:04:41,600
what the team is doing we're doing

98
00:04:44,790 --> 00:04:42,880
little checkouts of all of our

99
00:04:46,230 --> 00:04:44,800
mechanisms we're turning on our

100
00:04:47,270 --> 00:04:46,240
instruments making sure they're all good

101
00:04:48,950 --> 00:04:47,280
to go

102
00:04:50,390 --> 00:04:48,960
and then eventually in a few days we're

103
00:04:52,310 --> 00:04:50,400
going to do something that's called a

104
00:04:53,909 --> 00:04:52,320
fight software transition

105
00:04:56,390 --> 00:04:53,919
so there's an operating system that we

106
00:04:58,469 --> 00:04:56,400
use on board and we use that throughout

107
00:05:00,070 --> 00:04:58,479
the cruise phase of the mission

108
00:05:02,070 --> 00:05:00,080
but now that we're on the surface we're

109
00:05:03,830 --> 00:05:02,080
going to need a new set of capabilities

110
00:05:05,510 --> 00:05:03,840
so that we can operate on the surface of

111
00:05:06,629 --> 00:05:05,520
mars and let the scientists do the

112
00:05:08,710 --> 00:05:06,639
things that they need to do in the

113
00:05:09,909 --> 00:05:08,720

future in the future

114
00:05:11,590 --> 00:05:09,919
yeah i just listened to the press

115
00:05:13,590 --> 00:05:11,600
conference they said it would take about

116
00:05:16,150 --> 00:05:13,600
four days to do the software transfer so

117
00:05:17,909 --> 00:05:16,160
nice and and steady right

118
00:05:19,430 --> 00:05:17,919
exactly with something like this on mars

119
00:05:21,510 --> 00:05:19,440
you don't want to rush through it so you

120
00:05:22,790 --> 00:05:21,520
do little by little just not not all at

121
00:05:25,830 --> 00:05:22,800
once

122
00:05:28,790 --> 00:05:25,840
awesome that's amazing so kelsey from

123
00:05:30,790 --> 00:05:28,800
your perspective as a scientist please

124
00:05:33,430 --> 00:05:30,800
tell us what's next

125
00:05:35,350 --> 00:05:33,440
yeah definitely so once the rover is

126
00:05:37,350 --> 00:05:35,360
kind of fully awake as gregorio

127
00:05:40,870 --> 00:05:37,360
described we get to dive into the

128
00:05:42,870 --> 00:05:40,880
science so i am a field geoscientist so

129
00:05:45,430 --> 00:05:42,880
on earth when i want to learn about the

130
00:05:48,390 --> 00:05:45,440
ancient earth past i go into the field

131
00:05:50,629 --> 00:05:48,400
and i analyze big rock outcrops and then

132
00:05:52,469 --> 00:05:50,639
i collect samples and bring them back

133
00:05:53,830 --> 00:05:52,479
into the lab so that i can analyze them

134
00:05:56,710 --> 00:05:53,840
in more detail

135
00:05:59,189 --> 00:05:56,720
so perseverance is kind of our little

136
00:06:01,990 --> 00:05:59,199
robotic field geologist on the surface

137
00:06:04,710 --> 00:06:02,000
of mars so perseverance will be roving

138
00:06:07,510 --> 00:06:04,720

around and analyzing the rocks assessing

139
00:06:10,150 --> 00:06:07,520
the outcrops getting context for us

140
00:06:12,390 --> 00:06:10,160
and very excitingly the rover will be

141
00:06:14,469 --> 00:06:12,400
picking up samples collecting samples

142
00:06:15,990 --> 00:06:14,479
that will eventually be returned

143
00:06:17,830 --> 00:06:16,000
hopefully on the mars sample return

144
00:06:21,510 --> 00:06:17,840
mission so that we can then analyze

145
00:06:23,590 --> 00:06:21,520
those martian samples back on earth

146
00:06:26,870 --> 00:06:23,600
that is incredible

147
00:06:29,029 --> 00:06:26,880
ah we know many of you at home have so

148
00:06:31,350 --> 00:06:29,039
many questions about nasa perseverance

149
00:06:33,350 --> 00:06:31,360
landing on mars and the exciting things

150
00:06:35,270 --> 00:06:33,360
that it will do on the red planet so

151
00:06:37,189 --> 00:06:35,280
join the conversation and ask your

152
00:06:39,189 --> 00:06:37,199
questions by writing in the comment box

153
00:06:41,670 --> 00:06:39,199
wherever you're watching this or by

154
00:06:43,029 --> 00:06:41,680
using the hashtag countdown to mars on

155
00:06:44,710 --> 00:06:43,039
social media

156
00:06:46,550 --> 00:06:44,720
but first let's start things off with a

157
00:06:53,029 --> 00:06:46,560
question millions of people around the

158
00:07:01,189 --> 00:06:54,870
is mars habitable

159
00:07:05,510 --> 00:07:02,710
the question is

160
00:07:07,909 --> 00:07:05,520
is it habitable and for whom

161
00:07:10,230 --> 00:07:07,919
mars is hundreds of degrees colder than

162
00:07:12,070 --> 00:07:10,240
earth it has a hundred times less

163
00:07:14,870 --> 00:07:12,080

atmosphere and that atmosphere has

164
00:07:16,950 --> 00:07:14,880
hardly any oxygen but there may be other

165
00:07:19,110 --> 00:07:16,960
forms of life that could have evolved

166
00:07:21,510 --> 00:07:19,120
that aren't very much like us but are

167
00:07:24,710 --> 00:07:21,520
very much like the early forms of life

168
00:07:26,950 --> 00:07:24,720
that evolved on earth mars has evidence

169
00:07:29,589 --> 00:07:26,960
of being warmer in the past and of

170
00:07:31,589 --> 00:07:29,599
having stable liquid surface water for

171
00:07:32,469 --> 00:07:31,599
potentially hundreds of thousands of

172
00:07:36,150 --> 00:07:32,479
years

173
00:07:38,309 --> 00:07:36,160
so it's possible that in mars's past

174
00:07:41,029 --> 00:07:38,319
there was a time where life could have

175
00:07:42,950 --> 00:07:41,039
evolved in that particular environment

176
00:07:45,270 --> 00:07:42,960
we have been trying to answer that

177
00:07:47,189 --> 00:07:45,280
