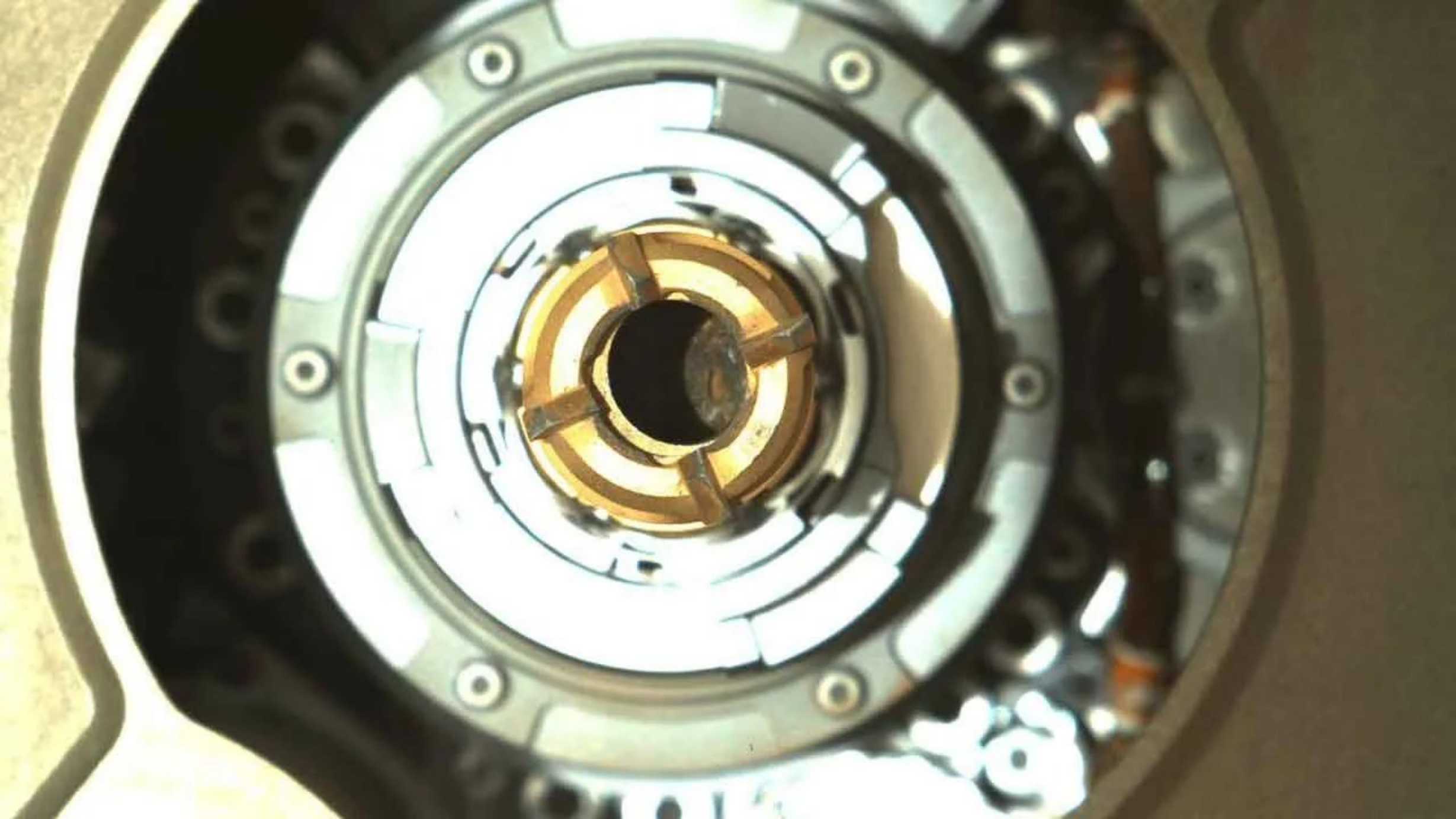

1
00:03:21,550 --> 00:00:19,820
[Music]

2
00:03:59,850 --> 00:03:21,560
[Applause]

3
00:06:39,590 --> 00:04:15,740
[Music]

4
00:06:58,800 --> 00:06:42,250
so

5
00:07:01,180 --> 00:06:58,810
[Music]

6
00:07:38,650 --> 00:07:01,190
[Applause]

7
00:10:31,750 --> 00:07:54,590
[Music]

