
MARS
PERSEVERANCE

1
00:03:25,110 --> 00:03:23,190
as the countdown to mars continues

2
00:03:27,190 --> 00:03:25,120
the perseverance of humanity launching

3
00:03:32,200 --> 00:03:27,200
the next generation of robotic explorers

4
00:03:39,700 --> 00:03:32,210
to the red planet

5
00:03:39,710 --> 00:04:07,750
[Music]

6
00:04:12,309 --> 00:04:10,309
nasa's mars perseverance rover left

7
00:04:14,470 --> 00:04:12,319
earth six months ago

8
00:04:16,550 --> 00:04:14,480
now we are gearing up for touchdown on

9
00:04:18,229 --> 00:04:16,560
the red planet this week

10
00:04:20,229 --> 00:04:18,239
the rover will attempt to land in

11
00:04:22,390 --> 00:04:20,239
jezreel crater this thursday

12
00:04:24,150 --> 00:04:22,400
it's the most difficult landing site on

13
00:04:26,629 --> 00:04:24,160

mars ever attempted

14
00:04:29,030 --> 00:04:26,639
but the perseverance rover and the team

15
00:04:30,710 --> 00:04:29,040
are ready welcome to nasa's jet

16
00:04:31,670 --> 00:04:30,720
propulsion laboratory in southern

17
00:04:34,390 --> 00:04:31,680
california

18
00:04:35,749 --> 00:04:34,400
i'm marina jurica your host today as we

19
00:04:38,390 --> 00:04:35,759
bring you a closer look

20
00:04:38,950 --> 00:04:38,400
into perseverance's mission and science

21
00:04:40,950 --> 00:04:38,960
goals

22
00:04:42,469 --> 00:04:40,960
we will discuss the new advanced

23
00:04:45,030 --> 00:04:42,479
instruments on board

24
00:04:47,350 --> 00:04:45,040
why this landing site was chosen and how

25
00:04:47,990 --> 00:04:47,360
perseverance fits into nasa's future

26
00:04:51,110 --> 00:04:48,000
plans

27
00:04:52,950 --> 00:04:51,120
for mars sample return as we are social

28
00:04:55,030 --> 00:04:52,960
distancing i will introduce you to some

29
00:04:57,670 --> 00:04:55,040
of the key scientists on the mission

30
00:04:58,550 --> 00:04:57,680
here and joining us virtually on our

31
00:05:01,270 --> 00:04:58,560
panel today

32
00:05:01,990 --> 00:05:01,280
are nasa planetary science division

33
00:05:05,749 --> 00:05:02,000
director

34
00:05:09,430 --> 00:05:05,759
lori glaze perseverance deputy project

35
00:05:11,590 --> 00:05:09,440
scientist ken williford

36
00:05:14,390 --> 00:05:11,600
principal investigator for the sherlock

37
00:05:16,710 --> 00:05:14,400
instrument luther beagle

38
00:05:17,830 --> 00:05:16,720

principal investigator for the mass cam

39
00:05:21,830 --> 00:05:17,840
z instrument

40
00:05:22,550 --> 00:05:21,840
jim bell principal investigator for the

41
00:05:24,629 --> 00:05:22,560
super cam

42
00:05:27,110 --> 00:05:24,639
instrument from the institute the

43
00:05:28,629 --> 00:05:27,120
research on astrophysique a planetology

44
00:05:31,670 --> 00:05:28,639
known as irap

45
00:05:33,430 --> 00:05:31,680
in france sylvester maurice

46
00:05:34,710 --> 00:05:33,440
for anyone watching who would like to

47
00:05:36,790 --> 00:05:34,720
submit a question

48
00:05:38,230 --> 00:05:36,800
you can do so by using the countdown to

49
00:05:40,070 --> 00:05:38,240
mars hashtag

50
00:05:42,550 --> 00:05:40,080
our phone lines are now open to the

51
00:05:45,029 --> 00:05:42,560
media you can ask a question by pressing

52
00:05:48,310 --> 00:05:45,039
star one and enter the queue

53
00:05:50,629 --> 00:05:48,320
to start i'd like to welcome lori glaze

54
00:05:52,230 --> 00:05:50,639
good afternoon lori good afternoon nice

55
00:05:54,950 --> 00:05:52,240
to see you marina

56
00:05:56,150 --> 00:05:54,960
so nasa has been exploring mars for more

57
00:05:58,230 --> 00:05:56,160
than 50 years

58
00:06:00,309 --> 00:05:58,240
and we are just getting so excited as we

59
00:06:03,350 --> 00:06:00,319
prepare for thursday

60
00:06:06,870 --> 00:06:03,360
and although we now know that mars

61
00:06:08,870 --> 00:06:06,880
now today is cold and dry

62
00:06:10,870 --> 00:06:08,880
and a place that's bombarded by cosmic

63
00:06:12,230 --> 00:06:10,880

rays really a place that's inhospitable

64
00:06:14,629 --> 00:06:12,240
to hosting life

65
00:06:15,670 --> 00:06:14,639
today what we've learned over the last

66
00:06:18,070 --> 00:06:15,680
couple of decades

67
00:06:19,029 --> 00:06:18,080
in our exploration of mars is that mars

68
00:06:21,590 --> 00:06:19,039
was much

69
00:06:22,230 --> 00:06:21,600
warmer and wetter a few billion years

70
00:06:24,469 --> 00:06:22,240
ago

71
00:06:25,590 --> 00:06:24,479
and that some of the environments on

72
00:06:27,909 --> 00:06:25,600
mars

73
00:06:29,029 --> 00:06:27,919
actually could have had all of the right

74
00:06:31,670 --> 00:06:29,039
ingredients

75
00:06:33,430 --> 00:06:31,680
to support microbial life at about the

76
00:06:35,430 --> 00:06:33,440
same time that life emerged

77
00:06:36,790 --> 00:06:35,440
on earth if i could have the first

78
00:06:39,670 --> 00:06:36,800
graphic there it is

79
00:06:42,870 --> 00:06:39,680
you can see on the far left we began our

80
00:06:45,029 --> 00:06:42,880
rover program in 1997 with sojourner and

81
00:06:47,350 --> 00:06:45,039
all of these rovers have helped pave the

82
00:06:47,990 --> 00:06:47,360
way for our understanding of the mars

83
00:06:49,749 --> 00:06:48,000
environment

84
00:06:51,350 --> 00:06:49,759
and what mars is like and how it has

85
00:06:53,670 --> 00:06:51,360
evolved over time and

86
00:06:56,070 --> 00:06:53,680
led us to the perseverance mission that

87
00:06:58,070 --> 00:06:56,080
we're waiting to land on thursday

88
00:07:00,950 --> 00:06:58,080

so the sojourner rover kicked it off in

89
00:07:03,350 --> 00:07:00,960
97 followed by spirit and opportunity

90
00:07:04,629 --> 00:07:03,360
shown there towards the left spirit and

91
00:07:07,350 --> 00:07:04,639
opportunity were really

92
00:07:08,150 --> 00:07:07,360
following the water on mars trying to

93
00:07:09,990 --> 00:07:08,160
identify

94
00:07:11,909 --> 00:07:10,000
was liquid water ever present in

95
00:07:14,309 --> 00:07:11,919
substantial quantities over a

96
00:07:16,309 --> 00:07:14,319
extended period of time on mars and they

97
00:07:17,990 --> 00:07:16,319
found rocks that really did require

98
00:07:20,469 --> 00:07:18,000
water to be present in order for them to

99
00:07:21,990 --> 00:07:20,479
be formed the next step of course was

100
00:07:24,550 --> 00:07:22,000
the curiosity rover

101
00:07:25,670 --> 00:07:24,560
and curiosity went to gale crater

102
00:07:27,990 --> 00:07:25,680
looking to

103
00:07:30,070 --> 00:07:28,000
identify searching for habitable

104
00:07:30,790 --> 00:07:30,080
environments exploring habitability on

105
00:07:33,670 --> 00:07:30,800
mars

106
00:07:33,990 --> 00:07:33,680
and in gale crater was able to confirm

107
00:07:36,790 --> 00:07:34,000
that

108
00:07:38,629 --> 00:07:36,800
yes liquid water was present on mars for

109
00:07:40,790 --> 00:07:38,639
an extended period of time

110
00:07:42,469 --> 00:07:40,800
long enough to deposit sediments on the

111
00:07:45,029 --> 00:07:42,479
on the floor of gale crater

112
00:07:46,070 --> 00:07:45,039
to generate and create clays that are

113
00:07:47,430 --> 00:07:46,080

are found

114
00:07:49,430 --> 00:07:47,440
in some of the units there at gale

115
00:07:51,749 --> 00:07:49,440
crater and also we found

116
00:07:52,550 --> 00:07:51,759
complex organic molecules so with the

117
00:07:54,550 --> 00:07:52,560
water

118
00:07:56,710 --> 00:07:54,560
and the complex organic molecules two of

119
00:07:57,430 --> 00:07:56,720
the real key ingredients to life were

120
00:07:59,350 --> 00:07:57,440
present

121
00:08:01,589 --> 00:07:59,360
and in a habitable environment there

122
00:08:04,629 --> 00:08:01,599
that they life could have possibly

123
00:08:07,589 --> 00:08:04,639
started to take form and all of that

124
00:08:09,270 --> 00:08:07,599
led the way and prepared us to design

125
00:08:11,270 --> 00:08:09,280
the perseverance rover

126
00:08:13,990 --> 00:08:11,280
which is really now our first mission

127
00:08:16,629 --> 00:08:14,000
our first mobile astrobiologist

128
00:08:17,670 --> 00:08:16,639
that's out really seeking the signs of

129
00:08:20,469 --> 00:08:17,680
life

130
00:08:21,589 --> 00:08:20,479
perseverance is our next step in

131
00:08:22,869 --> 00:08:21,599
exploration

132
00:08:24,629 --> 00:08:22,879
and we've learned from everything that

133
00:08:25,350 --> 00:08:24,639
we've learned we've been able to better

134
00:08:27,270 --> 00:08:25,360
identify

135
00:08:29,670 --> 00:08:27,280
exactly what kind of site we wanted to

136
00:08:32,630 --> 00:08:29,680
visit that had the highest probability

137
00:08:34,070 --> 00:08:32,640
of having preserved ancient microbial

138
00:08:35,350 --> 00:08:34,080

life and ken williford is going to speak

139
00:08:36,230 --> 00:08:35,360
a little bit more to that in a few

140
00:08:39,029 --> 00:08:36,240
minutes

141
00:08:39,750 --> 00:08:39,039
we also are now better prepared to

142
00:08:41,350 --> 00:08:39,760
design the

143
00:08:43,029 --> 00:08:41,360
instruments and the experiments that we

144
00:08:44,630 --> 00:08:43,039
want to conduct on the surface of mars

145
00:08:47,430 --> 00:08:44,640
specifically designed

146
00:08:49,430 --> 00:08:47,440
to look for those markers those uh

147
00:08:50,230 --> 00:08:49,440
biologic markers that can give us a hint

148
00:08:52,630 --> 00:08:50,240
that perhaps

149
00:08:54,070 --> 00:08:52,640
there was life early in mars's history

150
00:08:56,070 --> 00:08:54,080
and that it might be preserved in those

151
00:08:58,630 --> 00:08:56,080
rocks at jezreel crater

152
00:09:00,230 --> 00:08:58,640
and then of course the next step beyond

153
00:09:02,870 --> 00:09:00,240
perseverance will be

154
00:09:04,389 --> 00:09:02,880
the uh the ability to bring samples back

155
00:09:06,070 --> 00:09:04,399
so perseverance is going to

156
00:09:08,630 --> 00:09:06,080
identify rocks that we'd like to bring

157
00:09:10,230 --> 00:09:08,640
back to earth drill the rocks and soil

158
00:09:12,070 --> 00:09:10,240
save them on the surface for that next

159
00:09:13,750 --> 00:09:12,080
mission that you see which is mars

160
00:09:14,710 --> 00:09:13,760
sample return which will launch those

161