question definitively is mars habitable

178
00:07:48,430 --> 00:07:47,199
and as of yet the answer is still

179
00:07:54,230 --> 00:07:48,440
definitely maybe

180
00:07:58,869 --> 00:07:56,869
wow it's so exciting that perseverance

181
00:08:01,029 --> 00:07:58,879
is now on the surface of mars to help us

182
00:08:03,749 --> 00:08:01,039
answer these questions and to search for

183
00:08:06,070 --> 00:08:03,759
signs of ancient life itself

184
00:08:08,230 --> 00:08:06,080
the internet is buzzing with excitement

185
00:08:10,469 --> 00:08:08,240
over yesterday's mars landing so let's

186
00:08:12,230 --> 00:08:10,479
take questions from the public um for

187
00:08:14,070 --> 00:08:12,240
everyone that's watching it's not too

188
00:08:16,390 --> 00:08:14,080

late to join the conversation submit

189
00:08:18,390 --> 00:08:16,400
your questions using

190
00:08:20,950 --> 00:08:18,400
countdown to mars or comment in the

191
00:08:23,670 --> 00:08:20,960
stream wherever you're watching this

192
00:08:24,790 --> 00:08:23,680
our first question is from alex on

193
00:08:27,510 --> 00:08:24,800
twitter

194
00:08:30,150 --> 00:08:27,520
does percy have any way to move rocks or

195
00:08:32,790 --> 00:08:30,160
sand to see what is underneath this is a

196
00:08:34,949 --> 00:08:32,800
great question for kelsey

197
00:08:37,829 --> 00:08:34,959
yeah so once the rover starts driving

198
00:08:39,909 --> 00:08:37,839
around uh we can do sort of two types of

199
00:08:42,469 --> 00:08:39,919
science we can analyze the rocks from

200
00:08:44,389 --> 00:08:42,479
far away using supercam

201
00:08:46,470 --> 00:08:44,399
and and collect some data that is a

202
00:08:48,550 --> 00:08:46,480
couple of meters away from the rover and

203
00:08:50,150 --> 00:08:48,560
then we can also analyze the rocks up

204
00:08:51,990 --> 00:08:50,160
close with some of the other instruments

205
00:08:53,990 --> 00:08:52,000
like pixel and sherlock

206
00:08:56,310 --> 00:08:54,000
and what we'll do is get right up next

207
00:08:57,990 --> 00:08:56,320
to the rocks place those instruments so

208
00:09:00,470 --> 00:08:58,000
they're close to the surface and then be

209
00:09:03,829 --> 00:09:00,480
able to analyze the rocks below and then

210
00:09:05,990 --> 00:09:03,839
um we can do some abrading to get rid of

211
00:09:07,910 --> 00:09:06,000
this the surfacial area and then we get

212
00:09:09,430 --> 00:09:07,920
a good signal in the rocks below that

213
00:09:11,590 --> 00:09:09,440

are underneath the what we call the

214
00:09:12,389 --> 00:09:11,600
weathered surface

215
00:09:13,910 --> 00:09:12,399
yeah

216
00:09:17,350 --> 00:09:13,920
what about that laser

217
00:09:20,550 --> 00:09:19,110
no i'm actually kelsey what about the

218
00:09:22,630 --> 00:09:20,560
laser

219
00:09:24,550 --> 00:09:22,640
yeah so we'll be able to use uh

220
00:09:27,509 --> 00:09:24,560
different kinds of lasers and x-rays to

221
00:09:29,750 --> 00:09:27,519
analyze all of the the chemistry the

222
00:09:31,350 --> 00:09:29,760
mineralogy the organic compounds that

223
00:09:33,990 --> 00:09:31,360
are inside of the rocks so we're really

224
00:09:36,310 --> 00:09:34,000
excited to see what kind of data we get

225
00:09:39,030 --> 00:09:36,320
yeah and another cool feature uh you

226
00:09:41,750 --> 00:09:39,040
also have the gas dust removal tool the

227
00:09:43,590 --> 00:09:41,760
gdrt which is able to puff a gas of

228
00:09:45,750 --> 00:09:43,600
nitrogen on the surface and and blow

229
00:09:47,509 --> 00:09:45,760
things away so that's pretty pretty cool

230
00:09:49,030 --> 00:09:47,519
a lot of great suite of instruments

231
00:09:51,269 --> 00:09:49,040
there

232
00:09:54,949 --> 00:09:51,279
we have another question from panda

233
00:09:56,870 --> 00:09:54,959
wannabe on twitter um panda wannabe asks

234
00:09:58,870 --> 00:09:56,880
what precautions did you take to make

235
00:10:01,509 --> 00:09:58,880
sure no earth microbes hitched a ride

236
00:10:04,870 --> 00:10:01,519
with you on mars two mars and will you

237
00:10:06,630 --> 00:10:04,880
be stopping by to say hi to curiosity

238
00:10:09,430 --> 00:10:06,640

this is a great kelsey question i would

239
00:10:12,470 --> 00:10:09,440
love to answer i do

240
00:10:16,949 --> 00:10:14,550
yeah that is a great question so one of

241
00:10:18,230 --> 00:10:16,959
the big um the big fears at the

242
00:10:19,910 --> 00:10:18,240
beginning when you're thinking about

243
00:10:22,230 --> 00:10:19,920
bringing samples back is we don't want

244
00:10:23,990 --> 00:10:22,240
to get a false positive so we don't want

245
00:10:25,829 --> 00:10:24,000
to analyze rocks that are brought back

246
00:10:27,990 --> 00:10:25,839
from mars and think that we found

247
00:10:29,430 --> 00:10:28,000
evidence of life and really it's

248
00:10:32,230 --> 00:10:29,440
evidence of life on earth that was

249
00:10:34,150 --> 00:10:32,240
brought along for the ride so the sample

250
00:10:35,990 --> 00:10:34,160
tubes which the samples would be

251
00:10:38,150 --> 00:10:36,000
collected in on mars have gone through

252
00:10:40,630 --> 00:10:38,160
extensive cleaning processes to make

253
00:10:43,269 --> 00:10:40,640
sure that they are absolutely pristinely

254
00:10:46,550 --> 00:10:43,279
clean no traces of any kind of earth

255
00:10:48,949 --> 00:10:46,560
microbial matter on them um and so we've

256
00:10:50,710 --> 00:10:48,959
done done our due diligence all the

257