8
00:10:36,710 --> 00:10:33,750
welcome to nasa's jet propulsion

9
00:10:39,110 --> 00:10:36,720
laboratory in southern california

10
00:10:41,269 --> 00:10:39,120
nasa's perseverance rover started the

11
00:10:42,310 --> 00:10:41,279
science phase of its mission back in

12
00:10:45,110 --> 00:10:42,320
june

13
00:10:47,910 --> 00:10:45,120

now it has successfully acquired its

14
00:10:51,750 --> 00:10:47,920
first rock samples of mars

15
00:10:53,990 --> 00:10:51,760
i'm raquel villanueva of jpl's digital

16
00:10:56,389 --> 00:10:54,000
news and media office

17
00:10:58,710 --> 00:10:56,399
i'll be your host today as we discuss

18
00:11:01,190 --> 00:10:58,720
collecting martian samples that are

19
00:11:04,230 --> 00:11:01,200
planned to return to earth

20
00:11:06,630 --> 00:11:04,240
those of us here at jpl are all masked

21
00:11:09,190 --> 00:11:06,640
in accordance to la county guidelines

22
00:11:12,310 --> 00:11:09,200
here in california

23
00:11:15,110 --> 00:11:12,320
our speakers today include from nasa

24
00:11:17,750 --> 00:11:15,120
headquarters lori glaze

25
00:11:18,949 --> 00:11:17,760
director of nasa's planetary science

26
00:11:21,269 --> 00:11:18,959
division

27
00:11:22,870 --> 00:11:21,279
and here at jpl

28
00:11:27,269 --> 00:11:22,880
jessica samuels

29
00:11:28,870 --> 00:11:27,279
perseverance surface mission manager

30
00:11:31,110 --> 00:11:28,880
matt robinson

31
00:11:35,190 --> 00:11:31,120
perseverance strategic sampling

32
00:11:41,750 --> 00:11:38,310
katie stack morgan perseverance deputy

33
00:11:48,310 --> 00:11:45,910
yulia goriva perseverance return sample

34
00:11:51,590 --> 00:11:48,320
investigation scientist

35
00:11:53,030 --> 00:11:51,600
and joining us virtually is menakshi

36
00:11:56,790 --> 00:11:53,040
wadwa

37
00:11:58,550 --> 00:11:56,800
mars sample return principal scientist

38
00:12:00,790 --> 00:11:58,560

we'll be taking questions during the

39
00:12:03,269 --> 00:12:00,800
briefing so if you're a member of the

40
00:12:04,790 --> 00:12:03,279
media on the phone lines press star one

41
00:12:07,030 --> 00:12:04,800
to be put in the queue

42
00:12:09,590 --> 00:12:07,040
if you're on social media use the

43
00:12:14,550 --> 00:12:09,600
hashtag asknasa

44
00:12:18,629 --> 00:12:16,069
thank you raquel

45
00:12:21,670 --> 00:12:18,639
i am excited to be here today to talk

46
00:12:24,710 --> 00:12:21,680
about just how important it is for us to

47
00:12:27,750 --> 00:12:24,720
collect and analyze these first martian

48
00:12:29,509 --> 00:12:27,760
rock samples for return back to earth

49
00:12:32,550 --> 00:12:29,519
you know at nasa we get to see a lot of

50
00:12:35,269 --> 00:12:32,560
things that rewrite the history books

51
00:12:38,069 --> 00:12:35,279
and what occurred september 6th at

52
00:12:39,269 --> 00:12:38,079
jezreel crater is right up there with

53
00:12:41,910 --> 00:12:39,279
any of them

54
00:12:43,590 --> 00:12:41,920
i'm happy to say that not one

55
00:12:45,829 --> 00:12:43,600
but that the first

56
00:12:48,550 --> 00:12:45,839
two samples of another planet are

57
00:12:51,190 --> 00:12:48,560
prepped and stowed as the first official

58
00:12:53,509 --> 00:12:51,200
candidate samples to be returned to

59
00:12:55,829 --> 00:12:53,519
earth by a future mission

60
00:12:58,389 --> 00:12:55,839
nasa's team leading that next mission

61
00:13:00,230 --> 00:12:58,399
called mars sample return is thrilled

62
00:13:02,389 --> 00:13:00,240
about this achievement and what can be

63
00:13:05,910 --> 00:13:02,399

officially declared as the start of the

64
00:13:08,790 --> 00:13:05,920
mars sample return relay the mars sample

65
00:13:10,470 --> 00:13:08,800
return mission is a strategic and bold

66
00:13:12,629 --> 00:13:10,480
partnership with the european space

67
00:13:15,350 --> 00:13:12,639
agency and will be the first sample

68
00:13:17,750 --> 00:13:15,360
return mission from another planet

69
00:13:19,990 --> 00:13:17,760
a bit later i'm excited to hear dr

70
00:13:23,670 --> 00:13:20,000
minnie wadwa detail the significance of

71
00:13:25,670 --> 00:13:23,680
bringing those samples back to earth

72
00:13:27,990 --> 00:13:25,680
one of the reasons we explore mars is

73
00:13:29,670 --> 00:13:28,000
because it holds a rock record that's

74
00:13:32,069 --> 00:13:29,680
been untouched for about three and a

75
00:13:34,389 --> 00:13:32,079
half to four billion years and here on

76
00:13:37,110 --> 00:13:34,399
earth we have plate tectonics

77
00:13:40,310 --> 00:13:37,120
our planet's crust has broken into large

78
00:13:43,670 --> 00:13:40,320
blocky plates that turn shift compress

79
00:13:46,230 --> 00:13:43,680
and expand over and over and what we see

80
00:13:48,310 --> 00:13:46,240
today on earth's surface is not at all

81
00:13:49,670 --> 00:13:48,320
the same as what earth was like when it

82
00:13:51,750 --> 00:13:49,680
first formed

83
00:13:53,509 --> 00:13:51,760
but mars doesn't have plate tectonics

84
00:13:55,750 --> 00:13:53,519
and so its early history is well

85
00:13:57,430 --> 00:13:55,760
preserved in the layers of the rocks on

86
00:13:58,710 --> 00:13:57,440
the planet's surface

87
00:14:00,710 --> 00:13:58,720
and perseverance is playing an

88
00:14:03,350 --> 00:14:00,720

incredibly important role in our

89
00:14:05,269 --> 00:14:03,360
understanding of mars and demonstrating

90
00:14:07,829 --> 00:14:05,279
key technologies as we take our next

91
00:14:10,389 --> 00:14:07,839
steps in exploring the solar system

92
00:14:12,470 --> 00:14:10,399
if i could have my first graphic please

93
00:14:14,710 --> 00:14:12,480
just want to emphasize that everything

94
00:14:16,949 --> 00:14:14,720
we do builds on what we've learned

95
00:14:19,829 --> 00:14:16,959
before we stand on the shoulders of the

96
00:14:21,590 --> 00:14:19,839
giants to be where we are today

97
00:14:24,310 --> 00:14:21,600
from the left tears beginning with

98
00:14:26,949 --> 00:14:24,320
sojourner our very first foray into

99
00:14:28,870 --> 00:14:26,959
roving on mars in 1996 through the

100
00:14:31,829 --> 00:14:28,880
spirit and opportunity rovers through

101
00:14:34,150 --> 00:14:31,839
curiosity and now perseverance and then

102
00:14:36,790 --> 00:14:34,160
on to the mars ascent vehicle that will

103
00:14:38,310 --> 00:14:36,800
begin the journey to bring these samples

104
00:14:40,150 --> 00:14:38,320
back to earth

105
00:14:42,949 --> 00:14:40,160
all feeding forward to the eventual

106
00:14:45,910 --> 00:14:42,959
human exploration of mars

107
00:14:48,230 --> 00:14:45,920
as we head into this amazing future we

108
00:14:49,269 --> 00:14:48,240