00:09:16,790 --> 00:09:14,720
samples

162
00:09:18,470 --> 00:09:16,800
back to earth back into orbit and then

163
00:09:19,269 --> 00:09:18,480

captured and returned back to earth

164
00:09:21,430 --> 00:09:19,279
eventually

165
00:09:22,389 --> 00:09:21,440
and then preparing the way for human

166
00:09:23,829 --> 00:09:22,399
exploration

167
00:09:26,550 --> 00:09:23,839
at some time in the not too distant

168
00:09:28,230 --> 00:09:26,560
future the mars sample return project of

169
00:09:29,990 --> 00:09:28,240
course is probably the most

170
00:09:32,230 --> 00:09:30,000
challenging thing we've ever attempted

171
00:09:33,670 --> 00:09:32,240
within nasa and we don't do any of these

172
00:09:35,910 --> 00:09:33,680
things alone

173
00:09:37,269 --> 00:09:35,920
between our partnerships on perseverance

174
00:09:39,030 --> 00:09:37,279
and partnerships for

175
00:09:41,350 --> 00:09:39,040
our sample return we have almost a dozen

176
00:09:44,790 --> 00:09:41,360
international partners that we work with

177
00:09:47,190 --> 00:09:44,800
and together we are hoping to learn

178
00:09:48,150 --> 00:09:47,200
if life ever existed in the ancient past

179
00:09:49,509 --> 00:09:48,160
on mars

180
00:09:51,110 --> 00:09:49,519
and so with that i'd like to hand it

181
00:09:52,790 --> 00:09:51,120
over to ken um who's going to talk a

182
00:09:56,550 --> 00:09:52,800
little bit about what we might find in

183
00:09:59,910 --> 00:09:58,630
well thanks laurie uh for that great

184
00:10:02,389 --> 00:09:59,920
introduction

185
00:10:04,069 --> 00:10:02,399
and uh i want to start out by just

186
00:10:07,509 --> 00:10:04,079
sharing with you all how

187
00:10:10,550 --> 00:10:07,519
fortunate i feel how excited i am to be

188
00:10:12,710 --> 00:10:10,560

uh you know just days away from a

189
00:10:14,949 --> 00:10:12,720
really a momentous occasion uh

190
00:10:17,430 --> 00:10:14,959
technically with all the work it's taken

191
00:10:18,150 --> 00:10:17,440
to to get our spacecraft to where it is

192
00:10:21,590 --> 00:10:18,160
now and

193
00:10:23,910 --> 00:10:21,600
also scientifically

194
00:10:25,110 --> 00:10:23,920
just for me personally the opportunity

195
00:10:27,670 --> 00:10:25,120
to um

196
00:10:28,630 --> 00:10:27,680
be a part of this mission which is

197
00:10:30,710 --> 00:10:28,640
directly

198
00:10:33,509 --> 00:10:30,720
looking for life on other planets it's

199
00:10:37,030 --> 00:10:33,519
really a scientific dream come true

200
00:10:40,310 --> 00:10:37,040
it's not an exaggeration uh so

201
00:10:44,389 --> 00:10:40,320
so it's going to be a big week for us um

202
00:10:45,750 --> 00:10:44,399
and pulling back a bit um

203
00:10:47,910 --> 00:10:45,760
if you take a minute to think about it

204
00:10:48,870 --> 00:10:47,920
the implications of the science of this

205
00:10:52,150 --> 00:10:48,880
mission

206
00:10:53,190 --> 00:10:52,160
are really enormous i mean where mars

207
00:10:55,750 --> 00:10:53,200
2020 and

208
00:10:57,030 --> 00:10:55,760
mars sample return as laurie described

209
00:10:59,590 --> 00:10:57,040
are about

210
00:11:00,790 --> 00:10:59,600
really an age-old question you know are

211
00:11:04,150 --> 00:11:00,800
we alone

212
00:11:06,069 --> 00:11:04,160
in the universe we say that a lot but um

213
00:11:07,269 --> 00:11:06,079

you know about these astrobiology

214
00:11:10,310 --> 00:11:07,279
missions but

215
00:11:11,350 --> 00:11:10,320
um it's a big a big question if you stop

216
00:11:14,470 --> 00:11:11,360
to think about it

217
00:11:16,710 --> 00:11:14,480
is you know our we know that that life

218
00:11:18,790 --> 00:11:16,720
exists on earth we know earth is a very

219
00:11:20,230 --> 00:11:18,800
hospitable planet and has been for

220
00:11:23,670 --> 00:11:20,240
billions of years

221
00:11:26,230 --> 00:11:23,680
uh life obviously thrives here today um

222
00:11:27,990 --> 00:11:26,240
but are we are we alone in in a sort of

223
00:11:30,069 --> 00:11:28,000
vast cosmic desert

224
00:11:31,750 --> 00:11:30,079
you know just flying through space or is

225
00:11:33,990 --> 00:11:31,760
life much more common

226
00:11:35,910 --> 00:11:34,000
uh does it just emerge whenever and

227
00:11:38,230 --> 00:11:35,920
wherever the conditions are right

228
00:11:39,750 --> 00:11:38,240
big basic questions and we don't know

229
00:11:42,310 --> 00:11:39,760
the answers yet so we're

230
00:11:42,949 --> 00:11:42,320
we're really uh on the verge of being

231
00:11:45,030 --> 00:11:42,959
able to

232
00:11:46,630 --> 00:11:45,040
to potentially answer these these

233
00:11:49,190 --> 00:11:46,640
enormous questions

234
00:11:50,870 --> 00:11:49,200
um to start to get a feeling for the

235
00:11:54,150 --> 00:11:50,880
kinds of things we might

236
00:11:55,910 --> 00:11:54,160
uh hope to find at our landing site in

237
00:11:58,550 --> 00:11:55,920
jezreel crater

238
00:12:00,550 --> 00:11:58,560

a group of us from nasa some nasa

239
00:12:03,829 --> 00:12:00,560
scientists and some esa scientists

240
00:12:05,590 --> 00:12:03,839
european space agency scientists went to

241
00:12:06,710 --> 00:12:05,600
australia to a place called the pilbara

242
00:12:10,069 --> 00:12:06,720
so if we could just get the

243
00:12:13,910 --> 00:12:10,079
the video and this place in

244
00:12:15,030 --> 00:12:13,920
western australia um holds what is what

245
00:12:18,069 --> 00:12:15,040
is really the best

246
00:12:19,030 --> 00:12:18,079
early evidence for life on earth so this

247
00:12:20,790 --> 00:12:19,040
is where this is

248
00:12:22,629 --> 00:12:20,800
uh the rocks that were deposited about

249
00:12:25,269 --> 00:12:22,639
three and a half billion years ago

250
00:12:26,949 --> 00:12:25,279
here on earth where you know pretty much

251
00:12:27,670 --> 00:12:26,959
any scientist who works in this field

252
00:12:29,670 --> 00:12:27,680
can agree

253
00:12:30,790 --> 00:12:29,680
we have very good evidence for life

254
00:12:33,110 --> 00:12:30,800
there um

255
00:12:34,870 --> 00:12:33,120
and what does that look like and so here

256
00:12:37,910 --> 00:12:34,880
you see us actually exploring

257
00:12:39,829 --> 00:12:37,920
um you know the shores actually not none

258
00:12:40,629 --> 00:12:39,839
in this specific spot but but we did on

259
00:12:42,230 --> 00:12:40,639
that trip

260
00:12:43,990 --> 00:12:42,240
explore the shores of an ancient lake

261
00:12:45,190 --> 00:12:44,000
and i'll just hold up this rock sample

262
00:12:46,870 --> 00:12:45,200
that i brought back

263
00:12:48,550 --> 00:12:46,880

hopefully you get a good focused image

264
00:12:49,670 --> 00:12:48,560
of that you can see it on your screen as

265
00:12:51,670 --> 00:12:49,680
well in a picture

266
00:12:53,030 --> 00:12:51,680
but this is a stromatolite sample that i

267
00:12:56,389 --> 00:12:53,040
brought back

268
00:12:57,509 --> 00:12:56,399
from a 2.7 billion year old lake deposit

269
00:12:59,590 --> 00:12:57,519
so it originally would have been

270
00:13:02,790 --> 00:12:59,600
oriented like this with a dome

271
00:13:04,710 --> 00:13:02,800
of microbial mats and so

272
00:13:06,389 --> 00:13:04,720
these are structures that form when

273
00:13:08,389 --> 00:13:06,399
little microscopic single-celled

274
00:13:11,110 --> 00:13:08,399
organisms like bacteria

275
00:13:11,509 --> 00:13:11,120
join together in in communities and

276
00:13:13,910 --> 00:13:11,519
layer

277
00:13:16,629 --> 00:13:13,920
one on top of the other and sometimes

278
00:13:19,110 --> 00:13:16,639
exude these sticky substances

279
00:13:20,230 --> 00:13:19,120
that can trap and bind sediment

280
00:13:22,069 --> 00:13:20,240
particles there

281
00:13:24,949 --> 00:13:22,079
the organisms themselves can also

282
00:13:26,949 --> 00:13:24,959
stimulate the precipitation of minerals

283
00:13:29,350 --> 00:13:26,959
thereby entombing themselves sort of

284
00:13:30,949 --> 00:13:29,360
making their own microbial fossil

285
00:13:32,629 --> 00:13:30,959
which as we can see in the case of that

286
00:13:34,310 --> 00:13:32,639
rock i showed you can be preserved for

287
00:13:36,949 --> 00:13:34,320
billions of years

288
00:13:38,310 --> 00:13:36,959

and so in a sense to answer these big

289
00:13:41,269 --> 00:13:38,320
questions we're going

290
00:13:43,269 --> 00:13:41,279
back in time three to four billion years

291
00:13:43,990 --> 00:13:43,279
ago to look at this very ancient lake

292
00:13:45,350 --> 00:13:44,000
system

293
00:13:47,430 --> 00:13:45,360
and look at all the different sub

294
00:13:48,710 --> 00:13:47,440
environments uh in and around that

295
00:13:50,870 --> 00:13:48,720
ancient lake

296
00:13:52,870 --> 00:13:50,880
and um asking you know what was this

297
00:13:53,350 --> 00:13:52,880
environment like could it have supported

298
00:13:55,750 --> 00:13:53,360
life

299
00:13:56,470 --> 00:13:55,760
but then taking that next step as laurie

300
00:13:58,949 --> 00:13:56,480
said

301
00:14:00,550 --> 00:13:58,959
uh and and looking for any evidence that

302
00:14:01,590 --> 00:14:00,560
life may have left behind like these

303
00:14:05,110 --> 00:14:01,600
stromatolites

304
00:14:05,910 --> 00:14:05,120
or what we might more likely expect

305
00:14:08,710 --> 00:14:05,920
something

306
00:14:09,829 --> 00:14:08,720
significantly more ambiguous so that

307
00:14:12,550 --> 00:14:09,839
that ambiguity

308
00:14:14,150 --> 00:14:12,560
that tends to uh you know be a part of

309
00:14:15,110 --> 00:14:14,160
the search for the most ancient record

310
00:14:17,030 --> 00:14:15,120
of life on earth

311
00:14:18,710 --> 00:14:17,040
and we can expect it to be the same on

312
00:14:20,949 --> 00:14:18,720
mars that ambiguity

313
00:14:22,949 --> 00:14:20,959

is why we need this incredibly complex

314
00:14:24,710 --> 00:14:22,959
and capable scientific payload

315
00:14:26,870 --> 00:14:24,720
so to start telling you a bit more about

316
00:14:27,750 --> 00:14:26,880
that i'll pass it to luther beagle who's

317
00:14:29,509 --> 00:14:27,760
the principal

318
00:14:31,430 --> 00:14:29,519
investigator of the sherlock instrument

319
00:14:32,550 --> 00:14:31,440
on mars 2020.