00:10:52,470 --> 00:10:50,720
engineers and scientists working on this

258
00:10:55,269 --> 00:10:52,480
to make sure that those sample holders

259
00:10:56,949 --> 00:10:55,279
are as clean as they possibly can be

260
00:10:57,829 --> 00:10:56,959
awesome yeah and i actually have a

261
00:11:00,550 --> 00:10:57,839
little

262
00:11:03,269 --> 00:11:00,560
3d printed tube here so we actually

263
00:11:06,389 --> 00:11:03,279

baked out these tube assemblies at 150

264
00:11:09,350 --> 00:11:06,399
degrees celsius for over 26 hours so

265
00:11:11,350 --> 00:11:09,360
they are ridiculously clean

266
00:11:14,310 --> 00:11:11,360
a lot of effort went into that a huge

267
00:11:16,630 --> 00:11:14,320
team made sure that that was uh not an

268
00:11:18,710 --> 00:11:16,640
issue the whole false positive so yeah

269
00:11:21,430 --> 00:11:18,720
we are excited for the science coming

270
00:11:23,750 --> 00:11:21,440
from these pristine tubes

271
00:11:26,710 --> 00:11:23,760
uh the next question we have is from

272
00:11:28,949 --> 00:11:26,720
mike on twitter to what depth do you

273
00:11:31,430 --> 00:11:28,959
drill and how long is the core sample

274
00:11:33,509 --> 00:11:31,440
that you collect to analyze also a great

275
00:11:35,269 --> 00:11:33,519
kelsey question

276
00:11:37,430 --> 00:11:35,279
gregorio feel free to put it in but as

277
00:11:39,590 --> 00:11:37,440
well

278
00:11:41,110 --> 00:11:39,600
are our samples that we'll be getting

279
00:11:43,590 --> 00:11:41,120
back are going to be about the size of a

280
00:11:45,990 --> 00:11:43,600
piece of chalk so a little here's a

281
00:11:48,150 --> 00:11:46,000
video for us um so very small little

282
00:11:50,389 --> 00:11:48,160
pieces of drill core um and we're

283
00:11:52,470 --> 00:11:50,399
working on ways to make sure that we

284
00:11:54,470 --> 00:11:52,480
kind of get the contacts around those

285
00:11:56,150 --> 00:11:54,480
drill cores right before we collect them

286
00:11:58,389 --> 00:11:56,160
so that we know what the look like

287
00:12:01,670 --> 00:11:58,399
before they're taken and then placed

288
00:12:03,990 --> 00:12:01,680

into the tubes and brought back

289
00:12:06,230 --> 00:12:04,000
that's awesome and and in order to get

290
00:12:09,590 --> 00:12:06,240
to this location just to bring gregorio

291
00:12:12,949 --> 00:12:09,600
in i mean to land in jezreel career

292
00:12:16,230 --> 00:12:12,959
we needed trn we needed the edl gurus

293
00:12:19,110 --> 00:12:16,240
here can you talk about that quickly

294
00:12:21,910 --> 00:12:19,120
absolutely so trn is the terrain

295
00:12:24,310 --> 00:12:21,920
relative navigation system that is new

296
00:12:26,550 --> 00:12:24,320
that we did not have on curiosity and it

297
00:12:27,750 --> 00:12:26,560
really enabled science to go to jezreel

298
00:12:28,870 --> 00:12:27,760
creator

299
00:12:30,710 --> 00:12:28,880
there is a

300
00:12:32,629 --> 00:12:30,720
hazard map that we have where we chose

301
00:12:34,710 --> 00:12:32,639
where we landed you probably saw it in

302
00:12:36,470 --> 00:12:34,720
yesterday's press conference but you can

303
00:12:38,230 --> 00:12:36,480
see there are a lot of hazards on in

304
00:12:40,150 --> 00:12:38,240
jezreel crater and they were marked as

305
00:12:41,590 --> 00:12:40,160
red and we were able to sneak right in

306
00:12:43,750 --> 00:12:41,600
there into that green little dot that

307
00:12:45,190 --> 00:12:43,760
was a safe parking lot area which is

308
00:12:46,870 --> 00:12:45,200
really really cool

309
00:12:49,269 --> 00:12:46,880
and the way we were able to do that was

310
00:12:52,310 --> 00:12:49,279
that during the descent phase we have a

311
00:12:53,990 --> 00:12:52,320
camera on board and it's taking images

312
00:12:56,150 --> 00:12:54,000
and correlating that with a map that's

313
00:12:57,990 --> 00:12:56,160

on board and be able to better

314
00:12:59,030 --> 00:12:58,000
understand where we are relative to the

315
00:13:00,949 --> 00:12:59,040
ground

316
00:13:02,870 --> 00:13:00,959
and then when we know that knowledge we

317
00:13:05,110 --> 00:13:02,880
have we know all of the safe spots that

318
00:13:06,790 --> 00:13:05,120
we would want or that we could go to so

319
00:13:09,269 --> 00:13:06,800
when we're on this jet pack we tell the

320
00:13:10,949 --> 00:13:09,279
jet pack to fly to the optimal safe

321
00:13:12,310 --> 00:13:10,959
point on the map

322
00:13:14,230 --> 00:13:12,320
and then you know here's the picture

323
00:13:17,910 --> 00:13:14,240
where we are able to do that luckily in

324
00:13:19,590 --> 00:13:17,920
a nice safe area on jezebel crater

325
00:13:22,389 --> 00:13:19,600
that's amazing

326
00:13:24,230 --> 00:13:22,399
um so speaking of these amazing samples

327
00:13:26,790 --> 00:13:24,240
the next question a lot of people are

328
00:13:29,990 --> 00:13:26,800
asking how will the samples get back to

329
00:13:31,750 --> 00:13:30,000
earth who wants to take that question

330
00:13:32,870 --> 00:13:31,760
i could give it a shot

331
00:13:34,870 --> 00:13:32,880
so

332
00:13:37,030 --> 00:13:34,880
perseverance is actually the first leg

333
00:13:39,110 --> 00:13:37,040
of what's called the mars sample return

334
00:13:40,949 --> 00:13:39,120
campaign it's going to be a joint effort

335
00:13:42,790 --> 00:13:40,959
amongst three missions

336
00:13:44,230 --> 00:13:42,800
so perseverance is the first of that

337
00:13:46,069 --> 00:13:44,240