know that even though some of its rocks

109
00:14:51,030 --> 00:14:49,279
are not

110
00:14:52,629 --> 00:14:51,040
mars is hard

111
00:14:54,629 --> 00:14:52,639
and there will be trials along the way

112
00:14:57,110 --> 00:14:54,639
for both this team and for future

113
00:14:59,829 --> 00:14:57,120

missions but the scientific return is

114
00:15:02,710 --> 00:14:59,839
worth every challenge and we've made

115
00:15:04,629 --> 00:15:02,720
unprecedented progress and now i want to

116
00:15:06,790 --> 00:15:04,639
hand things over to jessica samuels

117
00:15:07,990 --> 00:15:06,800
who'll walk us through what perseverance

118
00:15:09,829 --> 00:15:08,000
has been up to

119
00:15:11,949 --> 00:15:09,839
thank you lori

120
00:15:15,670 --> 00:15:11,959
so we are currently on our

121
00:15:17,910 --> 00:15:15,680
198th saw or martian day um in the

122
00:15:20,470 --> 00:15:17,920
mission and happy to report that the

123
00:15:23,269 --> 00:15:20,480
vehicle continues to be healthy with all

124
00:15:25,030 --> 00:15:23,279
of our systems operating nominally

125
00:15:26,389 --> 00:15:25,040
to give you all a little reminder of

126
00:15:27,750 --> 00:15:26,399
where we are

127
00:15:29,910 --> 00:15:27,760
in our saul

128
00:15:31,749 --> 00:15:29,920
path here let's look at this first

129
00:15:34,150 --> 00:15:31,759
graphic

130
00:15:37,189 --> 00:15:34,160
so to date the rover has traveled 2.2

131
00:15:40,230 --> 00:15:37,199
kilometers or about 1.4 miles

132
00:15:42,310 --> 00:15:40,240
and if you follow the path leg south you

133
00:15:45,110 --> 00:15:42,320
can find the location of our first

134
00:15:47,430 --> 00:15:45,120
sampling attempt at rubion

135
00:15:48,629 --> 00:15:47,440
as we continued our leg

136
00:15:52,150 --> 00:15:48,639
to the west

137
00:15:54,629 --> 00:15:52,160
we were very pleased to see our enhanced

138
00:15:57,910 --> 00:15:54,639

autonomous navigation system performance

139
00:16:00,230 --> 00:15:57,920
travel about 560 meters in just over the

140
00:16:02,629 --> 00:16:00,240
course of two weeks while performing

141
00:16:05,110 --> 00:16:02,639
remote sensing along the way so we are

142
00:16:08,230 --> 00:16:05,120
well on our way with a fast traversing

143
00:16:10,150 --> 00:16:08,240
vehicle on mars making great strides but

144
00:16:11,590 --> 00:16:10,160
let's talk about the sampling

145
00:16:12,310 --> 00:16:11,600
so let's see

146
00:16:14,790 --> 00:16:12,320
the

147
00:16:18,150 --> 00:16:14,800
our next image here

148
00:16:20,150 --> 00:16:18,160
so this is a image of our first locate

149
00:16:22,150 --> 00:16:20,160
sampling location

150
00:16:24,389 --> 00:16:22,160
our target rubion is on the right and

151
00:16:27,110 --> 00:16:24,399
you can see this is a paver stone

152
00:16:30,550 --> 00:16:27,120
and while we failed to acquire

153
00:16:32,550 --> 00:16:30,560
a solid core at this location

154
00:16:35,030 --> 00:16:32,560
we believed it to be a result of the

155
00:16:36,389 --> 00:16:35,040
actual properties of the target but we

156
00:16:38,389 --> 00:16:36,399
also needed to make sure that we didn't

157
00:16:40,069 --> 00:16:38,399
have a problem with the sampling system

158
00:16:42,069 --> 00:16:40,079
itself

159
00:16:43,670 --> 00:16:42,079
so the engineering team working with the

160
00:16:46,230 --> 00:16:43,680
project science team

161
00:16:48,310 --> 00:16:46,240
sought out to reach a new target

162
00:16:49,990 --> 00:16:48,320
and we nicknamed this target we found a

163
00:16:51,110 --> 00:16:50,000

target which we believe to be less

164
00:16:53,749 --> 00:16:51,120
weathered

165
00:16:54,790 --> 00:16:53,759
and more robust and nicknamed the target

166
00:16:56,870 --> 00:16:54,800
rochette

167
00:16:58,629 --> 00:16:56,880
so in this next image you can see this

168
00:17:01,509 --> 00:16:58,639
target rochette and you can see the

169
00:17:03,509 --> 00:17:01,519
robotic arm placed on that target

170
00:17:06,150 --> 00:17:03,519
now prior to sampling we go through a

171
00:17:08,949 --> 00:17:06,160
series of pre-sampling steps

172
00:17:10,949 --> 00:17:08,959
and here you can see that the watson

173
00:17:12,710 --> 00:17:10,959
image is actually

174
00:17:14,949 --> 00:17:12,720
observing different locations on the

175
00:17:15,909 --> 00:17:14,959
target to assess where we may want to

176
00:17:17,590 --> 00:17:15,919
core

177
00:17:19,750 --> 00:17:17,600
on the right side of the image you can

178
00:17:22,309 --> 00:17:19,760
actually see the coring tool and it

179
00:17:24,949 --> 00:17:22,319
currently has an abrading bit installed

180
00:17:27,429 --> 00:17:24,959
now we use this abrading bit to create a

181
00:17:30,470 --> 00:17:27,439
five centimeter patch

182
00:17:32,310 --> 00:17:30,480
and remove a few millimeters across of

183
00:17:34,150 --> 00:17:32,320
the top of the surface so that we can

184
00:17:36,710 --> 00:17:34,160
see the internal structure of the rock

185
00:17:38,150 --> 00:17:36,720
and evaluate its composition with the

186
00:17:40,230 --> 00:17:38,160
science instruments that we have on

187
00:17:43,270 --> 00:17:40,240
board

188
00:17:44,789 --> 00:17:43,280

now after reviewing uh the abrasion of

189
00:17:47,830 --> 00:17:44,799
this target which we can see in this

190
00:17:49,909 --> 00:17:47,840
next image the engineering and sampling

191
00:17:51,830 --> 00:17:49,919
team felt quite engineering and science

192
00:17:55,110 --> 00:17:51,840
team and sampling team felt quite

193
00:17:57,990 --> 00:17:55,120
confident uh about proceeding with an

194
00:18:01,029 --> 00:17:58,000
acquisition in this rock

195
00:18:04,310 --> 00:18:01,039
and as laurie mentioned not only did we

196
00:18:06,310 --> 00:18:04,320
receive did we core and acquire acquire

197
00:18:07,750 --> 00:18:06,320
and store one sample

198
00:18:08,630 --> 00:18:07,760
but we acquired

199
00:18:10,230 --> 00:18:08,640
two

200
00:18:12,870 --> 00:18:10,240
rock core samples

201
00:18:15,110 --> 00:18:12,880
as we were evaluating this target the

202
00:18:16,549 --> 00:18:15,120
science team found very

203
00:18:19,190 --> 00:18:16,559
found this target to be a very high

204
00:18:21,669 --> 00:18:19,200
value as well and we proceeded with our

205
00:18:23,990 --> 00:18:21,679
paired sampling strategy and the second

206
00:18:27,750 --> 00:18:24,000
sample was acquired just two days after

207
00:18:33,270 --> 00:18:30,150
so the height of each of our two rock

208
00:18:36,710 --> 00:18:33,280
core samples uh the first was 5.9

209
00:18:39,909 --> 00:18:36,720
centimeters the second 6.1 centimeters

210
