
NASA'S PERSEVERANCE MARS ROVER
INVESTIGATES GEOLOGICALLY RICH AREA
Thursday, Sept. 15 at 8:30 a.m. PDT, 11:30 a.m. EDT

1
00:00:33,590 --> 00:00:31,850
[Music]

2
00:00:57,940 --> 00:00:33,600
[Applause]

3
00:00:57,950 --> 00:01:26,230
[Music]

4
00:01:31,030 --> 00:01:28,149
welcome to nasa's jet propulsion

5
00:01:33,830 --> 00:01:31,040
laboratory in southern california

6
00:01:36,390 --> 00:01:33,840
nasa's perseverance rover is currently

7
00:01:39,190 --> 00:01:36,400
investigating a geologically rich area

8
00:01:41,590 --> 00:01:39,200
on mars and has successfully acquired

9
00:01:44,069 --> 00:01:41,600
several rock samples i'm raquel

10
00:01:46,710 --> 00:01:44,079
villanueva with the jpl digital news and

11
00:01:48,870 --> 00:01:46,720
media office i'll be your host today as

12
00:01:51,030 --> 00:01:48,880
we discuss the samples the rover has

13
00:01:53,429 --> 00:01:51,040

collected on the red planet

14
00:01:55,109 --> 00:01:53,439
our speakers today include

15
00:01:57,429 --> 00:01:55,119
lori glaze

16
00:02:00,870 --> 00:01:57,439
director of nasa's planetary science

17
00:02:04,230 --> 00:02:00,880
division nasa headquarters and here on

18
00:02:07,749 --> 00:02:04,240
stage we have ken farley perseverance

19
00:02:09,350 --> 00:02:07,759
project scientist caltech in pasadena

20
00:02:12,790 --> 00:02:09,360
sunanda sharma

21
00:02:15,589 --> 00:02:12,800
sherlock instrument scientist jpl

22
00:02:17,589 --> 00:02:15,599
rick welch perseverance deputy project

23
00:02:20,309 --> 00:02:17,599
manager jpl

24
00:02:23,110 --> 00:02:20,319
and joining us virtually is david

25
00:02:26,150 --> 00:02:23,120
shuster perseverance return sample

26
00:02:27,350 --> 00:02:26,160
scientist university of california

27
00:02:29,190 --> 00:02:27,360
berkeley

28
00:02:31,350 --> 00:02:29,200
now we'll be taking questions after

29
00:02:33,270 --> 00:02:31,360
hearing from our speakers if you're a

30
00:02:35,910 --> 00:02:33,280
member of the media on the phone line

31
00:02:37,990 --> 00:02:35,920
press star one to get put in the queue

32
00:02:41,190 --> 00:02:38,000
and if you're watching on social media

33
00:02:43,350 --> 00:02:41,200
use the hashtag asknasa to ask a

34
00:02:45,910 --> 00:02:43,360
question and we have members of the

35
00:02:48,229 --> 00:02:45,920
media in the audience today welcome

36
00:02:50,470 --> 00:02:48,239
if you have a question you'd like to ask

37
00:02:51,670 --> 00:02:50,480
raise your hand and we will bring a mic

38
00:02:53,990 --> 00:02:51,680

to you

39
00:02:56,710 --> 00:02:54,000
now before we get started we'd like to

40
00:03:00,550 --> 00:02:56,720
set the stage with some opening remarks

41
00:03:03,160 --> 00:03:00,560
so please welcome jpl director lori

42
00:03:08,470 --> 00:03:03,170
leshen

43
00:03:11,509 --> 00:03:08,480
[Applause]

