
MARS 2020
PERSEVERANCE

1
00:00:00,000 --> 00:00:35,430
[Music]

2
00:01:05,350 --> 00:00:45,040
t-minus one minute

3
00:01:12,200 --> 00:01:05,360
[Music]

4
00:01:18,870 --> 00:01:12,210
t-minus 30 seconds

5
00:01:24,630 --> 00:01:20,660
we are go for launch

6
00:01:28,469 --> 00:01:24,640
[Music]

7
00:01:32,310 --> 00:01:28,479
t-minus 10 9 8

8
00:01:35,990 --> 00:01:32,320
7 6 5 4

9
00:01:38,069 --> 00:01:36,000
3 2 1.

10
00:01:39,350 --> 00:01:38,079
welcome to the nasa social for the mars

11
00:01:55,960 --> 00:01:39,360
2020 mission

12
00:02:23,190 --> 00:02:11,840
[Music]

13
00:02:26,949 --> 00:02:25,430

welcome everybody welcome to the

14
00:02:29,430 --> 00:02:26,959
countdown to mars

15
00:02:31,190 --> 00:02:29,440
virtual nasa social i'm your host eve

16
00:02:33,589 --> 00:02:31,200
lamothe i'm with the exploration ground

17
00:02:36,309 --> 00:02:33,599
systems com systems project manager

18
00:02:37,830 --> 00:02:36,319
and with me today is the one and only

19
00:02:39,830 --> 00:02:37,840
maddie maddie how are we doing today

20
00:02:41,830 --> 00:02:39,840
i am great it is always a pleasure to be

21
00:02:43,430 --> 00:02:41,840
here with you my gosh you know if you're

22
00:02:45,190 --> 00:02:43,440
great and it means i'm great so let's

23
00:02:46,630 --> 00:02:45,200
make everyone else great right so

24
00:02:48,470 --> 00:02:46,640
talk to us a little bit maddie perfect

25
00:02:48,869 --> 00:02:48,480
so we're going to have two very special

26
00:02:50,790 --> 00:02:48,879
guests

27
00:02:52,550 --> 00:02:50,800
joining us today and while you're

28
00:02:54,630 --> 00:02:52,560
watching we're encouraging you to

29
00:02:57,350 --> 00:02:54,640
drop your comments either in the youtube

30
00:02:58,550 --> 00:02:57,360
chat the virtual nasa social facebook

31
00:03:01,030 --> 00:02:58,560
group or on twitter

32
00:03:01,830 --> 00:03:01,040
using using the hashtag countdown to

33
00:03:04,149 --> 00:03:01,840
mars

34
00:03:05,910 --> 00:03:04,159
awesome fantastic so again folks we are

35
00:03:06,630 --> 00:03:05,920
here to talk about the perseverance

36
00:03:08,869 --> 00:03:06,640
mission

37
00:03:10,229 --> 00:03:08,879
right nasa we're always doing um you

38
00:03:13,350 --> 00:03:10,239

know exciting things

39
00:03:15,670 --> 00:03:13,360
and with us today we have dr z dr z

40
00:03:17,270 --> 00:03:15,680
is the is an associate administrator for

41
00:03:18,949 --> 00:03:17,280
the science science mission

42
00:03:20,710 --> 00:03:18,959
directorate and he's going to tell us a

43
00:03:22,149 --> 00:03:20,720
little bit about his role and what he

44
00:03:23,190 --> 00:03:22,159
does in regards to the perseverance

45
00:03:25,110 --> 00:03:23,200
mission dr z

46
00:03:27,190 --> 00:03:25,120
how's it going today i'm doing well live

47
00:03:28,789 --> 00:03:27,200
sorry you i'm doing fantastic thanks

48
00:03:29,350 --> 00:03:28,799
again for being here with us i'm so

49
00:03:31,190 --> 00:03:29,360
excited

50
00:03:32,630 --> 00:03:31,200
so so please talk to us this is this is

51
00:03:34,949 --> 00:03:32,640
such an exciting moment and

52
00:03:36,710 --> 00:03:34,959
i know our guests are you know very

53
00:03:38,390 --> 00:03:36,720
envious to learn all about what's going

54
00:03:40,309 --> 00:03:38,400
on here um here

55
00:03:41,830 --> 00:03:40,319
absolutely happy i'm so excited to have

56
00:03:43,910 --> 00:03:41,840
all these

57
00:03:46,949 --> 00:03:43,920
social media friends all over the world

58
00:03:48,869 --> 00:03:46,959
with us this truly is an international

59
00:03:50,630 --> 00:03:48,879
view that we have here you know like so

60
00:03:53,830 --> 00:03:50,640
many of these instruments

61
00:03:54,630 --> 00:03:53,840
were built in other countries france

62
00:03:58,070 --> 00:03:54,640
norway

63
00:04:00,869 --> 00:03:58,080

you know and in spain for example

64
00:04:01,429 --> 00:04:00,879
and we're really working on this so my

65
00:04:04,149 --> 00:04:01,439
job

66
00:04:04,710 --> 00:04:04,159
you asked that what it is is is to lead

67
00:04:07,830 --> 00:04:04,720
nasa

68
00:04:09,990 --> 00:04:07,840
science program so as part of that

69
00:04:11,670 --> 00:04:10,000
we have about 105 missions that we're

70
00:04:12,550 --> 00:04:11,680
currently working on i can tell you some

71
00:04:14,309 --> 00:04:12,560
of these

72
00:04:16,229 --> 00:04:14,319
missions are absolute classics you know

73
00:04:17,509 --> 00:04:16,239
about the hubble space telescope you

74
00:04:19,430 --> 00:04:17,519
know of course about

75
00:04:21,270 --> 00:04:19,440
curiosity that's already there you know

76
00:04:23,670 --> 00:04:21,280
about the parker solar probe

77
00:04:25,270 --> 00:04:23,680
and you know about some of these amazing

78
00:04:28,310 --> 00:04:25,280
earth science missions

79
00:04:30,950 --> 00:04:28,320
that are in fact even now today

80
00:04:32,950 --> 00:04:30,960
providing information that improves and

81
00:04:36,790 --> 00:04:32,960
protects life on earth so we have

82
00:04:38,870 --> 00:04:36,800
a broad set of portfolios this mission

83
00:04:41,270 --> 00:04:38,880
is really a jewel in it and i'll tell

84
00:04:42,710 --> 00:04:41,280