00:18:41,990 --> 00:18:39,919
and with a target depth for acquisition

211
00:18:44,150 --> 00:18:42,000
being 6.6 centimeters you can imagine we

212
00:18:45,350 --> 00:18:44,160
were all very very pleased with these

213
00:18:47,750 --> 00:18:45,360

results

214
00:18:50,549 --> 00:18:47,760
the volume is measured by an internal

215
00:18:53,110 --> 00:18:50,559
station inside the cavity of the inside

216
00:18:55,669 --> 00:18:53,120
the rover itself

217
00:18:58,870 --> 00:18:55,679
so personally reflecting on this moment

218
00:19:02,230 --> 00:18:58,880
this has been the culmination of so many

219
00:19:03,830 --> 00:19:02,240
years of so many people's hard work and

220
00:19:04,710 --> 00:19:03,840
time and effort

221
00:19:06,390 --> 00:19:04,720
and

222
00:19:09,270 --> 00:19:06,400
i know that when i joined this

223
00:19:12,390 --> 00:19:09,280
particular project in 2014

224
00:19:14,710 --> 00:19:12,400
i wanted to be a part of this moment to

225
00:19:17,510 --> 00:19:14,720
be able to achieve something that

226
00:19:20,310 --> 00:19:17,520
has never ever been done before

227
00:19:22,870 --> 00:19:20,320
and while it definitely was a very long

228
00:19:26,230 --> 00:19:22,880
time waiting i think all of us can say

229
00:19:29,510 --> 00:19:26,240
that it feels fantastic to be able to be

230
00:19:31,590 --> 00:19:29,520
up here and share this all with you

231
00:19:33,430 --> 00:19:31,600
but of course building spacecraft and

232
00:19:35,909 --> 00:19:33,440
operating them on mars does not come

233
00:19:36,789 --> 00:19:35,919
without its challenges

234
00:19:38,549 --> 00:19:36,799
but

235
00:19:40,789 --> 00:19:38,559
these are the challenges that keep us

236
00:19:42,789 --> 00:19:40,799
all going and motivated to do what we do

237
00:19:45,430 --> 00:19:42,799
you know whether it's building a piece

238
00:19:47,029 --> 00:19:45,440

of hardware and finding that it doesn't

239
00:19:48,870 --> 00:19:47,039
do what you intended it to do and you

240
00:19:51,430 --> 00:19:48,880
need to redesign it during development

241
00:19:54,870 --> 00:19:51,440
or or schedule slips because that just

242
00:19:57,430 --> 00:19:54,880
how long it takes to perform the work

243
00:19:59,190 --> 00:19:57,440
or having mars react to you in a way

244
00:20:00,789 --> 00:19:59,200
that you never experienced in your

245
00:20:04,070 --> 00:20:00,799
ground test program

246
00:20:06,470 --> 00:20:04,080
these are the challenges that continue

247
00:20:09,909 --> 00:20:06,480
to make us better engineers

248
00:20:12,710 --> 00:20:09,919
better scientists and better teammates

249
00:20:14,950 --> 00:20:12,720
like our perseverance rover this team

250
00:20:16,710 --> 00:20:14,960
continues to persevere

251
00:20:18,549 --> 00:20:16,720
and maintain the confidence in our

252
00:20:21,350 --> 00:20:18,559
engineering capabilities

253
00:20:24,390 --> 00:20:21,360
as demonstrated now with our two

254
00:20:25,750 --> 00:20:24,400
sealed rock core samples

255
00:20:27,590 --> 00:20:25,760
we all take

256
00:20:30,549 --> 00:20:27,600
significant pride

257
00:20:32,549 --> 00:20:30,559
in continuing to do things that are hard

258
00:20:35,350 --> 00:20:32,559
and challenge ourselves

259
00:20:37,510 --> 00:20:35,360
but we know and as demonstrated by what

260
00:20:39,750 --> 00:20:37,520
we have just done that continuing to

261
00:20:42,149 --> 00:20:39,760
work as a team we really can achieve

262
00:20:43,350 --> 00:20:42,159
these amazing accomplishments

263
00:20:44,950 --> 00:20:43,360

so to tell you a little bit more about

264
00:20:46,710 --> 00:20:44,960
how our sampling system works i'd like

265
00:20:51,350 --> 00:20:46,720
to introduce you to matt robinson our

266
00:20:55,909 --> 00:20:53,830
thank you jessica

267
00:20:58,630 --> 00:20:55,919
the sampling and caching system is the

268
00:21:00,470 --> 00:20:58,640
most complex mechanism ever flown into

269
00:21:02,549 --> 00:21:00,480
space

270
00:21:04,549 --> 00:21:02,559
however it's the appropriate level of

271
00:21:05,909 --> 00:21:04,559
complexity for the job that we've asked

272
00:21:08,310 --> 00:21:05,919
to do

273
00:21:11,510 --> 00:21:08,320
and so far on mars it's performed

274
00:21:14,070 --> 00:21:11,520
absolutely beautifully

275
00:21:15,350 --> 00:21:14,080
the robotic arm has a coring drill on

276
00:21:17,830 --> 00:21:15,360
the end of it

277
00:21:20,070 --> 00:21:17,840
it places and preloads the drill on the

278
00:21:22,230 --> 00:21:20,080
rock target

279
00:21:24,230 --> 00:21:22,240
as the chlorine drill

280
00:21:27,270 --> 00:21:24,240
drills into the surface

281
00:21:29,270 --> 00:21:27,280
the sample enters a sample tube

282
00:21:31,430 --> 00:21:29,280
and here's an example from our test

283
00:21:35,190 --> 00:21:31,440
program of what the sample tube looks

284
00:21:35,200 --> 00:21:38,390
start the video please

285
00:21:41,110 --> 00:21:40,149
then the robotic arm retracts from the

286
00:21:43,590 --> 00:21:41,120
surface

287
00:21:45,350 --> 00:21:43,600
and drops off the drill bit with the now

288
00:21:49,029 --> 00:21:45,360

filled sample tube

289
00:21:51,350 --> 00:21:49,039
into our sample processing center

290
00:21:53,830 --> 00:21:51,360
there's a sample handling arm

291
00:21:56,070 --> 00:21:53,840
which manipulates the sample

292
00:21:58,870 --> 00:21:56,080
to take images of the sample

293
00:22:01,110 --> 00:21:58,880
to measure its volume

294
00:22:02,789 --> 00:22:01,120
to seal the sample tube and then to

295
00:22:10,070 --> 00:22:02,799
store it on board

296
00:22:14,149 --> 00:22:12,310
in our first attempt to acquire a core

297
00:22:16,390 --> 00:22:14,159
at target rubion

298
00:22:19,270 --> 00:22:16,400
we compar we commanded the sampling

299
00:22:24,070 --> 00:22:19,280
system to acquire and process a sample

300
00:22:29,190 --> 00:22:27,029
for our second sample attempt at target

301
00:22:32,230 --> 00:22:29,200
mont deignier we wanted to do things a

302
00:22:36,390 --> 00:22:34,149
and what we did was

303
00:22:39,270 --> 00:22:36,400
we acquired the sample first or

304
00:22:41,430 --> 00:22:39,280
attempted to acquire the sample first

305
00:22:43,669 --> 00:22:41,440
we then paused before processing the

306
00:22:45,350 --> 00:22:43,679
sample so that we could confirm that

307
00:22:48,070 --> 00:22:45,360
there was a sample

308
00:22:50,710 --> 00:22:48,080
in the drill and then the tube

309
00:22:52,630 --> 00:22:50,720
so next image please

310
00:22:55,830 --> 00:22:52,640
so if we look at the images on the left

311
00:22:57,029 --> 00:22:55,840
and the right these were acquired

312