320
00:14:34,550 --> 00:14:32,560
hey ken thanks for that great

321
00:14:36,310 --> 00:14:34,560
introduction i really appreciate it when

322
00:14:39,189 --> 00:14:36,320
i got to jpl in april

323
00:14:40,150 --> 00:14:39,199
of 1997 we were getting ready to land

324
00:14:42,310 --> 00:14:40,160
soldier

325
00:14:43,910 --> 00:14:42,320
rover on mars and it was a very exciting

326
00:14:45,430 --> 00:14:43,920
time to be here and i thought stuff like

327
00:14:47,509 --> 00:14:45,440
that happened all the time

328
00:14:49,110 --> 00:14:47,519
um didn't realize exactly how much hard

329
00:14:51,670 --> 00:14:49,120
work went into it until

330
00:14:53,110 --> 00:14:51,680
later on when myrrh and then msl and now

331
00:14:54,629 --> 00:14:53,120
2020 lands

332
00:14:56,389 --> 00:14:54,639
but it's a great time to be here and i'm

333
00:14:57,430 --> 00:14:56,399
honored to be part of this project

334
00:14:59,990 --> 00:14:57,440
the science we're going to do is

335
00:15:02,389 --> 00:15:00,000
spectacular uh as ken mentioned i'm the

336
00:15:03,509 --> 00:15:02,399
principal investigator of the sherlock

337
00:15:05,110 --> 00:15:03,519
instrument that's on our mounted

338
00:15:06,470 --> 00:15:05,120

instrument on the end of on the

339
00:15:08,470 --> 00:15:06,480
perseverance rover

340
00:15:09,990 --> 00:15:08,480
um we chose sherlock because we're going

341
00:15:12,230 --> 00:15:10,000
to mars to look for clues we're looking

342
00:15:14,069 --> 00:15:12,240
for clues for two specific things

343
00:15:15,829 --> 00:15:14,079
one we want to know whether mars could

344
00:15:17,189 --> 00:15:15,839
have been habitable in the past that is

345
00:15:20,030 --> 00:15:17,199
were the conditions right

346
00:15:21,509 --> 00:15:20,040
to have organic material turn into

347
00:15:24,069 --> 00:15:21,519
microorganisms and

348
00:15:24,870 --> 00:15:24,079
with the origin of life the second thing

349
00:15:27,189 --> 00:15:24,880
we're looking for

350
00:15:28,389 --> 00:15:27,199
is evidence of that origin of life we're

351
00:15:30,069 --> 00:15:28,399
looking for clues

352
00:15:31,590 --> 00:15:30,079
uh with two different things and this is

353
00:15:33,990 --> 00:15:31,600
a picture of the instrument

354
00:15:35,670 --> 00:15:34,000
that you're seeing here now we have two

355
00:15:36,949 --> 00:15:35,680
different cameras on this instrument

356
00:15:39,189 --> 00:15:36,959
the camera on the right as we call

357
00:15:41,030 --> 00:15:39,199
watson which is like a magnifying glass

358
00:15:41,749 --> 00:15:41,040
sherlock always has magnifying glass

359
00:15:43,509 --> 00:15:41,759
with him

360
00:15:45,110 --> 00:15:43,519
and what watson does is watson takes

361
00:15:47,430 --> 00:15:45,120
microscopic images

362
00:15:48,790 --> 00:15:47,440
and it also takes uh panoramic images as

363
00:15:50,069 --> 00:15:48,800

well so you can take a picture of the

364
00:15:53,990 --> 00:15:50,079
rover

365
00:15:56,470 --> 00:15:54,000
done with mali on msl

366
00:15:58,470 --> 00:15:56,480
this is a re-flight of that camera and

367
00:16:00,230 --> 00:15:58,480
we were able to take pictures of the en

368
00:16:02,069 --> 00:16:00,240
of the rover and we're also able to take

369
00:16:03,910 --> 00:16:02,079
pictures of the rock and we can actually

370
00:16:04,710 --> 00:16:03,920
zoom in on the rock and get down to

371
00:16:07,670 --> 00:16:04,720
really

372
00:16:08,230 --> 00:16:07,680
fine spatial scales the second camera is

373
00:16:11,269 --> 00:16:08,240
uh

374
00:16:13,430 --> 00:16:11,279
camera we take

375
00:16:14,389 --> 00:16:13,440
even finer images uh with that

376
00:16:16,389 --> 00:16:14,399
particular camera

377
00:16:18,069 --> 00:16:16,399
um and we do spectroscopy we do two

378
00:16:19,110 --> 00:16:18,079
different types of spectroscopy raman

379
00:16:20,629 --> 00:16:19,120
spectroscopy

380
00:16:22,550 --> 00:16:20,639
which tells us what kind of molecules

381
00:16:24,310 --> 00:16:22,560
are present on the surface which gives

382
00:16:26,710 --> 00:16:24,320
us organic material

383
00:16:28,710 --> 00:16:26,720
chemicals and mineralogy and fluorescent

384
00:16:29,670 --> 00:16:28,720
spectroscopy which identifies organic

385
00:16:31,509 --> 00:16:29,680
materials

386
00:16:33,269 --> 00:16:31,519
so how we work on the end of the arm is

387
00:16:35,509 --> 00:16:33,279
a this is a

388
00:16:37,590 --> 00:16:35,519

movie you're about to see and it shows

389
00:16:41,110 --> 00:16:37,600
how sherlock actually is moved

390
00:16:43,030 --> 00:16:41,120
on the robotic arm this robotic arm

391
00:16:44,470 --> 00:16:43,040
you can see sherlock on the outer part

392
00:16:47,749 --> 00:16:44,480
of the arm here

393
00:16:48,310 --> 00:16:47,759
we attach the drill pixel our sister

394
00:16:49,749 --> 00:16:48,320
element

395
00:16:51,590 --> 00:16:49,759
our sister instrument is on the other

396
00:16:53,670 --> 00:16:51,600
side of the rover and pixel does

397
00:16:55,430 --> 00:16:53,680
elemental abundances the same way we do

398
00:16:57,110 --> 00:16:55,440
on the microscopic scale

399
00:16:58,949 --> 00:16:57,120
we're looking really at really fine

400
00:17:01,269 --> 00:16:58,959
scales on mar on mars

401
00:17:02,870 --> 00:17:01,279
on the order of 100 microns that's about

402
00:17:03,670 --> 00:17:02,880
the size of a human hair and we're

403
00:17:06,470 --> 00:17:03,680
looking for

404
00:17:08,309 --> 00:17:06,480
clues in the in those very small regions

405
00:17:09,350 --> 00:17:08,319
this is the way the arm moves this is a

406
00:17:11,669 --> 00:17:09,360
video

407
00:17:13,429 --> 00:17:11,679
showing how we get deployed we don't

408
00:17:14,069 --> 00:17:13,439
bring the sample to us we go to the

409
00:17:16,470 --> 00:17:14,079
sample

410
00:17:17,990 --> 00:17:16,480
so you can see really how slow the arm

411
00:17:20,789 --> 00:17:18,000
moves and how deliberate it

412
00:17:21,590 --> 00:17:20,799
is the arm is really really big and we

413
00:17:23,270 --> 00:17:21,600

can actually

414
00:17:24,789 --> 00:17:23,280
where we command it to about five

415
00:17:26,549 --> 00:17:24,799
centimeters above the surface we're a

416
00:17:29,029 --> 00:17:26,559
contactless instrument

417
00:17:29,590 --> 00:17:29,039
um and what we are actually doing is

418
00:17:32,390 --> 00:17:29,600
kind of

419
00:17:34,310 --> 00:17:32,400
slide one is we're we're able to map

420
00:17:34,789 --> 00:17:34,320
things out we're able to take an image

421
00:17:37,510 --> 00:17:34,799
of a

422
00:17:39,270 --> 00:17:37,520
very fine microscopic image and we're

423
00:17:40,789 --> 00:17:39,280
able to take our laser and and

424
00:17:42,950 --> 00:17:40,799
raster it across the surface and

425
00:17:45,669 --> 00:17:42,960
identify organic material

426
00:17:47,430 --> 00:17:45,679
minerals uh and and the like and we're

427
00:17:48,630 --> 00:17:47,440
able to do that with pixel too

428
00:17:50,870 --> 00:17:48,640
so the image on the left is a

429
00:17:53,750 --> 00:17:50,880
stromatolite ken like ken showed that we

430
00:17:55,909 --> 00:17:53,760
obtained from uh australia and we took

431
00:17:58,390 --> 00:17:55,919
two different images uh at the bottom

432
00:18:00,549 --> 00:17:58,400
the sherlock one is in the small red box

433
00:18:04,150 --> 00:18:00,559
and the pixel one is in the large

434
00:18:06,870 --> 00:18:04,160
larger red rectangle box

435
00:18:07,590 --> 00:18:06,880
pixel identifies uh where different

436
00:18:09,830 --> 00:18:07,600
elements are

437
00:18:11,590 --> 00:18:09,840
and we map them out and so we can map

438
00:18:14,230 --> 00:18:11,600

out context of

439
00:18:15,270 --> 00:18:14,240
in the images with actual organic and

440
00:18:16,870 --> 00:18:15,280
mineral maps

441
00:18:18,470 --> 00:18:16,880
on the right and this tells us a lot

442
00:18:20,070 --> 00:18:18,480
more about the rock than just doing one

443
00:18:21,029 --> 00:18:20,080
instrument by itself so we can take our

444
00:18:23,029 --> 00:18:21,039
measurements

445
00:18:24,310 --> 00:18:23,039
and combine them with pixel and combine

446
00:18:26,549 --> 00:18:24,320
them with supercam which we'll

447
00:18:28,150 --> 00:18:26,559
hear about in a second and get a really

448
00:18:30,950 --> 00:18:28,160
better idea of what the entire

449
00:18:31,430 --> 00:18:30,960
sample is all about the next slide shows

450
00:18:33,669 --> 00:18:31,440
uh

451
00:18:34,710 --> 00:18:33,679
must hermatelite and this particular

452
00:18:36,950 --> 00:18:34,720
spermatolate

453
00:18:38,470 --> 00:18:36,960
is from the pillbarrow region and we got

454
00:18:40,310 --> 00:18:38,480
it a few years ago and we wanted to show

455
00:18:42,230 --> 00:18:40,320
what we could do with sherlock and so

456
00:18:43,990 --> 00:18:42,240
what we did was is we scanned across the

457
00:18:44,549 --> 00:18:44,000
surface we took an image that's the top

458
00:18:48,150 --> 00:18:44,559
image

459
00:18:50,070 --> 00:18:48,160
and wherever you see deep blue

460
00:18:51,590 --> 00:18:50,080
is where there was a microorganism a

461
00:18:54,230 --> 00:18:51,600
single-celled organism

462
00:18:55,110 --> 00:18:54,240
existed and where you don't see any dark

463
00:18:57,190 --> 00:18:55,120

blue

464
00:18:59,510 --> 00:18:57,200
you see that's not where there's there's

465
00:19:01,350 --> 00:18:59,520
no little or no organisms there

466
00:19:03,909 --> 00:19:01,360
so we scan across and where we where you

467
00:19:06,630 --> 00:19:03,919
think where you see organic

468
00:19:08,070 --> 00:19:06,640
when you see microorganisms on the

469
00:19:09,350 --> 00:19:08,080
outside of the rock you can see them in

470
00:19:10,470 --> 00:19:09,360
cracks you can see them in fissures

471
00:19:11,669 --> 00:19:10,480
which is where you would think that

472
00:19:13,190 --> 00:19:11,679
organisms would live

473
00:19:15,669 --> 00:19:13,200
because they have accessibility to both

474
00:19:17,029 --> 00:19:15,679
water and nutrients

475
00:19:18,470 --> 00:19:17,039
we didn't there were two features on

476
00:19:19,430 --> 00:19:18,480
this particular scan that we weren't

477
00:19:21,350 --> 00:19:19,440
quite sure about

478
00:19:22,789 --> 00:19:21,360
one is in the upper right hand corner

479
00:19:24,549 --> 00:19:22,799
the dark blue

480
00:19:26,870 --> 00:19:24,559
on the rock and then one is on the

481
00:19:30,230 --> 00:19:26,880
bottom left hand corner the purplish

482
00:19:32,230 --> 00:19:30,240
uh feature down there

483
00:19:33,909 --> 00:19:32,240
with these what these two features are

484
00:19:35,510 --> 00:19:33,919
actually the fingerprints of a postdoc

485
00:19:37,029 --> 00:19:35,520
that accidentally picked up the rock so

486
00:19:38,549 --> 00:19:37,039
this shows you exactly how sensitive

487
00:19:39,430 --> 00:19:38,559
sherlock is we actually were able to

488
00:19:41,110 --> 00:19:39,440

identify

489
00:19:42,470 --> 00:19:41,120
uh the fact that he picked up this rock

490
00:19:44,230 --> 00:19:42,480
without any um

491
00:19:45,669 --> 00:19:44,240
gloves on which then contaminated the

492
00:19:47,190 --> 00:19:45,679
surface and we uh

493
00:19:49,029 --> 00:19:47,200
we could get his fingerprints from that

494
00:19:49,430 --> 00:19:49,039
surface so that's kind of what sherlock

495
00:19:51,830 --> 00:19:49,440
does

496
00:19:52,470 --> 00:19:51,840
and for the uh to understand where we

497
00:19:54,150 --> 00:19:52,480
come where

498
00:19:55,750 --> 00:19:54,160
where our samples are looking at in

499
00:19:56,950 --> 00:19:55,760
context i'm going to throw it over to

500
00:19:57,990 --> 00:19:56,960
jim bell who's the principal

501
00:20:02,230 --> 00:19:58,000
investigator

502
00:20:05,430 --> 00:20:02,240
of mass camzy jim

503
00:20:07,510 --> 00:20:05,440
hey uh thanks thanks luther i

504
00:20:08,950 --> 00:20:07,520
am super excited about being able to

505
00:20:11,430 --> 00:20:08,960
talk about the science

506
00:20:12,470 --> 00:20:11,440
of our mission and i'm also just super

507
00:20:14,950 --> 00:20:12,480
fortunate uh

508
00:20:15,669 --> 00:20:14,960
to have been able to participate in all

509
00:20:18,950 --> 00:20:15,679
four

510
00:20:21,510 --> 00:20:18,960
of nasa's rover missions to mars so far

511
00:20:22,310 --> 00:20:21,520
in my career and so this uh this

512
00:20:24,710 --> 00:20:22,320
upcoming

513
00:20:25,909 --> 00:20:24,720

seven minutes of terror on the thursday

514
00:20:28,470 --> 00:20:25,919
will be my

515
00:20:29,430 --> 00:20:28,480
fifth ride down these particular class

516
00:20:31,669 --> 00:20:29,440
five rapids

517
00:20:33,029 --> 00:20:31,679
and uh just really looking forward to

518
00:20:33,510 --> 00:20:33,039
the great ride the engineer is going to

519
00:20:35,190 --> 00:20:33,520
give us

520
00:20:37,350 --> 00:20:35,200
and then the great science that we're

521
00:20:39,190 --> 00:20:37,360
going to do with this mission

522
00:20:41,350 --> 00:20:39,200
i'm here in the mission operations

523
00:20:43,110 --> 00:20:41,360
center at arizona state university

524
00:20:45,190 --> 00:20:43,120
in tempe this is the mission operations

525
00:20:48,710 --> 00:20:45,200
center for the mass cam z

526
00:20:49,510 --> 00:20:48,720
camera mounted instruments on on

527
00:20:51,110 --> 00:20:49,520
perseverance

528
00:20:52,630 --> 00:20:51,120
this is where our part of the science

529
00:20:53,590 --> 00:20:52,640
and engineering team will be watching

530
00:20:56,310 --> 00:20:53,600