you what's special about it

85
00:04:45,350 --> 00:04:42,720
one of the questions we're really

86
00:04:47,350 --> 00:04:45,360
focused on in all of science

87
00:04:49,189 --> 00:04:47,360
not just in planetary science but in all

88
00:04:51,590 --> 00:04:49,199

of science it's the question

89
00:04:52,310 --> 00:04:51,600
that people have asked for thousands of

90
00:04:54,710 --> 00:04:52,320
years which

91
00:04:55,749 --> 00:04:54,720
is there a life elsewhere you know

92
00:04:58,070 --> 00:04:55,759
philosophers

93
00:04:59,590 --> 00:04:58,080
have asked that there's books full of it

94
00:05:02,390 --> 00:04:59,600
well we're ready we believe

95
00:05:04,110 --> 00:05:02,400
to start answering that question with

96
00:05:05,909 --> 00:05:04,120
missions that are focused on

97
00:05:08,390 --> 00:05:05,919
astrobiology

98
00:05:10,230 --> 00:05:08,400
focused on that question this is nasa's

99
00:05:12,710 --> 00:05:10,240
first astrobiology mission

100
00:05:13,749 --> 00:05:12,720
that we have done for for many many

101
00:05:16,550 --> 00:05:13,759
decades

102
00:05:17,990 --> 00:05:16,560
i would argue that really since viking

103
00:05:19,990 --> 00:05:18,000
we're ready now

104
00:05:21,670 --> 00:05:20,000
to ask that question is there life

105
00:05:23,110 --> 00:05:21,680
elsewhere based on the work that

106
00:05:25,350 --> 00:05:23,120
happened before by the way

107
00:05:27,270 --> 00:05:25,360
there's others behind it the dragonfly

108
00:05:29,670 --> 00:05:27,280
mission to titan is another

109
00:05:30,790 --> 00:05:29,680
astrobiology mission and frankly many of

110
00:05:32,710 --> 00:05:30,800
the other missions even

111
00:05:34,150 --> 00:05:32,720
telescopes that are looking at planets

112
00:05:37,029 --> 00:05:34,160
like james webb have

113
00:05:38,870 --> 00:05:37,039

astrobiology contents that are part of

114
00:05:39,830 --> 00:05:38,880
that like looking at atmospheres of

115
00:05:42,469 --> 00:05:39,840
exoplanets

116
00:05:43,430 --> 00:05:42,479
so when i look at this i think of that

117
00:05:45,670 --> 00:05:43,440
question

118
00:05:47,110 --> 00:05:45,680
and the importance of asking that

119
00:05:50,870 --> 00:05:47,120
question now

120
00:05:53,110 --> 00:05:50,880
today in 2020 as we go forward

121
00:05:54,150 --> 00:05:53,120
wow wow so i mean just just with that

122
00:05:56,469 --> 00:05:54,160
alone i already

123
00:05:58,150 --> 00:05:56,479
have a thousand questions in my head um

124
00:05:59,430 --> 00:05:58,160
but before before we do that maddie do

125
00:06:00,629 --> 00:05:59,440
we have any questions um from the

126
00:06:01,990 --> 00:06:00,639
audience yet i don't want to take all

127
00:06:04,390 --> 00:06:02,000
the time or anything like that

128
00:06:06,469 --> 00:06:04,400
yes we do so first question from social

129
00:06:08,469 --> 00:06:06,479
media is how does perseverance differ

130
00:06:09,510 --> 00:06:08,479
from curiosity and the types of science

131
00:06:12,469 --> 00:06:09,520
it will perform

132
00:06:14,070 --> 00:06:12,479
love that question so curiosity was

133
00:06:15,990 --> 00:06:14,080
really the mission

134
00:06:17,110 --> 00:06:16,000
the first mission after spared an

135
00:06:18,629 --> 00:06:17,120
opportunity remember experience

136
00:06:20,469 --> 00:06:18,639
opportunity i had one

137
00:06:22,550 --> 00:06:20,479
kind of objective which is to follow the

138
00:06:23,909 --> 00:06:22,560

water you look at mars you think hey

139
00:06:26,070 --> 00:06:23,919
some of these things look almost look

140
00:06:26,550 --> 00:06:26,080
like channels was there water well it's

141
00:06:28,309 --> 00:06:26,560
actually

142
00:06:30,070 --> 00:06:28,319
easy to ask that question really hard to

143
00:06:33,350 --> 00:06:30,080
prove that it was there you have to go

144
00:06:35,510 --> 00:06:33,360
land and look at it and what we found is

145
00:06:38,550 --> 00:06:35,520
not only was there water there it

146
00:06:40,870 --> 00:06:38,560
the signs of water were everywhere

147
00:06:42,710 --> 00:06:40,880
like river deltas you know kind of

148
00:06:44,790 --> 00:06:42,720
microscopic structures that look just

149
00:06:47,590 --> 00:06:44,800
like some of the things on earth

150
00:06:48,070 --> 00:06:47,600
and so what curiosity did it went there

151
00:06:52,790 --> 00:06:48,080
with

152
00:06:54,629 --> 00:06:52,800
still the best instruments that i have

153
00:06:57,510 --> 00:06:54,639
ever been on mars looking at that such

154
00:06:59,189 --> 00:06:57,520
as mass spectrometry looking at

155
00:07:01,189 --> 00:06:59,199
molecules that were there basically

156
00:07:02,710 --> 00:07:01,199
saying what do we have any of the

157
00:07:03,830 --> 00:07:02,720
organic so we have water which is a

158
00:07:05,990 --> 00:07:03,840
major ingredient

159
00:07:06,870 --> 00:07:06,000
do we have complex chemistry which is

160
00:07:09,110 --> 00:07:06,880
another one

161
00:07:11,110 --> 00:07:09,120
together with energy there's one of the

162
00:07:13,270 --> 00:07:11,120
key ingredients for life

163
00:07:14,629 --> 00:07:13,280

and the answer is yes with an

164
00:07:16,950 --> 00:07:14,639