00:23:00,549 --> 00:22:57,039
after

313
00:23:02,870 --> 00:23:00,559

picked up the sample but before

314
00:23:03,990 --> 00:23:02,880
processing on the left you can see a

315
00:23:06,470 --> 00:23:04,000
beautiful

316
00:23:07,990 --> 00:23:06,480
image of the core within the bit and

317
00:23:10,230 --> 00:23:08,000
tube

318
00:23:12,390 --> 00:23:10,240
but on the right it's not so clear that

319
00:23:14,630 --> 00:23:12,400
we actually have a core

320
00:23:16,950 --> 00:23:14,640
in the bit or the tube so what happened

321
00:23:18,950 --> 00:23:16,960
between the left and the right

322
00:23:23,029 --> 00:23:18,960
and the answer has to do

323
00:23:26,230 --> 00:23:23,039
with our process for acquiring a core

324
00:23:28,470 --> 00:23:26,240
when the drill breaks off the core

325
00:23:30,310 --> 00:23:28,480
to capture it sometimes we get a little

326
00:23:32,789 --> 00:23:30,320
piece of rock stuck

327
00:23:35,190 --> 00:23:32,799
between the sample tube

328
00:23:37,029 --> 00:23:35,200
and the drill bit teeth

329
00:23:39,590 --> 00:23:37,039
in order to mitigate that

330
00:23:40,549 --> 00:23:39,600
we point the drill bit at a bit of an

331
00:23:42,310 --> 00:23:40,559
angle

332
00:23:45,350 --> 00:23:42,320
and we perform a

333
00:23:47,269 --> 00:23:45,360
couple brief percussion activities

334
00:23:48,390 --> 00:23:47,279
to try to either shake that little piece

335
00:23:49,750 --> 00:23:48,400
of rock

336
00:23:52,230 --> 00:23:49,760
out of a bit

337
00:23:55,029 --> 00:23:52,240
or to force it down into the tube with

338
00:23:57,190 --> 00:23:55,039

the rest of the core

339
00:24:00,310 --> 00:23:57,200
the image on the right

340
00:24:03,350 --> 00:24:00,320
is after that procedure was executed

341
00:24:04,789 --> 00:24:03,360
so when these images came down

342
00:24:06,789 --> 00:24:04,799
and we took a look at the one on the

343
00:24:08,310 --> 00:24:06,799
right we knew one of two things had to

344
00:24:10,390 --> 00:24:08,320
have happened

345
00:24:13,590 --> 00:24:10,400
either our core sample

346
00:24:15,909 --> 00:24:13,600
was ejected out of the bit

347
00:24:18,549 --> 00:24:15,919
during that percussion activity

348
00:24:21,430 --> 00:24:18,559
which we thought was highly unlikely

349
00:24:22,390 --> 00:24:21,440
or our core sample slid down into the

350
00:24:24,070 --> 00:24:22,400
tube

351
00:24:27,110 --> 00:24:24,080
and we just couldn't see it

352
00:24:29,029 --> 00:24:27,120
due to the lighting conditions

353
00:24:32,470 --> 00:24:29,039
so in order to

354
00:24:35,269 --> 00:24:32,480
not process an empty sample tube what we

355
00:24:37,750 --> 00:24:35,279
decided to do was take an extra day

356
00:24:41,029 --> 00:24:37,760
acquire additional images under better

357
00:24:47,510 --> 00:24:43,990
just to verify that we had a sample

358
00:24:49,750 --> 00:24:47,520
so just imagine we had a couple days of

359
00:24:52,149 --> 00:24:49,760
being anxious

360
00:24:54,230 --> 00:24:52,159
we then met in our command center we

361
00:24:58,470 --> 00:24:54,240
were huddled around our computer waiting

362
00:25:02,390 --> 00:25:01,029
and then the next image please

363
00:25:05,029 --> 00:25:02,400

and then this is what we got we were

364
00:25:07,430 --> 00:25:05,039
rewarded for our patience

365
00:25:09,510 --> 00:25:07,440
so you see an image looking down the

366
00:25:12,070 --> 00:25:09,520
drill bit into the tube and you see a

367
00:25:13,510 --> 00:25:12,080
beautiful core there

368
00:25:14,870 --> 00:25:13,520
and

369
00:25:16,549 --> 00:25:14,880
at that point our team was just

370
00:25:19,190 --> 00:25:16,559
absolutely ecstatic

371
00:25:21,350 --> 00:25:19,200
i don't have words to say how we felt

372
00:25:22,470 --> 00:25:21,360
many of us have worked eight years or

373
00:25:24,710 --> 00:25:22,480
more

374
00:25:27,029 --> 00:25:24,720
to design build

375
00:25:29,750 --> 00:25:27,039
and test this system

376
00:25:30,789 --> 00:25:29,760
and this was just the fruition of our

377
00:25:33,190 --> 00:25:30,799
efforts

378
00:25:34,390 --> 00:25:33,200
and we were just thrilled uh that it

379
00:25:35,350 --> 00:25:34,400
worked

380
00:25:37,669 --> 00:25:35,360
but

381
00:25:39,909 --> 00:25:37,679
our job wasn't quite done

382
00:25:42,470 --> 00:25:39,919
we had to process the sample

383
00:25:44,310 --> 00:25:42,480
so we gave the go-ahead to proceed with

384
00:25:46,149 --> 00:25:44,320
processing the sample

385
00:25:47,909 --> 00:25:46,159
next image please

386
00:25:49,909 --> 00:25:47,919
so what we see here

387
00:25:52,710 --> 00:25:49,919
are a series of images at our vision

388
00:25:55,190 --> 00:25:52,720

station within our processing center

389
00:25:57,029 --> 00:25:55,200
and you can see as we move the tube up

390
00:25:59,510 --> 00:25:57,039
into the camera

391
00:26:02,470 --> 00:25:59,520
our sample comes into focus

392
00:26:04,950 --> 00:26:02,480
this is the absolute best view that we

393
00:26:07,110 --> 00:26:04,960
have at the bottom of the core

394
00:26:10,549 --> 00:26:07,120
and we're rewarded once again with an

395
00:26:11,830 --> 00:26:10,559
absolutely beautiful image

396
00:26:13,430 --> 00:26:11,840
after that

397
00:26:16,710 --> 00:26:13,440
was finished

398
00:26:18,710 --> 00:26:16,720
we then had to seal the sample

399
00:26:21,510 --> 00:26:18,720
next image please

400
00:26:23,029 --> 00:26:21,520
so this is a before and after

401
00:26:24,870 --> 00:26:23,039
of the sealing process where we could

402
00:26:25,909 --> 00:26:24,880
see that it was activated

403
00:26:27,909 --> 00:26:25,919
these image

404
00:26:29,669 --> 00:26:27,919
images were taken again at our vision

405
00:26:31,430 --> 00:26:29,679
station

406
00:26:33,110 --> 00:26:31,440
and then finally we stored the sample on

407
00:26:36,549 --> 00:26:33,120
board

408
00:26:39,430 --> 00:26:36,559
now the resulting core that we got

409
00:26:40,950 --> 00:26:39,440
was roughly six centimeters which is

410
00:26:42,230 --> 00:26:40,960
about two inches

411
00:26:44,630 --> 00:26:42,240
and it would look probably something

412
00:26:50,070 --> 00:26:44,640
like this one this is a sample from our

413
00:26:55,830 --> 00:26:53,430

well mount dignier was our first sample

414
00:26:57,750 --> 00:26:55,840
acquisition and processing

415
00:26:59,029 --> 00:26:57,760
a couple days later we processed our

416
00:27:00,510 --> 00:26:59,039
second sample

417
00:27:03,350 --> 00:27:00,520
at

418
00:27:05,190 --> 00:27:03,360
montenegro on the same rock

419
00:27:08,710 --> 00:27:05,200
but our job's not done

420
00:27:12,149 --> 00:27:08,720