44
00:03:14,390 --> 00:03:11,519
well welcome everyone and good morning

45
00:03:16,710 --> 00:03:14,400
so just over 18 months ago perseverance

46
00:03:19,430 --> 00:03:16,720
landed on mars in the middle of a global

47
00:03:22,630 --> 00:03:19,440
pandemic and caused us all to look to

48
00:03:24,309 --> 00:03:22,640
the sky and remember and reimagine

49
00:03:28,390 --> 00:03:24,319
what's possible

50
00:03:31,350 --> 00:03:28,400
now over 550 sauls martian days

51
00:03:34,070 --> 00:03:31,360
later this amazing rover has collected a

52
00:03:36,390 --> 00:03:34,080
really tantalizing suite of rocks with

53
00:03:38,470 --> 00:03:36,400
extraordinary science potential and

54
00:03:40,630 --> 00:03:38,480
really wetting our appetite for what's

55
00:03:43,830 --> 00:03:40,640
next and that's really what we're here

56
00:03:46,789 --> 00:03:43,840
to celebrate and talk about today

57
00:03:49,190 --> 00:03:46,799
that does not just happen it happens

58
00:03:52,390 --> 00:03:49,200
through the collaboration of folks

59
00:03:55,270 --> 00:03:52,400
across disciplines across organizations

60
00:03:57,110 --> 00:03:55,280
across continents and we're celebrating

61
00:03:58,789 --> 00:03:57,120
that as well

62
00:04:01,190 --> 00:03:58,799
they have brought mars into sharper

63
00:04:03,589 --> 00:04:01,200

focus than ever before and i want to

64
00:04:07,190 --> 00:04:03,599
just give huge kudos to the team here at

65
00:04:09,110 --> 00:04:07,200
nasa at jpl across academia across

66
00:04:10,550 --> 00:04:09,120
industry across our international

67
00:04:13,270 --> 00:04:10,560
partners

68
00:04:15,429 --> 00:04:13,280
and while percy has ignited imaginations

69
00:04:17,110 --> 00:04:15,439
everywhere i will say it's a specially

70
00:04:19,270 --> 00:04:17,120
ignited mine

71
00:04:21,189 --> 00:04:19,280
as a 10 year old girl i was riveted by

72
00:04:23,510 --> 00:04:21,199
the first images of mars sent back by

73
00:04:24,950 --> 00:04:23,520
the viking landers i loved those red

74
00:04:27,590 --> 00:04:24,960
rocks and i wanted to reach out and

75
00:04:29,189 --> 00:04:27,600
touch them and that has really animated

76
00:04:31,670 --> 00:04:29,199
my whole career

77
00:04:34,870 --> 00:04:31,680
and you'll see that we are doing better

78
00:04:36,870 --> 00:04:34,880
and better at uh querying those rocks

79
00:04:38,790 --> 00:04:36,880
and finding the most interesting ones

80
00:04:41,350 --> 00:04:38,800
i'm especially thrilled at where we are

81
00:04:43,909 --> 00:04:41,360
today with perseverance and building on

82
00:04:45,430 --> 00:04:43,919
that legacy of viking 25 years ago we

83
00:04:47,670 --> 00:04:45,440
landed mars pathfinder with its

84
00:04:49,670 --> 00:04:47,680
sojourner rover and since then we've

85
00:04:51,430 --> 00:04:49,680
been getting more and more sophisticated

86
00:04:53,670 --> 00:04:51,440
in exploring the surface of mars with

87
00:04:56,790 --> 00:04:53,680
better and better uh instrumentation

88
00:04:59,189 --> 00:04:56,800

better and better roving capabilities

89
00:05:01,110 --> 00:04:59,199
and we have been building towards what

90
00:05:03,749 --> 00:05:01,120
we're going to talk about today

91
00:05:06,390 --> 00:05:03,759
collecting the most

92
00:05:08,950 --> 00:05:06,400
exciting suite of samples that we can

93
00:05:11,270 --> 00:05:08,960
can manage that has been building up

94
00:05:13,350 --> 00:05:11,280
over time for us to get to this point

95
00:05:15,590 --> 00:05:13,360
we've been working towards that so that

96
00:05:18,070 --> 00:05:15,600
we can bring these rocks back to earth

97
00:05:20,390 --> 00:05:18,080
where we can query them in the most

98
00:05:22,629 --> 00:05:20,400
sophisticated laboratories that we have

99
00:05:24,310 --> 00:05:22,639
so that we can get at answering some of

100
00:05:26,469 --> 00:05:24,320
the biggest questions that we as

101
00:05:28,550 --> 00:05:26,479
scientists can ask

102
00:05:30,230 --> 00:05:28,560
really to undertake the challenge and

103
00:05:33,189 --> 00:05:30,240
the expense of a mars sample return

104
00:05:34,710 --> 00:05:33,199
mission we need a great suite of rocks

105
00:05:36,230 --> 00:05:34,720
to bring back

106
00:05:39,350 --> 00:05:36,240
and that's what you're going to hear

107
00:05:41,029 --> 00:05:39,360
about in today's briefing i think i hope

108
00:05:44,150 --> 00:05:41,039
you all will agree with me that we are

109
00:05:46,150 --> 00:05:44,160
off to a great start in that goal

110
00:05:47,510 --> 00:05:46,160
so to say that i'm thrilled as someone

111
00:05:50,469 --> 00:05:47,520
who's been working towards mars sample

112
00:05:51,830 --> 00:05:50,479
return for frankly a couple of decades

113
00:05:53,510 --> 00:05:51,840

to say that i'm thrilled with where we

114
00:05:56,070 --> 00:05:53,520
stand today it would be a huge

115
00:05:57,029 --> 00:05:56,080
understatement so again huge kudos to

116
00:05:59,110 --> 00:05:57,039
the team

117
00:06:01,909 --> 00:05:59,120
so onward perseverance onward mars

118
00:06:04,550 --> 00:06:01,919
sample return and uh thanks to all of

119
00:06:06,870 --> 00:06:04,560
you for joining us today to hear the

120
00:06:08,550 --> 00:06:06,880
exciting news from mars

121
00:06:10,870 --> 00:06:08,560
and now i'd love to hand off for a few

122
00:06:12,230 --> 00:06:10,880
words from the head of science at nasa

123
00:06:17,189 --> 00:06:12,240
i'm one of the greatest supporters of

124
00:06:21,909 --> 00:06:18,790
hey i'm thomas turpin the head of

125
00:06:24,870 --> 00:06:21,919
science at nasa and i'm so excited

126
00:06:26,629 --> 00:06:24,880
together with the perseverance team

127
00:06:29,110 --> 00:06:26,639
to really celebrate this huge

128
00:06:32,150 --> 00:06:29,120
achievement we've been on the surface of

129
00:06:33,189 --> 00:06:32,160
mars for over a year now have collected

130
00:06:35,510 --> 00:06:33,199
12

131
00:06:37,270 --> 00:06:35,520
samples and have learned a lot about

132
00:06:39,350 --> 00:06:37,280
this amazing region

133
00:06:41,670 --> 00:06:39,360
called chessroad crater i remember the

134
00:06:44,150 --> 00:06:41,680
first time i saw this it was one of the

135
00:06:47,909 --> 00:06:44,160
target landing sites and frankly the

136
00:06:50,390 --> 00:06:47,919
most hazardous ones of the oldest sites

137
00:06:52,790 --> 00:06:50,400
one that really required uh terrain

138
00:06:55,189 --> 00:06:52,800

relative navigation on the way in during

139
00:06:57,510 --> 00:06:55,199
the landing to absolutely work

140
00:06:59,670 --> 00:06:57,520
of course all of that is history we have

141
00:07:01,990 --> 00:06:59,680
landed successfully that technology did

142
00:07:03,990 --> 00:07:02,000
work and frankly we landed a little bit

143
00:07:07,589 --> 00:07:04,000
off to the side because of that

144
00:07:09,749 --> 00:07:07,599
technology that saved us from being in a

145
00:07:10,950 --> 00:07:09,759
kind of dune field which uh of course we

146
00:07:13,830 --> 00:07:10,960
don't want to be

147
00:07:16,390 --> 00:07:13,840
that uh technology also got us to sit

148
00:07:18,790 --> 00:07:16,400
there and actually explore a region that

149
00:07:20,390 --> 00:07:18,800
has already been the subject of a number

150
00:07:22,710 --> 00:07:20,400
of publications

151
00:07:25,189 --> 00:07:22,720
and with the samples that we're taking

152
00:07:27,510 --> 00:07:25,199
now in this more sedimentary area we of

153
00:07:30,309 --> 00:07:27,520
course are right at the heart of what we

154
00:07:32,230 --> 00:07:30,319
wanted to do to start with look at areas

155
00:07:33,830 --> 00:07:32,240
where on earth we would look at to

156
00:07:35,990 --> 00:07:33,840
actually see whether there is fossil

157
00:07:38,070 --> 00:07:36,000
life i remember as a child playing in a

158
00:07:40,550 --> 00:07:38,080
place like this that used to be

159
00:07:43,589 --> 00:07:40,560
a coastal region elsewhere now in the

160
00:07:45,830 --> 00:07:43,599
central a part of europe so i'm really

161
00:07:47,350 --> 00:07:45,840
excited for the results and of course in

162
00:07:49,270 --> 00:07:47,360
my mind i'm also thinking of the

163
00:07:52,309 --> 00:07:49,280

international team that is going to

164
00:07:54,869 --> 00:07:52,319
bring those samples back to earth

165
00:07:56,869 --> 00:07:54,879
with two missions in the late 20s so in

166
00:07:58,790 --> 00:07:56,879
the early 30s these amazing samples can

167
00:08:00,869 --> 00:07:58,800
be analyzed with the best labs available

168
00:08:07,749 --> 00:08:00,879
to humanity right here on earth

169
00:08:13,589 --> 00:08:10,150
thank you lori ann thomas we'll now hand

170
00:08:14,309 --> 00:08:13,599
it over to ken thanks very much raquel

171
00:08:21,749 --> 00:08:14,319
and

172
00:08:24,309 --> 00:08:21,759
to tell you about what we've been doing

173
00:08:25,990 --> 00:08:24,319
over about the last five months

174
00:08:28,390 --> 00:08:26,000
when we've been exploring a region that

175
00:08:30,150 --> 00:08:28,400
we call the delta front if i can have

176
00:08:31,990 --> 00:08:30,160
that first image

177
00:08:34,709 --> 00:08:32,000
i want to remind everybody that

178
00:08:37,509 --> 00:08:34,719
perseverance is exploring jezreel crater

179
00:08:39,110 --> 00:08:37,519
and this crater held a lake about three

180
00:08:41,430 --> 00:08:39,120
and a half billion years ago very large

181
00:08:43,670 --> 00:08:41,440
like about 40 kilometers across

182
00:08:45,829 --> 00:08:43,680
and the evidence for that is very clear

183
00:08:48,630 --> 00:08:45,839
in this first image on the west side of

184
00:08:50,790 --> 00:08:48,640
the image is the crater rim this is

185
00:08:53,190 --> 00:08:50,800
about one kilometer high and you can see

186
00:08:56,550 --> 00:08:53,200
that that crater rim is breached by a

187
00:08:59,670 --> 00:08:56,560
canyon that canyon transported water

188
00:09:02,389 --> 00:08:59,680

into the lake and it also transported

189
00:09:04,550 --> 00:09:02,399
sediment and when that sediment uh was

190
00:09:06,710 --> 00:09:04,560
brought into the lake hit the slackwater

191
00:09:08,710 --> 00:09:06,720
lake the sediment deposited and formed

192
00:09:10,310 --> 00:09:08,720
the delta the feature that's labeled on

193
00:09:12,790 --> 00:09:10,320
this image that's where we have been

194
00:09:14,870 --> 00:09:12,800
working recently

195
00:09:17,110 --> 00:09:14,880
jezreel was selected for this mission

196
00:09:18,470 --> 00:09:17,120
because it meets several key mission

197
00:09:20,310 --> 00:09:18,480
goals

198
00:09:22,389 --> 00:09:20,320
it allows us to explore an ancient

199
00:09:24,310 --> 00:09:22,399
habitable environment

200
00:09:27,190 --> 00:09:24,320
it allows us to seek evidence of

201
00:09:29,110 --> 00:09:27,200
possible martian life in rocks deposited

202
00:09:30,230 --> 00:09:29,120
at that time about three and a half

203
00:09:32,550 --> 00:09:30,240
billion years ago and i want to

204
00:09:34,389 --> 00:09:32,560
emphasize this mission is not looking

205
00:09:36,470 --> 00:09:34,399
for extant life things that are alive

206
00:09:39,350 --> 00:09:36,480
today instead we're looking into the

207
00:09:41,190 --> 00:09:39,360
very distant past when mars climate was

208
00:09:43,110 --> 00:09:41,200
very different than it is today much

209
00:09:44,630 --> 00:09:43,120
more conducive to life so we are looking

210
00:09:45,990 --> 00:09:44,640
for ancient life

211
00:09:48,550 --> 00:09:46,000
and as you already heard from the

212
00:09:50,949 --> 00:09:48,560
previous speakers we are preparing a

213
00:09:53,190 --> 00:09:50,959

diverse suite of samples for potential

214
00:09:55,350 --> 00:09:53,200
return to earth by future missions and i

215
00:09:57,430 --> 00:09:55,360
want to emphasize the idea of diversity

216
00:09:59,430 --> 00:09:57,440
the objective of diversity is to allow

217
00:10:01,430 --> 00:09:59,440
these samples when they come back to be

218
00:10:03,350 --> 00:10:01,440
studied for a huge range of topics not

219
00:10:05,509 --> 00:10:03,360
just astrobiology there are a huge

220
00:10:06,710 --> 00:10:05,519
number of questions that can only be

221
00:10:08,870 --> 00:10:06,720
answered by samples that are brought

222
00:10:11,590 --> 00:10:08,880
back to earth and and investigated in

223
00:10:13,590 --> 00:10:11,600
terrestrial laboratories

224
00:10:15,829 --> 00:10:13,600
so i'm happy to say that we have made

225
00:10:17,509 --> 00:10:15,839
excellent progress uh towards achieving

226
00:10:19,590 --> 00:10:17,519
the goals that i just laid out we've

227
00:10:21,910 --> 00:10:19,600
also managed to piece together a quite a

228
00:10:24,310 --> 00:10:21,920
detailed history of jezreel crater a

229
00:10:27,030 --> 00:10:24,320
history that is surprising it's not not

230
00:10:29,509 --> 00:10:27,040
exactly what we expected

231
00:10:31,829 --> 00:10:29,519
the image that you see now also shows

232
00:10:34,790 --> 00:10:31,839
the root of the perseverance rover in

233
00:10:37,269 --> 00:10:34,800
its 18 months on mars the white line

234
00:10:40,870 --> 00:10:37,279
the region with the red star is where

235
00:10:44,069 --> 00:10:42,710
in the first year of the mission we

236
00:10:46,230 --> 00:10:44,079
undertook what we called the crater

237
00:10:47,910 --> 00:10:46,240
floor campaign that's on the southeast

238
00:10:49,590 --> 00:10:47,920

part of this traverse

239
00:10:51,990 --> 00:10:49,600
this is exploring the crater floor the

240
00:10:53,910 --> 00:10:52,000
rocks that are below the delta

241
00:10:55,750 --> 00:10:53,920
and what we found is not what we

242
00:10:57,509 --> 00:10:55,760
expected to find many of us expected to

243
00:10:59,590 --> 00:10:57,519
find out there in the middle of this

244
00:11:01,990 --> 00:10:59,600
crater that once held a lake we expected

245
00:11:04,230 --> 00:11:02,000
to find sedimentary rocks deposited in

246
00:11:05,750 --> 00:11:04,240
that lake and instead what we found is

247
00:11:07,590 --> 00:11:05,760
igneous rocks rocks that were

248
00:11:09,269 --> 00:11:07,600
crystallized from a melt

249
00:11:11,670 --> 00:11:09,279
so that suggests a history that is more

250
00:11:13,910 --> 00:11:11,680
complicated than we expected this crater

251
00:11:16,870 --> 00:11:13,920
not only held a lake at one point but

252
00:11:18,870 --> 00:11:16,880
prior to that likely prior to it it also

253
00:11:20,790 --> 00:11:18,880
had active volcanism

254
00:11:22,470 --> 00:11:20,800
and possibly even a lava lake filling

255
00:11:24,790 --> 00:11:22,480
that crater so there's some complexity

256
00:11:26,630 --> 00:11:24,800
there that we hadn't actually expected

257
00:11:28,310 --> 00:11:26,640
and we acquired some excellent samples

258
00:11:30,389 --> 00:11:28,320
of those igneous rocks and this is an

259
00:11:32,230 --> 00:11:30,399
example of why diversity is important

260
00:11:34,470 --> 00:11:32,240
those igneous rocks will tell us a lot

261
00:11:35,829 --> 00:11:34,480
about the early history of a rocky

262
00:11:37,990 --> 00:11:35,839
planet mars

263
00:11:39,910 --> 00:11:38,000

and in addition one of the key things

264
00:11:41,910 --> 00:11:39,920
that an igneous rock return to earth

265
00:11:45,030 --> 00:11:41,920
will allow us to do is for the first

266
00:11:46,630 --> 00:11:45,040
time put a quantitative age

267
00:11:49,269 --> 00:11:46,640
on the surface of mars this is something

268
00:11:50,870 --> 00:11:49,279
that we just infer indirectly at present

269
00:11:52,470 --> 00:11:50,880
so it will be very important to get

270
00:11:55,350 --> 00:11:52,480
quantitative estimates of age on

271
00:11:56,710 --> 00:11:55,360
returned igneous rocks

272
00:11:58,790 --> 00:11:56,720
after we finished the crater floor

273
00:12:01,590 --> 00:11:58,800
campaign we drove very quickly in that

274
00:12:03,670 --> 00:12:01,600
arc around to where the rover is today

275
00:12:05,910 --> 00:12:03,680
at the delta front if i could have the

276
00:12:08,870 --> 00:12:05,920
next slide please

277
00:12:11,190 --> 00:12:08,880
so the delta front is a scarp cliff

278
00:12:13,110 --> 00:12:11,200
about 40 meters high

279
00:12:14,790 --> 00:12:13,120
you can see that we have driven back and

280
00:12:16,870 --> 00:12:14,800
forth studying this place it's a really

281
00:12:19,910 --> 00:12:16,880
interesting place and the reason it's

282
00:12:22,069 --> 00:12:19,920
interesting is that the delta is

283
00:12:24,710 --> 00:12:22,079
a place where the sedimentary layers

284
00:12:26,550 --> 00:12:24,720
deposited in that lake are exposed in

285
00:12:28,230 --> 00:12:26,560