the landing

531
00:20:57,990 --> 00:20:56,320
uh because of covid uh the four or 500

532
00:21:00,230 --> 00:20:58,000
members of the science team can't be all

533
00:21:01,430 --> 00:21:00,240
together at jpl like we normally are and

534
00:21:03,590 --> 00:21:01,440
jumping up and down yelling and

535
00:21:06,230 --> 00:21:03,600
screaming with the engineers

536
00:21:07,750 --> 00:21:06,240
we can't do that so we're all back at

537
00:21:09,029 --> 00:21:07,760
our home institutions

538
00:21:11,029 --> 00:21:09,039

and we'll be running our part of the

539
00:21:13,590 --> 00:21:11,039
investigation here

540
00:21:15,270 --> 00:21:13,600
from campus in 10 p so we'll be doing

541
00:21:16,070 --> 00:21:15,280
the day-to-day health assessment of the

542
00:21:18,630 --> 00:21:16,080
cameras

543
00:21:19,669 --> 00:21:18,640
the calibration the image processing and

544
00:21:21,830 --> 00:21:19,679
getting that information

545
00:21:24,390 --> 00:21:21,840
out to the rest of the science team as

546
00:21:25,190 --> 00:21:24,400
well as to the public via the jpl and

547
00:21:28,149 --> 00:21:25,200
nasa

548
00:21:28,549 --> 00:21:28,159
public websites um so if i could have my

549
00:21:32,070 --> 00:21:28,559
first

550
00:21:35,110 --> 00:21:32,080
slide up so this

551
00:21:37,430 --> 00:21:35,120
rover is loaded

552
00:21:39,669 --> 00:21:37,440
loaded with engineering and science

553
00:21:41,750 --> 00:21:39,679
cameras galore and microphones and

554
00:21:43,750 --> 00:21:41,760
you'll hear more about those later

555
00:21:44,950 --> 00:21:43,760
this rover and this mission is going to

556
00:21:47,510 --> 00:21:44,960
be a feast

557
00:21:48,870 --> 00:21:47,520
for the eyes and ears it's really going

558
00:21:52,230 --> 00:21:48,880
to be spectacular

559
00:21:54,390 --> 00:21:52,240
uh 23 cameras on the rover and its

560
00:21:56,310 --> 00:21:54,400
descent stage itself plus two more

561
00:21:59,669 --> 00:21:56,320
cameras on the helicopter

562
00:22:01,750 --> 00:21:59,679
25 cameras total the most uh camera

563
00:22:03,350 --> 00:22:01,760

heavy mission of deep space robotic

564
00:22:06,230 --> 00:22:03,360
exploration ever sent

565
00:22:07,909 --> 00:22:06,240
out there so very very excited about

566
00:22:10,950 --> 00:22:07,919
that and the cameras that we'll be

567
00:22:12,789 --> 00:22:10,960
operating and using to help

568
00:22:14,630 --> 00:22:12,799
achieve our mission goals called mass

569
00:22:17,430 --> 00:22:14,640
kamzi go to the next one

570
00:22:18,070 --> 00:22:17,440
please next slide you can see them up on

571
00:22:20,070 --> 00:22:18,080
the mast

572
00:22:22,310 --> 00:22:20,080
and the technician here doing some final

573
00:22:25,350 --> 00:22:22,320
cleaning and check out those square

574
00:22:26,950 --> 00:22:25,360
uh aperture ends there you can see and

575
00:22:28,470 --> 00:22:26,960
i've got a little model here i can show

576
00:22:30,549 --> 00:22:28,480
off it's about the size each one of

577
00:22:32,630 --> 00:22:30,559
those is about the size of a

578
00:22:34,950 --> 00:22:32,640
a typical can of tennis balls for

579
00:22:37,430 --> 00:22:34,960
example and we have two of them

580
00:22:38,070 --> 00:22:37,440
the two of them give us stereo vision

581
00:22:41,750 --> 00:22:38,080
they're

582
00:22:44,630 --> 00:22:41,760
the z in mass cam z stands for zoom

583
00:22:45,590 --> 00:22:44,640
so we can go from wide angle stereo view

584
00:22:48,870 --> 00:22:45,600
of the landscape

585
00:22:50,789 --> 00:22:48,880
all the way to telephoto super close up

586
00:22:52,630 --> 00:22:50,799
high resolution view of the landscape we

587
00:22:53,350 --> 00:22:52,640
can resolve features on the millimeter

588
00:22:55,350 --> 00:22:53,360

scale

589
00:22:56,630 --> 00:22:55,360
close in to the rover and on the

590
00:22:58,390 --> 00:22:56,640
centimeter scale

591
00:23:00,310 --> 00:22:58,400
off at the distance we can see for

592
00:23:02,070 --> 00:23:00,320
example something and resolve something

593
00:23:04,390 --> 00:23:02,080
the size of a house fly

594
00:23:06,310 --> 00:23:04,400
at the length of a football field so

595
00:23:07,029 --> 00:23:06,320
here's an example of the zoom capability

596
00:23:09,830 --> 00:23:07,039
and the next

597
00:23:11,909 --> 00:23:09,840
uh slides here taking the cameras and

598
00:23:14,310 --> 00:23:11,919
pointing them out the laboratory window

599
00:23:15,990 --> 00:23:14,320
we go from the wide-angle view of that

600
00:23:18,950 --> 00:23:16,000
ridge it's about a kilometer away

601
00:23:20,390 --> 00:23:18,960
all the way zooming in to full uh

602
00:23:23,029 --> 00:23:20,400
telephoto

603
00:23:24,230 --> 00:23:23,039
so we've spent the past seven years

604
00:23:27,590 --> 00:23:24,240
designing

605
00:23:29,350 --> 00:23:27,600
uh manufacturing testing uh

606
00:23:30,870 --> 00:23:29,360
these cameras with in close

607
00:23:32,470 --> 00:23:30,880
collaboration with our colleagues at

608
00:23:33,750 --> 00:23:32,480
male and space science systems in san

609
00:23:37,029 --> 00:23:33,760
diego who have done

610
00:23:38,789 --> 00:23:37,039
a lot of really great deep space cameras

611
00:23:40,950 --> 00:23:38,799
we took the engineering model cameras

612
00:23:43,269 --> 00:23:40,960
out in the mars yard just last week

613
00:23:44,710 --> 00:23:43,279

this is the engineering model uh rover

614
00:23:46,310 --> 00:23:44,720
we use this to test everything that

615
00:23:49,590 --> 00:23:46,320
we're going to do on the real rover

616
00:23:52,149 --> 00:23:49,600
and we took this beautiful 360 degree

617
00:23:55,669 --> 00:23:52,159
panorama at a relatively wide angle

618
00:23:58,310 --> 00:23:55,679
setting so about 142 images go into this

619
00:23:59,350 --> 00:23:58,320
rgb color panorama and so we can see all

620
00:24:01,430 --> 00:23:59,360
the way around

621
00:24:03,269 --> 00:24:01,440
and the rover itself and this is an

622
00:24:04,310 --> 00:24:03,279
example of one of the early products

623
00:24:06,470 --> 00:24:04,320
that we'll get from

624
00:24:08,390 --> 00:24:06,480
one of the early saws on the mission

625
00:24:10,870 --> 00:24:08,400
after we pop that mast up

626
00:24:13,590 --> 00:24:10,880
and take our first 360 degree look

627
00:24:16,070 --> 00:24:13,600
around we can also project that into a

628
00:24:17,830 --> 00:24:16,080
selfie here's the same view projected

629
00:24:19,590 --> 00:24:17,840
looking down onto the rover of course

630
00:24:21,510 --> 00:24:19,600
that the cameras tilt up and down as

631
00:24:23,190 --> 00:24:21,520
well we can look down on the rover and

632
00:24:25,029 --> 00:24:23,200
take a picture of the deck for

633
00:24:26,549 --> 00:24:25,039
characterizing the things on the deck

634
00:24:28,630 --> 00:24:26,559
that the engineers are interested in

635
00:24:30,070 --> 00:24:28,640
as well as our calibration targets which

636
00:24:31,590 --> 00:24:30,080
we're very interested in to make sure we

637
00:24:33,750 --> 00:24:31,600
get the colors right

638
00:24:35,430 --> 00:24:33,760

so these are just some examples of the

639
00:24:36,870 --> 00:24:35,440
kinds of things that we won't be seeing

640
00:24:40,070 --> 00:24:36,880
the mars yard in jpl

641
00:24:42,789 --> 00:24:40,080
we'll be seeing jezreel's backyard

642
00:24:43,590 --> 00:24:42,799
on mars starting next week so we're

643
00:24:45,990 --> 00:24:43,600
we're super

644
00:24:46,870 --> 00:24:46,000
excited about that and really excited

645
00:24:49,830 --> 00:24:46,880
especially about

646
00:24:51,669 --> 00:24:49,840
sharing all these images with the public

647
00:24:53,990 --> 00:24:51,679
as they start coming down

648
00:24:55,590 --> 00:24:54,000
okay so uh you saw a bunch of stuff

649
00:24:57,510 --> 00:24:55,600
going on in that mast

650
00:24:59,350 --> 00:24:57,520
up on top of that mass including the

651
00:25:01,190 --> 00:24:59,360
mass kimseas well we share that space

652
00:25:02,390 --> 00:25:01,200
with navigation cameras and with another

653
00:25:04,230 --> 00:25:02,400
science instrument

654
00:25:06,149 --> 00:25:04,240
uh called supercam and you're going to

655
00:25:06,549 --> 00:25:06,159
hear more about that i'll turn it over

656
00:25:08,710 --> 00:25:06,559
to

657
00:25:10,390 --> 00:25:08,720
sylvester maurice for more details take

658
00:25:13,590 --> 00:25:10,400
it away

659
00:25:14,070 --> 00:25:13,600
yeah thanks so much jim um thanks really

660
00:25:16,310 --> 00:25:14,080
great

661
00:25:18,549 --> 00:25:16,320
uh i'm silvers morris i'm the deputy pi

662
00:25:20,390 --> 00:25:18,559
of supercam and i'm glad to attend this

663
00:25:22,549 --> 00:25:20,400

briefing from toulouse and my home

664
00:25:25,909 --> 00:25:22,559
institution here in france

665
00:25:28,789 --> 00:25:25,919
very lucky to be here our super cam

666
00:25:30,710 --> 00:25:28,799
is largely innovated from chemcam a very

667
00:25:33,350 --> 00:25:30,720
active instrument on curiosity

668
00:25:34,630 --> 00:25:33,360
that has shot its laser more than eight

669
00:25:38,310 --> 00:25:34,640
hundred thousand times

670
00:25:39,990 --> 00:25:38,320
so far similarly to chemcam supercam

671
00:25:41,990 --> 00:25:40,000
has been built by the los alamos

672
00:25:45,110 --> 00:25:42,000
national lab in new mexico

673
00:25:45,590 --> 00:25:45,120
and france but if supercam seems just

674
00:25:48,070 --> 00:25:45,600
like

675
00:25:51,029 --> 00:25:48,080
camcam it is actually very different

676
00:25:54,070 --> 00:25:51,039
let's look at the video now

677
00:25:54,470 --> 00:25:54,080
supercam is made of three parts the mass

678
00:25:56,710 --> 00:25:54,480
unit

679
00:25:57,909 --> 00:25:56,720
is at the top of the mast it's as high

680
00:26:00,710 --> 00:25:57,919
as 2 meter

681
00:26:01,990 --> 00:26:00,720
and it looks like the perseverance high

682
00:26:04,310 --> 00:26:02,000
in a rover body

683
00:26:05,909 --> 00:26:04,320
you have the body unit that handles

684
00:26:07,750 --> 00:26:05,919
communication with the rover

685
00:26:10,390 --> 00:26:07,760
and at the rear we have calibration

686
00:26:13,269 --> 00:26:10,400
targets to obtain reference measurements

687
00:26:15,669 --> 00:26:13,279
on well-known standards

688
00:26:16,710 --> 00:26:15,679

supercam consists of three spectroscopy

689
00:26:19,110 --> 00:26:16,720
techniques

690
00:26:20,230 --> 00:26:19,120
just like chemcam the mass unit fires an

691
00:26:23,190 --> 00:26:20,240
infrared laser

692
00:26:24,070 --> 00:26:23,200
create a plasma and within the body unit

693
00:26:26,230 --> 00:26:24,080
the return line

694
00:26:28,310 --> 00:26:26,240
is being analyzed and thus we find the

695
00:26:31,909 --> 00:26:28,320
atomic composition of the targets

696
00:26:34,870 --> 00:26:31,919
how much iron titanium sonia and so on

697
00:26:36,789 --> 00:26:34,880
we also have two new techniques raman

698
00:26:38,710 --> 00:26:36,799
spectroscopy it's a green laser to

699
00:26:40,710 --> 00:26:38,720
vibrate the molecule just like sherlock

700
00:26:43,830 --> 00:26:40,720
with a different kind of laser

701
00:26:44,710 --> 00:26:43,840
we also analyzing infrared light from

702
00:26:47,669 --> 00:26:44,720
the sun

703
00:26:48,870 --> 00:26:47,679
has it's been reflected by the rocks

704
00:26:50,830 --> 00:26:48,880
these are very new

705
00:26:54,630 --> 00:26:50,840
both techniques yield a molecular

706
00:26:57,110 --> 00:26:54,640
structure and possibly organic molecules

707
00:26:59,669 --> 00:26:57,120
to find out where we're shooting at we

708
00:27:02,630 --> 00:26:59,679
have also a microscopic imager it's

709
00:27:05,269 --> 00:27:02,640
another camera on gm list

710
00:27:07,029 --> 00:27:05,279
high resolution very small field of view

711
00:27:09,190 --> 00:27:07,039
for ourselves

712
00:27:11,350 --> 00:27:09,200
and at last but not least we have a

713
00:27:12,549 --> 00:27:11,360

microphone one of the two microphones on

714
00:27:14,630 --> 00:27:12,559
a rover

715
00:27:17,350 --> 00:27:14,640
to listen to the wind leads another

716
00:27:21,029 --> 00:27:17,360
rover and also the infrared laser

717
00:27:23,110 --> 00:27:21,039
shooting at mars well you can see that

718
00:27:24,070 --> 00:27:23,120
supercam is quite a complex instrument

719
00:27:27,110 --> 00:27:24,080
and yet

720
00:27:30,310 --> 00:27:27,120
a very powerful one it can voice

721
00:27:32,630 --> 00:27:30,320
at the atmosphere at rocks from 2 meter

722
00:27:35,029 --> 00:27:32,640
distance to up to 7 meters

723
00:27:37,350 --> 00:27:35,039
without moving the rover and at scale as

724
00:27:39,909 --> 00:27:37,360
small as one millimeter

725
00:27:41,510 --> 00:27:39,919
so supercam will characterize in situ

726
00:27:44,070 --> 00:27:41,520
the habitability

727
00:27:45,990 --> 00:27:44,080
and search for traces of life it will

728
00:27:47,909 --> 00:27:46,000
support sample caching

729
00:27:49,510 --> 00:27:47,919
at this we're going to help to find the

730
00:27:51,830 --> 00:27:49,520
best sample to pick up

731
00:27:53,430 --> 00:27:51,840
and also we're going to document their

732
00:27:57,830 --> 00:27:53,440
geological context

733
00:27:59,510 --> 00:27:57,840
that is supercam back to you marina

734
00:28:02,070 --> 00:27:59,520
thank you so much sylvester and thank

735
00:28:04,630 --> 00:28:02,080
you so much to our panelist presenters

736
00:28:05,909 --> 00:28:04,640
we are now ready to take media questions

737
00:28:08,870 --> 00:28:05,919