perseverance is going to start

338
00:13:47,430 --> 00:13:46,079

collecting samples along the way over

339
00:13:48,710 --> 00:13:47,440
its mission

340
00:13:50,470 --> 00:13:48,720
and now we're also working on a new

341
00:13:52,470 --> 00:13:50,480
mission called the sample retrieval

342
00:13:54,310 --> 00:13:52,480
lander so we're going to send a smaller

343
00:13:56,230 --> 00:13:54,320
rover to mars accompanied with a little

344
00:13:57,910 --> 00:13:56,240
rocket as you can see there we're going

345
00:13:59,829 --> 00:13:57,920
to put the rocket on so we're going to

346
00:14:02,550 --> 00:13:59,839
put samples onto the rocket to launch it

347
00:14:04,550 --> 00:14:02,560
into mars mars orbit and then we'll send

348
00:14:06,470 --> 00:14:04,560
another orbiter to pick up those set of

349
00:14:08,310 --> 00:14:06,480
samples and then fly it back to earth

350
00:14:09,910 --> 00:14:08,320
and bring it back to earth for the

351
00:14:11,509 --> 00:14:09,920
scientists here to be able to analyze

352
00:14:13,430 --> 00:14:11,519
them

353
00:14:14,949 --> 00:14:13,440
yeah that is an incredible feat of

354
00:14:17,269 --> 00:14:14,959
engineering and an international

355
00:14:19,269 --> 00:14:17,279
collaboration too i mean it's not only

356
00:14:22,069 --> 00:14:19,279
nasa efficient but it's going to involve

357
00:14:23,509 --> 00:14:22,079
issa as well so it's pretty spectacular

358
00:14:25,430 --> 00:14:23,519
kelsey do you want to have some inputs

359
00:14:27,829 --> 00:14:25,440
about getting the samples back to earth

360
00:14:29,990 --> 00:14:27,839
i mean as the scientist

361
00:14:32,150 --> 00:14:30,000
yeah absolutely we're really excited

362
00:14:34,069 --> 00:14:32,160
about that component of the mission so

363
00:14:35,910 --> 00:14:34,079

the the rover as i said has some really

364
00:14:38,230 --> 00:14:35,920
great instruments that can analyze the

365
00:14:40,629 --> 00:14:38,240
rocks on the surface of mars as it

366
00:14:43,110 --> 00:14:40,639
drives along but there's a limit to our

367
00:14:45,350 --> 00:14:43,120
capabilities that of the kinds of data

368
00:14:46,790 --> 00:14:45,360
that we can collect on the surface

369
00:14:48,790 --> 00:14:46,800
we have a lot of really incredible

370
00:14:50,629 --> 00:14:48,800
instruments in our labs that are just

371
00:14:53,670 --> 00:14:50,639
enormous instruments and we don't have

372
00:14:55,829 --> 00:14:53,680
the technology to send those to mars so

373
00:14:57,350 --> 00:14:55,839
getting the samples back will allow us

374
00:14:59,350 --> 00:14:57,360
to really dig into the science a little

375
00:15:01,509 --> 00:14:59,360
bit more and and be better able to

376
00:15:03,430 --> 00:15:01,519
characterize the samples and what i'm

377
00:15:05,910 --> 00:15:03,440
most excited about hopefully search for

378
00:15:07,430 --> 00:15:05,920
signs of past life

379
00:15:09,670 --> 00:15:07,440
that's awesome

380
00:15:11,829 --> 00:15:09,680
all right our next question is from

381
00:15:14,949 --> 00:15:11,839
marina on facebook and this is really

382
00:15:17,350 --> 00:15:14,959
for gregorio where is the jet pack and

383
00:15:18,870 --> 00:15:17,360
parachute now

384
00:15:20,550 --> 00:15:18,880
oh yes

385
00:15:23,030 --> 00:15:20,560
so the jet pack or what we call the

386
00:15:25,110 --> 00:15:23,040
descent stage after it does its job and

387
00:15:27,110 --> 00:15:25,120
lowers the rover on the ground it flies

388
00:15:30,069 --> 00:15:27,120

away from the rover and just crash lands

389
00:15:31,430 --> 00:15:30,079
away from us somewhere over over 400

390
00:15:33,189 --> 00:15:31,440
meters away

391
00:15:35,110 --> 00:15:33,199
the parachute also does the same thing

392
00:15:36,629 --> 00:15:35,120
so the parachute is controlling the

393
00:15:37,910 --> 00:15:36,639
aeroshell or the back shell and it's

394
00:15:38,710 --> 00:15:37,920
floating away

395
00:15:39,990 --> 00:15:38,720
and

396
00:15:42,230 --> 00:15:40,000
you know we're going to try to do what

397
00:15:43,670 --> 00:15:42,240
we did on curiosity where we had images

398
00:15:45,269 --> 00:15:43,680
from some of our

399
00:15:48,230 --> 00:15:45,279
assets and hopefully we'll get some

400
00:15:49,990 --> 00:15:48,240
pictures um sometime in the future to

401
00:15:52,230 --> 00:15:50,000
see where these things are actually are

402
00:15:54,870 --> 00:15:52,240
located on mars

403
00:15:56,470 --> 00:15:54,880
fantastic awesome the next question is

404
00:15:59,030 --> 00:15:56,480
from yvonne on twitter and it's really

405
00:16:01,670 --> 00:15:59,040
it's for kelsey does perseverance have a

406
00:16:04,310 --> 00:16:01,680
way to measure the density of map or

407
00:16:06,629 --> 00:16:04,320
mass of rocks those porous looking rocks

408
00:16:08,629 --> 00:16:06,639
make me want to know if they are light

409
00:16:10,470 --> 00:16:08,639
like pumice

410
00:16:12,069 --> 00:16:10,480
that's a great question yeah and

411
00:16:13,749 --> 00:16:12,079
something that the science team has been

412
00:16:15,670 --> 00:16:13,759
talking a lot about trying to figure out

413
00:16:16,710 --> 00:16:15,680

exactly what those rocks are and what

414
00:16:19,670 --> 00:16:16,720
they mean

415
00:16:22,389 --> 00:16:19,680
um so we can do a few things to try to

416
00:16:25,110 --> 00:16:22,399
characterize the mineralogy of the rocks

417
00:16:27,430 --> 00:16:25,120
figure out if it's a basalt that maybe

418
00:16:29,509 --> 00:16:27,440