cross section so rather than just

286
00:12:30,230 --> 00:12:28,240
driving around on top of those

287
00:12:32,790 --> 00:12:30,240
sedimentary layers we can actually drive

288
00:12:34,470 --> 00:12:32,800

up and see them one by one

289
00:12:36,150 --> 00:12:34,480
if i could have the next

290
00:12:37,509 --> 00:12:36,160
image

291
00:12:39,110 --> 00:12:37,519
this is from the area that you're going

292
00:12:41,430 --> 00:12:39,120
to hear a lot about it's called hogwalla

293
00:12:43,350 --> 00:12:41,440
flat and you can see putting down a

294
00:12:45,350 --> 00:12:43,360
subset of them on the surface of mars as

295
00:12:47,910 --> 00:12:45,360
a target for the future missions to pick

296
00:12:49,910 --> 00:12:47,920
up and bring back to earth

297
00:12:53,110 --> 00:12:49,920
so good progress overall and with that

298
00:12:55,190 --> 00:12:53,120
i'll turn it over to david shuster

299
00:12:58,389 --> 00:12:55,200
all right thank you ken and good morning

300
00:12:59,350 --> 00:12:58,399
everyone can everyone hear me okay

301
00:13:00,230 --> 00:12:59,360
okay

302
00:13:03,509 --> 00:13:00,240
um

303
00:13:05,190 --> 00:13:03,519
yeah so as ken mentioned we've spent uh

304
00:13:07,590 --> 00:13:05,200
something in the order of five months

305
00:13:09,670 --> 00:13:07,600
exploring this delta front region and

306
00:13:11,670 --> 00:13:09,680
you saw the rover traverse and that

307
00:13:13,190 --> 00:13:11,680
first map that he showed

308
00:13:14,710 --> 00:13:13,200
this image that you're looking at i like

309
00:13:17,190 --> 00:13:14,720
very much because

310
00:13:19,829 --> 00:13:17,200
the team worked very hard to find two

311
00:13:22,150 --> 00:13:19,839
different types of samples to collect

312
00:13:25,350 --> 00:13:22,160
from the delta front and we ended up

313
00:13:27,350 --> 00:13:25,360

finding them only about 20 meters apart

314
00:13:29,190 --> 00:13:27,360
these two rocks named skinner ridge on

315
00:13:30,710 --> 00:13:29,200
the right and wildcat ridge on the left

316
00:13:33,430 --> 00:13:30,720
are very different

317
00:13:35,190 --> 00:13:33,440
they each have high science value

318
00:13:36,710 --> 00:13:35,200
for quite different purposes that i'm

319
00:13:39,110 --> 00:13:36,720
going to explain

320
00:13:41,509 --> 00:13:39,120
skinner ridge as ken mentioned

321
00:13:44,470 --> 00:13:41,519
is a sandstone it's a fine to medium

322
00:13:46,949 --> 00:13:44,480
grain sandstone it contains importantly

323
00:13:48,389 --> 00:13:46,959
a quite diverse mixture of lithologies

324
00:13:49,990 --> 00:13:48,399
meaning that it has a whole bunch of

325
00:13:52,069 --> 00:13:50,000
rocky material

326
00:13:53,990 --> 00:13:52,079
that was potentially transported into

327
00:13:56,710 --> 00:13:54,000
jezreel crater from

328
00:13:58,470 --> 00:13:56,720
hundreds of kilometers outside jezreel

329
00:14:00,710 --> 00:13:58,480
that's important because this is giving

330
00:14:03,350 --> 00:14:00,720
us material from a very far

331
00:14:05,590 --> 00:14:03,360
distance that the rover will will not

332
00:14:07,269 --> 00:14:05,600
visit in this mission

333
00:14:08,790 --> 00:14:07,279
wildcat ridge on the left on the other

334
00:14:12,069 --> 00:14:08,800
hand is a very different type of

335
00:14:13,990 --> 00:14:12,079
sedimentary rock it is a fine-grained

336
00:14:17,350 --> 00:14:14,000
sulfate-bearing mudstone that also

337
00:14:20,069 --> 00:14:17,360
contains clays and interestingly this

338
00:14:23,030 --> 00:14:20,079

appears to have formed in salty water

339
00:14:25,509 --> 00:14:23,040
possibly during the lake evaporation

340
00:14:27,829 --> 00:14:25,519
stage at some point the lake filled up

341
00:14:29,990 --> 00:14:27,839
with water and as that evaporated it

342
00:14:31,030 --> 00:14:30,000
appears that this rock on the left

343
00:14:32,949 --> 00:14:31,040
formed

344
00:14:35,030 --> 00:14:32,959
this is really important that this has

345
00:14:36,949 --> 00:14:35,040
sulfate in it and also clays because

346
00:14:38,069 --> 00:14:36,959
that means that this rock has high

347
00:14:40,949 --> 00:14:38,079
potential

348
00:14:43,829 --> 00:14:40,959
for biosignature preservation meaning

349
00:14:46,389 --> 00:14:43,839
that if there were bio signatures

350
00:14:48,230 --> 00:14:46,399
this vicinity when that rock formed this

351
00:14:50,870 --> 00:14:48,240
is precisely the type of material that

352
00:14:52,629 --> 00:14:50,880
will preserve that for us to study when

353
00:14:54,389 --> 00:14:52,639
they come back to earth

354
00:14:56,150 --> 00:14:54,399
so what we have here is both of these

355
00:14:58,470 --> 00:14:56,160
rocks are composed of sediments that

356
00:15:01,269 --> 00:14:58,480
were transported by liquid water

357
00:15:03,430 --> 00:15:01,279
they were both deposited into a lake

358
00:15:05,910 --> 00:15:03,440
and then they subsequently experienced

359
00:15:07,269 --> 00:15:05,920
aqueous alterations alterations also

360
00:15:10,230 --> 00:15:07,279
involving water

361
00:15:13,750 --> 00:15:10,240
and cementation after deposition

362
00:15:16,870 --> 00:15:13,760
thus these rocks formed in and record

363
00:15:20,310 --> 00:15:16,880

conditions of a habitable environment

364
00:15:23,990 --> 00:15:21,910
in this image you can see the layering

365
00:15:25,189 --> 00:15:24,000
that ken mentioned up on rocky top and

366
00:15:26,870 --> 00:15:25,199
i'm just showing you this because you

367
00:15:29,269 --> 00:15:26,880
can see the rover arm and you can see

368
00:15:30,389 --> 00:15:29,279
skinner ridge in in the lower part of

369
00:15:31,590 --> 00:15:30,399
this image

370
00:15:34,790 --> 00:15:31,600
and if you look you'll notice that

371
00:15:37,670 --> 00:15:34,800
there's an abrasion patch there's a very

372
00:15:39,350 --> 00:15:37,680
light colored circular

373
00:15:41,590 --> 00:15:39,360
position in that rock that i'm going to

374
00:15:46,389 --> 00:15:41,600
zoom in now

375
00:15:50,870 --> 00:15:47,990
and what you're seeing here is a

376
00:15:51,829 --> 00:15:50,880
close-up watson image of this abrasion

377
00:15:54,069 --> 00:15:51,839
patch

378
00:15:57,430 --> 00:15:54,079
and every time i look at this sort of

379
00:15:59,110 --> 00:15:57,440
image let's uh remark on how absolutely

380
00:16:01,749 --> 00:15:59,120
wonderful this is we're looking at a

381
00:16:04,949 --> 00:16:01,759
very very small region of space that is

382
00:16:07,749 --> 00:16:04,959
the five millimeter scale bar uh this is

383
00:16:09,350 --> 00:16:07,759
on mars right and we're looking and

384
00:16:11,670 --> 00:16:09,360
sonanda is going to show us even a

385
00:16:13,990 --> 00:16:11,680
higher resolution image we're looking in

386
00:16:16,069 --> 00:16:14,000
very very fine detail and what i'd like

387
00:16:18,710 --> 00:16:16,079
you to notice in this rock is that there

388
00:16:21,670 --> 00:16:18,720

are color variations that we can see

389
00:16:23,670 --> 00:16:21,680
and we can also see that there are

390
00:16:26,389 --> 00:16:23,680
grains that appear to have been rounded

391
00:16:29,509 --> 00:16:26,399
these indicate that this material the

392
00:16:31,670 --> 00:16:29,519
sediment these bits of mars in the rock

393
00:16:33,749 --> 00:16:31,680
uh form have been transported down a

394
00:16:35,910 --> 00:16:33,759
river and deposited into

395
00:16:38,550 --> 00:16:35,920
jezera lake you have the next slide

396
00:16:42,150 --> 00:16:40,310
and this image here is just showing that

397
00:16:44,470 --> 00:16:42,160
the two cores that we collected from

398
00:16:46,629 --> 00:16:44,480
that rock are absolutely fantastic it

399
00:16:48,550 --> 00:16:46,639
does not get any better than this what

400
00:16:50,310 --> 00:16:48,560
you're looking at is the the bottom of

401
00:16:51,189 --> 00:16:50,320
the core after we drilled it out of the

402
00:16:54,069 --> 00:16:51,199
rock

403
00:16:55,749 --> 00:16:54,079
and both of these cores are full they're

404
00:16:57,990 --> 00:16:55,759
they're

405
00:16:59,350 --> 00:16:58,000
as nice of a core as we have collected

406
00:17:01,509 --> 00:16:59,360
on this mission

407
00:17:03,829 --> 00:17:01,519
and importantly these materials will

408
00:17:05,270 --> 00:17:03,839
enable all sorts of science to happen as

409
00:17:07,829 --> 00:17:05,280
ken mentioned

410
00:17:09,590 --> 00:17:07,839
upon return to earth in laboratories on

411
00:17:11,829 --> 00:17:09,600
earth and importantly

412
00:17:13,350 --> 00:17:11,839
we can determine when each one of these

413
00:17:15,829 --> 00:17:13,360

little bits of rocky material

414
00:17:17,909 --> 00:17:15,839
crystallized in this rock in addition

415
00:17:20,309 --> 00:17:17,919
that we can also determine when the

416
00:17:21,510 --> 00:17:20,319
cementation when this rock was cemented

417
00:17:23,750 --> 00:17:21,520
together

418
00:17:25,750 --> 00:17:23,760
in principle we can learn a lot about

419
00:17:27,990 --> 00:17:25,760
the chemistry of the fluids that

420
00:17:29,990 --> 00:17:28,000
transported this rock things like the

421
00:17:32,390 --> 00:17:30,000
temperature of that cementation so we

422
00:17:33,909 --> 00:17:32,400
can learn a lot about when this material

423
00:17:37,350 --> 00:17:33,919
was deposited

424
00:17:41,669 --> 00:17:39,350
so this is now showing an image of the

425
00:17:43,270 --> 00:17:41,679
the wildcat ridge the other

426
00:17:44,950 --> 00:17:43,280
sampling location

427
00:17:47,909 --> 00:17:44,960
and what you see in this image are the

428
00:17:49,669 --> 00:17:47,919
the abrasion that circle on the right

429
00:17:52,310 --> 00:17:49,679
that we'll hear more about from sonanda

430
00:17:55,270 --> 00:17:52,320
in a minute and those two core locations

431
00:17:57,909 --> 00:17:55,280
on the left so once again we we had an

432
00:18:01,590 --> 00:17:57,919
absolutely successful uh coring at this

433
00:18:03,750 --> 00:18:01,600
rock the next slide please

434
00:18:05,830 --> 00:18:03,760
and these are the two cores from this

435
00:18:08,150 --> 00:18:05,840
rock again the cords are both full these

436
00:18:09,110 --> 00:18:08,160
are essentially slam dunk in terms of

437
00:18:10,390 --> 00:18:09,120
coring

438
00:18:13,190 --> 00:18:10,400

uh these

439
00:18:14,710 --> 00:18:13,200
two very important rocks at the front of

440
00:18:17,190 --> 00:18:14,720
the delta can i have the next slide

441
00:18:21,430 --> 00:18:18,870
and now when you look at the close-up

442
00:18:23,510 --> 00:18:21,440
watson image on the right of the wildcat

443
00:18:25,270 --> 00:18:23,520
ridge i hope that you can all see that

444
00:18:27,510 --> 00:18:25,280
these are two very different looking

445
00:18:29,430 --> 00:18:27,520
rocks specifically you can see that the

446
00:18:30,310 --> 00:18:29,440
one on the right is much lighter in

447
00:18:32,470 --> 00:18:30,320
color

448
00:18:34,950 --> 00:18:32,480
it's relatively uniform

449
00:18:37,750 --> 00:18:34,960
and it is fine grained as i mentioned it

450
00:18:39,990 --> 00:18:37,760
is also rich in sulfates and all of this

451
00:18:41,590 --> 00:18:40,000
is very important because these are the

452
00:18:43,909 --> 00:18:41,600
ingredients this is these are the

453
00:18:45,590 --> 00:18:43,919
qualities of rock that we're looking for

454
00:18:47,830 --> 00:18:45,600
that have high potential for

455
00:18:49,669 --> 00:18:47,840
biosignature preservation

456
00:18:51,270 --> 00:18:49,679
so to summarize both of these samples

457
00:18:54,549 --> 00:18:51,280
that we've collected from these two

458
00:18:56,630 --> 00:18:54,559
rocks record a paleo environment and

459
00:18:58,390 --> 00:18:56,640
environmental conditions of a formally

460
00:19:00,230 --> 00:18:58,400
habitable environment

461
00:19:01,909 --> 00:19:00,240
both of these have very high scientific

462
00:19:04,390 --> 00:19:01,919
value for the next generation of

463
00:19:06,470 --> 00:19:04,400

scientists when these return to earth to

464
00:19:08,470 --> 00:19:06,480
be studied in the laboratories that

465
00:19:10,150 --> 00:19:08,480
you've heard about

466
00:19:11,750 --> 00:19:10,160
i think it's safe to say that these are

467
00:19:13,590 --> 00:19:11,760
two of the most important samples that

468
00:19:15,590 --> 00:19:13,600
we will collect on this mission and

469
00:19:17,590 --> 00:19:15,600
we're all very excited about what we've

470
00:19:19,990 --> 00:19:17,600
found um and i'll pass it over to

471
00:19:21,990 --> 00:19:20,000
sunanda now who will tell us more about

472
00:19:23,590 --> 00:19:22,000
the wildcat ridge observations on the

473
00:19:25,270 --> 00:19:23,600
right

474
00:19:27,350 --> 00:19:25,280
thanks david and hi everybody it's great

475
00:19:30,070 --> 00:19:27,360
to be here um so i'll talk a little bit

476
00:19:32,070 --> 00:19:30,080
more about the science at wildcat ridge

477
00:19:33,750 --> 00:19:32,080
so the observation of organic matter at

478
00:19:35,350 --> 00:19:33,760
wildcat ridge was made by one of the

479
00:19:36,789 --> 00:19:35,360
instruments that's on the rover arm that

480
00:19:38,470 --> 00:19:36,799
you can see highlighted in the image

481
00:19:39,990 --> 00:19:38,480
which is called sherlock

482
00:19:42,150 --> 00:19:40,000
sherlock gives multiple types of

483
00:19:44,870 --> 00:19:42,160
information we have color images and

484
00:19:46,630 --> 00:19:44,880
black and white images and also spectra

485
00:19:48,470 --> 00:19:46,640
spectra are basically signals that

486
00:19:50,789 --> 00:19:48,480
result from light interaction with a

487
00:19:52,390 --> 00:19:50,799
rock surface the light that we use is a

488
00:19:54,950 --> 00:19:52,400

special type of laser that you can think

489
00:19:56,230 --> 00:19:54,960
of as a fancy black light and it helps

490
00:19:58,230 --> 00:19:56,240
us see things in the rock that would

491
00:19:59,990 --> 00:19:58,240
otherwise be invisible to us

492
00:20:02,070 --> 00:20:00,000
the images that we take with sherlock's

493
00:20:03,990 --> 00:20:02,080
two cameras provide visual context for

494
00:20:06,230 --> 00:20:04,000
where the laser hits in a map

495
00:20:08,710 --> 00:20:06,240
so when sherlock studies a rock surface

496
00:20:10,070 --> 00:20:08,720
it shoots its laser in a pattern across

497
00:20:15,430 --> 00:20:10,080
an area that's about the size of a

498
00:20:18,789 --> 00:20:17,350
yeah so when the laser lights up

499
00:20:21,350 --> 00:20:18,799
different components in the rock that

500
00:20:23,350 --> 00:20:21,360
includes chemicals minerals and organic

501
00:20:25,110 --> 00:20:23,360
matter and organics as you heard from

502
00:20:27,990 --> 00:20:25,120
ken are commonly called the building

503
00:20:30,310 --> 00:20:28,000
blocks of life all life as we know it is

504
00:20:32,310 --> 00:20:30,320
made up of organics but importantly

505
00:20:34,070 --> 00:20:32,320
organic matter can also be made up by

506
00:20:35,830 --> 00:20:34,080
processes that are chemical and they're

507
00:20:38,149 --> 00:20:35,840
not related to life so for instance

508
00:20:40,390 --> 00:20:38,159
through water rock interactions and it's

509
00:20:42,070 --> 00:20:40,400
also found in interstellar dust

510
00:20:43,750 --> 00:20:42,080
by putting together the image and the

511
00:20:45,669 --> 00:20:43,760
spectral information it collects

512
00:20:47,990 --> 00:20:45,679
sherlock can map where organics and

513
00:20:49,909 --> 00:20:48,000

minerals are in iraq which tells us more

514
00:20:53,110 --> 00:20:49,919
about how the organic matter was formed

515
00:20:55,270 --> 00:20:53,120
transported preserved or concentrated

516
00:20:57,350 --> 00:20:55,280
organics tend to form clumps we've seen

517
00:20:59,029 --> 00:20:57,360
this on earth and in martian meteorites

518
00:21:00,710 --> 00:20:59,039
and unless you can map you miss some of

519
00:21:02,470 --> 00:21:00,720
that key information

520
00:21:04,230 --> 00:21:02,480
this is the first instrument of its kind

521
00:21:06,390 --> 00:21:04,240
that's operating on mars and it gives us

522
00:21:08,950 --> 00:21:06,400
very important information from rocks as

523
00:21:10,789 --> 00:21:08,960
they are found in place to support the

524
00:21:12,470 --> 00:21:10,799
uh selection of samples for the return

525
00:21:15,510 --> 00:21:12,480
to earth

526
00:21:16,710 --> 00:21:15,520
so can i have the next slide

527
00:21:18,470 --> 00:21:16,720
thank you

528
00:21:20,710 --> 00:21:18,480
sherlock studied the abrasion patch on

529
00:21:24,149 --> 00:21:20,720
wildcat ridge on two different soles or

530
00:21:25,750 --> 00:21:24,159
martian days sol 505 and 513.