remember to press

738
00:28:10,950 --> 00:28:08,880

star one to get put in the queue and

739
00:28:12,710 --> 00:28:10,960
please direct your questions to one of

740
00:28:14,830 --> 00:28:12,720
the panelists in particular

741
00:28:16,950 --> 00:28:14,840
we're also taking questions through the

742
00:28:20,669 --> 00:28:16,960
hashtag countdown

743
00:28:22,310 --> 00:28:20,679
to mars our first caller is

744
00:28:23,990 --> 00:28:22,320
chelseagoadwithspace.com good afternoon

745
00:28:25,590 --> 00:28:24,000
chelsea

746
00:28:27,830 --> 00:28:25,600
good afternoon thank you for taking my

747
00:28:30,549 --> 00:28:27,840
question my question is for ken

748
00:28:32,470 --> 00:28:30,559
williford you mentioned that you and the

749
00:28:34,470 --> 00:28:32,480
larger team studied stromatolites in

750
00:28:35,190 --> 00:28:34,480
australia to demonstrate finding and

751
00:28:37,510 --> 00:28:35,200
scanning

752
00:28:38,310 --> 00:28:37,520
microorganisms in rock cracks and

753
00:28:40,710 --> 00:28:38,320
fissures

754
00:28:42,789 --> 00:28:40,720
do you expect that if and when

755
00:28:45,269 --> 00:28:42,799
perseverance does identify

756
00:28:46,710 --> 00:28:45,279
evidence of ancient organisms on mars

757
00:28:48,549 --> 00:28:46,720
that these organisms

758
00:28:53,669 --> 00:28:48,559
might be similar to the microbes you

759
00:28:58,470 --> 00:28:58,070
wow yeah it's a fantastic question so we

760
00:29:03,269 --> 00:28:58,480
did

761
00:29:05,750 --> 00:29:03,279
in the pilbara in western australia

762
00:29:07,190 --> 00:29:05,760
for an important reason uh and that's

763
00:29:10,070 --> 00:29:07,200

because

764
00:29:12,149 --> 00:29:10,080
in a certain way looking at the earliest

765
00:29:14,230 --> 00:29:12,159
evidence for life on earth

766
00:29:15,590 --> 00:29:14,240
is our best analog to the challenge we

767
00:29:19,190 --> 00:29:15,600
have in front of us

768
00:29:21,669 --> 00:29:19,200
so the similarities are uh are many

769
00:29:23,190 --> 00:29:21,679
the the environment we were looking at

770
00:29:25,350 --> 00:29:23,200
in australia in the case of

771
00:29:26,789 --> 00:29:25,360
at least this sample that i showed you

772
00:29:28,070 --> 00:29:26,799
was an ancient lake

773
00:29:30,870 --> 00:29:28,080
uh we looked at ancient lake

774
00:29:34,070 --> 00:29:30,880
environments there

775
00:29:35,990 --> 00:29:34,080
and i think it's it's fair enough to say

776
00:29:37,750 --> 00:29:36,000
uh of course i could go on forever on

777
00:29:38,310 --> 00:29:37,760
this topic but it's fair enough to say

778
00:29:41,590 --> 00:29:38,320
that

779
00:29:44,789 --> 00:29:41,600
of a

780
00:29:47,590 --> 00:29:44,799
life as we know it uh would be cellular

781
00:29:48,470 --> 00:29:47,600
that uh prior to we know from the the

782
00:29:51,350 --> 00:29:48,480
record of

783
00:29:53,750 --> 00:29:51,360
of life on earth that complex uh

784
00:29:55,909 --> 00:29:53,760
organisms complex multicellular

785
00:29:57,110 --> 00:29:55,919
organisms like we're familiar with today

786
00:29:59,430 --> 00:29:57,120
animals and plants

787
00:30:00,950 --> 00:29:59,440
didn't evolve until fairly late in the

788
00:30:02,630 --> 00:30:00,960

history of the earth after

789
00:30:04,710 --> 00:30:02,640
oxygen rose in the atmosphere to

790
00:30:06,470 --> 00:30:04,720
appreciable levels so we don't

791
00:30:08,549 --> 00:30:06,480
think anything like that happened on

792
00:30:10,710 --> 00:30:08,559
mars and so we think it's

793
00:30:12,389 --> 00:30:10,720
as likely as not that that any anything

794
00:30:14,070 --> 00:30:12,399
that was alive on mars

795
00:30:15,590 --> 00:30:14,080
three and a half billion years ago would

796
00:30:18,870 --> 00:30:15,600
be similar to

797
00:30:20,230 --> 00:30:18,880
to earth bacteria uh and other similar

798
00:30:22,070 --> 00:30:20,240
organisms called archaea

799
00:30:23,909 --> 00:30:22,080
which are the kind of organisms that we

800
00:30:26,789 --> 00:30:23,919
think made these stromatolites that we

801
00:30:30,389 --> 00:30:26,799
find in western australia

802
00:30:33,590 --> 00:30:30,399
thank you ken our next caller

803
00:30:36,389 --> 00:30:33,600
is deanne divis from al jazeera

804
00:30:38,710 --> 00:30:36,399
good afternoon deanne good afternoon

805
00:30:41,750 --> 00:30:38,720
thank you for this opportunity

806
00:30:43,590 --> 00:30:41,760
this one is to miss glaze

807
00:30:45,350 --> 00:30:43,600
it was mentioned in the last briefing

808
00:30:48,310 --> 00:30:45,360
that nasa hopes to use

809
00:30:49,350 --> 00:30:48,320
activities on the lunar surface to

810
00:30:52,470 --> 00:30:49,360
inform

811
00:30:54,389 --> 00:30:52,480
future mars exploration i was wondering

812
00:30:56,789 --> 00:30:54,399
if that might also be true from

813
00:30:58,870 --> 00:30:56,799

the mars work that your team is doing

814
00:31:01,110 --> 00:30:58,880
will it inform the work that will be

815
00:31:04,070 --> 00:31:01,120
happening through artemis or any other

816
00:31:05,909 --> 00:31:04,080
lunar activities

817
00:31:07,509 --> 00:31:05,919
a really interesting question and i

818
00:31:09,750 --> 00:31:07,519
think everything that we do is helping

819
00:31:12,470 --> 00:31:09,760
to inform everything across the board

820
00:31:13,110 --> 00:31:12,480
uh we're we're working together always

821
00:31:15,110 --> 00:31:13,120
science and

822
00:31:17,190 --> 00:31:15,120
and exploration working hand in hand

823
00:31:18,630 --> 00:31:17,200
science enabling exploration exploration

824
00:31:20,389 --> 00:31:18,640
enabling science

825
00:31:21,830 --> 00:31:20,399
and certainly i think some of the things

826
00:31:25,029 --> 00:31:21,840
that we're we're going to be doing

827
00:31:28,549 --> 00:31:25,039
on mars um thinking about uh

828
00:31:30,230 --> 00:31:28,559
uh you know how to uh to

829
00:31:31,430 --> 00:31:30,240
make take advantage of resources that

830
00:31:32,630 --> 00:31:31,440
are local of course it'd be a little

831
00:31:33,990 --> 00:31:32,640
differently when we're

832
00:31:36,630 --> 00:31:34,000
talking about the moon but thinking

833
00:31:39,430 --> 00:31:36,640
about how we do this actually in situ

834
00:31:39,830 --> 00:31:39,440
are things that will feed forward so

835
00:31:42,230 --> 00:31:39,840
there's

836
00:31:43,029 --> 00:31:42,240
a lot we can do there working together i

837
00:31:44,870 --> 00:31:43,039
don't know that i have anything

838
00:31:46,710 --> 00:31:44,880

specifically as far as a direct

839
00:31:49,269 --> 00:31:46,720
link but as i said we work together

840
00:31:52,710 --> 00:31:49,279
really closely

841
00:31:54,870 --> 00:31:52,720
if i might ask a follow-up rimfax

842
00:31:56,310 --> 00:31:54,880
could you speak to rimfax and what it

843
00:31:57,990 --> 00:31:56,320
will what you'll be looking for with

844
00:32:01,029 --> 00:31:58,000
rimfax

845
00:32:02,950 --> 00:32:01,039
bet um so

846
00:32:04,549 --> 00:32:02,960
rimfax is a really uh interesting

847
00:32:05,990 --> 00:32:04,559
instrument that is actually a ground

848
00:32:09,110 --> 00:32:06,000
penetrating radar

849
00:32:11,269 --> 00:32:09,120
uh that's going to be able to uh see uh

850
00:32:13,110 --> 00:32:11,279
several feet uh tens of feet below the

851
00:32:14,789 --> 00:32:13,120
surface and that allows us to

852
00:32:16,549 --> 00:32:14,799
actually better understand what the

853
00:32:18,310 --> 00:32:16,559
structure is beneath

854
00:32:19,990 --> 00:32:18,320
the surface that we can see and that

855
00:32:22,230 --> 00:32:20,000
we're going to be driving over

856
00:32:24,389 --> 00:32:22,240
so like i said we know that there should

857
00:32:26,630 --> 00:32:24,399
be these sediments that will be present

858
00:32:28,149 --> 00:32:26,640
at the bottom you know beneath the the

859
00:32:29,750 --> 00:32:28,159
rover but somewhere beneath that we

860
00:32:31,350 --> 00:32:29,760
might be able to see what if there's any

861
00:32:33,509 --> 00:32:31,360
other geologic structure

862
00:32:35,430 --> 00:32:33,519
uh within those sediments or or maybe

863
00:32:38,070 --> 00:32:35,440

even the the base of those

864
00:32:39,110 --> 00:32:38,080
so using rem facts will be able to uh to

865
00:32:42,070 --> 00:32:39,120
better understand

866
00:32:44,389 --> 00:32:42,080
the the full three-dimensional uh scope

867
00:32:47,509 --> 00:32:44,399
of what the geology looks like in

868
00:32:49,990 --> 00:32:47,519
jezreel thank you

869
00:32:50,950 --> 00:32:50,000
thank you so much lori our third caller

870
00:32:55,190 --> 00:32:50,960
is a leo

871
00:32:57,509 --> 00:32:55,200
enright from irish television

872
00:32:58,230 --> 00:32:57,519
thanks very much uh marina i i was

873
00:33:02,549 --> 00:32:58,240
wondering

874
00:33:05,750 --> 00:33:02,559
um your mission is uh clearly to collect

875
00:33:09,110 --> 00:33:05,760
uh science but it is also to collect

876
00:33:11,509 --> 00:33:09,120
samples uh and i'm wondering how you

877
00:33:13,430 --> 00:33:11,519
balance the two

878
00:33:15,750 --> 00:33:13,440
in the old days back in apollo i was

879
00:33:18,310 --> 00:33:15,760
actually in the mission control center

880
00:33:20,549 --> 00:33:18,320
and there was somebody with a stopwatch

881
00:33:21,110 --> 00:33:20,559
timing the astronauts at each sample

882
00:33:23,430 --> 00:33:21,120
point

883
00:33:24,710 --> 00:33:23,440
and saying now you've done your time

884
00:33:26,470 --> 00:33:24,720
move on

885
00:33:28,789 --> 00:33:26,480
is there going to be that sort of

886
00:33:32,230 --> 00:33:28,799
pressure because you have in a sense the

887
00:33:34,149 --> 00:33:32,240
future looking over your shoulder

888
00:33:36,789 --> 00:33:34,159

i can take that one i'll take that one

889
00:33:39,110 --> 00:33:36,799
leo it's a very very good question

890
00:33:40,870 --> 00:33:39,120
and you're absolutely right there is

891
00:33:42,070 --> 00:33:40,880
some incredible science that we're going

892
00:33:45,110 --> 00:33:42,080
to be able to do

893
00:33:46,710 --> 00:33:45,120
while we're in situ the great science

894
00:33:48,630 --> 00:33:46,720
but one of the main objectives of this

895
00:33:50,630 --> 00:33:48,640
mission is to collect

896
00:33:52,149 --> 00:33:50,640
samples a diverse collection of

897
00:33:54,230 --> 00:33:52,159
scientific samples

898
00:33:55,990 --> 00:33:54,240
that can be collected by mars sample

899
00:33:57,750 --> 00:33:56,000
return and we do have those

900
00:33:59,830 --> 00:33:57,760
tubes with us we want to make sure that

901
00:34:02,789 --> 00:33:59,840
within our prime mission which is

902
00:34:03,509 --> 00:34:02,799
two earth years one mars year uh that we

903
00:34:06,310 --> 00:34:03,519
do collect

904
00:34:08,389 --> 00:34:06,320
a scientifically justifiable sample that

905
00:34:09,030 --> 00:34:08,399
allows us to return to mars and collect

906
00:34:10,790 --> 00:34:09,040
those

907
00:34:12,389 --> 00:34:10,800
so we will be doing science along the

908
00:34:14,869 --> 00:34:12,399
way we'll also be using

909
00:34:15,909 --> 00:34:14,879
our science instruments to help us best

910
00:34:17,510 --> 00:34:15,919
identify the

911
00:34:19,190 --> 00:34:17,520
the samples that we do want to collect

912
00:34:20,950 --> 00:34:19,200
and bring back to make sure that we are

913
00:34:21,990 --> 00:34:20,960

collecting a scientifically diverse set

914
00:34:23,750 --> 00:34:22,000
of samples

915
00:34:25,430 --> 00:34:23,760
um so i wouldn't say that the stopwatch

916
00:34:26,230 --> 00:34:25,440
is going to be on but we are actually

917
00:34:28,869 --> 00:34:26,240
keeping

918
00:34:29,669 --> 00:34:28,879
an eye on uh that we're making progress

919
00:34:33,669 --> 00:34:29,679
and

920
00:34:38,950 --> 00:34:33,679
many samples as we can in diverse

921
00:34:42,950 --> 00:34:40,790
thank you lori and thank you leo for

922
00:34:45,990 --> 00:34:42,960
calling in our next caller

923
00:34:48,790 --> 00:34:46,000
is peter warren with the star tribune

924
00:34:51,510 --> 00:34:48,800
good afternoon peter

925
00:34:53,829 --> 00:34:51,520
hi thanks for uh doing this there's just

926
00:34:56,149 --> 00:34:53,839
questions for sylvestre and sort of

927
00:34:57,270 --> 00:34:56,159
more about the process and working with

928
00:34:58,550 --> 00:34:57,280
people than the actual

929
00:35:01,030 --> 00:34:58,560
you know science you know what was it

930
00:35:06,550 --> 00:35:01,040
like collaborating with with roger

931
00:35:10,390 --> 00:35:08,630
well uh thanks so much i'm not sure i

932
00:35:11,910 --> 00:35:10,400
got all the questions i'm sorry for that

933
00:35:13,349 --> 00:35:11,920
could you repeat the last part of your

934
00:35:15,510 --> 00:35:13,359
question

935
00:35:16,710 --> 00:35:15,520
yeah what was it like collaborating with

936
00:35:21,030 --> 00:35:16,720
with roger

937
00:35:24,230 --> 00:35:21,040
on on the supercam oh that's an easy one

938
00:35:26,710 --> 00:35:24,240

it was great uh you know this kind of

939
00:35:28,230 --> 00:35:26,720
project between two countries that are

940
00:35:29,670 --> 00:35:28,240
so complex

941
00:35:31,990 --> 00:35:29,680
you need to have an excellent

942
00:35:33,670 --> 00:35:32,000
relationship between the people first

943
00:35:35,030 --> 00:35:33,680
so with roger wins we've been

944
00:35:38,150 --> 00:35:35,040
collaborating together

945
00:35:40,790 --> 00:35:38,160
for the last 20 years i guess

946
00:35:41,750 --> 00:35:40,800