we have an additional 35 sample tubes

421
00:27:14,470 --> 00:27:12,159
to acquire samples in the process

422
00:27:15,669 --> 00:27:14,480
so we have a ways to go

423
00:27:17,510 --> 00:27:15,679
but

424
00:27:20,310 --> 00:27:17,520
we're excited to have the opportunity

425
00:27:23,110 --> 00:27:20,320
and we're thrilled to have the challenge

426
00:27:25,590 --> 00:27:23,120
and with that i'll pass it on to katie

427
00:27:27,430 --> 00:27:25,600
thanks matt on behalf of the mars 2020

428
00:27:29,510 --> 00:27:27,440
science team i would like to thank and

429
00:27:31,510 --> 00:27:29,520
acknowledge the thousands of engineers

430
00:27:33,750 --> 00:27:31,520
and scientists who contributed to this

431
00:27:36,470 --> 00:27:33,760
major mission milestone an important

432
00:27:38,149 --> 00:27:36,480
next step in planetary exploration since

433
00:27:39,990 --> 00:27:38,159
the apollo astronauts brought back

434
00:27:42,230 --> 00:27:40,000
samples from the moon to earth

435
00:27:44,630 --> 00:27:42,240
scientists have eagerly awaited mars

436
00:27:46,389 --> 00:27:44,640
sample return knowing that samples from

437
00:27:48,470 --> 00:27:46,399
mars could provide answers to some of

438
00:27:50,549 --> 00:27:48,480

the most fundamental and tantalizing

439
00:27:52,470 --> 00:27:50,559
questions about the origin of life

440
00:27:55,830 --> 00:27:52,480
beyond earth and the evolution of

441
00:28:00,070 --> 00:27:57,990
perseverance's accomplishments this week

442
00:28:02,710 --> 00:28:00,080
including the successful acquisition of

443
00:28:04,870 --> 00:28:02,720
its first rock sample mondegne and its

444
00:28:06,630 --> 00:28:04,880
pair montagnac

445
00:28:08,950 --> 00:28:06,640
show that we are well on our way to

446
00:28:10,789 --> 00:28:08,960
accomplishing mars sample return in

447
00:28:12,470 --> 00:28:10,799
addition to collecting samples

448
00:28:15,029 --> 00:28:12,480
perseverance has an important role to

449
00:28:17,269 --> 00:28:15,039
play in mars sample return providing the

450
00:28:19,750 --> 00:28:17,279
geologic context for the samples it

451
00:28:23,029 --> 00:28:19,760
collects perseverance uses its science

452
00:28:24,549 --> 00:28:23,039
payload to build that context

453
00:28:26,789 --> 00:28:24,559
building up the

454
00:28:28,630 --> 00:28:26,799
field notes and observations that will

455
00:28:31,590 --> 00:28:28,640
enable future scientists to better

456
00:28:33,350 --> 00:28:31,600
understand and interpret these samples

457
00:28:35,430 --> 00:28:33,360
today i'll share with you what we know

458
00:28:37,830 --> 00:28:35,440
about the geologic context of the first

459
00:28:39,350 --> 00:28:37,840
samples that perseverance has collected

460
00:28:40,789 --> 00:28:39,360
and why we were confident that this

461
00:28:42,070 --> 00:28:40,799
week's sample activities would be

462
00:28:43,830 --> 00:28:42,080
successful

463
00:28:45,590 --> 00:28:43,840

so we'll begin with an orbiter's eye

464
00:28:46,549 --> 00:28:45,600
view of jezreel crater in the first

465
00:28:48,950 --> 00:28:46,559
image

466
00:28:51,110 --> 00:28:48,960
we can see here the rover's landing site

467
00:28:53,269 --> 00:28:51,120
at octavia e butler landing shown there

468
00:28:54,230 --> 00:28:53,279
in blue and the rover's current location

469
00:28:55,830 --> 00:28:54,240
in green

470
00:28:57,990 --> 00:28:55,840
since landing perseverance has been

471
00:29:00,630 --> 00:28:58,000
exploring the rocks of of the present

472
00:29:02,310 --> 00:29:00,640
day floor of jezreel crater scientists

473
00:29:04,389 --> 00:29:02,320
have long debated whether these rocks

474
00:29:06,230 --> 00:29:04,399
are sedimentary perhaps related to the

475
00:29:07,909 --> 00:29:06,240
ancient lake in which the jezreel delta

476
00:29:09,830 --> 00:29:07,919
was formed or whether they were the

477
00:29:11,990 --> 00:29:09,840
result of volcanic activity in the

478
00:29:14,070 --> 00:29:12,000
region regardless of whether these rocks

479
00:29:15,990 --> 00:29:14,080
are sedimentary or volcanic they've been

480
00:29:17,909 --> 00:29:16,000
of interest to the perseverance team

481
00:29:20,310 --> 00:29:17,919
because they include both some of the

482
00:29:21,750 --> 00:29:20,320
oldest and amongst the youngest rocks in

483
00:29:23,269 --> 00:29:21,760
jezreel crater

484
00:29:25,110 --> 00:29:23,279
and these rocks have the ability to

485
00:29:27,190 --> 00:29:25,120
provide important time constraints and

486
00:29:29,430 --> 00:29:27,200
duration constraints on the jezreel lake

487
00:29:31,190 --> 00:29:29,440
and its habitability and aid in our

488
00:29:32,870 --> 00:29:31,200

construction of the geologic history of

489
00:29:34,870 --> 00:29:32,880
the region

490
00:29:37,750 --> 00:29:34,880
zooming into the rover's traverse thus

491
00:29:39,590 --> 00:29:37,760
far as seen in the next image we can see

492
00:29:42,470 --> 00:29:39,600
as jessica mentioned that after the

493
00:29:44,470 --> 00:29:42,480
rover landed we began traversing south

494
00:29:46,789 --> 00:29:44,480
carrying out a dedicated campaign to

495
00:29:48,950 --> 00:29:46,799
study the rocks of the crater floor we

496
00:29:50,870 --> 00:29:48,960
attempted our first sample of these

497
00:29:53,190 --> 00:29:50,880
crater floor rocks at a location called

498
00:29:55,430 --> 00:29:53,200
rubion rubion happened to be one of the

499
00:29:57,350 --> 00:29:55,440
lowest elevation places traverses

500
00:29:59,190 --> 00:29:57,360
traversed by the rover which could have

501
00:30:01,190 --> 00:29:59,200
offered us our first clue that these

502
00:30:03,110 --> 00:30:01,200
rocks were weak and perhaps particularly

503
00:30:04,789 --> 00:30:03,120
susceptible to erosion

504
00:30:06,549 --> 00:30:04,799
when our first sample attempt didn't go

505
00:30:08,549 --> 00:30:06,559
quite as expected

506
00:30:10,070 --> 00:30:08,559
we decided that our second attempt

507
00:30:11,669 --> 00:30:10,080
should be in a setting that was very

508
00:30:13,909 --> 00:30:11,679
different with rocks that had very

509
00:30:15,990 --> 00:30:13,919
different material properties we then

510
00:30:18,789 --> 00:30:16,000
turned our attention to the resistant

511
00:30:22,549 --> 00:30:18,799
rocks up on the caps capping the the

512
00:30:24,789 --> 00:30:22,559
cliffs and ridges nearby and past rubion

513
00:30:26,950 --> 00:30:24,799

we ended up traversing our tubey ridge a

514
00:30:29,269 --> 00:30:26,960
feature shown here in this image

515
00:30:30,789 --> 00:30:29,279
and ascended the top of our tubie ridge

516
00:30:33,669 --> 00:30:30,799