531
00:21:27,270 --> 00:21:25,760
we performed about eight scans on the

532
00:21:29,029 --> 00:21:27,280
patch overall

533
00:21:30,950 --> 00:21:29,039
the abrasion patch as a reminder is on

534
00:21:33,029 --> 00:21:30,960
the same rock of where we sample but

535
00:21:34,549 --> 00:21:33,039
it's not the exact same spot it is a

536
00:21:36,310 --> 00:21:34,559
good proxy however for what we are

537
00:21:37,990 --> 00:21:36,320
picking up in the raw core and it gives

538
00:21:39,510 --> 00:21:38,000

sort of a preview of what might be

539
00:21:40,710 --> 00:21:39,520
observed when we bring those samples

540
00:21:42,470 --> 00:21:40,720
back to earth

541
00:21:43,909 --> 00:21:42,480
in wildcat ridge we detected signals

542
00:21:45,909 --> 00:21:43,919
that we think are from a class of

543
00:21:47,590 --> 00:21:45,919
organic matter called aromatics which

544
00:21:49,350 --> 00:21:47,600
are stable molecules that are made up of

545
00:21:51,750 --> 00:21:49,360
carbon and hydrogen and sometimes other

546
00:21:53,350 --> 00:21:51,760
elements with ring structures

547
00:21:56,549 --> 00:21:53,360
these signals were present at nearly

548
00:21:58,149 --> 00:21:56,559
every single point in every scan

549
00:21:59,830 --> 00:21:58,159
they are also some of the brightest that

550
00:22:01,430 --> 00:21:59,840
we've seen thus far on the mission and

551
00:22:03,350 --> 00:22:01,440
they're about seven times brighter than

552
00:22:06,310 --> 00:22:03,360
what we saw at thornton gap which is an

553
00:22:08,390 --> 00:22:06,320
abrasion patch on uh skinner ridge

554
00:22:10,470 --> 00:22:08,400
and so the organic signals are also most

555
00:22:12,549 --> 00:22:10,480
strongly correlated to a mineral called

556
00:22:14,149 --> 00:22:12,559
sulfate that we saw in the rock this

557
00:22:16,549 --> 00:22:14,159
correlation suggests that when the lake

558
00:22:19,110 --> 00:22:16,559
was evaporating both sulfates and

559
00:22:21,350 --> 00:22:19,120
organics were deposited preserved and

560
00:22:22,950 --> 00:22:21,360
concentrated in this area

561
00:22:24,630 --> 00:22:22,960
so while the detection of this class of

562
00:22:26,789 --> 00:22:24,640
organics alone does not mean that life

563
00:22:28,310 --> 00:22:26,799

was definitively there this set of

564
00:22:29,510 --> 00:22:28,320
observations does start to look like

565
00:22:32,070 --> 00:22:29,520
some things that we've seen here on

566
00:22:33,750 --> 00:22:32,080
earth so on earth sulfate deposits are

567
00:22:35,350 --> 00:22:33,760
known to preserve organics and can

568
00:22:36,710 --> 00:22:35,360
harbor signs of life which are called

569
00:22:38,789 --> 00:22:36,720
biosignatures

570
00:22:40,549 --> 00:22:38,799
this makes these samples and this set of

571
00:22:41,909 --> 00:22:40,559
observations some of the most intriguing

572
00:22:43,590 --> 00:22:41,919
that we've done so far in the mission

573
00:22:44,630 --> 00:22:43,600
and it fulfills some of the excitement

574
00:22:47,029 --> 00:22:44,640
that the team had when we were

575
00:22:48,870 --> 00:22:47,039
approaching the delta front

576
00:22:50,390 --> 00:22:48,880
so when we put this finding into context

577
00:22:52,789 --> 00:22:50,400
of all the other observations we've done

578
00:22:54,070 --> 00:22:52,799
with sherlock so far which is 13 other

579
00:22:56,390 --> 00:22:54,080
targets we've observed through the

580
00:22:58,230 --> 00:22:56,400
crater floor and in the delta it's clear

581
00:23:00,310 --> 00:22:58,240
that we aren't covering a bigger story

582
00:23:01,909 --> 00:23:00,320
that's happening in jezreel crater

583
00:23:03,909 --> 00:23:01,919
so we found signals that we think are

584
00:23:05,990 --> 00:23:03,919
possibly from organic matter on every

585
00:23:08,470 --> 00:23:06,000
target that we've observed with sherlock

586
00:23:09,669 --> 00:23:08,480
to date and this isn't really unexpected

587
00:23:11,590 --> 00:23:09,679
it aligns with what we've learned from

588
00:23:13,190 --> 00:23:11,600

studies on earth and martian meteorites

589
00:23:15,750 --> 00:23:13,200
and from mars research from our sibling

590
00:23:17,669 --> 00:23:15,760
rover curiosity however it does say that

591
00:23:19,669 --> 00:23:17,679
organics seem to persist in the very

592
00:23:22,470 --> 00:23:19,679
harsh martian service environment which

593
00:23:24,149 --> 00:23:22,480
is very exciting for us and as we've

594
00:23:25,990 --> 00:23:24,159
made our way from the landing site to

595
00:23:27,750 --> 00:23:26,000
the delta front sherlock has seen this

596
00:23:30,230 --> 00:23:27,760
particular signal associated with

597
00:23:31,909 --> 00:23:30,240
sulfates in a couple of other places so

598
00:23:33,830 --> 00:23:31,919
at first we saw this at just a few

599
00:23:36,230 --> 00:23:33,840
points in a couple of scans in a couple

600
00:23:37,830 --> 00:23:36,240
of targets in the crater floor and as

601
00:23:39,669 --> 00:23:37,840
we're moving into the delta these sort

602
00:23:41,990 --> 00:23:39,679
of hints are becoming stronger and

603
00:23:43,430 --> 00:23:42,000
stronger and to the point that now as i

604
00:23:45,830 --> 00:23:43,440
said on this rock we're seeing it in

605
00:23:47,750 --> 00:23:45,840
every single point on every scan

606
00:23:49,350 --> 00:23:47,760
and so to put it simply if this is a

607
00:23:51,750 --> 00:23:49,360
treasure hunt for potential signs of

608
00:23:53,590 --> 00:23:51,760
life on another planet organic matter is

609
00:23:55,190 --> 00:23:53,600
a clue and we're getting stronger and

610
00:23:56,950 --> 00:23:55,200
stronger clues as we're moving through

611
00:23:58,630 --> 00:23:56,960
our delta campaign

612
00:24:00,070 --> 00:23:58,640
i personally find these results so

613
00:24:02,310 --> 00:24:00,080

moving because it feels like we're in

614
00:24:04,789 --> 00:24:02,320
the right place with the right tools at

615
00:24:06,390 --> 00:24:04,799
a very pivotal moment mars 2020 is

616
00:24:08,549 --> 00:24:06,400
giving us a better understanding than

617
00:24:10,549 --> 00:24:08,559
we've ever had of the martian surface to

618
00:24:12,470 --> 00:24:10,559
select samples for return

619
00:24:14,390 --> 00:24:12,480
and then mars sample return stands maybe

620
00:24:16,830 --> 00:24:14,400
the best chance ever of answering a very

621
00:24:19,350 --> 00:24:16,840
profound question are we alone in the

622
00:24:21,029 --> 00:24:19,360
universe we are building on a legacy of

623
00:24:22,149 --> 00:24:21,039
interdisciplinary and multi-scale

624
00:24:24,789 --> 00:24:22,159
research that's been taking a

625
00:24:26,470 --> 00:24:24,799
progressively closer look at mars

626
00:24:28,789 --> 00:24:26,480
our understanding of the planet bridges

627
00:24:30,230 --> 00:24:28,799
across scales from the orbit all the way

628
00:24:31,669 --> 00:24:30,240
down to this view that you're seeing

629
00:24:33,669 --> 00:24:31,679
from sherlock which is one of the

630
00:24:35,750 --> 00:24:33,679
closest we've ever had to a rock on the

631
00:24:38,149 --> 00:24:35,760
martian surface and it really highlights

632
00:24:40,149 --> 00:24:38,159
to me that perspective and context bring

633
00:24:41,669 --> 00:24:40,159
meaning to our findings

634
00:24:43,430 --> 00:24:41,679
the strength of each instrument on this

635
00:24:46,310 --> 00:24:43,440
rover really came into play on this rock

636
00:24:49,350 --> 00:24:46,320
so on wildcat ridge we now have chemical

637
00:24:51,190 --> 00:24:49,360
mineralogical elemental textural color

638
00:24:53,110 --> 00:24:51,200

and stratigraphic data to help provide

639
00:24:55,269 --> 00:24:53,120
some context to anchor what our findings

640
00:24:57,510 --> 00:24:55,279
are and this gives the most detailed

641
00:24:59,510 --> 00:24:57,520
information possible for across scales

642
00:25:00,549 --> 00:24:59,520
and observational axes for mars sample

643
00:25:02,390 --> 00:25:00,559
return

644
00:25:03,590 --> 00:25:02,400
and it just feels surreal to be part of

645
00:25:05,269 --> 00:25:03,600
the science team that's doing these

646
00:25:07,029 --> 00:25:05,279
observations i get to come to work and

647
00:25:09,190 --> 00:25:07,039
look at data from another planet every

648
00:25:11,510 --> 00:25:09,200
single day real data that's coming down

649
00:25:13,190 --> 00:25:11,520
from another rock on another planet

650
00:25:15,190 --> 00:25:13,200
so for years i've been hearing about

651
00:25:16,549 --> 00:25:15,200
this delta and all of its promise and

652
00:25:17,590 --> 00:25:16,559
it's deeply encouraging that now that

653
00:25:18,950 --> 00:25:17,600
we're here

654
00:25:21,110 --> 00:25:18,960
the data is actually matching our

655
00:25:22,230 --> 00:25:21,120
expectations so with that i'll pass it

656
00:25:23,590 --> 00:25:22,240
over to rick

657
00:25:24,870 --> 00:25:23,600
thanks ananda

658
00:25:26,950 --> 00:25:24,880
i'm going to talk a little bit about

659
00:25:27,990 --> 00:25:26,960
what perseverance is doing right now and

660
00:25:29,269 --> 00:25:28,000
what we're going to be doing in the in

661
00:25:31,870 --> 00:25:29,279
the future let me just say that it's

662
00:25:35,110 --> 00:25:31,880
very early morning on mars right now saw

663
00:25:37,190 --> 00:25:35,120

559 that's a 559th day of mars and

664
00:25:39,110 --> 00:25:37,200
perseverance probably still fast asleep

665
00:25:41,350 --> 00:25:39,120
awaiting her next command load of things

666
00:25:42,870 --> 00:25:41,360
that she'll be doing today

667
00:25:45,190 --> 00:25:42,880
very productive mission so far we've

668
00:25:46,789 --> 00:25:45,200
driven 13 kilometers over 13 kilometers

669
00:25:48,789 --> 00:25:46,799
that's over eight miles

670
00:25:50,950 --> 00:25:48,799
and as mentioned before we have 15

671
00:25:52,470 --> 00:25:50,960
sealed tubes on the rover so let me just

672
00:25:53,750 --> 00:25:52,480
remind folks what uh what a tube

673
00:25:56,310 --> 00:25:53,760
actually looks like

674
00:25:58,470 --> 00:25:56,320
uh and inside these titanium tubes is a

675
00:26:00,470 --> 00:25:58,480
we can store about a pinky sized rock

676
00:26:02,310 --> 00:26:00,480
right inside there right so we have 15

677
00:26:05,269 --> 00:26:02,320
sealed tubes on board the rotor we

678
00:26:07,269 --> 00:26:05,279
brought 43 tubes total we also have a

679
00:26:08,870 --> 00:26:07,279
sealed tube which is no rocket side just

680
00:26:10,390 --> 00:26:08,880
an atmospheric sample and we also have

681
00:26:12,549 --> 00:26:10,400
two witness tubes

682
00:26:14,870 --> 00:26:12,559
that are a measure of contamination that

683
00:26:16,470 --> 00:26:14,880
we can do along the mission as well

684
00:26:18,310 --> 00:26:16,480
let me also mention that ingenuity is

685
00:26:19,990 --> 00:26:18,320
also doing very well that technology

686
00:26:21,830 --> 00:26:20,000
demonstration for a helicopter on mars

687
00:26:23,510 --> 00:26:21,840
only designed for one month and has

688
00:26:25,909 --> 00:26:23,520

survived 18 months into the mission

689
00:26:27,669 --> 00:26:25,919
which is very exciting for us it is

690
00:26:29,430 --> 00:26:27,679
winter though and ingenuity was never

691
00:26:30,630 --> 00:26:29,440
designed to live through winter it has

692
00:26:32,149 --> 00:26:30,640
been an energy challenge and we're

693
00:26:33,909 --> 00:26:32,159
carefully monitoring that it does look

694
00:26:35,590 --> 00:26:33,919
like the energy is going up for

695
00:26:37,830 --> 00:26:35,600
ingenuity and we were just last week

696
00:26:39,669 --> 00:26:37,840
able to do a short hop of 100 meters

697
00:26:41,590 --> 00:26:39,679
showing ingenuity is fully functional so

698
00:26:43,830 --> 00:26:41,600
we're very happy that and hope

699
00:26:45,990 --> 00:26:43,840
ingenuity continues along with us in our

700
00:26:48,070 --> 00:26:46,000
journey so let me look at this first

701
00:26:49,510 --> 00:26:48,080
graphic here ken already showed this

702
00:26:51,269 --> 00:26:49,520
with a current rover location in the

703
00:26:53,750 --> 00:26:51,279
tracks of the rover exploring the delta

704
00:26:55,510 --> 00:26:53,760
front going back and forth

705
00:26:57,830 --> 00:26:55,520
we've just arrived back at enchanted

706
00:26:59,590 --> 00:26:57,840
lake here and our plan for the next two

707
00:27:00,710 --> 00:26:59,600
months about is to get several more

708
00:27:06,710 --> 00:27:00,720
samples

709
00:27:08,789 --> 00:27:06,720
another witness tube assembly so this

710
00:27:11,510 --> 00:27:08,799
will bring our total of tubes onboard

711
00:27:12,950 --> 00:27:11,520
the rover of 20 sealed tubes out of the

712
00:27:14,470 --> 00:27:12,960
43.