has basaltic type minerals or if it's a

419
00:16:31,110 --> 00:16:29,519
sedimentary rock that has different

420
00:16:32,790 --> 00:16:31,120
kinds of clays

421
00:16:34,629 --> 00:16:32,800
um so

422
00:16:36,310 --> 00:16:34,639
we will be integrating a lot of the

423
00:16:37,990 --> 00:16:36,320
different data sets that the rover is

424
00:16:40,870 --> 00:16:38,000
collecting and try to answer that

425
00:16:42,389 --> 00:16:40,880
question of how dense is it what kind of

426
00:16:45,269 --> 00:16:42,399
minerals are there what kinds of

427
00:16:47,509 --> 00:16:45,279
elements are there um so we can get a

428
00:16:49,350 --> 00:16:47,519
good approximation of what the material

429
00:16:50,949 --> 00:16:49,360
that we're looking at

430
00:16:53,430 --> 00:16:50,959
yeah yeah and there's also one of the

431
00:16:55,110 --> 00:16:53,440
many assessment stations in the

432
00:16:57,269 --> 00:16:55,120
adaptive caching assembly part of the

433
00:16:59,189 --> 00:16:57,279
rover is a volume assessment station so

434
00:17:01,430 --> 00:16:59,199
that we can actually measure not the

435
00:17:03,749 --> 00:17:01,440
density of the rock or the mass but at

436
00:17:06,230 --> 00:17:03,759
least get a rough idea of how much

437
00:17:08,470 --> 00:17:06,240
sample we collected uh so yeah a lot of

438
00:17:11,270 --> 00:17:08,480

great things to look forward to

439
00:17:13,350 --> 00:17:11,280
the next question is from tim props on

440
00:17:16,789 --> 00:17:13,360
youtube he asks

441
00:17:19,990 --> 00:17:16,799
or she tim asks what procedures will you

442
00:17:22,789 --> 00:17:20,000
take if we find signs of life on mars

443
00:17:25,189 --> 00:17:22,799
kelsey this is for you

444
00:17:27,110 --> 00:17:25,199
great definitely well i so there are

445
00:17:28,870 --> 00:17:27,120
kind of two ways that you could go with

446
00:17:30,630 --> 00:17:28,880
this i'm going to take the signs of past

447
00:17:32,870 --> 00:17:30,640
life on mars approach i'm not sure

448
00:17:35,190 --> 00:17:32,880
exactly if that's what they mean but um

449
00:17:37,350 --> 00:17:35,200
what i'm most excited about is seeing if

450
00:17:40,310 --> 00:17:37,360
life ever did exist on mars in its

451
00:17:42,789 --> 00:17:40,320
ancient past and so if we do find

452
00:17:45,190 --> 00:17:42,799
evidence that there was past life on

453
00:17:47,830 --> 00:17:45,200
mars a few billion years ago in a

454
00:17:50,070 --> 00:17:47,840
similar age to the most ancient life

455
00:17:51,590 --> 00:17:50,080
that we have evidence of on earth

456
00:17:54,150 --> 00:17:51,600
i think it's going to be really exciting

457
00:17:55,350 --> 00:17:54,160
to analyze that and reframe how we think

458
00:17:57,750 --> 00:17:55,360
about

459
00:17:59,430 --> 00:17:57,760
what types of environments are habitable

460
00:18:01,830 --> 00:17:59,440
how life emerged

461
00:18:04,230 --> 00:18:01,840
emerged in the past on different planets

462
00:18:06,150 --> 00:18:04,240
um so it will open up a lot of science

463
00:18:07,909 --> 00:18:06,160

questions that we can then ask and i'm

464
00:18:09,510 --> 00:18:07,919
really excited for the next couple of

465
00:18:11,110 --> 00:18:09,520
decades and what that means for

466
00:18:12,710 --> 00:18:11,120
scientists as we try to answer that

467
00:18:16,070 --> 00:18:12,720
question

468
00:18:18,070 --> 00:18:16,080
yeah and gregorio just as a human i mean

469
00:18:21,830 --> 00:18:18,080
how would you react if you heard that

470
00:18:23,750 --> 00:18:21,840
they found signs of ancient life on mars

471
00:18:25,430 --> 00:18:23,760
i would i would be really relieved you

472
00:18:27,909 --> 00:18:25,440
know one of my favorite movies growing

473
00:18:29,750 --> 00:18:27,919
up is contact and it kind of instilled

474
00:18:32,070 --> 00:18:29,760
upon this idea of like

475
00:18:33,750 --> 00:18:32,080
wanting to be life out there

476
00:18:35,990 --> 00:18:33,760
and in the movie the main character

477
00:18:38,549 --> 00:18:36,000
asked was asked you know do you believe

478
00:18:40,950 --> 00:18:38,559
in life outside of earth and her

479
00:18:43,190 --> 00:18:40,960
response was well if there wasn't that

480
00:18:44,789 --> 00:18:43,200
would be an awful waste of space

481
00:18:47,750 --> 00:18:44,799
and so i'm always hopeful to find what

482
00:18:48,789 --> 00:18:47,760
signs of life anywhere outside of earth

483
00:18:50,870 --> 00:18:48,799
yes

484
00:18:54,950 --> 00:18:50,880
big brownie points also my favorite

485
00:19:01,830 --> 00:18:59,350
awesome our next question is from ryan

486
00:19:04,070 --> 00:19:01,840
on facebook would it will it be possible

487
00:19:06,310 --> 00:19:04,080
for us to verify the prior existence of

488
00:19:07,830 --> 00:19:06,320

life on mars without the return of

489
00:19:10,630 --> 00:19:07,840
samples if we

490
00:19:12,789 --> 00:19:10,640
that we take with the mission so kelsey

491
00:19:15,110 --> 00:19:12,799
could we verify the existence of life on

492
00:19:17,750 --> 00:19:15,120
mars without returning the samples

493
00:19:18,789 --> 00:19:17,760
that is a question that i ask myself

494
00:19:20,549 --> 00:19:18,799
every day

495
00:19:23,669 --> 00:19:20,559
is an excellent question

496
00:19:25,150 --> 00:19:23,679
um yeah so there are kind of a range of

497
00:19:27,830 --> 00:19:25,160
different types of what we call

498
00:19:31,190 --> 00:19:27,840
biosignatures so those are evidence of