where these massive capping rocks

517
00:30:35,350 --> 00:30:33,679
occurred at a location called citadel

518
00:30:37,669 --> 00:30:35,360
when we arrived at citadel which we can

519
00:30:39,510 --> 00:30:37,679
see in the next image this is the view

520
00:30:41,830 --> 00:30:39,520
that we had

521
00:30:43,830 --> 00:30:41,840
we saw a series of blocks organized into

522
00:30:46,149 --> 00:30:43,840
a layer dipping about five degrees to

523
00:30:48,310 --> 00:30:46,159
the south although these rocks have been

524
00:30:50,149 --> 00:30:48,320
slightly displaced they probably haven't

525
00:30:51,590 --> 00:30:50,159
moved too far from their original

526
00:30:53,750 --> 00:30:51,600
location

527
00:30:55,909 --> 00:30:53,760
we were searching for a strong hard rock

528
00:30:58,710 --> 00:30:55,919
that was big enough for both an abrasion

529
00:31:00,389 --> 00:30:58,720
as well as up to two drill targets we

530
00:31:02,230 --> 00:31:00,399
found what we were looking for in a rock

531
00:31:04,789 --> 00:31:02,240
that we called rochet which you can see

532
00:31:07,990 --> 00:31:04,799
annotated in the next image

533
00:31:09,830 --> 00:31:08,000
a side-by-side comparison of rubion the

534
00:31:11,750 --> 00:31:09,840
place of our first sampling intent and

535
00:31:15,430 --> 00:31:11,760
rochet where we successfully cored this

536
00:31:17,509 --> 00:31:15,440
week can be seen in the next image

537
00:31:18,389 --> 00:31:17,519
what we have here is is rubion on the

538
00:31:21,350 --> 00:31:18,399

left side

539
00:31:24,389 --> 00:31:21,360
and we can see that this outcrop is

540
00:31:27,269 --> 00:31:24,399
low lying and flat with rounded edges

541
00:31:29,110 --> 00:31:27,279
and a rubbly crumbly surface texture on

542
00:31:31,269 --> 00:31:29,120
the right we have rochette

543
00:31:33,590 --> 00:31:31,279
it's standing up from the ground and has

544
00:31:36,870 --> 00:31:33,600
hard angular edges characteristic of

545
00:31:39,190 --> 00:31:36,880
hard rocks as we know them on earth

546
00:31:40,149 --> 00:31:39,200
and so we were we were thinking that

547
00:31:41,669 --> 00:31:40,159
also

548
00:31:42,630 --> 00:31:41,679
if you look at roche

549
00:31:44,950 --> 00:31:42,640
sorry

550
00:31:47,669 --> 00:31:44,960
rubion we can see that it is breaking

551
00:31:49,990 --> 00:31:47,679
down into pebble-sized grains in

552
00:31:52,070 --> 00:31:50,000
contrast rochette

553
00:31:54,070 --> 00:31:52,080
is relatively smooth with flutes and

554
00:31:56,149 --> 00:31:54,080
grooves on its surface suggesting that

555
00:31:57,669 --> 00:31:56,159
it has survived billions of years of

556
00:31:59,430 --> 00:31:57,679
wind erosion

557
00:32:02,789 --> 00:31:59,440
based on the observations that we have

558
00:32:05,110 --> 00:32:02,799
so far we tentatively interpret rubion

559
00:32:07,110 --> 00:32:05,120
and rochette as ancient volcanic lava

560
00:32:09,269 --> 00:32:07,120
flows

561
00:32:11,110 --> 00:32:09,279
we base this up this interpretation off

562
00:32:12,630 --> 00:32:11,120
of the lack of sedimentary textures

563
00:32:14,230 --> 00:32:12,640

obvious sedimentary textures in the

564
00:32:16,389 --> 00:32:14,240
rocks that perseverance has explored

565
00:32:18,870 --> 00:32:16,399
thus far and in fine scale textures that

566
00:32:20,870 --> 00:32:18,880
yulia will talk about in a moment

567
00:32:22,630 --> 00:32:20,880
volcanic rocks are an exciting addition

568
00:32:23,990 --> 00:32:22,640
to perseverance's sample collection

569
00:32:26,630 --> 00:32:24,000
because volcanic rocks have the

570
00:32:28,630 --> 00:32:26,640
potential to tell us about the

571
00:32:30,389 --> 00:32:28,640
interior and interior workings of

572
00:32:32,950 --> 00:32:30,399
planets and are particularly good for

573
00:32:34,549 --> 00:32:32,960
providing the ages of rocks

574
00:32:36,149 --> 00:32:34,559
an interesting thing about these rocks

575
00:32:39,669 --> 00:32:36,159
as well is that they show signs for

576
00:32:41,750 --> 00:32:39,679
sustained interaction with groundwater

577
00:32:43,830 --> 00:32:41,760
if if these rocks experience water for

578
00:32:45,830 --> 00:32:43,840
long periods of time there may be

579
00:32:47,669 --> 00:32:45,840
habitable niches within these rocks that

580
00:32:49,029 --> 00:32:47,679
could have supported ancient microbial

581
00:32:50,630 --> 00:32:49,039
life

582
00:32:52,549 --> 00:32:50,640
because these rocks were of such high

583
00:32:55,590 --> 00:32:52,559
scientific potential we decided to

584
00:32:57,750 --> 00:32:55,600
acquire two samples here at rochette the

585
00:33:00,470 --> 00:32:57,760
mars 2020 science team has a plan to

586
00:33:03,029 --> 00:33:00,480
acquire or and to place down

587
00:33:04,789 --> 00:33:03,039
one or more sample caches and so to

588
00:33:07,110 --> 00:33:04,799

ensure that each of these sample caches

589
00:33:09,590 --> 00:33:07,120
are as complete as they can be we have a

590
00:33:11,430 --> 00:33:09,600
strategy to acquire two two samples at

591
00:33:13,110 --> 00:33:11,440
each of our highest priority sampling

592
00:33:15,430 --> 00:33:13,120
locations

593
00:33:16,950 --> 00:33:15,440
to tell us more about these rocks what

594
00:33:19,029 --> 00:33:16,960
they're made of what they look like up

595
00:33:20,549 --> 00:33:19,039
close and what that means geologically

596
00:33:23,830 --> 00:33:20,559
i'll now pass it off to our return

597
00:33:25,350 --> 00:33:23,840
sample science mission scientist yulia

598
00:33:28,310 --> 00:33:25,360
thank you casey

599
00:33:31,590 --> 00:33:28,320
well the first slide as keta showed

600
00:33:33,669 --> 00:33:31,600
compares two drilled boulders

601
00:33:35,990 --> 00:33:33,679
and usually the rocks it did

602
00:33:38,310 --> 00:33:36,000
on the left seems scrumbly and the

603
00:33:41,990 --> 00:33:38,320
second on the right is high standing

604
00:33:44,710 --> 00:33:42,000
much more solid with sharp angular edges

605
00:33:47,509 --> 00:33:44,720
as both jessica and katie mentioned we

606
00:33:49,669 --> 00:33:47,519
use rover's drill to upgrade the rock

607
00:33:52,070 --> 00:33:49,679
and expose the fresh and dust-free

608
00:33:54,070 --> 00:33:52,080
interior of it just like geologists in

609
00:33:55,990 --> 00:33:54,080
the field when you want to see

610
00:33:58,710 --> 00:33:56,000
uh the interior of the rock we take a

611
00:34:01,190 --> 00:33:58,720
hammer we smack it down open it up and

612
00:34:03,270 --> 00:34:01,200
see this fresh surface so we use this

613
00:34:04,389 --> 00:34:03,280

abrasion patches and uh

614
00:34:07,029 --> 00:34:04,399
[Music]