713
00:27:16,149 --> 00:27:14,480

and i mentioned pairs of samples so let

714
00:27:17,669 --> 00:27:16,159
me say a little bit more about that

715
00:27:19,430 --> 00:27:17,679
we've actually had a pairing strategy

716
00:27:21,269 --> 00:27:19,440
from the very beginning of the mission

717
00:27:22,710 --> 00:27:21,279
and so every rock we've gone to we've

718
00:27:25,269 --> 00:27:22,720
actually gotten two samples from those

719
00:27:27,029 --> 00:27:25,279
rocks that allows us to have one for an

720
00:27:28,630 --> 00:27:27,039
initial cash depot on the surface of

721
00:27:30,390 --> 00:27:28,640
mars that we can put down and then

722
00:27:34,070 --> 00:27:30,400
maintain that second

723
00:27:35,669 --> 00:27:34,080
sample on board the rover

724
00:27:37,909 --> 00:27:35,679
so in the middle of this graph this is

725
00:27:39,669 --> 00:27:37,919
actually where the possible first drop

726
00:27:41,350 --> 00:27:39,679
location for our samples 2 is the first

727
00:27:45,830 --> 00:27:41,360
depot that we may form on the surface of

728
00:27:49,110 --> 00:27:47,830
and so about two weeks ago we took this

729
00:27:51,029 --> 00:27:49,120
image looking back at where that

730
00:27:52,549 --> 00:27:51,039
potential depot location would actually

731
00:27:54,630 --> 00:27:52,559
be you can see the rover tracks

732
00:27:56,389 --> 00:27:54,640
crisscrossing across this area and one

733
00:27:58,870 --> 00:27:56,399
of the notable features about this area

734
00:28:00,789 --> 00:27:58,880
is how smooth and flat it is right so

735
00:28:02,389 --> 00:28:00,799
over the past six months we've been very

736
00:28:04,630 --> 00:28:02,399
closely working with the mars sample

737
00:28:06,149 --> 00:28:04,640
return teams looking at this area

738
00:28:07,830 --> 00:28:06,159

because of course they have to have the

739
00:28:09,909 --> 00:28:07,840
job of actually successfully landing

740
00:28:12,630 --> 00:28:09,919
here and retrieving the samples and this

741
00:28:15,029 --> 00:28:12,640
really is an ideal location very flat

742
00:28:16,389 --> 00:28:15,039
very few rocks a great place to land and

743
00:28:18,470 --> 00:28:16,399
a great place to actually be able to

744
00:28:20,149 --> 00:28:18,480
retrieve sample tubes so we're looking

745
00:28:22,470 --> 00:28:20,159
at the potential putting down 10 to 11

746
00:28:24,630 --> 00:28:22,480
sample tubes here on the surface and

747
00:28:26,070 --> 00:28:24,640
then that would take about two months to

748
00:28:27,990 --> 00:28:26,080
probably put those samples down and

749
00:28:29,990 --> 00:28:28,000
actually carefully document where they

750
00:28:31,510 --> 00:28:30,000
are so the future mission can actually

751
00:28:33,190 --> 00:28:31,520
find them

752
00:28:34,389 --> 00:28:33,200
so let me talk now a little bit more

753
00:28:36,230 --> 00:28:34,399
about the future so if we could have the

754
00:28:38,310 --> 00:28:36,240
next graphic

755
00:28:40,710 --> 00:28:38,320
so what would happen after we put down

756
00:28:42,230 --> 00:28:40,720
that depot would be further exploration

757
00:28:43,909 --> 00:28:42,240
right we still have a set of samples on

758
00:28:45,669 --> 00:28:43,919
board where we want to go is up on top

759
00:28:47,269 --> 00:28:45,679
of the delta so this dark black line

760
00:28:49,110 --> 00:28:47,279
shows potential traverse paths we're

761
00:28:51,350 --> 00:28:49,120
actually looking at to explore the top

762
00:28:52,710 --> 00:28:51,360
of the delta gather more samples

763
00:28:54,389 --> 00:28:52,720

and get all the way over to where the

764
00:28:56,549 --> 00:28:54,399
edge of the lake was here in jezreel

765
00:28:58,710 --> 00:28:56,559
crater shown there near the crater rim

766
00:29:00,549 --> 00:28:58,720
on the left of the image that's probably

767
00:29:02,870 --> 00:29:00,559
going to take at least the next year of

768
00:29:04,310 --> 00:29:02,880
operations to do that exploration

769
00:29:05,830 --> 00:29:04,320
but we do even want to go farther than

770
00:29:08,149 --> 00:29:05,840
that let me just remind folks that

771
00:29:10,389 --> 00:29:08,159
curiosity just celebrated the 10th

772
00:29:12,149 --> 00:29:10,399
anniversary on mars right and

773
00:29:14,310 --> 00:29:12,159
perseverance is you know designed

774
00:29:16,389 --> 00:29:14,320
exactly like curiosity may expect a very

775
00:29:18,230 --> 00:29:16,399
long mission for perseverance as well

776
00:29:20,549 --> 00:29:18,240
and so our long-term plan is to climb up

777
00:29:22,789 --> 00:29:20,559
the crater rim to go beyond jezreel and

778
00:29:24,230 --> 00:29:22,799
explore and sample the area beyond that

779
00:29:25,909 --> 00:29:24,240
and to have the potential to actually

780
00:29:27,590 --> 00:29:25,919
rendezvous with the mars sample return

781
00:29:29,430 --> 00:29:27,600
missions in the future and actually

782
00:29:31,909 --> 00:29:29,440
deliver all the samples we've acquired

783
00:29:33,510 --> 00:29:31,919
at that time so a very exciting prospect

784
00:29:35,510 --> 00:29:33,520
for the future and with that let me turn

785
00:29:37,750 --> 00:29:35,520
it over to lori

786
00:29:38,950 --> 00:29:37,760
great thank you so much rick appreciate

787
00:29:41,590 --> 00:29:38,960
it

788
00:29:45,510 --> 00:29:41,600

so just from everything we've heard here

789
00:29:47,510 --> 00:29:45,520
today and just the complete body of work

790
00:29:49,669 --> 00:29:47,520
that's been completed by this incredible

791
00:29:51,510 --> 00:29:49,679
perseverance team to date

792
00:29:54,149 --> 00:29:51,520
tells me that

793
00:29:56,630 --> 00:29:54,159
we not only went to the right place but

794
00:29:59,110 --> 00:29:56,640
we spent the right spacecraft with the

795
00:30:02,470 --> 00:29:59,120
right science instruments to explore

796
00:30:03,990 --> 00:30:02,480
this uh amazing ancient environment

797
00:30:06,470 --> 00:30:04,000
on mars

798
00:30:09,190 --> 00:30:06,480
you know ever since perseverance's very

799
00:30:11,190 --> 00:30:09,200
first core was collected we've said that

800
00:30:12,230 --> 00:30:11,200
the mars sample return campaign is

801
00:30:14,789 --> 00:30:12,240
underway

802
00:30:16,310 --> 00:30:14,799
and progress continues to be made as

803
00:30:18,710 --> 00:30:16,320
you're hearing

804
00:30:21,669 --> 00:30:18,720
so the mars sample return campaign you

805
00:30:24,149 --> 00:30:21,679
know just it could really revolutionize

806
00:30:26,870 --> 00:30:24,159
humanity's understanding of mars you

807
00:30:29,510 --> 00:30:26,880
know by returning these scientifically

808
00:30:31,269 --> 00:30:29,520
selected samples for study using the

809
00:30:33,430 --> 00:30:31,279
most sophisticated instruments from

810
00:30:34,789 --> 00:30:33,440
around the world so let's talk just a

811
00:30:36,549 --> 00:30:34,799
little bit about what's going on with

812
00:30:38,230 --> 00:30:36,559
that next phase of the march sample

813
00:30:40,070 --> 00:30:38,240

return campaign

814
00:30:41,750 --> 00:30:40,080
we've recently made some changes to the

815
00:30:44,389 --> 00:30:41,760
campaign design and if i can get the

816
00:30:47,590 --> 00:30:44,399
first image there you can see our mars

817
00:30:49,350 --> 00:30:47,600
sample return family portrait

818
00:30:51,830 --> 00:30:49,360
our sample return of course this is a

819
00:30:54,710 --> 00:30:51,840
strategic partnership with the european

820
00:30:56,470 --> 00:30:54,720
space agency and it'll be the first

821
00:30:57,669 --> 00:30:56,480
mission to return samples from another

822
00:30:58,470 --> 00:30:57,679
planet

823
00:31:00,470 --> 00:30:58,480
and

824
00:31:02,789 --> 00:31:00,480
also the first to launch from the

825
00:31:05,190 --> 00:31:02,799
surface of another planet

826
00:31:06,470 --> 00:31:05,200
the samples uh to be returned those that

827
00:31:08,630 --> 00:31:06,480
are currently being collected by

828
00:31:10,549 --> 00:31:08,640
perseverance now during its exploration

829
00:31:12,549 --> 00:31:10,559
of jezreel crater and its ancient river

830
00:31:14,549 --> 00:31:12,559
delta those samples are thought to be

831
00:31:15,990 --> 00:31:14,559
the best opportunity to reveal the early

832
00:31:17,510 --> 00:31:16,000
evolution of mars including the

833
00:31:18,870 --> 00:31:17,520
potential for life as you've already

834
00:31:20,389 --> 00:31:18,880
been hearing here

835
00:31:23,190 --> 00:31:20,399
today

836
00:31:26,070 --> 00:31:23,200
in this image you can see a perseverance

837
00:31:28,230 --> 00:31:26,080
who's not only collecting samples but

838
00:31:31,029 --> 00:31:28,240

can be utilized to deliver the samples

839
00:31:32,630 --> 00:31:31,039
back to the sample return lander in fact

840
00:31:35,430 --> 00:31:32,640
based on a new assessment of the

841
00:31:37,509 --> 00:31:35,440
reliability and life expectancy for

842
00:31:39,190 --> 00:31:37,519
perseverance we now have increased

843
00:31:41,830 --> 00:31:39,200
confidence that the rover will be able

844
00:31:44,789 --> 00:31:41,840
to deliver those samples to the lander

845
00:31:46,950 --> 00:31:44,799
in the 20 20 30 time frame

846
00:31:48,789 --> 00:31:46,960
that lander the lander that we're going

847
00:31:50,149 --> 00:31:48,799
to deliver the samples to

848
00:31:52,230 --> 00:31:50,159
is going to carry a payload that

849
00:31:54,630 --> 00:31:52,240
includes uh two sample retrieval

850
00:31:56,389 --> 00:31:54,640
helicopters um those helicopters are

851
00:31:59,269 --> 00:31:56,399
going to build on this incredible

852
00:32:01,269 --> 00:31:59,279
experience we have with ingenuity and

853
00:32:03,190 --> 00:32:01,279
those little helicopters will be able to

854
00:32:04,789 --> 00:32:03,200
retrieve the samples that are left on

855
00:32:06,950 --> 00:32:04,799
the surface at the caching depot that

856
00:32:08,389 --> 00:32:06,960
rick was just talking about

857
00:32:09,669 --> 00:32:08,399
the lander will also carry the mars

858
00:32:11,509 --> 00:32:09,679
ascent vehicle

859
00:32:14,389 --> 00:32:11,519
which will place those samples into

860
00:32:16,710 --> 00:32:14,399
orbit around mars for capture by the

861
00:32:18,470 --> 00:32:16,720
european space agency's earth return

862
00:32:20,630 --> 00:32:18,480
orbiter

863
00:32:23,350 --> 00:32:20,640

so we're making tremendous progress

864
00:32:24,950 --> 00:32:23,360
in maturing our plans for mars sample

865
00:32:27,669 --> 00:32:24,960
return and if i could have the first

866
00:32:29,990 --> 00:32:27,679
video clip please

867
00:32:33,190 --> 00:32:30,000
this video is showing some testing

868
00:32:35,110 --> 00:32:33,200
that's going on in jpl's mars yard with

869
00:32:36,549 --> 00:32:35,120
the perseverance test bed known as

870
00:32:39,430 --> 00:32:36,559
optimism

871
00:32:42,230 --> 00:32:39,440
the goal of this set of tests was to

872
00:32:44,710 --> 00:32:42,240
practice dropping the sample tubes from

873
00:32:47,669 --> 00:32:44,720
the adaptive caching assembly to the

874
00:32:49,269 --> 00:32:47,679
ground on variously tilted terrain

875
00:32:52,470 --> 00:32:49,279
this is the same procedure that will be

876
00:32:53,990 --> 00:32:52,480
used when we drop the tubes on mars and

877
00:32:57,190 --> 00:32:54,000
this allows us

878
00:32:58,630 --> 00:32:57,200
to then design and test the systems

879
00:33:01,029 --> 00:32:58,640
those systems so that we can

880
00:33:03,190 --> 00:33:01,039
successfully pick up the samples from

881
00:33:05,669 --> 00:33:03,200
the surface and if i could have the next

882
00:33:06,870 --> 00:33:05,679
video clip please

883
00:33:09,430 --> 00:33:06,880
this video

884
00:33:11,830 --> 00:33:09,440
is showing some ongoing testing of the

885
00:33:12,630 --> 00:33:11,840
updated sample return lander landing

886
00:33:16,070 --> 00:33:12,640
gear

887
00:33:18,310 --> 00:33:16,080
this test using a 3 8 scale model of the

888
00:33:21,029 --> 00:33:18,320

sample return lander was specifically

889
00:33:23,350 --> 00:33:21,039
aimed at the legs supporting the lander

890
00:33:25,029 --> 00:33:23,360
structure with impact speeds of about

891
00:33:26,549 --> 00:33:25,039
one and a half to two and a half meters

892
00:33:28,389 --> 00:33:26,559
per second

893
00:33:31,110 --> 00:33:28,399
these tests are still ongoing the latest

894
00:33:34,070 --> 00:33:31,120
test just took place a week ago

895
00:33:36,389 --> 00:33:34,080
and the approach with this testing is to

896
00:33:38,950 --> 00:33:36,399
carefully construct

897
00:33:41,830 --> 00:33:38,960
the physical tests in the physical world

898
00:33:44,310 --> 00:33:41,840
and then construct the same exact tests

899
00:33:46,870 --> 00:33:44,320
in a computer model

900
00:33:49,669 --> 00:33:46,880
and that way we can make sure that the

901
00:33:51,430 --> 00:33:49,679
computer simulation matches what happens

902
00:33:53,110 --> 00:33:51,440
in the real world tests

903
00:33:55,990 --> 00:33:53,120
and then that lets us know that the

904
00:33:58,310 --> 00:33:56,000
computer model is correct and we can use

905
00:34:00,470 --> 00:33:58,320
that computer model to simulate

906
00:34:04,549 --> 00:34:00,480
thousands of landings on different

907
00:34:07,110 --> 00:34:04,559
slopes rocks ground types orientations

908
00:34:10,069 --> 00:34:07,120
to understand and predict how the lander

909
00:34:12,710 --> 00:34:10,079
would behave on mars

910
00:34:14,310 --> 00:34:12,720
so looking to the future on msr there's

911
00:34:15,270 --> 00:34:14,320
a few things coming up in the near

912
00:34:18,230 --> 00:34:15,280
future

913
00:34:20,470 --> 00:34:18,240

just next week i will be testing the

914
00:34:22,710 --> 00:34:20,480
thermal protection material conductivity

915
00:34:25,109 --> 00:34:22,720
out at the ames research center

916
00:34:27,669 --> 00:34:25,119
also in september on the 28th and 30th

917
00:34:29,589 --> 00:34:27,679
we'll be holding a science workshop

918
00:34:32,470 --> 00:34:29,599
that's open to the public

919
00:34:35,109 --> 00:34:32,480
to discuss ideas about the deployment of

920
00:34:37,190 --> 00:34:35,119
the msr cash depot there'll be a lot of

921
00:34:38,550 --> 00:34:37,200
discussion about that that caching

922
00:34:40,470 --> 00:34:38,560
activity

923
00:34:42,149 --> 00:34:40,480
and then following that workshop on

924
00:34:45,109 --> 00:34:42,159
october 19th

925
00:34:47,510 --> 00:34:45,119
there'll be a a go no go decisional

926
00:34:49,349 --> 00:34:47,520
meeting that'll confirm that we are

927
00:34:51,430 --> 00:34:49,359
ready for dropping those samples at the

928
00:34:53,270 --> 00:34:51,440
depot

929
00:34:55,589 --> 00:34:53,280
in november a little bit further on the

930
00:34:57,910 --> 00:34:55,599
horizon the european space agency's

931
00:34:59,990 --> 00:34:57,920
member state ministerial meeting is

932
00:35:02,150 --> 00:35:00,000
going to happen

933
00:35:04,550 --> 00:35:02,160
at that meeting we expect our partners

934
00:35:06,870 --> 00:35:04,560
the european space agency uh that they

935
00:35:11,349 --> 00:35:06,880
will finalize uh their architecture

936
00:35:14,950 --> 00:35:13,510
so i i mentioned earlier we've been

937
00:35:16,870 --> 00:35:14,960
saying that the mars staff return

938
00:35:18,950 --> 00:35:16,880

campaign began with perseverance's

939
00:35:20,230 --> 00:35:18,960
exploration and the first sampling at

940
00:35:23,990 --> 00:35:20,240
jezreel

941
00:35:25,670 --> 00:35:24,000
and what an amazing story those samples

942
00:35:27,910 --> 00:35:25,680
are telling us

943
00:35:30,390 --> 00:35:27,920
not only the wildcat ridge samples but

944
00:35:32,230 --> 00:35:30,400
the entirety of perseverance's samples

945
00:35:34,550 --> 00:35:32,240
are intriguing which means they're

946
00:35:36,470 --> 00:35:34,560
perfect for mars sample return

947
00:35:39,430 --> 00:35:36,480
perseverance collected both water

948
00:35:42,630 --> 00:35:39,440
deposited rocks and igneous rocks

949
00:35:45,030 --> 00:35:42,640
leading to a highly diverse sample suite

950
00:35:47,109 --> 00:35:45,040
and that diversity is central to the

951
00:35:49,589 --> 00:35:47,119
objective of mars sample return because

952
00:35:51,589 --> 00:35:49,599
the more diverse the sample suite the

953
00:35:53,910 --> 00:35:51,599
more diverse the science investigations

954
00:35:55,910 --> 00:35:53,920
the samples are going to support

955
00:35:58,150 --> 00:35:55,920
so with that i want to thank the entire

956
00:36:01,349 --> 00:35:58,160
perseverance team for all of their hard

957
00:36:04,470 --> 00:36:01,359
work and back to you raquel

958
00:36:06,950 --> 00:36:04,480
great thank you lori now it is now time

959
00:36:08,630 --> 00:36:06,960
for questions if you're a member of the

960
00:36:10,870 --> 00:36:08,640
media on the phone lines and have a

961
00:36:12,950 --> 00:36:10,880
question press star one to get put in

962
00:36:16,550 --> 00:36:12,960
the queue and if you're on social media

963
00:36:18,150 --> 00:36:16,560

use the hashtag ask nasa but first i'll

964
00:36:20,069 --> 00:36:18,160
take a look in the room and see if

965
00:36:22,310 --> 00:36:20,079
anyone has any questions if you do

966
00:36:24,870 --> 00:36:22,320
please raise your hand and we will bring

967
00:36:26,069 --> 00:36:24,880
a mic over to you

968
00:36:28,230 --> 00:36:26,079
looks like i'll give some people a

969
00:36:30,470 --> 00:36:28,240
chance to get ready let's take it to the

970
00:36:35,829 --> 00:36:30,480
phone lines we have

971
00:36:40,710 --> 00:36:38,790
hi marina coren with the atlantic um for

972
00:36:43,030 --> 00:36:40,720
ken a question about finding more

973
00:36:44,790 --> 00:36:43,040
igneous rock than you expected you said

974
00:36:47,109 --> 00:36:44,800
that this means that before there was a

975
00:36:49,510 --> 00:36:47,119
lake in jezreel crater there was magma

976
00:36:51,270 --> 00:36:49,520
and lava but i'm wondering if this

977
00:36:53,270 --> 00:36:51,280
discovery has made you

978
00:36:54,870 --> 00:36:53,280
reassess your current understanding of a

979
00:36:56,870 --> 00:36:54,880
lake here for example does this mean

980
00:36:59,510 --> 00:36:56,880
that the ancient lake was more

981
00:37:01,190 --> 00:36:59,520
short-lived than we might have expected

982
00:37:03,030 --> 00:37:01,200
and the quick one for david how does

983
00:37:05,109 --> 00:37:03,040
this igneous rock affect the story of

984
00:37:06,790 --> 00:37:05,119
how the lake even got there um you said

985
00:37:08,390 --> 00:37:06,800
the lake filled up

986
00:37:09,670 --> 00:37:08,400
but how maybe this is a very basic

987
00:37:11,589 --> 00:37:09,680
question but how did the lake even get

988
00:37:13,190 --> 00:37:11,599

there based on what you're seeing thank

989
00:37:16,230 --> 00:37:13,200
you

990
00:37:18,710 --> 00:37:16,240
so we have an indication that there is a

991
00:37:22,150 --> 00:37:18,720
significant amount of material that was

992
00:37:23,670 --> 00:37:22,160
deposited in this crater after it formed

993
00:37:26,390 --> 00:37:23,680
and

994
00:37:28,310 --> 00:37:26,400
it is undoubtedly now we know it is a

995
00:37:29,750 --> 00:37:28,320
mixture of different kinds of things

996
00:37:31,589 --> 00:37:29,760
including the igneous rocks that i

997
00:37:33,589 --> 00:37:31,599
described as well as the sedimentary

998
00:37:35,109 --> 00:37:33,599
rocks and the reality is all we can

999
00:37:37,829 --> 00:37:35,119
really know is what's exposed at the

1000
00:37:40,230 --> 00:37:37,839
surface so whether there are

1001
00:37:42,470 --> 00:37:40,240
lake deposits that lie below the igneous

1002
00:37:44,310 --> 00:37:42,480
rocks we don't know

1003
00:37:46,230 --> 00:37:44,320