uh first on chemcam now on supercam and

947
00:35:44,950 --> 00:35:41,760
we have

948
00:35:48,230 --> 00:35:44,960
a future project hopefully so it's

949
00:35:49,750 --> 00:35:48,240
it's fairly easy the trick was for us to

950
00:35:50,230 --> 00:35:49,760
have an instrument that you could define

951
00:35:53,430 --> 00:35:50,240
on very

952
00:35:56,710 --> 00:35:53,440
on different parts uh we took in france

953
00:35:58,550 --> 00:35:56,720
the upper part on the mast with simple

954
00:36:00,870 --> 00:35:58,560
interfaces with a rover

955
00:36:01,829 --> 00:36:00,880
and just one link to the body unit and

956
00:36:03,670 --> 00:36:01,839
they take care

957
00:36:05,190 --> 00:36:03,680
and roger takes care of talking to the

958
00:36:07,030 --> 00:36:05,200
rover so you define

959
00:36:09,109 --> 00:36:07,040
your interface of your hardware you have

960
00:36:09,990 --> 00:36:09,119
a good relationship and life is easy

961
00:36:16,069 --> 00:36:10,000
honestly

962
00:36:19,109 --> 00:36:17,270
well thank you so much for that

963
00:36:20,390 --> 00:36:19,119

sylvester and thank you to peter for

964
00:36:21,829 --> 00:36:20,400
calling in now we're going to switch

965
00:36:23,990 --> 00:36:21,839
over to social media

966
00:36:25,829 --> 00:36:24,000
remember you can ask questions on our

967
00:36:26,870 --> 00:36:25,839
social media platform by using the

968
00:36:29,990 --> 00:36:26,880
hashtag

969
00:36:33,270 --> 00:36:30,000
countdown to mars the first question

970
00:36:34,870 --> 00:36:33,280
is carol on facebook she asks does any

971
00:36:38,630 --> 00:36:34,880
of the science in the mars

972
00:36:41,349 --> 00:36:38,640
2020 mission give insight to benefit

973
00:36:43,109 --> 00:36:41,359
human health luther would you like to

974
00:36:44,790 --> 00:36:43,119
take that

975
00:36:47,349 --> 00:36:44,800
oh i've never been asked that question

976
00:36:47,910 --> 00:36:47,359
before um i think that a lot of what we

977
00:36:51,670 --> 00:36:47,920
do

978
00:36:54,310 --> 00:36:51,680
we're trying to

979
00:36:55,190 --> 00:36:54,320
make portable and miniaturized and

980
00:36:58,870 --> 00:36:55,200
different

981
00:37:00,550 --> 00:36:58,880
which you can easily

982
00:37:02,150 --> 00:37:00,560
move out into the commercial field i

983
00:37:03,910 --> 00:37:02,160
know that a lot of

984
00:37:05,349 --> 00:37:03,920
what we're doing on mars and what we did

985
00:37:07,430 --> 00:37:05,359
for sherlock can

986
00:37:09,190 --> 00:37:07,440
it is going to be integrated into uh

987
00:37:11,670 --> 00:37:09,200
food chains to understand

988
00:37:13,670 --> 00:37:11,680

whether there's contamination um whether

989
00:37:14,710 --> 00:37:13,680
there's insects uh contamination and

990
00:37:17,670 --> 00:37:14,720
things like that

991
00:37:19,510 --> 00:37:17,680
and that really does uh does it plays a

992
00:37:21,190 --> 00:37:19,520
part it's commercialization

993
00:37:23,829 --> 00:37:21,200
the laser that we developed will get

994
00:37:25,910 --> 00:37:23,839
smaller and more robust and be able to

995
00:37:27,430 --> 00:37:25,920
fit in food trucks and things like that

996
00:37:29,990 --> 00:37:27,440
and i think every instrument

997
00:37:31,349 --> 00:37:30,000
probably can tell that same story thank

998
00:37:34,390 --> 00:37:31,359
you luther

999
00:37:35,109 --> 00:37:34,400
conrad on facebook asks when can we see

1000
00:37:37,829 --> 00:37:35,119
the first

1001
00:37:40,630 --> 00:37:37,839
video and pictures from landing do you

1002
00:37:43,829 --> 00:37:40,640
want to take that jim

1003
00:37:44,310 --> 00:37:43,839
sure so everything goes according to

1004
00:37:46,790 --> 00:37:44,320
plan

1005
00:37:47,349 --> 00:37:46,800
on thursday it's possible we could get

1006
00:37:51,109 --> 00:37:47,359
the

1007
00:37:53,430 --> 00:37:51,119
wide angle

1008
00:37:54,950 --> 00:37:53,440
images uh down in that very first

1009
00:37:56,390 --> 00:37:54,960
downlink of course you know we don't

1010
00:37:57,109 --> 00:37:56,400
know exactly how everything's going to

1011
00:37:59,670 --> 00:37:57,119
go

1012
00:38:01,430 --> 00:37:59,680
uh but if if not then and there's uh i

1013
00:38:02,470 --> 00:38:01,440

believe mars odyssey pass just a few

1014
00:38:04,230 --> 00:38:02,480
hours after

1015
00:38:05,910 --> 00:38:04,240
landing maybe three hours or so that

1016
00:38:07,030 --> 00:38:05,920
could provide an opportunity for some of

1017
00:38:09,030 --> 00:38:07,040
the first images

1018
00:38:12,470 --> 00:38:09,040
and you know we land with the the mast

1019
00:38:15,109 --> 00:38:12,480
down tucked onto the deck for safety

1020
00:38:16,950 --> 00:38:15,119
and so we won't pop that that mast up

1021
00:38:19,270 --> 00:38:16,960
for a day or two

1022
00:38:22,150 --> 00:38:19,280
and then once we do that then the mass

1023
00:38:24,310 --> 00:38:22,160
cam z's the navigation cameras supercam

1024
00:38:26,310 --> 00:38:24,320
uh can really start to see the uh the

1025
00:38:29,190 --> 00:38:26,320
surroundings in the landscape so

1026
00:38:30,150 --> 00:38:29,200
i would i would expect and certainly in

1027
00:38:32,710 --> 00:38:30,160
planning

1028
00:38:34,710 --> 00:38:32,720
uh that uh sort of over the over the

1029
00:38:37,270 --> 00:38:34,720
course of the weekend as various

1030
00:38:38,390 --> 00:38:37,280
press conferences and other events uh go

1031
00:38:40,470 --> 00:38:38,400
on with updates

1032
00:38:41,910 --> 00:38:40,480
on the mission that the imaging data

1033
00:38:45,190 --> 00:38:41,920
will start to roll out

1034
00:38:47,030 --> 00:38:45,200
uh pretty quickly also as part of that

1035
00:38:48,390 --> 00:38:47,040
those early downlinks some of that some

1036
00:38:49,510 --> 00:38:48,400
of the movies that the cameras are

1037
00:38:51,829 --> 00:38:49,520
taking as

1038
00:38:53,030 --> 00:38:51,839

the rover comes down there are there are

1039
00:38:55,829 --> 00:38:53,040
video cameras

1040
00:38:57,349 --> 00:38:55,839
that are recording the parachute uh uh

1041
00:38:59,109 --> 00:38:57,359
from the rover looking up that are

1042
00:39:01,349 --> 00:38:59,119
recording the rover from the

1043
00:39:03,589 --> 00:39:01,359
descent stage looking down that are

1044
00:39:06,390 --> 00:39:03,599
recording the ground getting closer

1045
00:39:08,230 --> 00:39:06,400
as we get uh closer to the surface parts

1046
00:39:11,190 --> 00:39:08,240
of those movies could start coming down

1047
00:39:12,470 --> 00:39:11,200
within the first few days as well and

1048
00:39:13,030 --> 00:39:12,480
then looking a little bit into the

1049
00:39:15,589 --> 00:39:13,040
future

1050
00:39:17,670 --> 00:39:15,599
as we get preparing for the helicopter

1051
00:39:18,390 --> 00:39:17,680
operations we'll be using the mass cam z

1052
00:39:20,710 --> 00:39:18,400
cameras

1053
00:39:23,190 --> 00:39:20,720
to take movies of the helicopter flights

1054
00:39:24,870 --> 00:39:23,200
and i'm really excited about uh doing

1055
00:39:26,390 --> 00:39:24,880
that and sharing those movies

1056
00:39:28,470 --> 00:39:26,400
with the public as well as of course

1057
00:39:30,230 --> 00:39:28,480
with the engineering team

1058
00:39:32,069 --> 00:39:30,240
we are all getting excited to see that

1059
00:39:33,349 --> 00:39:32,079
for sure thank you jim we have a

1060
00:39:35,589 --> 00:39:33,359
follow-up question

1061
00:39:36,390 --> 00:39:35,599
from leo and wright with irish

1062
00:39:39,349 --> 00:39:36,400
television

1063
00:39:40,310 --> 00:39:39,359

good afternoon leo yeah thanks sir

1064
00:39:42,550 --> 00:39:40,320
thanks again

1065
00:39:43,589 --> 00:39:42,560
um just actually for jim bell you just

1066
00:39:47,829 --> 00:39:43,599
mentioned uh

1067
00:39:49,589 --> 00:39:47,839
the uh the helicopter uh how quickly

1068
00:39:51,109 --> 00:39:49,599
is this gonna happen what they call

1069
00:39:54,390 --> 00:39:51,119
their uh

1070
00:39:55,030 --> 00:39:54,400
their right moment um is that is that

1071
00:39:58,150 --> 00:39:55,040
gonna happen

1072
00:39:59,829 --> 00:39:58,160
very quickly uh

1073
00:40:01,430 --> 00:39:59,839
i i think it'll it's going to happen

1074
00:40:04,470 --> 00:40:01,440
early in the mission

1075
00:40:06,550 --> 00:40:04,480
uh you know it's going to take some many

1076
00:40:08,470 --> 00:40:06,560
days perhaps several weeks for the

1077
00:40:09,589 --> 00:40:08,480
engineers to do all the checkouts that

1078
00:40:12,630 --> 00:40:09,599
are required

1079
00:40:14,309 --> 00:40:12,640
of the basic rover systems themselves

1080
00:40:16,470 --> 00:40:14,319
as well as the scientific instruments

1081
00:40:18,390 --> 00:40:16,480
all that has to happen first the sort of

1082
00:40:20,630 --> 00:40:18,400
initial checkout phase

1083
00:40:22,230 --> 00:40:20,640
of the mission and the helicopter folks

1084
00:40:24,150 --> 00:40:22,240
are also doing some checkouts of the

1085
00:40:24,790 --> 00:40:24,160
helicopter and its battery and its

1086
00:40:27,430 --> 00:40:24,800
systems

1087
00:40:28,710 --> 00:40:27,440
while it's still attached to the rover

1088
00:40:30,230 --> 00:40:28,720

and then

1089
00:40:32,069 --> 00:40:30,240
as you may have seen in the previous

1090
00:40:35,430 --> 00:40:32,079
press briefing it's a

1091
00:40:37,589 --> 00:40:35,440
multi-day process multi-sol process

1092
00:40:39,430 --> 00:40:37,599
on mars to release the helicopter

1093
00:40:41,990 --> 00:40:39,440
release its shield

1094
00:40:43,510 --> 00:40:42,000
protective shield and then deploy it

1095
00:40:44,950 --> 00:40:43,520
onto the surface and then the rover

1096
00:40:46,710 --> 00:40:44,960
backs away and there's a bunch of

1097
00:40:49,190 --> 00:40:46,720
checkouts that happen there

1098
00:40:51,510 --> 00:40:49,200
so i would anticipate it could be you

1099
00:40:53,030 --> 00:40:51,520
know many weeks to perhaps even a month

1100
00:40:55,589 --> 00:40:53,040
into the mission

1101
00:40:57,589 --> 00:40:55,599
before we get to those first flights but

1102
00:41:00,069 --> 00:40:57,599
it's all going to depend on

1103
00:41:01,109 --> 00:41:00,079
the reality on the ground on how

1104
00:41:03,030 --> 00:41:01,119
everything has

1105
00:41:05,030 --> 00:41:03,040
is checking out during those initial

1106
00:41:08,230 --> 00:41:05,040
days

1107
00:41:09,829 --> 00:41:08,240
thank you jim and now we're going back

1108
00:41:13,190 --> 00:41:09,839
to social media

1109
00:41:15,990 --> 00:41:13,200
spiffybilly on instagram asks

1110
00:41:17,270 --> 00:41:16,000
what is the first science experiment to

1111
00:41:22,550 --> 00:41:17,280
be conducted

1112
00:41:27,109 --> 00:41:25,910
sure uh well as you've heard a number of

1113
00:41:29,670 --> 00:41:27,119

times now the

1114
00:41:30,950 --> 00:41:29,680
the first weeks of the mission uh are

1115
00:41:33,109 --> 00:41:30,960
about checking out

1116
00:41:35,190 --> 00:41:33,119
all the systems uh the engineering

1117
00:41:36,470 --> 00:41:35,200
systems that are required to make the

1118
00:41:39,589 --> 00:41:36,480
rover run

1119
00:41:41,430 --> 00:41:39,599
uh and the the engineering aspects of

1120
00:41:44,710 --> 00:41:41,440
the science system so the inter

1121
00:41:46,790 --> 00:41:44,720
instruments are being tested um as we

1122
00:41:49,030 --> 00:41:46,800
test the instruments out just to make

1123
00:41:51,510 --> 00:41:49,040
sure that they're functioning correctly

1124
00:41:53,349 --> 00:41:51,520
we will of course have an opportunity

1125
00:41:56,309 --> 00:41:53,359
for instance the first time we

1126
00:41:57,109 --> 00:41:56,319
we test out the supercam laser we will

1127
00:41:59,510 --> 00:41:57,119
be

1128
00:42:01,349 --> 00:41:59,520
interested to to hit a specific target

1129
00:42:02,069 --> 00:42:01,359
and we'll start to get some science data

1130
00:42:03,589 --> 00:42:02,079
in

1131
00:42:05,270 --> 00:42:03,599
but you asked the first science

1132
00:42:07,349 --> 00:42:05,280
experiment and to me

1133
00:42:09,030 --> 00:42:07,359
it's the the first images that come down

1134
00:42:11,430 --> 00:42:09,040
i mean as soon as we get

1135
00:42:12,950 --> 00:42:11,440
data uh image data really from the

1136
00:42:15,589 --> 00:42:12,960
surface we can start

1137
00:42:16,790 --> 00:42:15,599
making scientific interpretations uh so

1138
00:42:19,829 --> 00:42:16,800

not only is it this

1139
00:42:21,990 --> 00:42:19,839
sort of incredibly inspiring moment

1140
00:42:23,430 --> 00:42:22,000
uh to me anyway when we see the first

1141
00:42:25,829 --> 00:42:23,440
images from a

1142
00:42:26,950 --> 00:42:25,839
another body in the solar system or

1143
00:42:28,470 --> 00:42:26,960
another place

1144
00:42:30,550 --> 00:42:28,480
you know on a planet we've visited

1145
00:42:33,270 --> 00:42:30,560
before it's just such a thrilling thing

1146
00:42:35,910 --> 00:42:33,280
but there's also science to be gained

1147
00:42:39,670 --> 00:42:37,750
thank you so much for that and now we're

1148
00:42:42,950 --> 00:42:39,680
headed back to the phone

1149
00:42:46,390 --> 00:42:42,960
ken creamer from space up close

1150
00:42:47,829 --> 00:42:46,400
good afternoon ken hi thank you for

1151
00:42:48,470 --> 00:42:47,839
taking my question and thank you for

1152
00:42:50,870 --> 00:42:48,480
doing this

1153
00:42:52,230 --> 00:42:50,880
um my simplest uh my question is about

1154
00:42:54,550 --> 00:42:52,240
uh taking these uh

1155
00:42:56,069 --> 00:42:54,560
samples you're gonna put in the drill

1156
00:42:57,910 --> 00:42:56,079