exclamation mark just like

165
00:07:18,710 --> 00:07:16,960
water yes with an exclamation mark and

166
00:07:20,150 --> 00:07:18,720
now what we're now doing is basically

167
00:07:22,309 --> 00:07:20,160
saying okay

168
00:07:24,550 --> 00:07:22,319
so now we know that now it's we're ready

169
00:07:25,350 --> 00:07:24,560
to ask the direct question is there life

170
00:07:26,790 --> 00:07:25,360
there and

171
00:07:29,029 --> 00:07:26,800
the instruments that we have there

172
00:07:31,350 --> 00:07:29,039
frankly are there to equip

173
00:07:32,550 --> 00:07:31,360
us to get the right samples all the

174
00:07:34,710 --> 00:07:32,560
instruments whether it's

175
00:07:36,790 --> 00:07:34,720
the ground penetrating radar whether

176
00:07:37,909 --> 00:07:36,800
it's the cameras whether it's the

177
00:07:40,309 --> 00:07:37,919
spectrometers

178
00:07:41,430 --> 00:07:40,319
are are getting us ready to pick the

179
00:07:43,189 --> 00:07:41,440
right samples

180
00:07:45,749 --> 00:07:43,199
because what we believe that question

181
00:07:47,830 --> 00:07:45,759
about life needs to be answered with the

182
00:07:48,869 --> 00:07:47,840
best labs available to humanity not the

183
00:07:51,110 --> 00:07:48,879
best laps we can

184
00:07:52,469 --> 00:07:51,120
put on our rover the best laps available

185
00:07:54,150 --> 00:07:52,479
to humanity which are

186
00:07:56,950 --> 00:07:54,160
the labs right here so we're going to

187
00:08:00,390 --> 00:07:56,960
bring it back and in 26 we expect to

188
00:08:02,469 --> 00:08:00,400

launch a launch right from here i'm sure

189
00:08:03,909 --> 00:08:02,479
with a launch vehicle in it it's

190
00:08:07,029 --> 00:08:03,919
humanity's first

191
00:08:07,749 --> 00:08:07,039
another planet so we're going to land

192
00:08:10,790 --> 00:08:07,759
there

193
00:08:13,510 --> 00:08:10,800
in uh 27 or so and then

194
00:08:15,110 --> 00:08:13,520
in 29 or so we're going to take off off

195
00:08:17,510 --> 00:08:15,120
the surface of

196
00:08:18,629 --> 00:08:17,520
mars with that rocket and then bring

197
00:08:21,510 --> 00:08:18,639
those samples back

198
00:08:23,350 --> 00:08:21,520
and in early 31 we'll have them here and

199
00:08:25,350 --> 00:08:23,360
we're going to answer that question with

200
00:08:28,309 --> 00:08:25,360
the best lab so we're preparing

201
00:08:29,830 --> 00:08:28,319
for that 10 year long exploration and

202
00:08:33,190 --> 00:08:29,840
perseverance is really the

203
00:08:34,469 --> 00:08:33,200
start gate for that wow amazing so can

204
00:08:35,990 --> 00:08:34,479
can they talk to each other can

205
00:08:37,350 --> 00:08:36,000
curiosity and

206
00:08:39,190 --> 00:08:37,360
perseverance are they able to

207
00:08:41,909 --> 00:08:39,200
communicate with one another if they had

208
00:08:44,470 --> 00:08:41,919
a reason to say hi to each other

209
00:08:47,030 --> 00:08:44,480
the way they would do it is to go up

210
00:08:49,350 --> 00:08:47,040
into orbit uh with one of the spacecraft

211
00:08:51,110 --> 00:08:49,360
going over it and then down to them

212
00:08:52,710 --> 00:08:51,120
uh and to the other one they don't

213
00:08:53,030 --> 00:08:52,720

they're in very different regions you

214
00:08:55,269 --> 00:08:53,040
know

215
00:08:57,430 --> 00:08:55,279
if you look at that very often we forget

216
00:09:00,230 --> 00:08:57,440
how big mars really is so if you

217
00:09:01,990 --> 00:09:00,240
took all the ocean um away from the

218
00:09:03,670 --> 00:09:02,000
earth and just look at the land mass and

219
00:09:05,509 --> 00:09:03,680
you compare the land mass of earth with

220
00:09:06,949 --> 00:09:05,519
mars it's roughly the same

221
00:09:09,110 --> 00:09:06,959
so in other words you know one of them

222
00:09:11,190 --> 00:09:09,120
is if you want

223
00:09:13,430 --> 00:09:11,200
in asia and the other one is in north

224
00:09:15,190 --> 00:09:13,440
america right very far apart from each

225
00:09:15,990 --> 00:09:15,200
other right and so that's how you should

226
00:09:18,310 --> 00:09:16,000
think about

227
00:09:20,550 --> 00:09:18,320
curiosity and perseverance so they could

228
00:09:21,030 --> 00:09:20,560
if there was a good uh reason for it but

229
00:09:24,550 --> 00:09:21,040
uh

230
00:09:26,470 --> 00:09:24,560
missions exactly right and

231
00:09:27,990 --> 00:09:26,480
we're by the way curiosity we're still

232
00:09:29,910 --> 00:09:28,000
pushing the envelope at that you know

233
00:09:31,910 --> 00:09:29,920
make no mistake just like how we've

234
00:09:33,670 --> 00:09:31,920
kind of done uh spirit and opportunity

235
00:09:35,190 --> 00:09:33,680
to the best of our ability kind of

236
00:09:37,110 --> 00:09:35,200
squeeze all the signs out of

237
00:09:38,389 --> 00:09:37,120
it and there was a lot of signs there

238
00:09:39,829 --> 00:09:38,399

we're still doing the same with

239
00:09:42,550 --> 00:09:39,839
curiosity as well as some of the

240
00:09:44,550 --> 00:09:42,560
orbiting uh assets that we have also

241
00:09:46,470 --> 00:09:44,560
amazing amazing what else we have from

242
00:09:47,990 --> 00:09:46,480
the audience yeah so we'll do one more

243
00:09:49,910 --> 00:09:48,000