the question of how long the lake was

1004
00:37:48,790 --> 00:37:46,240
present this is an important question

1005
00:37:50,230 --> 00:37:48,800
and it is very difficult to determine

1006
00:37:51,589 --> 00:37:50,240
that with the rover this is the kind of

1007
00:37:55,750 --> 00:37:51,599
thing that we are hoping to do with the

1008
00:38:00,790 --> 00:37:57,670
doubt the existence of the lake but i'll

1009
00:38:02,630 --> 00:38:00,800
let david address that question

1010
00:38:04,550 --> 00:38:02,640
yeah i

1011
00:38:05,589 --> 00:38:04,560
echo everything that ken said you know

1012
00:38:08,790 --> 00:38:05,599
one of the

1013
00:38:10,550 --> 00:38:08,800

key variables that we really don't have

1014
00:38:14,470 --> 00:38:10,560
much knowledge on

1015
00:38:15,670 --> 00:38:14,480
is the time dimension right and so

1016
00:38:18,150 --> 00:38:15,680
i think one of the important

1017
00:38:19,910 --> 00:38:18,160
implications of the igneous rocks first

1018
00:38:22,310 --> 00:38:19,920
of all let's be clear the igneous rocks

1019
00:38:24,710 --> 00:38:22,320
at the crater floor at least

1020
00:38:27,670 --> 00:38:24,720
some of which we collected

1021
00:38:29,990 --> 00:38:27,680
uh we think are clearly beneath the

1022
00:38:32,630 --> 00:38:30,000
delta so that means they were in place

1023
00:38:34,710 --> 00:38:32,640
before the delta was in place

1024
00:38:36,150 --> 00:38:34,720
which at face value

1025
00:38:38,630 --> 00:38:36,160
indicates that those were in place

1026
00:38:40,710 --> 00:38:38,640
before the lake was present or at least

1027
00:38:43,190 --> 00:38:40,720
this iteration of the lake that we're

1028
00:38:44,310 --> 00:38:43,200
observing

1029
00:38:46,069 --> 00:38:44,320
and so

1030
00:38:48,230 --> 00:38:46,079
the the key variable there that we

1031
00:38:50,150 --> 00:38:48,240
really don't know is how much time we're

1032
00:38:52,150 --> 00:38:50,160
looking at for all for all we know there

1033
00:38:54,710 --> 00:38:52,160
could be hundreds of millions of years

1034
00:38:56,310 --> 00:38:54,720
or more between when those igneous rocks

1035
00:38:58,550 --> 00:38:56,320
were in place and then when the delta

1036
00:39:00,710 --> 00:38:58,560
wasn't placed on top of it

1037
00:39:02,470 --> 00:39:00,720
um so i think to answer your question if

1038
00:39:04,790 --> 00:39:02,480

i understood it correctly is it it

1039
00:39:05,910 --> 00:39:04,800
really doesn't have a much bearing so

1040
00:39:08,069 --> 00:39:05,920
much on

1041
00:39:10,550 --> 00:39:08,079
um how the late formed but it will have

1042
00:39:12,310 --> 00:39:10,560
very important implications that as ken

1043
00:39:14,550 --> 00:39:12,320
said we will be able to quantify when

1044
00:39:16,069 --> 00:39:14,560
these samples come back to earth about

1045
00:39:18,310 --> 00:39:16,079
when the lake was there and then

1046
00:39:21,190 --> 00:39:18,320
ultimately uh that will help

1047
00:39:23,190 --> 00:39:21,200
inform uh our understanding of how long

1048
00:39:24,630 --> 00:39:23,200
the lake was there how many times the

1049
00:39:26,710 --> 00:39:24,640
lake filled up

1050
00:39:32,550 --> 00:39:26,720
for example

1051
00:39:37,589 --> 00:39:34,870
right thank you we'll now move on to the

1052
00:39:45,670 --> 00:39:37,599
second caller which is bill harwood with

1053
00:39:49,030 --> 00:39:47,750
hey could you guys hear me i'm sorry we

1054
00:39:51,270 --> 00:39:49,040
can hear you bill

1055
00:39:53,190 --> 00:39:51,280
oh hey thanks um i just wanted to follow

1056
00:39:55,109 --> 00:39:53,200
up on that very same question i'm a

1057
00:39:57,430 --> 00:39:55,119
little fuzzy about

1058
00:39:59,430 --> 00:39:57,440
the richness and the organic

1059
00:40:00,950 --> 00:39:59,440
material you're finding at the base of

1060
00:40:02,710 --> 00:40:00,960
the delta

1061
00:40:05,589 --> 00:40:02,720
and then and then the transition from

1062
00:40:07,109 --> 00:40:05,599
there out into the more igneous

1063
00:40:09,109 --> 00:40:07,119

deposits toward the center of the lake

1064
00:40:11,670 --> 00:40:09,119
i'm still not understanding

1065
00:40:16,069 --> 00:40:11,680
i guess the possible history here

1066
00:40:18,069 --> 00:40:16,079
um of lake versus you know magma

1067
00:40:20,470 --> 00:40:18,079
versus you know whatever hitmar is in

1068
00:40:22,870 --> 00:40:20,480
the first place to excavate the crater

1069
00:40:24,790 --> 00:40:22,880
um i'm just i'm still not quite getting

1070
00:40:28,710 --> 00:40:24,800
that what what do you think the history

1071
00:40:32,150 --> 00:40:30,710
okay i'll i'll give a quick summary if

1072
00:40:34,230 --> 00:40:32,160
sonanda wants to

1073
00:40:36,710 --> 00:40:34,240
jump in she can the basic idea is this

1074
00:40:39,990 --> 00:40:36,720
crater formed it probably formed about

1075
00:40:42,550 --> 00:40:40,000
3.8 billion years ago it made a big hole

1076
00:40:43,829 --> 00:40:42,560
and that hole is filled with material as

1077
00:40:45,109 --> 00:40:43,839
i mentioned

1078
00:40:46,710 --> 00:40:45,119
but we don't know the origin of that

1079
00:40:48,790 --> 00:40:46,720
material but one of the key things that

1080
00:40:50,950 --> 00:40:48,800
is special about mars

1081
00:40:53,670 --> 00:40:50,960
is how long surface features persist

1082
00:40:55,990 --> 00:40:53,680
without plate tectonics and and uh the

1083
00:40:57,829 --> 00:40:56,000
kinds of reworking that we see on earth

1084
00:40:59,589 --> 00:40:57,839
features last a long time

1085
00:41:01,990 --> 00:40:59,599
so as david suggested there may have

1086
00:41:03,030 --> 00:41:02,000
been multiple iterations of lake you

1087
00:41:04,550 --> 00:41:03,040
know the lake might have filled and

1088
00:41:06,870 --> 00:41:04,560

dried up and then there might have been

1089
00:41:08,390 --> 00:41:06,880
uh magnetism filling it up with lava and

1090
00:41:10,710 --> 00:41:08,400
then more lake

1091
00:41:12,710 --> 00:41:10,720
so all we can really say

1092
00:41:14,790 --> 00:41:12,720
is that there is evidence that there are

1093
00:41:16,790 --> 00:41:14,800
igneous rocks that are older

1094
00:41:18,630 --> 00:41:16,800
than the final iteration of the lake

1095
00:41:20,470 --> 00:41:18,640
that we see that made the delta what

1096
00:41:22,309 --> 00:41:20,480
happened before that we don't know

1097
00:41:24,630 --> 00:41:22,319
uh but it's it's basically a time

1098
00:41:26,710 --> 00:41:24,640
history the bottom of which we see the

1099
00:41:29,349 --> 00:41:26,720
igneous rocks and then the upper part of

1100
00:41:31,670 --> 00:41:29,359
which is the uh delta that that is the

1101
00:41:33,030 --> 00:41:31,680
last iteration of the lake

1102
00:41:34,790 --> 00:41:33,040
yeah i'll add in there a little bit more

1103
00:41:36,710 --> 00:41:34,800
about the signals that we think are from

1104
00:41:37,829 --> 00:41:36,720
organic matter so

1105
00:41:40,470 --> 00:41:37,839
i guess there's a couple of different

1106
00:41:43,589 --> 00:41:40,480
metrics that we use to determine in that

1107
00:41:45,109 --> 00:41:43,599
map that you saw in a sherlock map

1108
00:41:47,670 --> 00:41:45,119
how much we're seeing and what is the

1109
00:41:49,589 --> 00:41:47,680
diversity of signals and so in both

1110
00:41:51,430 --> 00:41:49,599
those different metrics like how many

1111
00:41:53,270 --> 00:41:51,440
times we're seeing a signal um the

1112
00:41:55,109 --> 00:41:53,280
intensity of the signal actually and the

1113
00:41:56,390 --> 00:41:55,119

diversity of the different types of

1114
00:41:58,790 --> 00:41:56,400
signals that we think could come from

1115
00:41:59,829 --> 00:41:58,800
organic matter we're seeing what we saw

1116
00:42:01,190 --> 00:41:59,839
in the crater floor and what we're

1117
00:42:02,870 --> 00:42:01,200
seeing in the delta is two different

1118
00:42:04,950 --> 00:42:02,880
things the exciting thing that i was

1119
00:42:06,950 --> 00:42:04,960
mentioning is that we saw almost hints

1120
00:42:08,630 --> 00:42:06,960
of now what we're seeing so loudly so

1121
00:42:10,390 --> 00:42:08,640
clearly in the delta as we are moving

1122
00:42:11,990 --> 00:42:10,400
through the crater floor so there's a

1123
00:42:16,470 --> 00:42:12,000
relationship there but these are two

1124
00:42:20,150 --> 00:42:17,829
thanks hope that answers your question

1125
00:42:22,870 --> 00:42:20,160
bill we are now going to switch it over

1126
00:42:26,790 --> 00:42:22,880
to social media and i'll hand it over to

1127
00:42:29,109 --> 00:42:26,800
the jpl social media lead for questions

1128
00:42:31,270 --> 00:42:29,119
yes thanks everyone uh we have so many

1129
00:42:33,270 --> 00:42:31,280
great questions coming in the first one

1130
00:42:34,870 --> 00:42:33,280
is a question on the timing for the

1131
00:42:36,550 --> 00:42:34,880
return of these samples we actually have

1132
00:42:38,950 --> 00:42:36,560
a few of these questions

1133
00:42:40,790 --> 00:42:38,960
adam on twitter asks super exciting a

1134
00:42:43,349 --> 00:42:40,800
return mission would be very complicated

1135
00:42:44,950 --> 00:42:43,359
and probably decades away unfortunately

1136
00:42:47,270 --> 00:42:44,960
and to follow up on that melissa from

1137
00:42:49,510 --> 00:42:47,280
facebook asks how long will the return

1138
00:42:51,990 --> 00:42:49,520

trip take with the samples so we can

1139
00:42:54,230 --> 00:42:52,000
study them

1140
00:42:56,870 --> 00:42:54,240
i'll take that one uh those are some

1141
00:42:59,030 --> 00:42:56,880
great questions

1142
00:43:01,270 --> 00:42:59,040
and what's really exciting is that we

1143
00:43:03,750 --> 00:43:01,280
have the technologies now to bring these

1144
00:43:05,750 --> 00:43:03,760
samples back um i think this is just

1145
00:43:07,670 --> 00:43:05,760
amazing i think you've heard lori leshan

1146
00:43:09,510 --> 00:43:07,680
at the beginning perhaps say you know

1147
00:43:11,910 --> 00:43:09,520
that we are now uh really in the

1148
00:43:13,510 --> 00:43:11,920
position that these samples are

1149
00:43:15,829 --> 00:43:13,520
so compelling that we want to get them

1150
00:43:17,750 --> 00:43:15,839
back the march sample return campaign

1151
00:43:20,710 --> 00:43:17,760
that we're working on as you say is

1152
00:43:22,150 --> 00:43:20,720
incredibly complex but

1153
00:43:24,150 --> 00:43:22,160
we expect

1154
00:43:26,790 --> 00:43:24,160
to have two launches from earth later

1155
00:43:28,710 --> 00:43:26,800
this decade the earth return orbiter

1156
00:43:31,270 --> 00:43:28,720
that'll carry the samples back to earth

1157
00:43:33,589 --> 00:43:31,280
is expected to launch in 2027 in our

1158
00:43:35,910 --> 00:43:33,599
current design and the sample return

1159
00:43:37,670 --> 00:43:35,920
lander will actually launch a little bit

1160
00:43:39,670 --> 00:43:37,680
later a few months later in the spring

1161
00:43:41,990 --> 00:43:39,680
of 2028

1162
00:43:44,550 --> 00:43:42,000
it will arrive on the surface of mars

1163
00:43:46,390 --> 00:43:44,560

and spend a relatively short amount of

1164
00:43:48,470 --> 00:43:46,400
time hopefully with perseverance

1165
00:43:49,829 --> 00:43:48,480
bringing samples delivering them to the

1166
00:43:51,430 --> 00:43:49,839
rover or

1167
00:43:53,349 --> 00:43:51,440
having the helicopter pick them up and

1168
00:43:54,390 --> 00:43:53,359
bring them back to the lander and then

1169
00:43:57,109 --> 00:43:54,400
we will

1170
00:43:58,870 --> 00:43:57,119
launch those uh samples into orbit

1171
00:44:00,309 --> 00:43:58,880
around mars this will all happen around

1172
00:44:02,950 --> 00:44:00,319
2030

1173
00:44:05,030 --> 00:44:02,960
and then it begins the trip back

1174
00:44:10,390 --> 00:44:05,040
um back to earth and we expect those

1175
00:44:14,630 --> 00:44:11,910
thank you so much

1176
00:44:17,030 --> 00:44:14,640
uh and a question for ken

1177
00:44:19,190 --> 00:44:17,040
mike on twitter asks can perseverance

1178
00:44:21,270 --> 00:44:19,200
detect signs of life without samples

1179
00:44:23,349 --> 00:44:21,280
being brought back to earth

1180
00:44:24,950 --> 00:44:23,359
yeah that's a great question and it

1181
00:44:27,030 --> 00:44:24,960
really goes to this this point that i

1182
00:44:28,950 --> 00:44:27,040
was making about potential biosignatures

1183
00:44:30,230 --> 00:44:28,960
there's another kind of term that we

1184
00:44:31,589 --> 00:44:30,240
would use which is definitive

1185
00:44:33,430 --> 00:44:31,599
biosignature so a definitive

1186
00:44:36,470 --> 00:44:33,440
biosignature is something that is

1187
00:44:38,470 --> 00:44:36,480
undoubtedly due to life and so the way i

1188
00:44:39,990 --> 00:44:38,480

understand that question to be what is

1189
00:44:41,990 --> 00:44:40,000
the likelihood that the instruments

1190
00:44:44,550 --> 00:44:42,000
aboard the rover will

1191
00:44:46,870 --> 00:44:44,560
definitively detect evidence of life

1192
00:44:48,790 --> 00:44:46,880
and the reality is the burden of proof

1193
00:44:50,950 --> 00:44:48,800
for establishing life on another planet

1194
00:44:53,910 --> 00:44:50,960
is very very high

1195
00:44:55,829 --> 00:44:53,920
and it seems unlikely to most of us that

1196
00:44:57,750 --> 00:44:55,839
the evidence will be so compelling that

1197
00:44:58,790 --> 00:44:57,760
we will be able to do that and i just

1198
00:45:00,390 --> 00:44:58,800
want to make the point you know the

1199
00:45:01,829 --> 00:45:00,400
rover can only make the kinds of

1200
00:45:03,589 --> 00:45:01,839
observations

1201
00:45:05,270 --> 00:45:03,599
that we thought of building into the

1202
00:45:06,710 --> 00:45:05,280
rover years ago

1203
00:45:08,550 --> 00:45:06,720
that's very different than terrestrial

1204
00:45:10,309 --> 00:45:08,560
laboratories where you can say well if

1205
00:45:11,829 --> 00:45:10,319
we just make this kind of observation

1206
00:45:14,069 --> 00:45:11,839
some new thing that we haven't thought

1207
00:45:15,430 --> 00:45:14,079
of that'll answer the question

1208
00:45:17,589 --> 00:45:15,440
rover can't do that because the rover

1209
00:45:19,109 --> 00:45:17,599
only has what it has so this is one of

1210
00:45:21,829 --> 00:45:19,119
the reasons why bringing samples back to

1211
00:45:23,349 --> 00:45:21,839
earth is so important so in in answer

1212
00:45:25,510 --> 00:45:23,359
that question i think it's not very

1213
00:45:27,190 --> 00:45:25,520

likely that we will make a definitive

1214
00:45:28,470 --> 00:45:27,200
detection of life about the best we are

1215
00:45:29,750 --> 00:45:28,480
likely to be able to do is this

1216
00:45:32,950 --> 00:45:29,760
potential

1217
00:45:34,790 --> 00:45:32,960
uh detection

1218
00:45:36,630 --> 00:45:34,800
thank you for the social questions if

1219
00:45:39,670 --> 00:45:36,640
you want to ask a question online use

1220
00:45:42,950 --> 00:45:39,680
the hashtag asknasa we'll now take it

1221
00:45:46,710 --> 00:45:42,960
back to the callers up next we have ken

1222
00:45:48,710 --> 00:45:46,720
chang with the new york times

1223
00:45:50,390 --> 00:45:48,720
hi thank you um

1224
00:45:51,270 --> 00:45:50,400
a few years ago there's live talking

1225
00:45:53,670 --> 00:45:51,280
about

1226
00:45:55,030 --> 00:45:53,680
curiosity finding organic matter in the

1227
00:45:56,790 --> 00:45:55,040
old crater

1228
00:45:59,589 --> 00:45:56,800
and that's why i'd be

1229
00:46:01,910 --> 00:45:59,599
ambiguous and then

1230
00:46:03,829 --> 00:46:01,920
organic compounds weren't that complex

1231
00:46:05,829 --> 00:46:03,839
could you compare those findings with

1232
00:46:07,589 --> 00:46:05,839
what you have now

1233
00:46:09,829 --> 00:46:07,599
um

1234
00:46:12,550 --> 00:46:09,839
how much is there of a more complex

1235
00:46:16,309 --> 00:46:14,950
yeah i can take that so um

1236
00:46:18,150 --> 00:46:16,319
it's an interesting point and a really

1237
00:46:21,030 --> 00:46:18,160
good question so the technique that

1238
00:46:22,230 --> 00:46:21,040

curiosity uses to um detect organic

1239
00:46:23,670 --> 00:46:22,240
matter is different than what i

1240
00:46:24,710 --> 00:46:23,680
mentioned with sherlock so there are two

1241
00:46:27,829 --> 00:46:24,720
different types of techniques and

1242
00:46:28,630 --> 00:46:27,839
actually sherlock has two in itself um

1243
00:46:30,630 --> 00:46:28,640
so

1244
00:46:32,309 --> 00:46:30,640
it's not exactly a head-to-head apples

1245
00:46:35,030 --> 00:46:32,319
to apples comparison

1246
00:46:36,790 --> 00:46:35,040
um and so that's in order to really get

1247
00:46:38,870 --> 00:46:36,800
down to what they're seeing versus what

1248
00:46:40,470 --> 00:46:38,880
we're seeing and the concentrations we

1249
00:46:42,069 --> 00:46:40,480
need to go through the data a little bit

1250
00:46:43,670 --> 00:46:42,079
more and then also bring the samples

1251
00:46:45,670 --> 00:46:43,680
back would be the only way to be really

1252
00:46:47,270 --> 00:46:45,680
really definitive about it but what i

1253
00:46:49,510 --> 00:46:47,280
can say is the technique that we're

1254
00:46:51,589 --> 00:46:49,520
using is really important because we're

1255
00:46:53,270 --> 00:46:51,599
not um breaking up the rock at all we're

1256
00:46:55,270 --> 00:46:53,280
observing it basically the only change

1257
00:46:56,630 --> 00:46:55,280
that we make is abrading the surface

1258
00:46:58,390 --> 00:46:56,640
down and actually we even do

1259
00:47:00,790 --> 00:46:58,400
observations on rocks where we don't do

1260
00:47:02,309 --> 00:47:00,800
that so we think that what we're seeing

1261
00:47:04,150 --> 00:47:02,319
in the rock especially when we see

1262
00:47:05,829 --> 00:47:04,160
organic signals associated with a

1263
00:47:07,589 --> 00:47:05,839

mineral we think that really was in the

1264
00:47:09,750 --> 00:47:07,599
rock and it was formed at the same place

1265
00:47:11,349 --> 00:47:09,760
or concentrated within a mineral so we

1266
00:47:12,790 --> 00:47:11,359
have some confidence that the organic

1267
00:47:14,950 --> 00:47:12,800
matter we're seeing is actually in the

1268
00:47:18,630 --> 00:47:14,960
rock and i feel quite confident saying

1269
00:47:23,510 --> 00:47:20,470
thanks for the question up next on the

1270
00:47:27,030 --> 00:47:23,520
phone lines we have mike wahl with

1271
00:47:31,510 --> 00:47:29,109
thank you all um just just a quick

1272
00:47:33,430 --> 00:47:31,520
question to put these organics into a

1273
00:47:35,190 --> 00:47:33,440
little bit more context um

1274
00:47:37,270 --> 00:47:35,200
can you compare the sort of

1275
00:47:39,910 --> 00:47:37,280
concentration of them to what we might

1276
00:47:43,510 --> 00:47:39,920
find on earth in a river delta here

1277
00:47:45,109 --> 00:47:43,520
um or is that sort of comparison even

1278
00:47:47,270 --> 00:47:45,119
even worth doing because it's so kind of

1279
00:47:48,390 --> 00:47:47,280
apples to oranges

1280
00:47:50,150 --> 00:47:48,400
thank you

1281
00:47:53,430 --> 00:47:50,160
yeah um i think that's a good question

1282
00:47:55,510 --> 00:47:53,440
so earth is funny and great because it's

1283
00:47:57,589 --> 00:47:55,520
just teeming with life if you went to a

1284
00:47:59,349 --> 00:47:57,599
river delta there's probably so much

1285
00:48:00,870 --> 00:47:59,359
there and there's so much there that's

1286
00:48:02,230 --> 00:48:00,880
currently living right there's probably

1287
00:48:04,150 --> 00:48:02,240
older signs of life but then there's

1288
00:48:06,230 --> 00:48:04,160

just tons of stuff that's currently

1289
00:48:08,470 --> 00:48:06,240
living there as well so it's really hard

1290
00:48:10,470 --> 00:48:08,480
to find a example where there's not that

1291
00:48:11,270 --> 00:48:10,480