can you talk a little bit about

1157
00:42:59,990 --> 00:42:57,920
how the team is to work together and

1158
00:43:02,069 --> 00:43:00,000
which instruments they're going to use

1159
00:43:03,030 --> 00:43:02,079
to figure out which which samples to

1160
00:43:06,230 --> 00:43:03,040
drill

1161
00:43:08,150 --> 00:43:06,240
and to cash and and how many samples do

1162
00:43:12,870 --> 00:43:08,160
you plan to take in the first

1163
00:43:17,030 --> 00:43:12,880

mars year thanks

1164
00:43:19,270 --> 00:43:17,040
ken yeah so

1165
00:43:20,069 --> 00:43:19,280
another great question it's it's similar

1166
00:43:22,390 --> 00:43:20,079
to the one

1167
00:43:24,150 --> 00:43:22,400
that laurie took earlier uh looking at

1168
00:43:27,030 --> 00:43:24,160
the balance between

1169
00:43:28,550 --> 00:43:27,040
uh as the previous person said sort of

1170
00:43:30,870 --> 00:43:28,560
science and sampling

1171
00:43:31,750 --> 00:43:30,880
of course the samples you know the time

1172
00:43:33,670 --> 00:43:31,760
we spend

1173
00:43:36,470 --> 00:43:33,680
uh collecting the samples and

1174
00:43:38,309 --> 00:43:36,480
documenting them very specifically

1175
00:43:40,790 --> 00:43:38,319
is obviously uh in the interest of

1176
00:43:41,589 --> 00:43:40,800
science so those samples are scientific

1177
00:43:45,430 --> 00:43:41,599
samples

1178
00:43:48,550 --> 00:43:45,440
um a large part of the science we do

1179
00:43:50,550 --> 00:43:48,560
while we're not you know actively uh

1180
00:43:52,150 --> 00:43:50,560
collecting a sample or in the in the few

1181
00:43:55,030 --> 00:43:52,160
days leading up to that

1182
00:43:57,430 --> 00:43:55,040
um is science that we're doing to

1183
00:44:00,550 --> 00:43:57,440
provide context for those samples

1184
00:44:02,630 --> 00:44:00,560
and so um i i will just say that on this

1185
00:44:05,990 --> 00:44:02,640
mission we've known from very early on

1186
00:44:08,150 --> 00:44:06,000
early in our development that um we had

1187
00:44:09,829 --> 00:44:08,160
major challenges in front of us in terms

1188
00:44:12,710 --> 00:44:09,839

of our operations

1189
00:44:14,790 --> 00:44:12,720
planning and and this is because we we

1190
00:44:16,950 --> 00:44:14,800
have tried from the very beginning

1191
00:44:18,309 --> 00:44:16,960
to pack in an enormous amount of

1192
00:44:21,510 --> 00:44:18,319
capability

1193
00:44:21,990 --> 00:44:21,520
um to do things really well and to do

1194
00:44:24,870 --> 00:44:22,000
things

1195
00:44:26,230 --> 00:44:24,880
really quickly because this opportunity

1196
00:44:29,030 --> 00:44:26,240
to

1197
00:44:29,589 --> 00:44:29,040
select scientifically and collect and

1198
00:44:33,589 --> 00:44:29,599
return

1199
00:44:35,750 --> 00:44:33,599
samples from mars is so extraordinary

1200
00:44:37,190 --> 00:44:35,760
that that we want to be able to really

1201
00:44:39,829 --> 00:44:37,200
make it as rich

1202
00:44:42,630 --> 00:44:39,839
uh a mission as possible and so we've

1203
00:44:45,190 --> 00:44:42,640
been planning from very early on

1204
00:44:46,950 --> 00:44:45,200
um strategically if you like it was a

1205
00:44:48,950 --> 00:44:46,960
four or five year process

1206
00:44:50,950 --> 00:44:48,960
that led us to select our landing site

1207
00:44:52,470 --> 00:44:50,960
that was all part of the planning

1208
00:44:54,150 --> 00:44:52,480
and then once we have the landing site

1209
00:44:56,150 --> 00:44:54,160
we could use the science team to

1210
00:44:57,349 --> 00:44:56,160
to plan uh strategically more

1211
00:44:59,430 --> 00:44:57,359
specifically

1212
00:45:01,349 --> 00:44:59,440
and so as we did that we would often go

1213
00:45:03,270 --> 00:45:01,359

back to this quote that's attributed to

1214
00:45:05,670 --> 00:45:03,280
eisenhower that's something like

1215
00:45:06,309 --> 00:45:05,680
i've always found when going into battle

1216
00:45:08,230 --> 00:45:06,319
that

1217
00:45:09,430 --> 00:45:08,240
plans are useless but planning is

1218
00:45:12,950 --> 00:45:09,440
indispensable

1219
00:45:14,230 --> 00:45:12,960
and so so we we know that all this

1220
00:45:17,109 --> 00:45:14,240
planning effort

1221
00:45:19,510 --> 00:45:17,119
is indispensable we have to do it it

1222
00:45:20,470 --> 00:45:19,520
helps us get better at refining our

1223
00:45:22,150 --> 00:45:20,480
processes

1224
00:45:23,589 --> 00:45:22,160
and finding that balance that we

1225
00:45:25,670 --> 00:45:23,599
mentioned earlier

1226
00:45:27,510 --> 00:45:25,680
the time we spend with the stopwatch on

1227
00:45:29,589 --> 00:45:27,520
collecting the samples and the time

1228
00:45:31,430 --> 00:45:29,599
we allow ourselves to be driven a little

1229
00:45:33,430 --> 00:45:31,440
bit more by our curiosity and letting

1230
00:45:36,230 --> 00:45:33,440
this discovery lead us to the next

1231
00:45:38,230 --> 00:45:36,240
we have to do both of those things uh to

1232
00:45:40,550 --> 00:45:38,240
make the best of this opportunity and

1233
00:45:41,430 --> 00:45:40,560
and really it comes down to the time we

1234
00:45:43,829 --> 00:45:41,440
spend planning

1235
00:45:45,990 --> 00:45:43,839
and then our ability to flexibly adapt

1236
00:45:49,349 --> 00:45:46,000
as mars inevitably throws surprises

1237
00:45:51,750 --> 00:45:49,359
at us thank you so much ken

1238
00:45:53,589 --> 00:45:51,760

back you also sorry you also asked how

1239
00:45:56,470 --> 00:45:53,599
many samples we're planning to collect

1240
00:45:57,270 --> 00:45:56,480
which is a key question so we have 43

1241
00:45:59,589 --> 00:45:57,280
sample tubes

1242
00:46:00,550 --> 00:45:59,599
on board so we we hope to collect you

1243
00:46:03,349 --> 00:46:00,560
know 40

1244
00:46:03,750 --> 00:46:03,359
around 40 samples but but the idea is

1245
00:46:06,390 --> 00:46:03,760
that

1246
00:46:08,069 --> 00:46:06,400
30 samples uh could be returned those

1247
00:46:10,790 --> 00:46:08,079
return missions which are you know

1248
00:46:12,710 --> 00:46:10,800
not final yet completely but but that's

1249
00:46:15,349 --> 00:46:12,720
the the capability that nasa is looking

1250
00:46:17,829 --> 00:46:15,359
at right now is the ability to return 30

1251
00:46:22,069 --> 00:46:20,630
thank you so much next question is

1252
00:46:24,550 --> 00:46:22,079
coming from social media

1253
00:46:27,030 --> 00:46:24,560
a mall on twitter asks how will the

1254
00:46:30,710 --> 00:46:27,040
microphone help you in exploring

1255
00:46:33,589 --> 00:46:30,720
mars can you take that sylvester

1256
00:46:34,150 --> 00:46:33,599
oh yes i can because that's an excellent

1257
00:46:36,069 --> 00:46:34,160
question

1258
00:46:37,270 --> 00:46:36,079
because it's the first time we're having

1259
00:46:39,829 --> 00:46:37,280
microphones

1260
00:46:40,790 --> 00:46:39,839
on mars has been tried few times never

1261
00:46:43,829 --> 00:46:40,800
really

1262
00:46:47,030 --> 00:46:43,839
time we have two

1263
00:46:49,190 --> 00:46:47,040

so one of them is mostly technology is

1264
00:46:51,670 --> 00:46:49,200
going to recall the lending

1265
00:46:52,630 --> 00:46:51,680
and that is important and if it works

1266
00:46:54,309 --> 00:46:52,640
after we learn

1267
00:46:57,270 --> 00:46:54,319
is going to be used for science of

1268
00:47:00,790 --> 00:46:57,280
course the other one is part of supercam

1269
00:47:02,550 --> 00:47:00,800
the id is it it's happening in a world

1270
00:47:04,710 --> 00:47:02,560
where we know there are sounds because

1271
00:47:06,309 --> 00:47:04,720
we produce sounds rather produce some

1272
00:47:08,470 --> 00:47:06,319
laser produce sounds

1273
00:47:10,710 --> 00:47:08,480
but there are also winds different types

1274
00:47:11,190 --> 00:47:10,720
of winds that create turbulence that's

1275
00:47:15,030 --> 00:47:11,200
one

1276
00:47:17,349 --> 00:47:15,040
atmosphere that propagates

1277
00:47:19,190 --> 00:47:17,359
the sun's it does not propagate very

1278
00:47:20,470 --> 00:47:19,200
fast actually it's slower than earth it

1279
00:47:23,030 --> 00:47:20,480
doesn't matter so much

1280
00:47:24,470 --> 00:47:23,040
it's also dimmer it's very loud and the

1281
00:47:27,829 --> 00:47:24,480
high pitch

1282
00:47:30,230 --> 00:47:27,839
sounds don't propagate very well but

1283
00:47:31,430 --> 00:47:30,240
put everything together yes we will hear

1284
00:47:33,190 --> 00:47:31,440
some new sounds

1285
00:47:34,390 --> 00:47:33,200
with the atmosphere we're going to the

1286
00:47:36,630 --> 00:47:34,400
wind we're going to learn about the

1287
00:47:36,950 --> 00:47:36,640
atmosphere turbulence the convections on

1288
00:47:43,990 --> 00:47:36,960

a

1289
00:47:47,430 --> 00:47:44,000
it's like

1290
00:47:49,750 --> 00:47:47,440
knocking on the wood on on whatever

1291
00:47:51,030 --> 00:47:49,760
concrete you have by just listening to

1292
00:47:54,069 --> 00:47:51,040
this uh

1293
00:47:55,030 --> 00:47:54,079
zap we can infer what is the hardness of

1294
00:47:57,829 --> 00:47:55,040
the rocks so

1295
00:47:58,549 --> 00:47:57,839
it's it's a new place and a new place to

1296
00:48:00,150 --> 00:47:58,559
here

1297
00:48:02,390 --> 00:48:00,160
and we're really excited with these two

1298
00:48:04,630 --> 00:48:02,400
microphones

1299
00:48:05,589 --> 00:48:04,640
thank you sylvester we go back to the

1300
00:48:07,510 --> 00:48:05,599
phone lines

1301
00:48:10,870 --> 00:48:07,520
with a follow-up question from leo

1302
00:48:12,870 --> 00:48:10,880
enright with irish television leo

1303
00:48:14,309 --> 00:48:12,880
uh thanks very thanks very much uh

1304
00:48:17,109 --> 00:48:14,319
marina sorry for

1305
00:48:19,589 --> 00:48:17,119
for uh dominating but uh since the

1306
00:48:20,790 --> 00:48:19,599
opportunity is here i wanted to ask dr

1307
00:48:23,750 --> 00:48:20,800
maurice

1308
00:48:25,589 --> 00:48:23,760
about the french operations center for

1309
00:48:28,950 --> 00:48:25,599
science and exploration

1310
00:48:31,109 --> 00:48:28,960
i i think the acronym is foxy um

1311
00:48:32,230 --> 00:48:31,119
can you talk a little bit about how that

1312
00:48:35,349 --> 00:48:32,240
is going to operate

1313
00:48:36,549 --> 00:48:35,359

uh during the the time that the rover is

1314
00:48:38,950 --> 00:48:36,559
on mars and

1315
00:48:39,750 --> 00:48:38,960
uh you know what opportunities are there

1316
00:48:43,349 --> 00:48:39,760
for young

1317
00:48:45,829 --> 00:48:43,359
europeans uh uh french obviously but

1318
00:48:46,790 --> 00:48:45,839
also germans and even irish to get

1319
00:48:52,069 --> 00:48:46,800
involved

1320
00:48:55,829 --> 00:48:53,990
well uh thanks for this uh great

1321
00:48:57,829 --> 00:48:55,839
question and i mean

1322
00:48:59,750 --> 00:48:57,839
and norway could introduce that it's an

1323
00:49:01,510 --> 00:48:59,760
international i mean it's a nasa

1324
00:49:03,510 --> 00:49:01,520
mission but with an international

1325
00:49:06,549 --> 00:49:03,520
partnership and to build the

1326
00:49:07,670 --> 00:49:06,559
instrument to do the science but also to

1327
00:49:11,030 --> 00:49:07,680
operate

1328
00:49:14,069 --> 00:49:11,040
operations center

1329
00:49:16,630 --> 00:49:14,079
here in toulouse at canest and that it

1330
00:49:17,349 --> 00:49:16,640
is to support supercam operation but you

1331
00:49:19,829 --> 00:49:17,359
know when you

1332
00:49:20,630 --> 00:49:19,839
operate supercab you need resources from

1333
00:49:22,470 --> 00:49:20,640
the rover

1334
00:49:23,990 --> 00:49:22,480
you need to find what jim is doing with

1335
00:49:25,589 --> 00:49:24,000
this camera at the same time because

1336
00:49:28,309 --> 00:49:25,599
we're sharing the same mast

1337
00:49:30,710 --> 00:49:28,319
so operating an instrument it's kind of

1338
00:49:32,150 --> 00:49:30,720

being part of big game operating the

1339
00:49:33,430 --> 00:49:32,160
whole rover together

1340
00:49:35,670 --> 00:49:33,440
and for that reason we have an

1341
00:49:36,150 --> 00:49:35,680
operational center in france for super

1342
00:49:37,910 --> 00:49:36,160
cam

1343
00:49:39,670 --> 00:49:37,920
every other week rest of the time it's

1344
00:49:40,309 --> 00:49:39,680
in los alamos because we also need to

1345
00:49:42,150 --> 00:49:40,319
rest

1346
00:49:44,470 --> 00:49:42,160
but there's an operational center at gm

1347
00:49:46,230 --> 00:49:44,480
place and at jpl

1348
00:49:49,030 --> 00:49:46,240
in early europe we have another one in

1349
00:49:51,829 --> 00:49:49,040
spain for the meda instrument in norway

1350
00:49:52,309 --> 00:49:51,839
so everywhere we are operation center of

1351
00:49:55,349 --> 00:49:52,319
course

1352
00:49:56,230 --> 00:49:55,359
it is for the team we are welcoming our

1353
00:49:58,230 --> 00:49:56,240
students

1354
00:49:59,910 --> 00:49:58,240
it's a great way for them to learn how

1355
00:50:02,390 --> 00:49:59,920
we operate a spacecraft

1356
00:50:03,109 --> 00:50:02,400
and it is by operating a spacecraft an

1357
00:50:05,670 --> 00:50:03,119
instrument

1358
00:50:06,309 --> 00:50:05,680
you can really dive into the science and

1359
00:50:08,870 --> 00:50:06,319
that's

1360
00:50:09,589 --> 00:50:08,880
really the spirit of this mission that

1361
00:50:11,750 --> 00:50:09,599
everyone

1362
00:50:14,150 --> 00:50:11,760
who is doing science should try if

1363
00:50:16,150 --> 00:50:14,160

possible to be part of the ops

1364
00:50:17,990 --> 00:50:16,160
process because that's that's where you

1365
00:50:18,470 --> 00:50:18,000
define what kind of science you want to