question from social

244
00:09:52,310 --> 00:09:49,920
how did you prepare the rover for the

245
00:09:54,389 --> 00:09:52,320
harsh conditions on mars

246
00:09:56,230 --> 00:09:54,399
yeah it's a really good question also

247
00:09:58,470 --> 00:09:56,240
and you know it's one of those things

248
00:10:00,230 --> 00:09:58,480
the way we prepare it is to run them

249
00:10:00,470 --> 00:10:00,240
through the ringer i mean we beat them

250
00:10:03,430 --> 00:10:00,480
up

251
00:10:03,990 --> 00:10:03,440
we shake them we heat and we cool and we

252
00:10:10,790 --> 00:10:04,000
we

253
00:10:12,150 --> 00:10:10,800
blast sound at it at a volume that's

254
00:10:14,550 --> 00:10:12,160
very very high so

255
00:10:15,590 --> 00:10:14,560
everything is ready to deposit best of

256
00:10:18,310 --> 00:10:15,600
our ability

257
00:10:19,430 --> 00:10:18,320
to go there even testing in the dirt

258
00:10:21,829 --> 00:10:19,440
right of

259
00:10:23,430 --> 00:10:21,839
kind of quasi vacuum just like mars and

260
00:10:24,310 --> 00:10:23,440
making sure that everything works

261
00:10:26,949 --> 00:10:24,320
exactly

262
00:10:28,310 --> 00:10:26,959
like it should so this rover sitting on

263
00:10:31,190 --> 00:10:28,320

top of this rocket has

264
00:10:32,310 --> 00:10:31,200
persevered you know it has persevered a

265
00:10:34,790 --> 00:10:32,320
lot of testing

266
00:10:35,990 --> 00:10:34,800
uh kind of to the extent that frankly

267
00:10:37,829 --> 00:10:36,000
pretty much no other

268
00:10:40,550 --> 00:10:37,839
spacecraft has because it has to survive

269
00:10:42,790 --> 00:10:40,560
launch the cruise in vacuum and then

270
00:10:44,150 --> 00:10:42,800
operation in uh in the martian

271
00:10:46,230 --> 00:10:44,160
atmosphere which are really three

272
00:10:48,150 --> 00:10:46,240
totally different environments wow

273
00:10:50,230 --> 00:10:48,160
amazing so i mean in just this little

274
00:10:50,870 --> 00:10:50,240
short bit i think i've learned so much

275
00:10:52,949 --> 00:10:50,880
about

276
00:10:54,630 --> 00:10:52,959
um the mission itself and the

277
00:10:56,870 --> 00:10:54,640
capabilities of this

278
00:10:58,310 --> 00:10:56,880
beautiful machine are there any final

279
00:11:00,389 --> 00:10:58,320
thoughts that you want to leave us with

280
00:11:01,750 --> 00:11:00,399
for today i really appreciate that so

281
00:11:04,470 --> 00:11:01,760
when i looked at this rocket

282
00:11:06,069 --> 00:11:04,480
and i saw it roll out yesterday i

283
00:11:06,550 --> 00:11:06,079
remember of course that the rover is

284
00:11:09,750 --> 00:11:06,560
called

285
00:11:13,030 --> 00:11:09,760
perseverance and the helicopter

286
00:11:14,870 --> 00:11:13,040
is called ingenuity but what i want to

287
00:11:16,470 --> 00:11:14,880
just tell everybody is that i also

288
00:11:18,389 --> 00:11:16,480

remember and i think we also remember

289
00:11:20,949 --> 00:11:18,399
that with

290
00:11:23,430 --> 00:11:20,959
these uh you know vehicles up there is

291
00:11:25,990 --> 00:11:23,440
the perseverance and the injuries of

292
00:11:26,949 --> 00:11:26,000
thousands of people individuals that

293
00:11:29,430 --> 00:11:26,959
gave their all

294
00:11:31,430 --> 00:11:29,440
their sweat their tears to make sure

295
00:11:34,069 --> 00:11:31,440
that we're ready for that and i think

296
00:11:35,750 --> 00:11:34,079
when we see that launch tomorrow we need

297
00:11:37,509 --> 00:11:35,760
to remember that it's for them

298
00:11:39,430 --> 00:11:37,519
for that for their sake that we're

299
00:11:41,509 --> 00:11:39,440
actually able to do this launch this

300
00:11:42,630 --> 00:11:41,519
was very hard to get ready especially in

301
00:11:43,829 --> 00:11:42,640
the time we're in

302
00:11:45,750 --> 00:11:43,839
but it's the perseverance and the

303
00:11:48,150 --> 00:11:45,760
ingenuity of each one of them

304
00:11:49,910 --> 00:11:48,160
that got us there so thanks for that dr

305
00:11:50,470 --> 00:11:49,920
z and that is such a beautiful message

306
00:11:52,310 --> 00:11:50,480
because

307
00:11:53,750 --> 00:11:52,320
to me what i'm getting from that is as a

308
00:11:56,389 --> 00:11:53,760
people we will

309
00:11:57,430 --> 00:11:56,399
we will persevere right we will explore

310
00:11:59,750 --> 00:11:57,440
this beautiful

311
00:12:00,870 --> 00:11:59,760
landscape called space and we'll find

312
00:12:02,870 --> 00:12:00,880
out exactly what

313
00:12:04,710 --> 00:12:02,880

what we have going on there and speaking

314
00:12:05,590 --> 00:12:04,720
of perseverance guys let's take a closer

315
00:12:08,870 --> 00:12:05,600
look into

316
00:12:12,910 --> 00:12:08,880
what this mission is all about we

317
00:12:16,080 --> 00:12:12,920
are a species of explorers

318
00:12:20,069 --> 00:12:17,590
[Music]

319
00:12:20,870 --> 00:12:20,079
not because they are easy but because

320
00:12:23,750 --> 00:12:20,880
they are hard

321
00:12:26,230 --> 00:12:23,760
we are willing to do the hard things to

322
00:12:29,170 --> 00:12:26,240
overcome the many challenges

323
00:12:30,790 --> 00:12:29,180
this is what brings out the best in us

324
00:12:33,910 --> 00:12:30,800
[Music]