much life on earth in a river delta that

1292
00:48:13,510 --> 00:48:11,280
would be

1293
00:48:15,190 --> 00:48:13,520
active so it's a really different

1294
00:48:16,790 --> 00:48:15,200
situation and as ken said we're looking

1295
00:48:17,829 --> 00:48:16,800
for ancient signs of life so we think

1296
00:48:19,349 --> 00:48:17,839
that this

1297
00:48:21,349 --> 00:48:19,359
all of this was happening billions of

1298
00:48:23,430 --> 00:48:21,359
years ago so it is a really really

1299
00:48:25,190 --> 00:48:23,440
different type of comparison but mainly

1300
00:48:27,030 --> 00:48:25,200
because of the time difference that

1301
00:48:29,670 --> 00:48:27,040
we're looking at so it's a more

1302
00:48:31,430 --> 00:48:29,680
challenging case on mars and we're still

1303
00:48:32,950 --> 00:48:31,440
learning from things on earth so for

1304
00:48:34,309 --> 00:48:32,960
instance in earth labs we look at things

1305
00:48:36,549 --> 00:48:34,319
like martian meteorites and that gives

1306
00:48:37,910 --> 00:48:36,559
us a good understanding of what sorts of

1307
00:48:39,349 --> 00:48:37,920
minerals we would observe and how

1308
00:48:41,670 --> 00:48:39,359
organic matter is placed within those

1309
00:48:42,870 --> 00:48:41,680
minerals and of course we do have analog

1310
00:48:44,390 --> 00:48:42,880
sites on earth that we think are

1311
00:48:46,150 --> 00:48:44,400
somewhat representative of mars that

1312
00:48:50,309 --> 00:48:46,160
help inform our understanding of what we

1313
00:48:53,829 --> 00:48:52,870

point to that

1314
00:48:57,829 --> 00:48:53,839
um

1315
00:49:00,150 --> 00:48:57,839
the way that i think about this is these

1316
00:49:03,109 --> 00:49:00,160
samples that we've collected as we

1317
00:49:05,030 --> 00:49:03,119
presented here today have ingredients

1318
00:49:07,190 --> 00:49:05,040
for life in terms of the environmental

1319
00:49:09,990 --> 00:49:07,200
setting this material was transported by

1320
00:49:11,990 --> 00:49:10,000
water it was deposited into a lake

1321
00:49:13,990 --> 00:49:12,000
we have fine particles that were

1322
00:49:15,670 --> 00:49:14,000
settling out of that lake we have phases

1323
00:49:17,109 --> 00:49:15,680
that were formed during evaporation of

1324
00:49:18,710 --> 00:49:17,119
the lake

1325
00:49:20,390 --> 00:49:18,720
all of these things as we've discussed

1326
00:49:22,710 --> 00:49:20,400
have have high potential for

1327
00:49:25,670 --> 00:49:22,720
biosignature preservation

1328
00:49:27,910 --> 00:49:25,680
if these conditions existed i think

1329
00:49:29,589 --> 00:49:27,920
pretty much anywhere on earth at any

1330
00:49:31,750 --> 00:49:29,599
point in time over the last let's call

1331
00:49:34,150 --> 00:49:31,760
it three and a half billion years

1332
00:49:36,549 --> 00:49:34,160
i think it's safe to say or at least

1333
00:49:39,430 --> 00:49:36,559
assume that biology would have done its

1334
00:49:42,309 --> 00:49:39,440
thing and left its mark in these rocks

1335
00:49:44,390 --> 00:49:42,319
for us to observe and so that that's

1336
00:49:46,390 --> 00:49:44,400
really why we're so excited to be able

1337
00:49:48,069 --> 00:49:46,400
to address these questions upon

1338
00:49:50,069 --> 00:49:48,079

returning these samples to laboratories

1339
00:49:54,309 --> 00:49:50,079
here in earth we have all of the right

1340
00:50:03,430 --> 00:49:56,790
we could hear you david and the next

1341
00:50:09,270 --> 00:50:06,870
um hi thanks for uh for doing this can i

1342
00:50:12,230 --> 00:50:09,280
just talk about your future drive i have

1343
00:50:13,910 --> 00:50:12,240
a lot of discussion before we landed

1344
00:50:15,990 --> 00:50:13,920
about the bathtub

1345
00:50:16,870 --> 00:50:16,000
which from memory was on the northern

1346
00:50:18,950 --> 00:50:16,880
side

1347
00:50:20,150 --> 00:50:18,960
of the delta we don't appear to be going

1348
00:50:22,870 --> 00:50:20,160
anywhere

1349
00:50:27,510 --> 00:50:25,349
uh i'm not sure we can pull up the the

1350
00:50:28,790 --> 00:50:27,520
last image that rick showed which showed

1351
00:50:31,829 --> 00:50:28,800
the traverse

1352
00:50:33,829 --> 00:50:31,839
uh but i i think the question has to do

1353
00:50:35,510 --> 00:50:33,839
with the area that we call the marginal

1354
00:50:36,710 --> 00:50:35,520
units the units on the margin of the

1355
00:50:38,710 --> 00:50:36,720
crater

1356
00:50:40,230 --> 00:50:38,720
the route does traverse across that it's

1357
00:50:42,950 --> 00:50:40,240
not on the northern side it's more on

1358
00:50:45,750 --> 00:50:42,960
the north uh western side

1359
00:50:48,870 --> 00:50:45,760
so the yeah there we go so the area

1360
00:50:51,349 --> 00:50:48,880
where you see the direct uh east to west

1361
00:50:53,430 --> 00:50:51,359
traverse that is across the units that

1362
00:50:54,630 --> 00:50:53,440
could conceivably have been an ancient

1363
00:50:56,950 --> 00:50:54,640

shoreline

1364
00:50:59,430 --> 00:50:56,960
um we there are alternative explanations

1365
00:51:01,349 --> 00:50:59,440
as well and so the plan is that we will

1366
00:51:02,950 --> 00:51:01,359
as rick said we will explore the top of

1367
00:51:05,190 --> 00:51:02,960
the delta probably take us about the

1368
00:51:08,630 --> 00:51:05,200
next year and then we'll do that uh

1369
00:51:09,990 --> 00:51:08,640
westbound traverse across the the units

1370
00:51:11,990 --> 00:51:10,000
at the margin of the crater so we're

1371
00:51:18,309 --> 00:51:12,000
still intending to get there

1372
00:51:25,349 --> 00:51:20,710
thank you and up next on the phone lines

1373
00:51:27,030 --> 00:51:25,359
we have alex whitsey with nature

1374
00:51:28,069 --> 00:51:27,040
hi thanks my question is for david

1375
00:51:29,510 --> 00:51:28,079
chester

1376
00:51:31,589 --> 00:51:29,520
i wanted to ask if you could talk a

1377
00:51:33,190 --> 00:51:31,599
little bit about the types of studies

1378
00:51:35,030 --> 00:51:33,200
that you could do

1379
00:51:36,790 --> 00:51:35,040
especially on these these fine-grained

1380
00:51:38,549 --> 00:51:36,800
sedimentary rocks with organics when we

1381
00:51:40,549 --> 00:51:38,559
get them back on earth what are some

1382
00:51:42,069 --> 00:51:40,559
examples of the types of analyses you

1383
00:51:43,990 --> 00:51:42,079
would want to run on these rocks first

1384
00:51:46,069 --> 00:51:44,000
thing to see to see what the organics

1385
00:51:47,030 --> 00:51:46,079
really mean

1386
00:51:48,870 --> 00:51:47,040
yeah

1387
00:51:51,829 --> 00:51:48,880
this uh this

1388
00:51:55,270 --> 00:51:51,839

this question is one that that many of

1389
00:51:57,990 --> 00:51:55,280
us think about quite a bit the um

1390
00:51:59,990 --> 00:51:58,000
i i it is very fair to say that these

1391
00:52:01,910 --> 00:52:00,000
are going to be these already are the

1392
00:52:04,710 --> 00:52:01,920
most valuable rock samples that have

1393
00:52:06,150 --> 00:52:04,720
ever been collected and any um

1394
00:52:08,549 --> 00:52:06,160
state-of-the-art

1395
00:52:11,190 --> 00:52:08,559
analytical technique that will be

1396
00:52:12,870 --> 00:52:11,200
available uh will will be applied to

1397
00:52:14,150 --> 00:52:12,880
these rocks

1398
00:52:15,990 --> 00:52:14,160
in terms of your question about the

1399
00:52:17,910 --> 00:52:16,000
organics the the one of the most

1400
00:52:20,390 --> 00:52:17,920
important things that we can do is look

1401
00:52:22,150 --> 00:52:20,400
at a very fine scale at a much finer

1402
00:52:24,790 --> 00:52:22,160
scale than we're able to with the rover

1403
00:52:27,990 --> 00:52:24,800
so for example we could look with

1404
00:52:30,150 --> 00:52:28,000
various in-situ measurements to look at

1405
00:52:32,470 --> 00:52:30,160
the micron scale where

1406
00:52:35,190 --> 00:52:32,480
and what type of organics are seen what

1407
00:52:37,589 --> 00:52:35,200
minerals are they associated with um

1408
00:52:39,990 --> 00:52:37,599
that will inform uh

1409
00:52:42,230 --> 00:52:40,000
things like

1410
00:52:44,069 --> 00:52:42,240
were those organics trapped in certain

1411
00:52:46,549 --> 00:52:44,079
minerals at certain phases for example

1412
00:52:50,230 --> 00:52:46,559
when that rock became cemented when the

1413
00:52:51,829 --> 00:52:50,240

sulfite sulfate precipitated

1414
00:52:59,510 --> 00:52:51,839
so

1415
00:53:02,950 --> 00:52:59,520
there are basic chemistry observations

1416
00:53:04,790 --> 00:53:02,960
that can be made on a fine scale so

1417
00:53:06,390 --> 00:53:04,800
what we can do in a laboratory is

1418
00:53:07,349 --> 00:53:06,400
obviously

1419
00:53:08,470 --> 00:53:07,359
much

1420
00:53:10,150 --> 00:53:08,480
different

1421
00:53:11,750 --> 00:53:10,160
than what we can do with the rover

1422
00:53:13,430 --> 00:53:11,760
obviously the instruments that we have

1423
00:53:15,349 --> 00:53:13,440
in the rover are extraordinary and the

1424
00:53:16,069 --> 00:53:15,359
fact that we can make these observations

1425
00:53:18,069 --> 00:53:16,079
of

1426
00:53:20,309 --> 00:53:18,079
uh organic molecules on mars to begin

1427
00:53:22,710 --> 00:53:20,319
with is just awesome

1428
00:53:24,950 --> 00:53:22,720
um but it's really the level of detail

1429
00:53:28,870 --> 00:53:24,960
spatially that will be different here on

1430
00:53:32,870 --> 00:53:31,430
thank you and then up next on the phone

1431
00:53:37,910 --> 00:53:32,880
lines we have

1432
00:53:42,710 --> 00:53:40,309
all right thanks this is rameen um i was

1433
00:53:44,309 --> 00:53:42,720
a little bit uh confused so i'm not sure

1434
00:53:45,910 --> 00:53:44,319
who uh i should direct the question but

1435
00:53:50,790 --> 00:53:45,920
i was a little confused about how the

1436
00:53:54,069 --> 00:53:50,800
sample return will work um is um are you

1437
00:53:56,309 --> 00:53:54,079
is the plan to have a cache of samples

1438
00:53:57,349 --> 00:53:56,319

on a flat area that will that will be

1439
00:53:59,829 --> 00:53:57,359
retrieved

1440
00:54:01,270 --> 00:53:59,839
and perseverance also deliver samples

1441
00:54:04,150 --> 00:54:01,280
like are both of those things happening

1442
00:54:06,309 --> 00:54:04,160
or you're exploring both um

1443
00:54:10,790 --> 00:54:06,319
and to see what what is more uh uh

1444
00:54:14,390 --> 00:54:12,069
i don't know if rick wants to say

1445
00:54:16,549 --> 00:54:14,400
something first or or i can take this

1446
00:54:17,510 --> 00:54:16,559
one go ahead lori

1447
00:54:21,670 --> 00:54:17,520
okay

1448
00:54:23,109 --> 00:54:21,680
um so right now um as i mentioned uh the

1449
00:54:25,589 --> 00:54:23,119
perseverance rover we just did some

1450
00:54:28,230 --> 00:54:25,599
analyses on its reliability and its

1451
00:54:29,910 --> 00:54:28,240
expected lifetime um and you know

1452
00:54:32,069 --> 00:54:29,920
curiosity was mentioned already a couple

1453
00:54:34,309 --> 00:54:32,079
times here that curiosity lived uh has

1454
00:54:35,990 --> 00:54:34,319
already gone more than 10 years and is

1455
00:54:38,950 --> 00:54:36,000
still going strong

1456
00:54:41,829 --> 00:54:38,960
and so we expect that uh perseverance

1457
00:54:44,470 --> 00:54:41,839
will likewise be able to still be

1458
00:54:45,990 --> 00:54:44,480
operating in very very good condition uh

1459
00:54:49,109 --> 00:54:46,000
when we need to have those samples

1460
00:54:50,710 --> 00:54:49,119
delivered in 2030. so what the plan is

1461
00:54:52,790 --> 00:54:50,720
right now you heard us discussing you

1462
00:54:54,950 --> 00:54:52,800
heard rick talking about potentially

1463
00:54:57,430 --> 00:54:54,960

dropping as many as like 10 or so

1464
00:55:00,069 --> 00:54:57,440
samples on the surface in a caching

1465
00:55:01,510 --> 00:55:00,079
depot over the next several months

1466
00:55:04,230 --> 00:55:01,520
that that would happen down here in

1467
00:55:06,470 --> 00:55:04,240
front of the the river delta we know we

1468
00:55:08,870 --> 00:55:06,480
have a good landing site for the sample

1469
00:55:11,430 --> 00:55:08,880
return lander in this area it's very

1470
00:55:13,750 --> 00:55:11,440
smooth it's very flat it's very even

1471
00:55:16,630 --> 00:55:13,760
it's a great place for the lander to to

1472
00:55:17,990 --> 00:55:16,640
land and so kind of as a backup plan we

1473
00:55:20,710 --> 00:55:18,000
want to make sure that we're leaving

1474
00:55:22,710 --> 00:55:20,720
some samples here that we know for sure

1475
00:55:24,309 --> 00:55:22,720
um you know if anything happens in the

1476
00:55:25,829 --> 00:55:24,319
future that would preclude us from being

1477
00:55:28,549 --> 00:55:25,839
able to get the samples back using

1478
00:55:30,710 --> 00:55:28,559
perseverance we've got this backup cache

1479
00:55:32,950 --> 00:55:30,720
depot on the surface

1480
00:55:34,870 --> 00:55:32,960
and so we're sending as we're designing

1481
00:55:36,790 --> 00:55:34,880
the lander we're including the

1482
00:55:38,470 --> 00:55:36,800
helicopters again as kind of this part

1483
00:55:40,309 --> 00:55:38,480
of this backup plan

1484
00:55:42,150 --> 00:55:40,319
that if we end up landing in a place

1485
00:55:44,630 --> 00:55:42,160
where we need to pick up samples from

1486
00:55:46,390 --> 00:55:44,640
the surface as a from the cash depot

1487
00:55:48,069 --> 00:55:46,400
we'll have those two helicopters i

1488
00:55:51,510 --> 00:55:48,079

believe each of them can carry back as

1489
00:55:53,030 --> 00:55:51,520
many as like 15 tubes um so we'd have

1490
00:55:54,950 --> 00:55:53,040
more than we need for this particular

1491
00:55:57,750 --> 00:55:54,960
cash depot

1492
00:55:59,750 --> 00:55:57,760
but that that's kind of the backup plan

1493
00:56:01,349 --> 00:55:59,760
the main plan is that perseverance will

1494
00:56:02,950 --> 00:56:01,359
still be going strong it may as you

1495
00:56:05,190 --> 00:56:02,960
heard from rick it may be outside the

1496
00:56:06,150 --> 00:56:05,200
crater it may extend out

1497
00:56:08,230 --> 00:56:06,160
and go

1498
00:56:10,390 --> 00:56:08,240
start exploring outside of jezreel

1499
00:56:12,230 --> 00:56:10,400
crater and you know if we can find a

1500
00:56:13,270 --> 00:56:12,240
good place for the lander to land up

1501
00:56:15,190 --> 00:56:13,280
there

1502
00:56:16,870 --> 00:56:15,200
we'll be looking of course and hopefully

1503
00:56:19,190 --> 00:56:16,880
perseverance still going strong then we

1504
00:56:21,829 --> 00:56:19,200
can land the sample return lander near

1505
00:56:23,670 --> 00:56:21,839
perseverance and perseverance can just

1506
00:56:25,349 --> 00:56:23,680
drive over and drop off the samples

1507
00:56:27,349 --> 00:56:25,359
there at the lander not just the

1508
00:56:29,990 --> 00:56:27,359
duplicates of the ones that'll be at the

1509
00:56:32,069 --> 00:56:30,000
cash depot but all of the extra samples

1510
00:56:34,390 --> 00:56:32,079
the additional samples that we intend to

1511
00:56:36,069 --> 00:56:34,400
keep collecting as we continue our

1512
00:56:36,870 --> 00:56:36,079
exploration

1513
00:56:39,190 --> 00:56:36,880

um

1514
00:56:41,030 --> 00:56:39,200
so that's that's the baseline plan that

1515
00:56:43,109 --> 00:56:41,040
we would be able to use perseverance and

1516
00:56:44,950 --> 00:56:43,119
that we would drop the lander you know

1517
00:56:46,390 --> 00:56:44,960
deliver the lander somewhere near

1518
00:56:49,190 --> 00:56:46,400
perseverance so that we can use

1519
00:56:50,789 --> 00:56:49,200
perseverance but again if something else

1520
00:56:52,390 --> 00:56:50,799
were to happen along the way and for

1521
00:56:56,230 --> 00:56:52,400
some reason we thought perseverance

1522
00:56:58,309 --> 00:56:56,240
perhaps was not going to be able to

1523
00:57:00,710 --> 00:56:58,319
to deliver those samples we might

1524
00:57:02,630 --> 00:57:00,720
consider a second caching depot

1525
00:57:04,710 --> 00:57:02,640
at another location but that's a

1526
00:57:06,630 --> 00:57:04,720
decision for much further down the line

1527
00:57:09,190 --> 00:57:06,640
right now as i said perseverance is our

1528
00:57:10,870 --> 00:57:09,200
prime option and the helicopters at this

1529
00:57:14,870 --> 00:57:10,880
cash depot we're talking about near the

1530
00:57:14,880 --> 00:57:19,430
okay thank you

1531
00:57:28,630 --> 00:57:23,109
great thanks up next we have jim siegel

1532
00:57:32,710 --> 00:57:31,670
hi everybody and thank you for taking my

1533
00:57:36,069 --> 00:57:32,720
question

1534
00:57:39,510 --> 00:57:36,079
uh with respect to the earth return

1535
00:57:45,910 --> 00:57:43,670
is is the plan to have the sls

1536
00:57:46,950 --> 00:57:45,920
launch either from earth or from the

1537
00:57:49,190 --> 00:57:46,960
moon

1538
00:57:50,710 --> 00:57:49,200

uh to get to uh

1539
00:57:52,309 --> 00:57:50,720
mars or

1540
00:57:54,950 --> 00:57:52,319
would this be

1541
00:57:56,789 --> 00:57:54,960
some other private company for example

1542
00:58:00,470 --> 00:57:56,799
spacex with their

1543
00:58:03,109 --> 00:58:00,480
um uh with their starship uh has has

1544
00:58:05,750 --> 00:58:03,119
that been uh discussed at all and uh

1545
00:58:09,349 --> 00:58:05,760
where did that stand thank you

1546
00:58:12,150 --> 00:58:09,359
yeah i'll take that one as well uh so we

1547
00:58:14,230 --> 00:58:12,160
have uh within within nasa we have a

1548
00:58:17,109 --> 00:58:14,240
launch service provider contract that we

1549
00:58:18,789 --> 00:58:17,119
will use and we'll solicit um at the an

1550
00:58:21,030 --> 00:58:18,799
appropriate launch vehicle when the time

1551
00:58:23,829 --> 00:58:21,040
comes uh for launching the sample return

1552
00:58:26,950 --> 00:58:23,839
lander so that hasn't been decided just

1553
00:58:29,829 --> 00:58:26,960
yet but we do not need a capability as

1554
00:58:31,030 --> 00:58:29,839
as big as sls or or even as big as

1555
00:58:33,030 --> 00:58:31,040
starship

1556
00:58:35,990 --> 00:58:33,040
so the the spacecraft that we're going

1557
00:58:38,390 --> 00:58:36,000
to fly there um can be can be launched

1558
00:58:40,470 --> 00:58:38,400
on on existing capabilities

1559
00:58:42,870 --> 00:58:40,480
um and so we will run that competition

1560
00:58:45,990 --> 00:58:42,880
like we always do for for every uh

1561
00:58:48,309 --> 00:58:46,000
interplanetary mission uh we compete

1562
00:58:50,549 --> 00:58:48,319
those and and then we'll select uh the

1563
00:58:53,430 --> 00:58:50,559

best launch uh vehicle and launch

1564
00:58:55,270 --> 00:58:53,440
provider uh through that process

1565
00:58:58,309 --> 00:58:55,280
um and it'll launch from earth and it'll

1566
00:59:00,870 --> 00:58:58,319
launch uh just as our as our normal uh

1567
00:59:03,589 --> 00:59:00,880
interplanetary missions um launch from

1568
00:59:08,630 --> 00:59:06,390
okay thank you thank you

1569
00:59:13,109 --> 00:59:08,640
and now on the phone lines we have matt

1570
00:59:16,870 --> 00:59:15,190
hi everyone uh congratulations on the

1571
00:59:17,910 --> 00:59:16,880
collection of these very exciting

1572
00:59:19,109 --> 00:59:17,920
samples

1573
00:59:21,510 --> 00:59:19,119
part of my question has already been

1574
00:59:24,230 --> 00:59:21,520
answered but i'm i'm still curious as we

1575
00:59:26,470 --> 00:59:24,240
wait for them to return to earth

1576
00:59:28,630 --> 00:59:26,480
do you ever wish and i'm certainly not

1577
00:59:31,349 --> 00:59:28,640
suggesting this would be possible the

1578
00:59:34,950 --> 00:59:31,359
curiosity could drive over to jezreel

1579
00:59:36,789 --> 00:59:34,960
and add its capabilities i i imagine

1580
00:59:41,630 --> 00:59:36,799
that has to run through some of your

1581
00:59:46,309 --> 00:59:44,230
[Laughter]