499
00:19:33,909 --> 00:19:31,200
past life that can be actual fossils

500
00:19:35,909 --> 00:19:33,919
little individual fossils of bacterial

501
00:19:37,830 --> 00:19:35,919
cells and things like that we do find on

502
00:19:40,549 --> 00:19:37,840
ancient earth rocks

503
00:19:43,190 --> 00:19:40,559
it can be stromatolites so microbial

504
00:19:45,350 --> 00:19:43,200
structures like when you see a kind of

505
00:19:47,750 --> 00:19:45,360
scuzzy mat on the surface of a rock in a

506
00:19:49,270 --> 00:19:47,760
pond those microbial mats can get

507
00:19:52,549 --> 00:19:49,280
preserved

508
00:19:53,350 --> 00:19:52,559
organic compounds carbon-based compounds

509
00:19:55,190 --> 00:19:53,360
so

510
00:19:57,190 --> 00:19:55,200
all of those biosignatures have

511
00:19:58,710 --> 00:19:57,200
different chemical compositions

512
00:20:00,789 --> 00:19:58,720
different elemental

513
00:20:02,390 --> 00:20:00,799

compositions different textures

514
00:20:04,630 --> 00:20:02,400
associated with them

515
00:20:06,470 --> 00:20:04,640
some of them are really easy to identify

516
00:20:09,590 --> 00:20:06,480
and some of them are not quite as easy

517
00:20:11,750 --> 00:20:09,600
to identify so it'll it'll take

518
00:20:13,510 --> 00:20:11,760
a lot of work for us to really analyze

519
00:20:15,830 --> 00:20:13,520
them using the instruments on board and

520
00:20:18,070 --> 00:20:15,840
see if we can convince ourselves uh

521
00:20:20,390 --> 00:20:18,080
depending on how obvious those potential

522
00:20:23,510 --> 00:20:20,400
biosignatures are so

523
00:20:27,669 --> 00:20:25,510
that's very fascinating i love how it

524
00:20:30,470 --> 00:20:27,679
leverages all of your experience in the

525
00:20:32,070 --> 00:20:30,480
field um now you're applying it to mars

526
00:20:34,950 --> 00:20:32,080
that's pretty crazy

527
00:20:37,830 --> 00:20:34,960
pretty great

528
00:20:39,909 --> 00:20:37,840
yeah the next question uh from luke on

529
00:20:42,310 --> 00:20:39,919
twitter is for gregorio

530
00:20:44,870 --> 00:20:42,320
how long before perseverance gets

531
00:20:47,190 --> 00:20:44,880
driving around

532
00:20:49,909 --> 00:20:47,200
oh that you know that's really highly

533
00:20:52,230 --> 00:20:49,919
dependent on how things go there is a

534
00:20:53,990 --> 00:20:52,240
nominal plan for us to start driving

535
00:20:56,230 --> 00:20:54,000
um but i would say it's on the order of

536
00:20:57,430 --> 00:20:56,240
uh you know a few weeks or so but again

537
00:20:58,470 --> 00:20:57,440
we're doing all of our checkouts and

538
00:21:00,549 --> 00:20:58,480

we're gonna have to go through a

539
00:21:02,710 --> 00:21:00,559
software transition and then after that

540
00:21:05,350 --> 00:21:02,720
we're gonna go start looking for a

541
00:21:09,830 --> 00:21:05,360
helicopter pad too for us to be able to

542
00:21:15,990 --> 00:21:13,110
that's awesome yeah so the that's

543
00:21:18,310 --> 00:21:16,000
incredible uh the next question is from

544
00:21:20,070 --> 00:21:18,320
patrick fleming on youtube he is a big

545
00:21:21,510 --> 00:21:20,080
dr kelsey

546
00:21:24,230 --> 00:21:21,520
uh

547
00:21:25,350 --> 00:21:24,240
your question is

548
00:21:26,870 --> 00:21:25,360
questions regarding studying

549
00:21:29,350 --> 00:21:26,880
astrobiology

550
00:21:31,430 --> 00:21:29,360
what does the career consist of what

551
00:21:34,310 --> 00:21:31,440
subjects do i need to focus on to study

552
00:21:36,390 --> 00:21:34,320
this career and thanks congratulations

553
00:21:38,710 --> 00:21:36,400
nasa

554
00:21:41,270 --> 00:21:38,720
this is one of my favorite questions

555
00:21:43,430 --> 00:21:41,280
the answer is there is not one single

556
00:21:45,190 --> 00:21:43,440
path there are so many different paths

557
00:21:47,830 --> 00:21:45,200
that you could take to become an

558
00:21:50,470 --> 00:21:47,840
astrobiologist and study life in the

559
00:21:53,029 --> 00:21:50,480
universe on our science team we have

560
00:21:55,590 --> 00:21:53,039
this incredible group of people who have

561
00:21:58,470 --> 00:21:55,600
backgrounds in chemistry and physics and

562
00:22:00,470 --> 00:21:58,480
biology and geology and all of those

563
00:22:02,630 --> 00:22:00,480

people come together and we're living in

564
00:22:04,510 --> 00:22:02,640
this really amazing moment in science

565
00:22:07,190 --> 00:22:04,520
history where science is so

566
00:22:09,350 --> 00:22:07,200
interdisciplinary and collaborative that

567
00:22:10,630 --> 00:22:09,360
we all can work together to put all of

568
00:22:12,149 --> 00:22:10,640
those different types of science

569
00:22:14,950 --> 00:22:12,159
together

570
00:22:16,789 --> 00:22:14,960
so i would say my advice is

571
00:22:19,270 --> 00:22:16,799
study what you're passionate about what

572
00:22:21,430 --> 00:22:19,280
you get excited about whether that be

573
00:22:24,470 --> 00:22:21,440
any type of science any type of math

574
00:22:26,470 --> 00:22:24,480
engineering and just push it forward

575
00:22:28,149 --> 00:22:26,480
follow your dreams and you will be able

576
00:22:29,669 --> 00:22:28,159
to get to a position where you can

577
00:22:31,590 --> 00:22:29,679
integrate that in some way into

578
00:22:33,669 --> 00:22:31,600
astrobiology

579
00:22:36,390 --> 00:22:33,679
that's amazing and since we're on this

580
00:22:38,310 --> 00:22:36,400
topic gregorio i know you have a great

581
00:22:40,390 --> 00:22:38,320