1366
00:50:20,790 --> 00:50:18,480
do

1367
00:50:21,589 --> 00:50:20,800
can be in europe it can be everywhere in

1368
00:50:25,990 --> 00:50:21,599
the us

1369
00:50:27,910 --> 00:50:26,000
it's all together

1370
00:50:29,670 --> 00:50:27,920
thank you so much sylvester and on that

1371
00:50:32,630 --> 00:50:29,680
line of inspiring the next

1372
00:50:34,390 --> 00:50:32,640
generation christina on facebook asks

1373
00:50:35,109 --> 00:50:34,400
how will you be inspiring school

1374
00:50:37,589 --> 00:50:35,119
children

1375
00:50:39,510 --> 00:50:37,599
and in particular girls into science

1376
00:50:40,630 --> 00:50:39,520
through perseverance lori can you take

1377
00:50:51,589 --> 00:50:40,640
that

1378
00:50:53,990 --> 00:50:51,599
is absolutely inspirational and

1379
00:50:56,069 --> 00:50:54,000
certainly uh you know perseverance rover

1380
00:50:58,069 --> 00:50:56,079
is no exception an ingenuity helicopter

1381
00:51:00,470 --> 00:50:58,079
as well no exception these are

1382
00:51:01,750 --> 00:51:00,480
absolutely inspirational and so i

1383
00:51:03,349 --> 00:51:01,760
certainly encourage

1384
00:51:05,270 --> 00:51:03,359
anyone that's out there to make sure you

1385
00:51:05,910 --> 00:51:05,280
check out we've got materials that are

1386
00:51:09,670 --> 00:51:05,920
available

1387
00:51:13,109 --> 00:51:09,680
online at go.nasa.gov

1388
00:51:14,390 --> 00:51:13,119

mars toolkit i believe and make sure you

1389
00:51:16,150 --> 00:51:14,400
check that out because

1390
00:51:17,750 --> 00:51:16,160
i'm sorry stem toolkit i think it's the

1391
00:51:19,349 --> 00:51:17,760
mars stem toolkit

1392
00:51:21,510 --> 00:51:19,359
and and make sure you check that out

1393
00:51:23,349 --> 00:51:21,520
there's all kinds of ways for

1394
00:51:24,630 --> 00:51:23,359
students around the world to get engaged

1395
00:51:27,589 --> 00:51:24,640
through the the mars

1396
00:51:28,470 --> 00:51:27,599
perseverance challenge get engaged there

1397
00:51:30,150 --> 00:51:28,480
there's

1398
00:51:32,230 --> 00:51:30,160
lots and lots of opportunities for

1399
00:51:34,790 --> 00:51:32,240
engagement and to get involved

1400
00:51:35,270 --> 00:51:34,800
with nasa and come along with us as we

1401
00:51:37,030 --> 00:51:35,280
as we

1402
00:51:40,150 --> 00:51:37,040
go through this incredibly exciting time

1403
00:51:42,470 --> 00:51:40,160
to land but also as we go forward

1404
00:51:44,790 --> 00:51:42,480
stay engaged and and follow us as we

1405
00:51:46,950 --> 00:51:44,800
explore mars

1406
00:51:48,870 --> 00:51:46,960
thank you lori and another question for

1407
00:51:51,109 --> 00:51:48,880
you from citizen science

1408
00:51:53,190 --> 00:51:51,119
are you going to accept volunteers to

1409
00:51:55,270 --> 00:51:53,200
analyze information we get from the

1410
00:51:58,390 --> 00:51:55,280
rover

1411
00:51:59,829 --> 00:51:58,400
i can take that one as well there are

1412
00:52:02,150 --> 00:51:59,839
always opportunities

1413
00:52:03,109 --> 00:52:02,160

for citizen science and this is another

1414
00:52:05,990 --> 00:52:03,119
area that

1415
00:52:07,910 --> 00:52:06,000
we are really excited about the

1416
00:52:09,589 --> 00:52:07,920
incredible discoveries that citizen

1417
00:52:09,829 --> 00:52:09,599
scientists are making across the board

1418
00:52:15,910 --> 00:52:09,839
in

1419
00:52:17,270 --> 00:52:15,920
tons of data available through through

1420
00:52:18,950 --> 00:52:17,280
this mission

1421
00:52:20,390 --> 00:52:18,960
and i'm sure that there will be

1422
00:52:21,589 --> 00:52:20,400
opportunities i don't know of them

1423
00:52:23,030 --> 00:52:21,599
specifically that i can

1424
00:52:24,710 --> 00:52:23,040
cite right now but i know that there

1425
00:52:25,829 --> 00:52:24,720
will be specific opportunities and i

1426
00:52:27,349 --> 00:52:25,839
don't know if any of the instrument

1427
00:52:29,030 --> 00:52:27,359
folks that are online with us know of

1428
00:52:30,470 --> 00:52:29,040
anything related to their instruments

1429
00:52:31,750 --> 00:52:30,480
they might want to share

1430
00:52:33,349 --> 00:52:31,760
but i know that there's going to be an

1431
00:52:35,109 --> 00:52:33,359
incredible amount of data and and

1432
00:52:36,710 --> 00:52:35,119
citizen science is is a great

1433
00:52:39,109 --> 00:52:36,720
opportunity again

1434
00:52:41,109 --> 00:52:39,119
to uh to enhance what we are able to do

1435
00:52:42,390 --> 00:52:41,119
with our science teams which are only so

1436
00:52:44,790 --> 00:52:42,400
many people and there's just an

1437
00:52:47,510 --> 00:52:44,800
incredible amount of data out there

1438
00:52:48,390 --> 00:52:47,520

a lot of ways to get involved i could

1439
00:52:51,990 --> 00:52:48,400
chime in a little bit

1440
00:52:54,470 --> 00:52:52,000
on that as well marina go ahead jim

1441
00:52:56,069 --> 00:52:54,480
oh sure so uh just a couple of things

1442
00:52:58,470 --> 00:52:56,079
from an imaging perspective

1443
00:53:01,109 --> 00:52:58,480
you know we will be sharing all of the

1444
00:53:03,109 --> 00:53:01,119
images from all of those cameras

1445
00:53:05,430 --> 00:53:03,119
on the rover shortly after landing

1446
00:53:07,510 --> 00:53:05,440
they'll go out onto a website that jpl

1447
00:53:09,750 --> 00:53:07,520
is hosting and we've done this with

1448
00:53:11,190 --> 00:53:09,760
previous rovers spirit opportunity and

1449
00:53:13,990 --> 00:53:11,200
other nasa missions

1450
00:53:16,069 --> 00:53:14,000
so that gets real data imaging data into

1451
00:53:18,069 --> 00:53:16,079
the hands of anybody who wants to

1452
00:53:19,829 --> 00:53:18,079
do anything with it and and sort of

1453
00:53:23,430 --> 00:53:19,839
acknowledging the fact that

1454
00:53:25,510 --> 00:53:23,440
there is a large community of amateur

1455
00:53:26,470 --> 00:53:25,520
imaging enthusiasts and people who make

1456
00:53:29,109 --> 00:53:26,480
their own

1457
00:53:31,190 --> 00:53:29,119
andy warhol false color composites and

1458
00:53:33,670 --> 00:53:31,200
mosaics and panoramas

1459
00:53:35,030 --> 00:53:33,680
will have a place on the asu mass camzy

1460
00:53:37,190 --> 00:53:35,040
website where people can

1461
00:53:39,030 --> 00:53:37,200
upload the products that they've

1462
00:53:41,109 --> 00:53:39,040
produced from masscam z

1463
00:53:42,069 --> 00:53:41,119

data and then we'll feature some of

1464
00:53:43,990 --> 00:53:42,079
those and

1465
00:53:45,510 --> 00:53:44,000
you know talk about what kids are doing

1466
00:53:46,790 --> 00:53:45,520
or kids with their teachers for class

1467
00:53:49,270 --> 00:53:46,800
projects

1468
00:53:49,829 --> 00:53:49,280
or just other enthusiasts so i totally

1469
00:53:52,710 --> 00:53:49,839
agree

1470
00:53:55,270 --> 00:53:52,720
with uh with lori that we're our aim is

1471
00:53:57,030 --> 00:53:55,280
to involve as many people as possible

1472
00:53:58,549 --> 00:53:57,040
getting their hands on some real data

1473
00:54:02,150 --> 00:53:58,559
and making some real contributions to

1474
00:54:06,549 --> 00:54:05,910
yes ken yeah i just wanted to quickly

1475
00:54:09,109 --> 00:54:06,559
say

1476
00:54:10,470 --> 00:54:09,119
we are looking at at some very specific

1477
00:54:13,030 --> 00:54:10,480
citizen science

1478
00:54:15,109 --> 00:54:13,040
initiatives um that aren't ready right

1479
00:54:18,390 --> 00:54:15,119
yet but but do stay tuned

1480
00:54:20,069 --> 00:54:18,400
uh and join in with us down the line um

1481
00:54:22,230 --> 00:54:20,079
but i also wanted to comment on on the

1482
00:54:25,270 --> 00:54:22,240
last question what are we doing to

1483
00:54:27,670 --> 00:54:25,280
to inspire young folks and

1484
00:54:28,390 --> 00:54:27,680
uh i was just thinking about it as we

1485
00:54:30,950 --> 00:54:28,400
were talking

1486
00:54:32,710 --> 00:54:30,960
and the earliest so we're collecting

1487
00:54:33,589 --> 00:54:32,720
samples with the intention that they

1488
00:54:36,710 --> 00:54:33,599

could be returned

1489
00:54:38,390 --> 00:54:36,720
to earth for for future work by

1490
00:54:39,990 --> 00:54:38,400
maybe scientists who are currently

1491
00:54:43,270 --> 00:54:40,000
working or

1492
00:54:45,349 --> 00:54:43,280
future scientists and so imagining

1493
00:54:47,349 --> 00:54:45,359
people on a trajectory where they go say

1494
00:54:49,109 --> 00:54:47,359
straight from an undergraduate

1495
00:54:50,950 --> 00:54:49,119
science degree straight into graduate

1496
00:54:53,109 --> 00:54:50,960
school and have a

1497
00:54:54,549 --> 00:54:53,119
graduate school a phd project that's

1498
00:54:57,990 --> 00:54:54,559
working on these samples

1499
00:55:00,870 --> 00:54:58,000
the earliest day will come back is 2031.

1500
00:55:01,589 --> 00:55:00,880
so if a student is say 22 graduating

1501
00:55:03,589 --> 00:55:01,599
from college

1502
00:55:05,670 --> 00:55:03,599
getting ready to go for to grad school

1503
00:55:05,990 --> 00:55:05,680
that person could be 12 years old right

1504
00:55:08,309 --> 00:55:06,000
now

1505
00:55:10,230 --> 00:55:08,319
10 or 12 years old out there just

1506
00:55:12,309 --> 00:55:10,240
getting you know really turned on

1507
00:55:13,470 --> 00:55:12,319
to science so i think mars sample return

1508
00:55:16,870 --> 00:55:13,480
in that it's this

1509
00:55:19,990 --> 00:55:16,880
intergenerational uh effort um

1510
00:55:23,030 --> 00:55:20,000
is just a great way uh for you know

1511
00:55:25,349 --> 00:55:23,040
science teachers and and uh us as a

1512
00:55:27,589 --> 00:55:25,359
you know a world community to to get and

1513
00:55:30,870 --> 00:55:27,599

stay excited about science the potential

1514
00:55:33,030 --> 00:55:30,880
is so enormous thank you so much ken

1515
00:55:33,990 --> 00:55:33,040
yes that potential is there we

1516
00:55:36,630 --> 00:55:34,000
unfortunately can't

1517
00:55:37,990 --> 00:55:36,640
answer all of the media questions on air

1518
00:55:40,390 --> 00:55:38,000
for those of you with additional

1519
00:55:41,670 --> 00:55:40,400
questions please call jpl's digital news

1520
00:55:43,349 --> 00:55:41,680
and media office

1521
00:55:44,789 --> 00:55:43,359
we'll also continue to answer your

1522
00:55:47,510 --> 00:55:44,799
social media questions

1523
00:55:47,990 --> 00:55:47,520
online for the rest of the day thank you

1524
00:55:50,069 --> 00:55:48,000
for your

1525
00:55:51,109 --> 00:55:50,079
questions and thank you so much to all

1526
00:55:53,990 --> 00:55:51,119
of our panelists

1527
00:55:55,349 --> 00:55:54,000
for joining us today tomorrow at 10 a.m

1528
00:55:57,510 --> 00:55:55,359
pacific standard time

1529
00:55:59,510 --> 00:55:57,520
we will have a briefing giving us a

1530
00:56:01,750 --> 00:55:59,520
final landing mission update

1531
00:56:04,069 --> 00:56:01,760
and then at 12 p.m we'll dive into a

1532
00:56:05,109 --> 00:56:04,079
briefing on searching for signs of

1533
00:56:07,670 --> 00:56:05,119
ancient life

1534
00:56:09,990 --> 00:56:07,680
and the mars sample return mission

1535
00:56:11,510 --> 00:56:10,000
perseverance is set to land on mars on

1536
00:56:14,390 --> 00:56:11,520
february 18th

1537
00:56:16,069 --> 00:56:14,400
with commentary beginning at 11 15 a.m

1538
00:56:18,230 --> 00:56:16,079

pacific standard time

1539
00:56:19,430 --> 00:56:18,240
and we are offering lots of ways to ride

1540
00:56:21,589 --> 00:56:19,440
along with us

1541
00:56:23,109 --> 00:56:21,599
to join the virtual nasa social and

1542
00:56:25,430 --> 00:56:23,119
virtual guest events

1543
00:56:27,750 --> 00:56:25,440
register for the mission to mars student

1544
00:56:31,870 --> 00:56:27,760
challenge laurie mentioned this earlier

1545
00:56:33,589 --> 00:56:31,880
and live stream the mars landing visit

1546
00:56:36,549 --> 00:56:33,599
go.nasa.gov

1547
00:56:38,230 --> 00:56:36,559
mars 2020 toolkit for those of you

1548
00:56:40,950 --> 00:56:38,240
interested in a deeper dive

1549
00:56:41,430 --> 00:56:40,960
we have a new press kit available online

1550
00:56:43,430 --> 00:56:41,440
too

1551
00:56:45,910 --> 00:56:43,440
with lots of information and graphics

1552
00:56:47,670 --> 00:56:45,920
describing the rover and its mission

1553
00:56:49,589 --> 00:56:47,680
there you'll also have a chance to sign

1554
00:56:52,950 --> 00:56:49,599
up to send your name to mars

1555
00:56:53,829 --> 00:56:52,960
on nasa's next flight to the red planet

1556
00:56:55,589 --> 00:56:53,839
and put yourself

1557
00:56:57,510 --> 00:56:55,599
right into the action with our

1558
00:56:59,910 --> 00:56:57,520
perseverance photo booth

1559
00:57:01,750 --> 00:56:59,920
you can pose next to the rover place

1560
00:57:04,230 --> 00:57:01,760
yourself in our mission control

1561
00:57:05,510 --> 00:57:04,240
and even see what you might look like

1562
00:57:08,069 --> 00:57:05,520
taking a selfie

1563
00:57:08,789 --> 00:57:08,079

on the red planet again it's all

1564
00:57:12,390 --> 00:57:08,799
available

1565
00:57:15,750 --> 00:57:12,400
at dot go.nasa.gov

1566
00:57:17,829 --> 00:57:15,760
slash mars 2020 toolkit if you're on

1567
00:57:20,150 --> 00:57:17,839
social media join the conversation with

1568
00:57:22,870 --> 00:57:20,160
the mission on facebook and twitter

1569
00:57:23,910 --> 00:57:22,880
follow at nasa persevere and use the

1570
00:57:26,710 --> 00:57:23,920
hashtag

1571
00:57:28,230 --> 00:57:26,720
countdown to mars thank you so much for

1572
00:58:34,829 --> 00:57:28,240
watching with us today