325
00:12:34,710 --> 00:12:33,920
our path has led to success and to

326
00:12:36,949 --> 00:12:34,720
bitter losses

327
00:12:38,949 --> 00:12:36,959
we come together today to mourn the loss

328
00:12:43,110 --> 00:12:38,959
of seven brave americans

329
00:12:47,670 --> 00:12:43,120
yet even when faced with tragedy

330
00:12:51,110 --> 00:12:47,680
and setbacks we persevere

331
00:12:54,150 --> 00:12:51,120
we keep striving we

332
00:12:57,350 --> 00:12:54,160
keep believing from space

333
00:12:58,069 --> 00:12:57,360
we see our planet as a whole we see the

334
00:13:05,030 --> 00:12:58,079
challenges

335
00:13:08,629 --> 00:13:05,040
together we will not give

336
00:13:10,949 --> 00:13:08,639
up we challenge convention we refuse to

337
00:13:14,069 --> 00:13:10,959
accept the status quo

338
00:13:17,590 --> 00:13:14,079

the time at hand is hard but

339
00:13:18,470 --> 00:13:17,600
we will persevere we can still draw hope

340
00:13:22,150 --> 00:13:18,480
from the moon

341
00:13:25,829 --> 00:13:22,160
and the stars from space

342
00:13:29,190 --> 00:13:25,839
from exploration there is a new day

343
00:13:32,310 --> 00:13:29,200
beyond the challenges we face now

344
00:13:35,190 --> 00:13:32,320
curiosity spirit

345
00:13:37,269 --> 00:13:35,200
opportunity if you think about it all of

346
00:13:38,900 --> 00:13:37,279
these names of past mars rovers are

347
00:13:41,430 --> 00:13:38,910
qualities we possess as humans

348
00:13:43,670 --> 00:13:41,440
[Music]

349
00:13:45,509 --> 00:13:43,680
we have ignition sequence stars but if

350
00:13:56,320 --> 00:13:45,519
rovers are to be the qualities of us as

351
00:13:56,330 --> 00:13:59,829
[Music]

352
00:13:59,839 --> 00:14:04,949
of explorers

353
00:14:10,150 --> 00:14:07,990
we will meet many obstacles on our way

354
00:14:11,509 --> 00:14:10,160
to mars

355
00:14:14,870 --> 00:14:11,519
[Music]