story about how you got to where you are

582
00:22:42,070 --> 00:22:40,400
today

583
00:22:43,270 --> 00:22:42,080
oh right so

584
00:22:44,549 --> 00:22:43,280
when i was a

585
00:22:45,909 --> 00:22:44,559
undergrad

586
00:22:47,350 --> 00:22:45,919
my professor

587
00:22:49,190 --> 00:22:47,360
was asking if i wanted to help out one

588
00:22:50,310 --> 00:22:49,200

of these old postdocs who was working at

589
00:22:52,310 --> 00:22:50,320
jpl

590
00:22:54,470 --> 00:22:52,320
so i said yes and i had this fortunate

591
00:22:55,909 --> 00:22:54,480
opportunity to work in the palomar

592
00:22:57,669 --> 00:22:55,919
observatory

593
00:23:00,390 --> 00:22:57,679
and i remember the first time i was able

594
00:23:02,549 --> 00:23:00,400
to be inside that ginormous telescope

595
00:23:04,310 --> 00:23:02,559
and i noticed like this is what i want

596
00:23:05,830 --> 00:23:04,320
to do one day and i think that's a

597
00:23:07,430 --> 00:23:05,840
really important message for everyone

598
00:23:09,029 --> 00:23:07,440
out there it's whether you want to get

599
00:23:10,710 --> 00:23:09,039
into a specific field or you don't know

600
00:23:11,830 --> 00:23:10,720
what you want to do i think it's

601
00:23:14,470 --> 00:23:11,840
important to find something that you

602
00:23:17,029 --> 00:23:14,480
love to do because i'm sure for moo and

603
00:23:18,710 --> 00:23:17,039
kelsey and myself you know we probably

604
00:23:19,590 --> 00:23:18,720
never really feel like we're going into

605
00:23:21,590 --> 00:23:19,600
work

606
00:23:23,430 --> 00:23:21,600
just because we love it so much

607
00:23:25,190 --> 00:23:23,440
and so that's what i did

608
00:23:26,870 --> 00:23:25,200
when i started college i was actually

609
00:23:28,870 --> 00:23:26,880
doing accounting pre-law

610
00:23:30,630 --> 00:23:28,880
and i wasn't really enjoying it

611
00:23:32,390 --> 00:23:30,640
so i made over made the switch over to

612
00:23:34,470 --> 00:23:32,400
physics and physics led me to

613
00:23:36,390 --> 00:23:34,480

astrophysics which led me to jpl which

614
00:23:38,070 --> 00:23:36,400
led me to doing some engineering

615
00:23:40,230 --> 00:23:38,080
and now has let me be part of this

616
00:23:41,269 --> 00:23:40,240
amazing team that landed perseverance on

617
00:23:42,710 --> 00:23:41,279
mars

618
00:23:44,710 --> 00:23:42,720
so everyone should be able to find

619
00:23:47,029 --> 00:23:44,720
something that they love to do

620
00:23:57,830 --> 00:23:47,039
yes so you too can be a doctor kelsey

621
00:24:01,909 --> 00:23:59,510
all right the next question is from

622
00:24:04,310 --> 00:24:01,919
harmony on twitter how much of the

623
00:24:06,310 --> 00:24:04,320
planet will perseverance be able to

624
00:24:07,990 --> 00:24:06,320
explore kelsey this is a great question

625
00:24:10,710 --> 00:24:08,000
for you

626
00:24:14,149 --> 00:24:10,720
definitely yeah so the rover is going to

627
00:24:15,590 --> 00:24:14,159
start out looking at jezreel crater the

628
00:24:17,029 --> 00:24:15,600
the landing site of the rover and

629
00:24:19,590 --> 00:24:17,039
analyzing there are some really

630
00:24:21,350 --> 00:24:19,600
incredible rock deposits here

631
00:24:24,470 --> 00:24:21,360
as you said at the beginning this is a

632
00:24:26,870 --> 00:24:24,480
river delta um so we're really excited

633
00:24:29,350 --> 00:24:26,880
to find out what kind of changes in the

634
00:24:31,029 --> 00:24:29,360
rocks we can see as we drive up around

635
00:24:33,830 --> 00:24:31,039
the delta and

636
00:24:35,750 --> 00:24:33,840
eventually go outside of the crater and

637
00:24:38,710 --> 00:24:35,760
uh potentially extend to the mission

638
00:24:40,710 --> 00:24:38,720

beyond that so for right now we're gonna

639
00:24:42,310 --> 00:24:40,720
kind of stay within the bounds of of the

640
00:24:46,149 --> 00:24:42,320
crater and look at the delta and then

641
00:24:48,230 --> 00:24:46,159
potentially expand farther out

642
00:24:50,470 --> 00:24:48,240
awesome and to follow up with that dr

643
00:24:52,310 --> 00:24:50,480
moore eric on facebook wants to know

644
00:24:54,230 --> 00:24:52,320
approximately how long until the first

645
00:24:55,669 --> 00:24:54,240
sample results will be tabulated and

646
00:24:58,149 --> 00:24:55,679
analyzed

647
00:24:59,590 --> 00:24:58,159
oh that's a really good question i don't

648
00:25:01,909 --> 00:24:59,600
have an answer to that it's going to

649
00:25:03,190 --> 00:25:01,919
depend on what rocks we see as we drive

650
00:25:04,870 --> 00:25:03,200
around

651
00:25:06,390 --> 00:25:04,880
so one of the best parts about being on

652
00:25:07,990 --> 00:25:06,400
this science team and having these

653
00:25:09,830 --> 00:25:08,000
really great discussions with all these

654
00:25:12,870 --> 00:25:09,840
different scientists and engineers is

655
00:25:15,110 --> 00:25:12,880
that we get to talk about it as we go as

656
00:25:18,549 --> 00:25:15,120
we see rocks that look like cool rocks

657
00:25:20,310 --> 00:25:18,559
to collect we get conversations and and

658
00:25:21,990 --> 00:25:20,320
learn about the rocks and decide which

659
00:25:24,149 --> 00:25:22,000
ones we want to collect

660
00:25:25,510 --> 00:25:24,159
so we'll have to see what the rocks look

661
00:25:28,310 --> 00:25:25,520
like

662
00:25:31,269 --> 00:25:28,320
awesome so emile on facebook wants to

663
00:25:34,630 --> 00:25:31,279

know from gregorio is there a delay in

664