1582
00:59:47,670 --> 00:59:46,319
yeah if only rovers could drive that far

1583
00:59:50,230 --> 00:59:47,680
um

1584
00:59:51,510 --> 00:59:50,240
yeah well i i guess the the the one

1585
00:59:52,870 --> 00:59:51,520
thing that i would pick up on is

1586
00:59:54,870 --> 00:59:52,880
something that sunanda said and i'll

1587
00:59:56,710 --> 00:59:54,880
just say it a little bit differently you

1588
01:00:00,309 --> 00:59:56,720

have two very different kinds of

1589
01:00:02,950 --> 01:00:00,319
capabilities for characterizing uh both

1590
01:00:04,549 --> 01:00:02,960
uh the chemical composition and the

1591
01:00:06,230 --> 01:00:04,559
organic composition in the rocks there's

1592
01:00:07,030 --> 01:00:06,240
the sherlock instrument which makes a

1593
01:00:08,950 --> 01:00:07,040
map

1594
01:00:11,109 --> 01:00:08,960
it is not as sensitive as the sam

1595
01:00:12,630 --> 01:00:11,119
instrument on curiosity this is a

1596
01:00:14,630 --> 01:00:12,640
wonderful combination that you could

1597
01:00:16,150 --> 01:00:14,640
bring together where the sherlock

1598
01:00:19,190 --> 01:00:16,160
instrument could provide spatial

1599
01:00:20,710 --> 01:00:19,200
resolution and really detailed mapping

1600
01:00:23,190 --> 01:00:20,720
and then we could take advantage of the

1601
01:00:26,150 --> 01:00:23,200
kinds of capabilities that exist on sam

1602
01:00:27,109 --> 01:00:26,160
to penetrate deeper and get not only

1603
01:00:28,470 --> 01:00:27,119
lower

1604
01:00:29,589 --> 01:00:28,480
detection limits for certain kinds of

1605
01:00:31,430 --> 01:00:29,599
molecules but we could actually learn a

1606
01:00:33,109 --> 01:00:31,440
little bit more about which molecules

1607
01:00:34,630 --> 01:00:33,119
are present so that's that's the thing

1608
01:00:36,630 --> 01:00:34,640
that i would do if i could bring the two

1609
01:00:38,470 --> 01:00:36,640
rovers together yeah i completely agree

1610
01:00:39,670 --> 01:00:38,480
that would be what i would want to do as

1611
01:00:40,710 --> 01:00:39,680
well so we could get a couple of

1612
01:00:42,710 --> 01:00:40,720
different views because that's what i

1613
01:00:44,069 --> 01:00:42,720

would do on earth if we when we bring

1614
01:00:46,470 --> 01:00:44,079
these samples back to earth if and when

1615
01:00:47,910 --> 01:00:46,480
that happens um that's what i would do i

1616
01:00:49,910 --> 01:00:47,920
would put together the capabilities that

1617
01:00:51,109 --> 01:00:49,920
sam has on curiosity and the things that

1618
01:00:53,510 --> 01:00:51,119
we could do with sherlock but at much

1619
01:00:55,510 --> 01:00:53,520
higher space spatial resolution as uh

1620
01:00:57,030 --> 01:00:55,520
david was saying and figure out what's

1621
01:01:01,510 --> 01:00:57,040
going on in these rocks so that would be

1622
01:01:09,349 --> 01:01:05,030
rover friends now up next we have marsha

1623
01:01:11,270 --> 01:01:09,359
smith with space policy online

1624
01:01:13,670 --> 01:01:11,280
thanks so much for taking my question i

1625
01:01:16,630 --> 01:01:13,680
think it's to rick welch but maybe also

1626
01:01:19,589 --> 01:01:16,640
to lori glaze and it's about ingenuity

1627
01:01:21,030 --> 01:01:19,599
and its relationship to the helicopters

1628
01:01:21,990 --> 01:01:21,040
that will be on the sample return

1629
01:01:22,710 --> 01:01:22,000
mission

1630
01:01:24,710 --> 01:01:22,720
so

1631
01:01:27,990 --> 01:01:24,720
ricky said that you hadn't expected

1632
01:01:30,309 --> 01:01:28,000
ingenuity to last through the winter so

1633
01:01:31,990 --> 01:01:30,319
what is your projection now for how long

1634
01:01:32,870 --> 01:01:32,000
it's going to last

1635
01:01:34,950 --> 01:01:32,880
and

1636
01:01:37,430 --> 01:01:34,960
what is the difference between ingenuity

1637
01:01:40,150 --> 01:01:37,440
and the sample return versions of it

1638
01:01:42,470 --> 01:01:40,160

does it need to be structurally more

1639
01:01:44,789 --> 01:01:42,480
capable i mean i don't if you just put a

1640
01:01:47,750 --> 01:01:44,799
hook on ingenuity as it is now could it

1641
01:01:50,710 --> 01:01:47,760
lift up 15 sample tubes i'm just not

1642
01:01:53,430 --> 01:01:50,720
sure how much of a technological

1643
01:01:55,589 --> 01:01:53,440
leap it's going to be to take ingenuity

1644
01:01:57,589 --> 01:01:55,599
and turn it into something that can lift

1645
01:01:59,430 --> 01:01:57,599
sample tubes yeah that's a great

1646
01:02:01,430 --> 01:01:59,440
question and laura you can certainly

1647
01:02:02,710 --> 01:02:01,440
jump in here but i'll start out right

1648
01:02:04,309 --> 01:02:02,720
one of the great things about having

1649
01:02:05,990 --> 01:02:04,319
done this technology demonstration is

1650
01:02:08,230 --> 01:02:06,000
now we have information of how the

1651
01:02:09,510 --> 01:02:08,240
helicopter really behaves on mars right

1652
01:02:11,750 --> 01:02:09,520
so we actually know the flight

1653
01:02:13,829 --> 01:02:11,760
performance we know the margins how much

1654
01:02:15,990 --> 01:02:13,839
you can carry and and that allows us to

1655
01:02:18,069 --> 01:02:16,000
actually know that we can pick up a full

1656
01:02:20,230 --> 01:02:18,079
sample tube and actually be able to

1657
01:02:22,470 --> 01:02:20,240
transport that the hundred of meters

1658
01:02:24,069 --> 01:02:22,480
between the depot back to the lander and

1659
01:02:26,630 --> 01:02:24,079
do it one at a time would be the plan to

1660
01:02:28,789 --> 01:02:26,640
do that and so the idea is to leverage

1661
01:02:30,710 --> 01:02:28,799
the ingenuity design as much as possible

1662
01:02:32,069 --> 01:02:30,720
right because it's the proven design and

1663
01:02:33,109 --> 01:02:32,079

we think we can do that so we really

1664
01:02:35,750 --> 01:02:33,119
don't think there's a lot of new

1665
01:02:37,510 --> 01:02:35,760
technology here uh the the helicopter

1666
01:02:38,789 --> 01:02:37,520
does have to have one little sort of new

1667
01:02:40,470 --> 01:02:38,799
feature it has to be able to sort of

1668
01:02:41,910 --> 01:02:40,480
scoot around to get close to the tube

1669
01:02:42,950 --> 01:02:41,920
and so we are looking at putting small

1670
01:02:44,230 --> 01:02:42,960
wheels

1671
01:02:46,309 --> 01:02:44,240
on the bottom of the legs of the

1672
01:02:48,230 --> 01:02:46,319
helicopter it's going to be able to line

1673
01:02:49,670 --> 01:02:48,240
very close to the tubes but still need

1674
01:02:52,069 --> 01:02:49,680
to do that final maneuvering to be able

1675
01:02:53,510 --> 01:02:52,079
to pick them up

1676
01:02:54,950 --> 01:02:53,520
yeah and i think rick covered most of

1677
01:02:56,789 --> 01:02:54,960
that it'll need to have the wheel so

1678
01:02:57,990 --> 01:02:56,799
that it can maneuver close enough to the

1679
01:02:59,270 --> 01:02:58,000
samples

1680
01:03:00,549 --> 01:02:59,280
to allow it to pick up and you'll have

1681
01:03:02,470 --> 01:03:00,559
to carry as you said a little grapple

1682
01:03:04,309 --> 01:03:02,480
hook that'll allow it to pick up

1683
01:03:06,150 --> 01:03:04,319
uh the grapple that's on the end of each

1684
01:03:07,990 --> 01:03:06,160
of those sample tubes

1685
01:03:09,190 --> 01:03:08,000
and carry them back as he said one at a

1686
01:03:10,390 --> 01:03:09,200
time

1687
01:03:14,789 --> 01:03:10,400
the

1688
01:03:18,630 --> 01:03:14,799

considering right now really is just

1689
01:03:20,150 --> 01:03:18,640
only slightly larger than uh than the

1690
01:03:21,670 --> 01:03:20,160
ingenuity and when i say larger a little

1691
01:03:23,750 --> 01:03:21,680
more mass because you do have to carry

1692
01:03:26,069 --> 01:03:23,760
the the wheeled system and the and the

1693
01:03:28,470 --> 01:03:26,079
grapple but the mass is really just a

1694
01:03:30,549 --> 01:03:28,480
very tiny increment more than uh than

1695
01:03:32,549 --> 01:03:30,559
ingenuity we definitely want to build

1696
01:03:34,309 --> 01:03:32,559
and take advantage of

1697
01:03:36,710 --> 01:03:34,319
the technologies that we used on

1698
01:03:38,710 --> 01:03:36,720
ingenuity um it was a technology demo

1699
01:03:40,069 --> 01:03:38,720
and yet has been fantastic so we don't

1700
01:03:44,789 --> 01:03:40,079
want to change any of that we want to

1701
01:03:48,789 --> 01:03:46,549
thank you and we have been getting your

1702
01:03:51,670 --> 01:03:48,799
questions coming out on social i'll now

1703
01:03:54,069 --> 01:03:51,680
hand it over to our jpl social lead for

1704
01:03:56,309 --> 01:03:54,079
your questions

1705
01:03:58,549 --> 01:03:56,319
all right anytime we talk about mars

1706
01:04:00,309 --> 01:03:58,559
sample return we always get lots of

1707
01:04:02,630 --> 01:04:00,319
questions about

1708
01:04:03,589 --> 01:04:02,640
the safety of bringing samples back to

1709
01:04:06,470 --> 01:04:03,599
earth

1710
01:04:08,549 --> 01:04:06,480
could lori could you talk about how nasa

1711
01:04:10,710 --> 01:04:08,559
approaches and thinks about planetary

1712
01:04:12,470 --> 01:04:10,720
protection especially when considering

1713
01:04:13,670 --> 01:04:12,480

bringing samples like these back to our

1714
01:04:15,750 --> 01:04:13,680
planet

1715
01:04:17,510 --> 01:04:15,760
yeah and that that is a really really

1716
01:04:19,029 --> 01:04:17,520
important question and we want to keep

1717
01:04:20,470 --> 01:04:19,039
talking about it and talking with the

1718
01:04:22,789 --> 01:04:20,480
public and getting the public's

1719
01:04:26,630 --> 01:04:22,799
questions on this um so the first thing

1720
01:04:29,430 --> 01:04:26,640
i really want to do is stress that

1721
01:04:33,270 --> 01:04:29,440
right now the conditions on mars

1722
01:04:35,430 --> 01:04:33,280
are really not conducive to life we

1723
01:04:38,230 --> 01:04:35,440
really do not expect anything to be

1724
01:04:40,549 --> 01:04:38,240
alive on the surface there today number

1725
01:04:42,069 --> 01:04:40,559
one it's extremely dry it's extremely

1726
01:04:43,589 --> 01:04:42,079
cold and

1727
01:04:46,789 --> 01:04:43,599
life there would be

1728
01:04:48,870 --> 01:04:46,799
exposed to a really deadly

1729
01:04:50,710 --> 01:04:48,880
radiation environment with very little

1730
01:04:52,390 --> 01:04:50,720
atmosphere to protect

1731
01:04:54,789 --> 01:04:52,400
anything on the surface

1732
01:04:56,710 --> 01:04:54,799
that radiation would likely uh you know

1733
01:04:59,270 --> 01:04:56,720
kill anything that were there on the

1734
01:05:02,069 --> 01:04:59,280
surface so it's highly unlikely the

1735
01:05:03,750 --> 01:05:02,079
probability of something uh being alive

1736
01:05:06,069 --> 01:05:03,760
on the surface that could be dangerous

1737
01:05:09,349 --> 01:05:06,079
is very small that being said we are

1738
01:05:10,230 --> 01:05:09,359

still being very cautious we are making

1739
01:05:12,950 --> 01:05:10,240
sure

1740
01:05:14,549 --> 01:05:12,960
that when the samples are

1741
01:05:16,150 --> 01:05:14,559
are launched into orbit and then

1742
01:05:17,829 --> 01:05:16,160
transferred and captured into this

1743
01:05:20,309 --> 01:05:17,839
capture and containment system on the

1744
01:05:22,230 --> 01:05:20,319
earth return orbiter there's multiple

1745
01:05:24,150 --> 01:05:22,240
layers of seals in there so that we've

1746
01:05:25,109 --> 01:05:24,160
done something we call breaking the

1747
01:05:28,390 --> 01:05:25,119
chain

1748
01:05:31,430 --> 01:05:28,400
so that there's no chance of any of the

1749
01:05:34,390 --> 01:05:31,440
mars material actually uh getting

1750
01:05:35,829 --> 01:05:34,400
outside of that earth return system um

1751
01:05:37,829 --> 01:05:35,839
and and coming into the earth's

1752
01:05:40,870 --> 01:05:37,839
atmosphere all of the mars material will

1753
01:05:43,029 --> 01:05:40,880
be contained inside of of that earth

1754
01:05:46,710 --> 01:05:43,039
return system

1755
01:05:48,710 --> 01:05:46,720
we've designed the the uh entry system

1756
01:05:51,190 --> 01:05:48,720
such that it doesn't even need to rely

1757
01:05:53,109 --> 01:05:51,200
on a parachute so one of the biggest

1758
01:05:54,549 --> 01:05:53,119
risks we have on an atmospheric entry is

1759
01:05:56,470 --> 01:05:54,559
that the parachute doesn't deploy

1760
01:05:58,390 --> 01:05:56,480
properly well we've said let's just

1761
01:06:01,109 --> 01:05:58,400
bypass the parachute altogether we will

1762
01:06:02,870 --> 01:06:01,119
just plan on a hard landing and we've

1763
01:06:06,870 --> 01:06:02,880

done many tests

1764
01:06:09,270 --> 01:06:06,880
of landing a heat shield uh on hard a

1765
01:06:11,349 --> 01:06:09,280
hard desert floor uh such as we they

1766
01:06:13,750 --> 01:06:11,359
will experience in the utah desert when

1767
01:06:15,349 --> 01:06:13,760
the sample return canister comes back

1768
01:06:17,349 --> 01:06:15,359
and maintain the integrity of the

1769
01:06:19,430 --> 01:06:17,359
structure and particularly the structure

1770
01:06:21,510 --> 01:06:19,440
of that orbit stamp you know the

1771
01:06:22,549 --> 01:06:21,520
sampling uh container that holds the

1772
01:06:24,150 --> 01:06:22,559
samples

1773
01:06:27,029 --> 01:06:24,160
we'll then make sure that we have all

1774
01:06:30,230 --> 01:06:27,039
the proper precautions in place as we uh

1775
01:06:33,270 --> 01:06:30,240
open and disassemble the entry system

1776
01:06:36,230 --> 01:06:33,280
and make sure that we are uh are keeping

1777
01:06:38,870 --> 01:06:36,240
uh the sample uh contained until we're

1778
01:06:41,990 --> 01:06:38,880
we're confident that um that it's safe

1779
01:06:43,910 --> 01:06:42,000
to be handled and safe to be uh you know

1780
01:06:47,190 --> 01:06:43,920
distributed for for the scientific

1781
01:06:49,829 --> 01:06:48,470
and we don't expect that to take

1782
01:06:51,430 --> 01:06:49,839
terribly long i just want to say we want

1783
01:06:53,910 --> 01:06:51,440
to get those samples to the scientists

1784
01:06:55,109 --> 01:06:53,920
as quickly as possible uh low

1785
01:06:56,710 --> 01:06:55,119
probability that there's something

1786
01:06:58,230 --> 01:06:56,720
dangerous but we're going to make sure

1787
01:07:01,270 --> 01:06:58,240
that we know

1788
01:07:04,230 --> 01:07:01,280

thank you uh this question is for

1789
01:07:06,630 --> 01:07:04,240
possibly sunanda or dave

1790
01:07:08,309 --> 01:07:06,640
daniel from facebook asks is it safe to

1791
01:07:10,390 --> 01:07:08,319
assume that there will be a program

1792
01:07:12,390 --> 01:07:10,400
similar to the apollo moon samples in

1793
01:07:14,309 --> 01:07:12,400
which a portion of the mars samples will

1794
01:07:16,470 --> 01:07:14,319
be archived for decades to take

1795
01:07:18,390 --> 01:07:16,480
advantage of evolving analysis

1796
01:07:20,710 --> 01:07:18,400
capabilities

1797
01:07:22,230 --> 01:07:20,720
i'll let you take this one david

1798
01:07:24,230 --> 01:07:22,240
yeah actually

1799
01:07:27,029 --> 01:07:24,240
i'm actually really happy to have this

1800
01:07:29,349 --> 01:07:27,039
question because um

1801
01:07:31,990 --> 01:07:29,359
i have worked on apollo samples and

1802
01:07:34,390 --> 01:07:32,000
these samples i'm gonna i'm gonna reveal

1803
01:07:36,309 --> 01:07:34,400
my age but these were collected before i

1804
01:07:39,109 --> 01:07:36,319
was born um

1805
01:07:41,990 --> 01:07:39,119
and that archive uh that happened with

1806
01:07:43,750 --> 01:07:42,000
the apollo samples is is extraordinary

1807
01:07:45,109 --> 01:07:43,760
and of course the obvious reason for

1808
01:07:47,109 --> 01:07:45,119
doing this

1809
01:07:49,029 --> 01:07:47,119
is analytical technologies and

1810
01:07:52,309 --> 01:07:49,039
laboratories change through time and

1811
01:07:53,589 --> 01:07:52,319
they change in fact quite rapidly

1812
01:07:55,430 --> 01:07:53,599
that said

1813
01:07:57,589 --> 01:07:55,440

as you heard today

1814
01:08:00,630 --> 01:07:57,599
and i hope you all appreciate the size

1815
01:08:03,510 --> 01:08:00,640
of these samples is very very small

1816
01:08:05,349 --> 01:08:03,520
relative to the all the samples that we

1817
01:08:07,510 --> 01:08:05,359
collected

1818
01:08:08,789 --> 01:08:07,520
but almost certainly i now i should have

1819
01:08:11,670 --> 01:08:08,799
started by saying i don't know the

1820
01:08:13,349 --> 01:08:11,680
details but almost certainly um some of

1821
01:08:15,910 --> 01:08:13,359
some portion of these samples will be

1822
01:08:17,669 --> 01:08:15,920
archived in a similar manner

1823
01:08:20,470 --> 01:08:17,679
laura you may have something more to say

1824
01:08:22,789 --> 01:08:20,480
about that um i i am certain people are

1825
01:08:25,349 --> 01:08:22,799
thinking this through very carefully but

1826
01:08:27,430 --> 01:08:25,359
i will say it's obviously going to be

1827
01:08:31,669 --> 01:08:27,440
pretty complicated to figure out who

1828
01:08:33,669 --> 01:08:31,679
gets to measure what on which sample

1829
01:08:35,510 --> 01:08:33,679
it will be but we have processes in

1830
01:08:37,349 --> 01:08:35,520
place for doing that particularly

1831
01:08:40,149 --> 01:08:37,359
through you know the apollo sample

1832
01:08:42,709 --> 01:08:40,159
programs we've we've uh you know we have

1833
01:08:44,950 --> 01:08:42,719
ways to to do that um allocation we're

1834
01:08:47,749 --> 01:08:44,960
also of course working extremely closely

1835
01:08:50,550 --> 01:08:47,759
with european space agency we are we are

1836
01:08:53,590 --> 01:08:50,560
partners on this uh on this mars sample

1837
01:08:55,269 --> 01:08:53,600
return mission and so the the one thing

1838
01:08:57,349 --> 01:08:55,279

that we are planning to do which is a

1839
01:09:01,030 --> 01:08:57,359
little different from normal is that

1840
01:09:03,990 --> 01:09:01,040
this will be a a a jointly uh you know

1841
01:09:06,630 --> 01:09:04,000
jointly owned sample of both europe and

1842
01:09:08,630 --> 01:09:06,640
the us uh these are our samples it will

1843
01:09:11,669 --> 01:09:08,640
be a a uh

1844
01:09:14,550 --> 01:09:11,679
you know a a collection uh that is that

1845
01:09:16,470 --> 01:09:14,560
is for for everyone and we will probably

1846
01:09:18,789 --> 01:09:16,480
curate it in different places uh but

1847
01:09:21,669 --> 01:09:18,799
we'll have the process uh for for

1848
01:09:25,269 --> 01:09:21,679
allocating those and absolutely uh there

1849
01:09:28,070 --> 01:09:25,279
are plans to preserve um significant uh

1850
01:09:31,189 --> 01:09:28,080
fractions of the samples uh for future

1851
01:09:34,070 --> 01:09:31,199
that's as you said that is the um the

1852
01:09:36,390 --> 01:09:34,080
incredible value of these sample return

1853
01:09:37,269 --> 01:09:36,400
programs that we have is that we can

1854
01:09:39,189 --> 01:09:37,279
save

1855
01:09:41,590 --> 01:09:39,199
large fractions of the sample as you say

1856
01:09:43,669 --> 01:09:41,600
for future analytical capabilities for

1857
01:09:45,510 --> 01:09:43,679
for new hypotheses to be tested in the

1858
01:09:46,709 --> 01:09:45,520
future that we don't even know to test

1859
01:09:48,789 --> 01:09:46,719
yet

1860
01:09:50,789 --> 01:09:48,799
and we've seen that demonstrated with

1861
01:09:53,510 --> 01:09:50,799
the lunar samples with

1862
01:09:55,669 --> 01:09:53,520
the most recent samples that were

1863
01:09:57,110 --> 01:09:55,679

opened uh you know almost 50 years after

1864
01:10:00,790 --> 01:09:57,120
they were collected still in their

1865
01:10:02,709 --> 01:10:00,800
pristine sealed sample tubes

1866
01:10:04,790 --> 01:10:02,719
fantastic opportunity to test new

1867
01:10:07,350 --> 01:10:04,800
hypotheses and allow the

1868
01:10:10,709 --> 01:10:07,360
the new generations of scientists to um

1869
01:10:13,189 --> 01:10:12,070
sunanda did you have anything you'd like

1870
01:10:14,470 --> 01:10:13,199
to add

1871
01:10:16,070 --> 01:10:14,480
no i just want you to agree with that i

1872
01:10:17,669 --> 01:10:16,080
just wanted to bring up one point from

1873
01:10:19,750 --> 01:10:17,679
studies on martian meteorites some of

1874
01:10:21,830 --> 01:10:19,760
those for instance those are those give

1875
01:10:24,149 --> 01:10:21,840
us an idea of what mars is made up of

1876
01:10:26,390 --> 01:10:24,159
and those have been studied for decades

1877
01:10:28,870 --> 01:10:26,400
like i studied one last week and that's

1878
01:10:30,709 --> 01:10:28,880
been studying for a really long time and

1879
01:10:32,229 --> 01:10:30,719
we have newer capabilities in the lab as

1880
01:10:34,470 --> 01:10:32,239
dave was mentioning that we didn't have

1881
01:10:36,470 --> 01:10:34,480
when they were first discovered so it's

1882
01:10:37,990 --> 01:10:36,480
a really great opportunity for science

1883
01:10:40,310 --> 01:10:38,000
to develop and i think getting new

1884
01:10:41,830 --> 01:10:40,320
samples will really spur the development

1885
01:10:43,830 --> 01:10:41,840
of new technology so i'm excited to see

1886
01:10:45,669 --> 01:10:43,840
that

1887
01:10:46,950 --> 01:10:45,679
thank you and we have lots of questions

1888
01:10:50,070 --> 01:10:46,960

still coming in let's go back to the

1889
01:10:52,870 --> 01:10:50,080
phone lines we have marina coren with

1890
01:10:57,430 --> 01:10:55,669
hi marina with the atlantic again i am

1891
01:10:59,510 --> 01:10:57,440
looking at the names of each sample and

1892
01:11:02,550 --> 01:10:59,520
i'm wondering what naming conventions

1893
01:11:04,229 --> 01:11:02,560
you're using uh specifically hazel top

1894
01:11:05,750 --> 01:11:04,239
and bear walla which i believe you said

1895
01:11:06,630 --> 01:11:05,760
are the samples that you're most excited

1896
01:11:08,310 --> 01:11:06,640
about

1897
01:11:09,830 --> 01:11:08,320
and perhaps if they contain what you're

1898
01:11:11,669 --> 01:11:09,840
hoping they contain these things might

1899
01:11:13,510 --> 01:11:11,679
become more famous in coming years so

1900
01:11:15,110 --> 01:11:13,520
i'm curious how you've come up with all

1901
01:11:17,350 --> 01:11:15,120
of these thanks

1902
01:11:19,110 --> 01:11:17,360
yeah i'll answer that

1903
01:11:22,390 --> 01:11:19,120
we have a

1904
01:11:23,910 --> 01:11:22,400
a grid that is laid down uh on the map

1905
01:11:26,550 --> 01:11:23,920
of the crater floor

1906
01:11:30,070 --> 01:11:26,560
and each box of this grid

1907
01:11:32,470 --> 01:11:30,080
we have associated with a national park

1908
01:11:35,590 --> 01:11:32,480
or preserve somewhere in the world

1909
01:11:38,709 --> 01:11:35,600
and so we take the names off of a map of

1910
01:11:41,110 --> 01:11:38,719
that national park or preserve

1911
01:11:42,950 --> 01:11:41,120
and assign it to the to the targets and

1912
01:11:44,390 --> 01:11:42,960
the so we do that with lots of different

1913
01:11:46,070 --> 01:11:44,400

targets so you heard us use lots of

1914
01:11:50,229 --> 01:11:46,080
different names not just

1915
01:11:52,229 --> 01:11:50,239
uh you know barry hollow and and uh

1916
01:11:53,510 --> 01:11:52,239
skyland we have all of these names are

1917
01:11:55,270 --> 01:11:53,520
pulled off

1918
01:11:56,950 --> 01:11:55,280
of the map and that

1919
01:11:58,709 --> 01:11:56,960
the the map that we are pulling names

1920
01:12:01,270 --> 01:11:58,719
off of uh that you've just been hearing

1921
01:12:02,630 --> 01:12:01,280
about is shenandoah shenandoah national

1922
01:12:06,830 --> 01:12:02,640
park in

1923
01:12:12,550 --> 01:12:10,310
states thanks ken and we now have a

1924
01:12:15,910 --> 01:12:12,560
follow-up question coming in from ken

1925
01:12:17,430 --> 01:12:15,920
chang with the new york times

1926
01:12:18,310 --> 01:12:17,440
all right thanks for taking my question

1927
01:12:21,430 --> 01:12:18,320
ken

1928
01:12:23,669 --> 01:12:21,440
um obviously you all know for years

1929
01:12:25,910 --> 01:12:23,679
until the samples come back to earth but

1930
01:12:28,390 --> 01:12:25,920
at this point if you were petting would

1931
01:12:34,950 --> 01:12:28,400
you bet that there's actual file

1932
01:12:38,470 --> 01:12:37,030
let's just say we are not going to bet

1933
01:12:40,630 --> 01:12:38,480
yeah

1934
01:12:45,110 --> 01:12:40,640
we're going to decline

1935
01:12:49,270 --> 01:12:47,110
all right and

1936
01:12:53,350 --> 01:12:49,280
let's take it back to the phone lines

1937
01:12:55,590 --> 01:12:53,360
next up we have ken kramer with space up

1938
01:12:57,510 --> 01:12:55,600

close

1939
01:12:58,229 --> 01:12:57,520
hi thank you for taking my question and

1940
01:12:59,750 --> 01:12:58,239
uh

1941
01:13:02,630 --> 01:12:59,760
good luck on congratulations on

1942
01:13:04,709 --> 01:13:02,640
everything you've done so far um i'm

1943
01:13:07,510 --> 01:13:04,719
wondering about the uh

1944
01:13:10,310 --> 01:13:07,520
why why do you think that uh

1945
01:13:11,990 --> 01:13:10,320
these samples are aromatics uh the

1946
01:13:14,790 --> 01:13:12,000
organics why do you think they're

1947
01:13:16,550 --> 01:13:14,800
aromatics and um do you see any evidence

1948
01:13:19,430 --> 01:13:16,560
for any functional groups like amines

1949
01:13:20,709 --> 01:13:19,440
halogens hydroxyls anything like that

1950
01:13:22,310 --> 01:13:20,719
thank you

1951
01:13:24,229 --> 01:13:22,320
yeah that's a really good question so

1952
01:13:25,910 --> 01:13:24,239
i'll first start by giving a little more

1953
01:13:28,630 --> 01:13:25,920
information about sherlock so sherlock

1954
01:13:30,310 --> 01:13:28,640
doesn't see all organics equally it has

1955
01:13:31,350 --> 01:13:30,320
sort of a preference and aromatics is

1956
01:13:33,590 --> 01:13:31,360
something that we would sort of

1957
01:13:35,189 --> 01:13:33,600
preferentially see because there's some

1958
01:13:36,630 --> 01:13:35,199
enhancement that we have so that's why

1959
01:13:38,709 --> 01:13:36,640
we think when it's showing up and it's

1960
01:13:40,390 --> 01:13:38,719
showing up so clearly more likely that

1961
01:13:42,390 --> 01:13:40,400
it looks like aromatics

1962
01:13:44,709 --> 01:13:42,400
and then we also have analog instruments

1963
01:13:46,950 --> 01:13:44,719

here at jpl and a couple of other places

1964
01:13:48,470 --> 01:13:46,960
that we have um reference libraries that

1965
01:13:50,229 --> 01:13:48,480
we've built up so basically every time

1966
01:13:52,630 --> 01:13:50,239
we get signals we compare to our

1967
01:13:54,310 --> 01:13:52,640
reference libraries that we've um

1968
01:13:56,310 --> 01:13:54,320
developed using the analog sherlock

1969
01:13:58,229 --> 01:13:56,320
instruments and then compare to see what

1970
01:14:00,790 --> 01:13:58,239
those signals look like so that's why we

1971
01:14:01,990 --> 01:14:00,800
think that this one is aromatic

1972
01:14:03,430 --> 01:14:02,000
because it matches the things that we're

1973
01:14:04,470 --> 01:14:03,440
seeing in the library and then what was

1974
01:14:05,910 --> 01:14:04,480
the last part of the question i think i

1975
01:14:07,750 --> 01:14:05,920
missed something

1976
01:14:09,990 --> 01:14:07,760
any functional groups like amines

1977
01:14:12,149 --> 01:14:10,000
halogens hydroxyls what are on these

1978
01:14:13,430 --> 01:14:12,159
aromatics if you might know

1979
01:14:15,910 --> 01:14:13,440
i don't think the data can tell us that

1980
01:14:17,669 --> 01:14:15,920
yet i think we gotta we gotta get those

1981
01:14:19,110 --> 01:14:17,679
back and find more information about it

1982
01:14:22,229 --> 01:14:19,120
because the data that from the service

1983
01:14:25,990 --> 01:14:24,149
all right thank you

1984
01:14:28,229 --> 01:14:26,000
well that is all the time we have for

1985
01:14:29,750 --> 01:14:28,239
questions today thank you so much to our

1986
01:14:32,070 --> 01:14:29,760
speakers and thank you for your

1987
01:14:34,149 --> 01:14:32,080
questions if you have additional

1988
01:14:36,910 --> 01:14:34,159

questions please contact immediate line

1989
01:14:42,149 --> 01:14:39,590
818-354-5011 if you have any follow-ups

1990
01:14:45,350 --> 01:14:42,159
and for more information on the mission

1991
01:14:47,270 --> 01:14:45,360
visit nasa.gov perseverance and

1992
01:14:50,070 --> 01:14:47,280
mars.nasa.gov

1993
01:14:51,750 --> 01:14:50,080
perseverance and we've got a new feature

1994
01:14:53,910 --> 01:14:51,760
on the perseverance site where you can

1995
01:14:57,830 --> 01:14:53,920
do a deeper dive on the samples we've

1996
01:15:01,030 --> 01:14:57,840
collected so check out mars.nasa.gov

1997
01:15:04,149 --> 01:15:01,040
mars dash rocks dash samples and don't

1998
01:15:06,630 --> 01:15:04,159
forget to follow us on social media at

1999
01:15:25,230 --> 01:15:06,640
nasa persevere