356
00:14:18,949 --> 00:14:14,880
but as humans will

357
00:14:31,670 --> 00:14:30,150
we will always persevere

358
00:14:33,430 --> 00:14:31,680
welcome back folks we hope you enjoyed

359
00:14:35,110 --> 00:14:33,440
that little snippet into what's going on

360
00:14:37,110 --> 00:14:35,120
with the perseverance mission

361
00:14:38,870 --> 00:14:37,120
once again i am your host yves lamothe

362
00:14:39,910 --> 00:14:38,880
i'm with the exploration ground systems

363
00:14:42,069 --> 00:14:39,920

comp systems

364
00:14:44,790 --> 00:14:42,079
as the project manager and we're back

365
00:14:47,670 --> 00:14:44,800
here again and this time with us is dr

366
00:14:48,629 --> 00:14:47,680
laurie glaze lori how's it going today

367
00:14:51,189 --> 00:14:48,639
uh it's great

368
00:14:51,670 --> 00:14:51,199
uh excitement is growing it is great i

369
00:14:53,269 --> 00:14:51,680
mean

370
00:14:55,509 --> 00:14:53,279
we're already excited about everything

371
00:14:57,189 --> 00:14:55,519
that dr z had to say and i tell you i

372
00:14:58,710 --> 00:14:57,199
bet we can sit with you guys for an

373
00:15:00,150 --> 00:14:58,720
entire day and it wouldn't be enough

374
00:15:02,470 --> 00:15:00,160
just to get more insight

375
00:15:03,590 --> 00:15:02,480
into what actually went into making all

376
00:15:05,110 --> 00:15:03,600
of this happen so

377
00:15:07,509 --> 00:15:05,120
can you tell us a little bit about your

378
00:15:09,829 --> 00:15:07,519
role in the perseverance mission

379
00:15:11,350 --> 00:15:09,839
you bet so i'm the director for the

380
00:15:14,710 --> 00:15:11,360
planetary science division

381
00:15:15,750 --> 00:15:14,720
at nasa and what that means is i oversee

382
00:15:19,189 --> 00:15:15,760
a program

383
00:15:21,590 --> 00:15:19,199
that develops spacecraft but also funds

384
00:15:23,670 --> 00:15:21,600
and supports a lot of science research

385
00:15:25,430 --> 00:15:23,680
that's all focused on trying to answer

386
00:15:27,590 --> 00:15:25,440
really important questions about how the

387
00:15:29,910 --> 00:15:27,600
planets and how the solar system formed

388
00:15:31,670 --> 00:15:29,920

how it has evolved and trying to

389
00:15:33,509 --> 00:15:31,680
understand what types of environments

390
00:15:34,870 --> 00:15:33,519
where life might form which is the field

391
00:15:36,230 --> 00:15:34,880
of astrobiology

392
00:15:38,389 --> 00:15:36,240
understanding those environments

393
00:15:40,150 --> 00:15:38,399
understanding how life comes to be

394
00:15:41,829 --> 00:15:40,160
and whether or not it can be sustained

395
00:15:43,509 --> 00:15:41,839
in various places so are you saying

396
00:15:45,590 --> 00:15:43,519
we're going to we're going to be gods

397
00:15:46,870 --> 00:15:45,600
figure out how to create life i didn't

398
00:15:48,710 --> 00:15:46,880
say we were going to create it i said

399
00:15:50,310 --> 00:15:48,720
we're trying to understand

400
00:15:53,189 --> 00:15:50,320
the environments where it can form in

401
00:15:55,350 --> 00:15:53,199
the environments where it can

402
00:15:56,230 --> 00:15:55,360
truly be amazing feat i mean i bet it's

403
00:15:57,749 --> 00:15:56,240
exciting

404
00:15:59,110 --> 00:15:57,759
all the things we can learn so i want to

405
00:16:00,949 --> 00:15:59,120
get right into the questions because i

406
00:16:02,629 --> 00:16:00,959
know our time is limited and i know our

407
00:16:04,310 --> 00:16:02,639
guests are chomping at the bit to

408
00:16:05,670 --> 00:16:04,320
get their questions answered so maddie

409
00:16:07,990 --> 00:16:05,680
what do we have yeah so

410
00:16:10,150 --> 00:16:08,000
first question is how does the rover

411
00:16:13,590 --> 00:16:10,160
search for signs of past life

412
00:16:15,910 --> 00:16:13,600
that is an absolutely great question so

413
00:16:17,110 --> 00:16:15,920

one of the things that it does is it's

414
00:16:18,870 --> 00:16:17,120
carrying

415
00:16:20,470 --> 00:16:18,880
multiple instruments which i think dr z

416
00:16:22,629 --> 00:16:20,480
mentioned a few of them

417
00:16:24,550 --> 00:16:22,639
we're carrying an instrument called

418
00:16:26,470 --> 00:16:24,560
sherlock and an instrument called pixel

419
00:16:28,470 --> 00:16:26,480
and an instrument um called super cam

420
00:16:32,790 --> 00:16:28,480
and those three instruments together

421
00:16:35,030 --> 00:16:32,800
are a fantastic very sophisticated suite

422
00:16:37,590 --> 00:16:35,040
of spectrometers that can

423
00:16:38,470 --> 00:16:37,600
look at the chemical makeup at a

424
00:16:39,990 --> 00:16:38,480
microscopic

425
00:16:41,350 --> 00:16:40,000
scale on the surface and so they're

426
00:16:43,269 --> 00:16:41,360
going to look at the minerals that are

427
00:16:44,389 --> 00:16:43,279
present the rocks and the minerals

428
00:16:46,069 --> 00:16:44,399
and they're going to measure the

429
00:16:47,030 --> 00:16:46,079
chemistry they're going to understand or

430
00:16:49,350 --> 00:16:47,040
help us to understand

431
00:16:51,350 --> 00:16:49,360
what elements are are present there are

432
00:16:53,430 --> 00:16:51,360
the building blocks for life present the

433
00:16:56,069 --> 00:16:53,440
hydrogen the carbon the nitrogen

434
00:16:57,509 --> 00:16:56,079
the oxygen are those elements there

435
00:16:59,910 --> 00:16:57,519
they're going to look for

436
00:17:01,189 --> 00:16:59,920
other types of bio signatures looking

437
00:17:02,949 --> 00:17:01,199
again at that chemicals

438
00:17:04,470 --> 00:17:02,959

that are present in those rocks and they

439
00:17:05,350 --> 00:17:04,480
do it in different ways each of those

440
00:17:06,710 --> 00:17:05,360
instruments

441
00:17:08,789 --> 00:17:06,720
and that'll help us put together a

442
00:17:11,750 --> 00:17:08,799
picture a puzzle that says

443
00:17:13,510 --> 00:17:11,760
um you know are these the right pieces

444
00:17:14,150 --> 00:17:13,520
that you need those building blocks to

445
00:17:16,549 --> 00:17:14,160
actually

446
00:17:17,829 --> 00:17:16,559
uh put the things that form life the

447
00:17:20,150 --> 00:17:17,839
things that we've seen

448
00:17:21,029 --> 00:17:20,160
at least on earth that that that come

449
00:17:23,429 --> 00:17:21,039
together to

450
00:17:25,669 --> 00:17:23,439
to result in life so that's what we're

451
00:17:27,510 --> 00:17:25,679
going to be looking for and as dr z said

452
00:17:29,750 --> 00:17:27,520
we'll use that information as we find

453
00:17:32,710 --> 00:17:29,760
those places that have those signatures

454
00:17:33,990 --> 00:17:32,720
potential bio signatures to guide us

455
00:17:35,510 --> 00:17:34,000
into the places where we want to take

456
00:17:37,190 --> 00:17:35,520
those drill samples and actually get

457