00:25:35,510 --> 00:25:34,640
controlling the rover on mars

665
00:25:37,029 --> 00:25:35,520
yes

666
00:25:39,029 --> 00:25:37,039
so

667
00:25:41,029 --> 00:25:39,039
i like to bring up remote control cars

668
00:25:42,950 --> 00:25:41,039
like here on earth and so if you ever

669
00:25:45,269 --> 00:25:42,960
push forward on the remote control car

670
00:25:46,950 --> 00:25:45,279
it it moves almost immediately

671
00:25:48,789 --> 00:25:46,960
but because mars and earth are so far

672
00:25:51,110 --> 00:25:48,799
apart depending where they are in their

673
00:25:52,870 --> 00:25:51,120
orbits it will take anywhere between 5

674
00:25:54,630 --> 00:25:52,880
and 20 minutes for a signal to get

675
00:25:56,390 --> 00:25:54,640
relayed between each other

676
00:25:58,710 --> 00:25:56,400
and so when we did entry descend and

677
00:26:00,390 --> 00:25:58,720
landing it was an automated process

678
00:26:02,870 --> 00:26:00,400
because at that time a signal would have

679
00:26:04,710 --> 00:26:02,880
taken 11 minutes or so to to be received

680
00:26:06,070 --> 00:26:04,720
between the two planets

681
00:26:07,590 --> 00:26:06,080
we have to account for that in surface

682
00:26:09,029 --> 00:26:07,600
operations as well

683
00:26:10,549 --> 00:26:09,039
and every morning we'll send out a set

684
00:26:12,390 --> 00:26:10,559
of instructions to the rover to

685
00:26:14,390 --> 00:26:12,400
perseverance and perseverance will

686
00:26:16,149 --> 00:26:14,400
execute those set of instructions

687
00:26:18,149 --> 00:26:16,159
and before it finishes for the day it

688
00:26:20,070 --> 00:26:18,159

will radio back what the information

689
00:26:24,310 --> 00:26:20,080
they got and will use that to plan the

690
00:26:25,830 --> 00:26:24,320
next day while perseverance is asleep

691
00:26:28,549 --> 00:26:25,840
that's awesome

692
00:26:29,830 --> 00:26:28,559
we have one last time for one last

693
00:26:33,830 --> 00:26:29,840
question

694
00:26:37,029 --> 00:26:33,840
so let's ask from nathan on youtube what

695
00:26:40,070 --> 00:26:37,039
data will we be listening to for sounds

696
00:26:41,990 --> 00:26:40,080
on mars um and what potato will we

697
00:26:44,310 --> 00:26:42,000
gather from that planet

698
00:26:46,630 --> 00:26:44,320
i'm guessing nathan wants to understand

699
00:26:48,549 --> 00:26:46,640
the the microphone data and and what

700
00:26:50,390 --> 00:26:48,559
we're listening for so let's hear both

701
00:26:52,870 --> 00:26:50,400
of your perspective

702
00:26:54,630 --> 00:26:52,880
now let's start with dr kelsey

703
00:26:59,029 --> 00:26:54,640
i'm gonna pass it over to gregorio

704
00:27:05,110 --> 00:27:00,950
so

705
00:27:07,029 --> 00:27:05,120
camera the microphone that we have on

706
00:27:09,430 --> 00:27:07,039
the edl system and kelsey can talk about

707
00:27:11,510 --> 00:27:09,440
the one that's on the rover but

708
00:27:12,950 --> 00:27:11,520
as part of our edl system we equipped it

709
00:27:14,470 --> 00:27:12,960
with a microphone

710
00:27:17,110 --> 00:27:14,480
and the idea was that it would be

711
00:27:20,630 --> 00:27:17,120
recording uh sounds during entry descent

712
00:27:22,789 --> 00:27:20,640
and landing and and so hopefully we'll

713
00:27:25,669 --> 00:27:22,799

be able to hear things like the engines

714
00:27:28,070 --> 00:27:25,679
firing or the parachute deploying

715
00:27:29,350 --> 00:27:28,080
um and so we'll we really know i mean

716
00:27:31,110 --> 00:27:29,360
for certain since we've never done this

717
00:27:33,110 --> 00:27:31,120
before what we'll hear but that's at

718
00:27:34,549 --> 00:27:33,120
least what we have the micro microphone

719
00:27:36,549 --> 00:27:34,559
4 on the entry descent and landing

720
00:27:39,269 --> 00:27:36,559
system

721
00:27:40,950 --> 00:27:39,279
all right sorry dr kelsey we don't have

722
00:27:42,310 --> 00:27:40,960
time for your amazing answer i know it's

723
00:27:44,149 --> 00:27:42,320
going to be great

724
00:27:45,510 --> 00:27:44,159
thank you so much those are great

725
00:27:47,350 --> 00:27:45,520
questions thank you to gregorio and

726
00:27:50,630 --> 00:27:47,360
kelsey for joining us

727
00:27:53,430 --> 00:27:50,640
thank you so much for having us

728
00:27:55,110 --> 00:27:53,440
and thank you at home for joining if

729
00:27:56,950 --> 00:27:55,120
you'd like to follow perseverance and

730
00:27:59,590 --> 00:27:56,960
its journey to the red planet please

731
00:28:01,430 --> 00:27:59,600
make sure to follow at nasa persevere on

732
00:28:03,870 --> 00:28:01,440
facebook and twitter for the latest

733
00:28:06,230 --> 00:28:03,880
updates and don't forget to bookmark

734
00:28:07,990 --> 00:28:06,240
mars.nasa.gov so you can see all of the

735
00:28:10,630 --> 00:28:08,000
photos and the sounds collected by the

736
00:28:12,950 --> 00:28:10,640
rover once operations begin you can also

737
00:28:16,070 --> 00:28:12,960
follow every step of the rover's journey

738
00:28:18,149 --> 00:28:16,080

with the explorer with the rover toolkit

739
00:28:20,230 --> 00:28:18,159
if you're an educator it's not too late

740
00:28:23,269 --> 00:28:20,240
to join and bring your students along

741
00:28:25,510 --> 00:28:23,279
visit go.nasa.gov backslash mars 2020

742
00:28:26,870 --> 00:28:25,520
toolkit to access the mission to mars

743
00:28:28,389 --> 00:28:26,880
student challenge

744
00:28:54,340 --> 00:28:28,399
until next time

745
00:28:54,350 --> 00:29:04,630
[Music]