00:17:39,430 --> 00:17:37,200
those precious samples back here

458
00:17:41,830 --> 00:17:39,440
to study okay so i want to ask a

459
00:17:44,150 --> 00:17:41,840
somewhat simple but complicated question

460
00:17:45,990 --> 00:17:44,160
and it is you know being that the

461
00:17:49,350 --> 00:17:46,000
there's atmospheric differences between

462
00:17:51,430 --> 00:17:49,360
earth and mars is there a concern as to

463
00:17:53,190 --> 00:17:51,440

how those samples you collect would

464
00:17:54,950 --> 00:17:53,200
behave on earth versus

465
00:17:56,870 --> 00:17:54,960
in their natural element which would be

466
00:17:58,710 --> 00:17:56,880
mars that's actually a really good

467
00:17:59,990 --> 00:17:58,720
question because you're absolutely right

468
00:18:02,150 --> 00:18:00,000
there they've existed

469
00:18:03,190 --> 00:18:02,160
here in a carbon dioxide atmosphere on

470
00:18:05,590 --> 00:18:03,200
mars

471
00:18:07,190 --> 00:18:05,600
for billions of years and certainly if

472
00:18:09,190 --> 00:18:07,200
we introduce them into our

473
00:18:10,470 --> 00:18:09,200
oxygen-rich atmosphere things are going

474
00:18:12,630 --> 00:18:10,480
to start to happen

475
00:18:14,230 --> 00:18:12,640
so we're going to be very very careful

476
00:18:15,909 --> 00:18:14,240
actually for many reasons we're going to

477
00:18:18,230 --> 00:18:15,919
be very careful but we'll have those

478
00:18:19,909 --> 00:18:18,240
sample tubes once we collect them

479
00:18:22,150 --> 00:18:19,919
contained in multiple layers of

480
00:18:23,669 --> 00:18:22,160
containment partly just to keep us safe

481
00:18:25,590 --> 00:18:23,679
in case there is something

482
00:18:27,669 --> 00:18:25,600
that might be in there that we don't

483
00:18:29,750 --> 00:18:27,679
want but we're going to keep it all very

484
00:18:31,110 --> 00:18:29,760
safe and contained and then once we get

485
00:18:34,150 --> 00:18:31,120
it here we'll keep it in

486
00:18:34,630 --> 00:18:34,160
a in an environment that's very similar

487
00:18:38,870 --> 00:18:34,640
to

488
00:18:40,070 --> 00:18:38,880

sample tubes they don't have any adverse

489
00:18:43,270 --> 00:18:40,080
reactions that we're

490
00:18:45,430 --> 00:18:43,280
we're going to make sure that we can

491
00:18:46,549 --> 00:18:45,440
uh extract the science that we want from

492
00:18:48,549 --> 00:18:46,559
those cells

493
00:18:50,470 --> 00:18:48,559
understand matty yeah we got another

494
00:18:52,310 --> 00:18:50,480
question from social media

495
00:18:54,830 --> 00:18:52,320
what is the type of samples that the

496
00:18:56,230 --> 00:18:54,840
rover is capable of analyzing and

497
00:18:59,669 --> 00:18:56,240
recognizing

498
00:19:02,150 --> 00:18:59,679
so the the the samples that the uh

499
00:19:03,430 --> 00:19:02,160
rover itself is going to analyze again

500
00:19:05,350 --> 00:19:03,440
it can look at

501
00:19:08,549 --> 00:19:05,360
the rocks in general using imaging it

502
00:19:09,510 --> 00:19:08,559
can use broad scale imaging microscopic

503
00:19:11,909 --> 00:19:09,520
imaging

504
00:19:13,750 --> 00:19:11,919
we're going to laze some of them with

505
00:19:14,870 --> 00:19:13,760
lasers and make little plasmas that we

506
00:19:16,710 --> 00:19:14,880
can observe

507
00:19:18,390 --> 00:19:16,720
we've also got x-ray imagers that can

508
00:19:19,669 --> 00:19:18,400
look at the rocks and get us the

509
00:19:22,390 --> 00:19:19,679
information

510
00:19:23,830 --> 00:19:22,400
and again we'll we'll use all of that to

511
00:19:25,990 --> 00:19:23,840
help us pick where we want to take the

512
00:19:27,990 --> 00:19:26,000
samples and then as dr z says we've got

513
00:19:29,110 --> 00:19:28,000

really sophisticated equipment here on

514
00:19:30,390 --> 00:19:29,120
earth we want to get them back here

515
00:19:31,590 --> 00:19:30,400
where we can do the the final

516
00:19:33,430 --> 00:19:31,600
announcements the water

517
00:19:35,430 --> 00:19:33,440
included in that as well so anywhere

518
00:19:37,270 --> 00:19:35,440
like those channels exist as dr z

519
00:19:37,990 --> 00:19:37,280
mentioned are is going to evaluate those

520
00:19:41,270 --> 00:19:38,000
channels as well

521
00:19:43,110 --> 00:19:41,280
and look for signs of it will yes and in

522
00:19:44,070 --> 00:19:43,120
fact we're going to a really special

523
00:19:46,230 --> 00:19:44,080
place on mars

524
00:19:48,310 --> 00:19:46,240
because we know that in the past mars

525
00:19:49,990 --> 00:19:48,320
was warmer and wetter and had a

526
00:19:51,750 --> 00:19:50,000
higher density atmosphere we know the

527
00:19:53,430 --> 00:19:51,760
climate changed over time but

528
00:19:55,669 --> 00:19:53,440
in the past three and a half billion

529
00:19:57,669 --> 00:19:55,679
years ago it was warm and wet and there

530
00:19:59,510 --> 00:19:57,679
was a standing lake standing body of

531
00:20:00,150 --> 00:19:59,520
water in jezreel crater where we're

532
00:20:02,950 --> 00:20:00,160
going

533
00:20:03,830 --> 00:20:02,960
and a river flowed into that lake and

534
00:20:06,630 --> 00:20:03,840
when it flowed in

535
00:20:07,590 --> 00:20:06,640
it dropped its sediment onto that floor

536
00:20:09,350 --> 00:20:07,600
of the crater

537
00:20:10,710 --> 00:20:09,360
leaving a delta just like we see here

538
00:20:13,909 --> 00:20:10,720

where rivers run into

539
00:20:15,590 --> 00:20:13,919
oceans and lakes and so those will be

540
00:20:17,750 --> 00:20:15,600
very very important that particular

541
00:20:19,590 --> 00:20:17,760
geologic feature is very important

542
00:20:20,390 --> 00:20:19,600
because that is exactly the kind of

543
00:20:22,710 --> 00:20:20,400
place

544
00:20:23,750 --> 00:20:22,720
you could preserve those early micro

545
00:20:25,430 --> 00:20:23,760
fossils of

546
00:20:27,510 --> 00:20:25,440
potential life that if it were there

547
00:20:30,149 --> 00:20:27,520
this is exactly where you would find it

548
00:20:31,590 --> 00:20:30,159
i understand yeah so we'll do a one more

549
00:20:33,990 --> 00:20:31,600
question from social

550
00:20:35,430 --> 00:20:34,000
why was the crater chosen as the landing

551
00:20:36,950 --> 00:20:35,440
site for the rover

552
00:20:38,070 --> 00:20:36,960
so i think that's a great follow-on

553
00:20:39,110 --> 00:20:38,080
because that's kind of what i was just

554
00:20:42,070 --> 00:20:39,120
talking about we

555
00:20:42,710 --> 00:20:42,080
chose it specifically because we

556
00:20:44,549 --> 00:20:42,720
believed

557
00:20:46,070 --> 00:20:44,559
that the conditions about three and a

558
00:20:47,990 --> 00:20:46,080
half billion years ago

559
00:20:49,750 --> 00:20:48,000
had all the pieces that you need for

560
00:20:51,990 --> 00:20:49,760
life to form we had

561
00:20:53,590 --> 00:20:52,000
water we had thermal energy because it

562
00:20:56,230 --> 00:20:53,600
was warmer

563
00:20:57,510 --> 00:20:56,240

and we had the nutrients there from the

564
00:20:59,590 --> 00:20:57,520
from the soils and

565
00:21:01,510 --> 00:20:59,600
from the from the environment and those

566
00:21:03,430 --> 00:21:01,520
are the key pieces that we need for for

567
00:21:05,430 --> 00:21:03,440
life to take form it's also about the

568
00:21:07,909 --> 00:21:05,440
same time that life started to form

569
00:21:09,510 --> 00:21:07,919
on earth and so we think at that time

570
00:21:10,310 --> 00:21:09,520
it's possible if the conditions were

571
00:21:12,950 --> 00:21:10,320
right

572
00:21:14,789 --> 00:21:12,960
uh that life would have taken hold on

573
00:21:18,070 --> 00:21:14,799
mars in that area

574
00:21:19,909 --> 00:21:18,080
and that river delta is actually feeding

575
00:21:21,990 --> 00:21:19,919
a large catchment area much

576
00:21:23,909 --> 00:21:22,000
broader than that crater itself so it's

577
00:21:24,950 --> 00:21:23,919
bringing in all of those materials and

578
00:21:27,750 --> 00:21:24,960
depositing them

579
00:21:29,990 --> 00:21:27,760
right there in that delta and so if life

580
00:21:31,909 --> 00:21:30,000
were present it should be preserved in

581
00:21:33,909 --> 00:21:31,919
that in that environment and in that

582
00:21:35,430 --> 00:21:33,919
geologic feature so that's why we chose

583
00:21:36,789 --> 00:21:35,440
it specifically

584
00:21:38,950 --> 00:21:36,799
because if we're going to look for

585
00:21:40,070 --> 00:21:38,960
evidence of past life this is the kind

586
00:21:42,789 --> 00:21:40,080
of place you would want to go

587
00:21:44,149 --> 00:21:42,799
quick follow on and is do we have an

588
00:21:46,149 --> 00:21:44,159

indication as to why

589
00:21:47,830 --> 00:21:46,159
it used to be warmer in wetter and it's

590
00:21:49,510 --> 00:21:47,840
not now oh

591
00:21:51,029 --> 00:21:49,520
that's the million dollar question right

592
00:21:53,350 --> 00:21:51,039
there

593
00:21:54,390 --> 00:21:53,360
it's really a fascinating question why

594
00:21:57,590 --> 00:21:54,400
the climates change

595
00:21:59,350 --> 00:21:57,600
on the various planets we see it on mars

596
00:22:00,870 --> 00:21:59,360
we've also seen it on venus another

597
00:22:02,390 --> 00:22:00,880
planet nearby and on earth we're

598
00:22:04,310 --> 00:22:02,400
starting we've seen evidence of

599
00:22:06,710 --> 00:22:04,320
past climate changes and of course we're

600
00:22:09,350 --> 00:22:06,720
we're living in a time now where we're

601
00:22:11,190 --> 00:22:09,360
witnessing some changes so understanding

602
00:22:13,990 --> 00:22:11,200
exactly what drives those climate

603
00:22:15,430 --> 00:22:14,000
changes is a really important question

604
00:22:17,110 --> 00:22:15,440
it's not necessarily the focus of the

605
00:22:18,950 --> 00:22:17,120
perseverance mission but it's something

606
00:22:20,630 --> 00:22:18,960
that many of our other missions to mars

607
00:22:21,669 --> 00:22:20,640
are focused on and trying to understand

608
00:22:23,350 --> 00:22:21,679
the answers

609
00:22:25,270 --> 00:22:23,360
what is it that actually drives those

610
00:22:26,470 --> 00:22:25,280
changes completely understand i am going

611
00:22:27,830 --> 00:22:26,480
to tell you that that's more like a 10

612
00:22:29,190 --> 00:22:27,840
million dollar question not a one

613
00:22:30,630 --> 00:22:29,200

million dollar question

614
00:22:32,710 --> 00:22:30,640
it's probably a billion dollar question

615
00:22:33,830 --> 00:22:32,720
yeah yeah that that's actually more like

616
00:22:38,310 --> 00:22:33,840
it more like it

617
00:22:40,230 --> 00:22:38,320
well lori wow i i think that um

618
00:22:41,750 --> 00:22:40,240
it would be such a journey just to step

619
00:22:43,350 --> 00:22:41,760
inside your head for a second and

620
00:22:44,630 --> 00:22:43,360
explore the things that you know

621
00:22:46,390 --> 00:22:44,640
or the things that you've seen and

622
00:22:49,110 --> 00:22:46,400
studied um over your time

623
00:22:50,630 --> 00:22:49,120
and it is just fascinating just to learn

624
00:22:53,270 --> 00:22:50,640
and understand like how

625
00:22:55,270 --> 00:22:53,280
life actually um began like i mean it's

626
00:22:57,669 --> 00:22:55,280
like we're going back in time

627
00:22:59,510 --> 00:22:57,679
and and how amazing is that and so you

628
00:23:00,149 --> 00:22:59,520
know we definitely want to thank you so

629
00:23:02,310 --> 00:23:00,159
much for

630
00:23:03,430 --> 00:23:02,320
for coming out here and sharing that

631
00:23:05,190 --> 00:23:03,440
with us this

632
00:23:07,190 --> 00:23:05,200
this all it does is it makes this

633
00:23:08,950 --> 00:23:07,200
mission even more more exciting

634
00:23:10,230 --> 00:23:08,960
and we can't wait to see you know in

635
00:23:13,110 --> 00:23:10,240
2031

636
00:23:15,029 --> 00:23:13,120
um god willing what we're gonna find out

637
00:23:16,390 --> 00:23:15,039
about what's going on in mars so thank

638
00:23:19,029 --> 00:23:16,400

you again for coming over here

639
00:23:21,350 --> 00:23:19,039
and sharing and sharing that with us um

640
00:23:23,029 --> 00:23:21,360
so in in closing folks um please keep

641
00:23:25,029 --> 00:23:23,039
your you can definitely keep your

642
00:23:26,310 --> 00:23:25,039
your questions coming and you know we'll

643
00:23:27,990 --> 00:23:26,320
do our best to uh

644
00:23:29,669 --> 00:23:28,000
you know to get you some answers on all

645
00:23:32,390 --> 00:23:29,679
of that we want to thank dr z

646
00:23:32,789 --> 00:23:32,400
and dr and lori for coming out here and

647
00:23:34,710 --> 00:23:32,799
sharing

648
00:23:36,310 --> 00:23:34,720
all all of this with us please stay

649
00:23:37,590 --> 00:23:36,320
tuned we have the 12 o'clock briefing

650
00:23:39,510 --> 00:23:37,600
coming for the mission

651
00:23:40,630 --> 00:23:39,520
um so tune into that and if you have an

652
00:23:43,669 --> 00:23:40,640
opportunity

653
00:23:45,029 --> 00:23:43,679
and uh countdown to mars it's an

654
00:23:47,590 --> 00:23:45,039
exciting thing

655
00:23:48,390 --> 00:23:47,600
it's coming and we hope that you can be

656
00:23:50,149 --> 00:23:48,400
part of it

657
00:23:52,230 --> 00:23:50,159
all right so thank you again for joining

658
00:23:53,269 --> 00:23:52,240
us today um we hope you guys have a good

659
00:23:54,710 --> 00:23:53,279
one um

660
00:23:56,310 --> 00:23:54,720
you'll see our schedule for the rest of

661
00:23:58,070 --> 00:23:56,320
the day in just a moment here

662
00:23:59,430 --> 00:23:58,080
please tune in for our other shows um

663
00:24:02,390 --> 00:23:59,440

that we have coming up on our