615
00:34:09,990 --> 00:34:07,039
next slide please uh this abridged

616
00:34:11,510 --> 00:34:10,000
braided patches to uh as this freshly

617
00:34:13,750 --> 00:34:11,520
exposed surface

618
00:34:15,430 --> 00:34:13,760
to a look at the texture

619
00:34:18,149 --> 00:34:15,440
and chemistry

620
00:34:20,790 --> 00:34:18,159
of the rock using our onboard

621
00:34:22,869 --> 00:34:20,800
instruments

622
00:34:31,030 --> 00:34:22,879
the next slide

623
00:34:34,069 --> 00:34:31,040
natural color close up of a part of bell

624
00:34:35,510 --> 00:34:34,079
guard that is our recent demonstration

625
00:34:38,069 --> 00:34:35,520
liberated patch

626
00:34:40,310 --> 00:34:38,079
made by supercam instrument

627
00:34:42,790 --> 00:34:40,320
supercam uses optical and laser

628
00:34:44,790 --> 00:34:42,800
spectroscopy to identify chemistry and

629
00:34:47,510 --> 00:34:44,800
mineralogy of the rock

630
00:34:49,829 --> 00:34:47,520
the image of belgaard here

631
00:34:52,310 --> 00:34:49,839
shows that the rock consists of several

632
00:34:54,629 --> 00:34:52,320
several mineral phases you can see them

633
00:34:55,510 --> 00:34:54,639
by color they are light

634
00:35:00,470 --> 00:34:55,520
white

635
00:35:02,310 --> 00:35:00,480
dark grayish and somewhat ricey color

636
00:35:03,670 --> 00:35:02,320
the overall chemical composition of

637
00:35:05,109 --> 00:35:03,680
belgaard

638
00:35:07,430 --> 00:35:05,119

is consistent

639
00:35:09,670 --> 00:35:07,440
with minerals typical for an igneous or

640
00:35:12,390 --> 00:35:09,680
volcanic rock the rock originally

641
00:35:14,950 --> 00:35:12,400
solidified from lava or magma such as

642
00:35:17,510 --> 00:35:14,960
basalt or gabriel

643
00:35:19,910 --> 00:35:17,520
but in addition raman spectrometer of

644
00:35:22,470 --> 00:35:19,920
supercam identified as salt within the

645
00:35:26,150 --> 00:35:22,480
rock and you can see that white speck

646
00:35:32,950 --> 00:35:29,589
further imaging by sherlock instrument

647
00:35:35,109 --> 00:35:32,960
you can see in the next slide

648
00:35:39,670 --> 00:35:35,119
that instrument is placed within only

649
00:35:45,030 --> 00:35:42,470
and it gives us even more detail you now

650
00:35:47,349 --> 00:35:45,040
can see individual crystals and some of

651
00:35:50,550 --> 00:35:47,359
them are angular

652
00:35:52,630 --> 00:35:50,560
or elongated we call them tabular

653
00:35:54,710 --> 00:35:52,640
and not rounded as you would expect in

654
00:35:56,550 --> 00:35:54,720
sedimentary rock

655
00:35:58,950 --> 00:35:56,560
that observation further supports the

656
00:36:01,190 --> 00:35:58,960
hypothesis of the rock's igneous or

657
00:36:03,750 --> 00:36:01,200
volcanic origin

658
00:36:06,390 --> 00:36:03,760
so let's zoom even closer

659
00:36:08,550 --> 00:36:06,400
the blue square in the middle

660
00:36:11,190 --> 00:36:08,560
is a footprint of sherlock spectral

661
00:36:13,670 --> 00:36:11,200
analysis and it's only six by six

662
00:36:15,510 --> 00:36:13,680
millimeter in size

663
00:36:18,470 --> 00:36:15,520

the next slide

664
00:36:20,870 --> 00:36:18,480
shows that footprint you really can see

665
00:36:22,870 --> 00:36:20,880
individual crystals here

666
00:36:25,270 --> 00:36:22,880
and where the detailed mineral analysis

667
00:36:27,750 --> 00:36:25,280
are still ongoing and the science team

668
00:36:30,470 --> 00:36:27,760
uh working and pouring over the data

669
00:36:31,510 --> 00:36:30,480
that is uh supplied by our perseverance

670
00:36:33,910 --> 00:36:31,520
rover

671
00:36:36,310 --> 00:36:33,920
sherlock spectroscopy results reveal the

672
00:36:38,069 --> 00:36:36,320
presence of salts as well

673
00:36:41,990 --> 00:36:38,079
so such as

674
00:36:43,030 --> 00:36:42,000
calcium sulfate those are yellow dots in

675
00:36:45,510 --> 00:36:43,040
the image

676
00:36:48,950 --> 00:36:45,520
the calcium sulfate is something like

677
00:36:51,270 --> 00:36:48,960
gypsum or relative to gypsum

678
00:36:53,349 --> 00:36:51,280
and a calcium phosphate those are the

679
00:36:56,150 --> 00:36:53,359
blue dots

680
00:36:58,950 --> 00:36:56,160
now next instrument pixel

681
00:37:00,069 --> 00:36:58,960
identified over 20 elements in bell

682
00:37:01,990 --> 00:37:00,079
guard

683
00:37:03,270 --> 00:37:02,000
the maps like you see on the on the

684
00:37:06,150 --> 00:37:03,280
slide

685
00:37:08,310 --> 00:37:06,160
same size as the sherlock's map

686
00:37:10,870 --> 00:37:08,320
show the chemical composition of each

687
00:37:12,950 --> 00:37:10,880
individual mineral grain

688
00:37:14,470 --> 00:37:12,960

from which mineral actually real mineral

689
00:37:16,470 --> 00:37:14,480
can be inferred

690
00:37:18,310 --> 00:37:16,480
here's shown a spectral signal from

691
00:37:19,349 --> 00:37:18,320
calcium in red

692
00:37:23,109 --> 00:37:19,359
sulfur

693
00:37:25,430 --> 00:37:23,119
in green and aluminum in blue

694
00:37:27,990 --> 00:37:25,440
combination of calcium and sulfur in the

695
00:37:30,710 --> 00:37:28,000
same spot

696
00:37:32,870 --> 00:37:30,720
indicates a calcium sulfate a yellow

697
00:37:34,950 --> 00:37:32,880
color in this image

698
00:37:36,950 --> 00:37:34,960
and that location for sulfate and

699
00:37:39,270 --> 00:37:36,960
composition correlate directly with

700
00:37:40,150 --> 00:37:39,280
sherlock findings

701
00:37:42,550 --> 00:37:40,160
so

702
00:37:43,829 --> 00:37:42,560
what does this actually mean

703
00:37:46,230 --> 00:37:43,839
what it means

704
00:37:49,349 --> 00:37:46,240
that we have collected a rock

705
00:37:53,349 --> 00:37:49,359
from the floor of the jazzer crater

706
00:37:56,150 --> 00:37:53,359
that is igneous or volcanic in origin

707
00:37:59,190 --> 00:37:56,160
and it has salts within it

708
00:38:02,069 --> 00:37:59,200
the presence of salts indicate that this

709
00:38:04,550 --> 00:38:02,079
rock was subject to water

710
00:38:06,870 --> 00:38:04,560
the water percolated through the rock

711
00:38:09,190 --> 00:38:06,880
and as it percolated and evaporated

712
00:38:10,630 --> 00:38:09,200
afterwards it's left behind the salty

713
00:38:12,550 --> 00:38:10,640

residue

714
00:38:15,349 --> 00:38:12,560
and why the science team was excited

715
00:38:16,870 --> 00:38:15,359
about that is because this rock once

716
00:38:19,349 --> 00:38:16,880
returned to earth

717
00:38:20,710 --> 00:38:19,359
once returned to state-of-the-art art

718
00:38:22,950 --> 00:38:20,720
laboratories

719
00:38:24,230 --> 00:38:22,960
it can be really interrogated for its

720
00:38:26,230 --> 00:38:24,240
chemistry

721
00:38:28,230 --> 00:38:26,240
for its mineralogy

722
00:38:30,950 --> 00:38:28,240
for its age

723
00:38:33,829 --> 00:38:30,960
and salts within it we can look at the

724
00:38:35,270 --> 00:38:33,839
composition and look for tiny inclusions

725
00:38:38,950 --> 00:38:35,280
such as

726
00:38:40,390 --> 00:38:38,960
tiny inclusions of liquid bubbles or

727
00:38:42,150 --> 00:38:40,400
bubble fluids

728
00:38:44,550 --> 00:38:42,160
inside of salts

729
00:38:46,950 --> 00:38:44,560
that would actually give us a glimpse of

730
00:38:48,150 --> 00:38:46,960
the gesture crater at the time when it

731
00:38:50,870 --> 00:38:48,160
was wet

732
00:38:52,470 --> 00:38:50,880
and was able to sustain an ancient

733
00:38:55,589 --> 00:38:52,480
martian life

734
00:38:57,190 --> 00:38:55,599
and with that uh um back to meaning

735
00:39:00,390 --> 00:38:57,200
or forward to menu

736
00:39:01,910 --> 00:39:00,400
great uh thank you yulia um so i know

737
00:39:04,390 --> 00:39:01,920
you've heard this from others on the

738
00:39:06,069 --> 00:39:04,400

panel today but i cannot overstate the

739
00:39:08,390 --> 00:39:06,079
significance of these rock samples that

740
00:39:10,550 --> 00:39:08,400
were collected by perseverance this is a

741
00:39:12,630 --> 00:39:10,560
truly historic achievement you know the

742
00:39:15,910 --> 00:39:12,640
very first rock cores collected on

743
00:39:18,390 --> 00:39:15,920
another terrestrial planet it's amazing

744
00:39:20,710 --> 00:39:18,400
these two rock cores as well as actually

745
00:39:23,030 --> 00:39:20,720
the first sample tube that contains

746
00:39:25,510 --> 00:39:23,040
martian atmosphere these actually

747
00:39:27,430 --> 00:39:25,520
represent now the beginning of mars

748
00:39:29,750 --> 00:39:27,440
sample return

749
00:39:32,069 --> 00:39:29,760
um i have to say i've dreamed of having

750
00:39:34,150 --> 00:39:32,079
samples back from mars to analyze in my

751
00:39:36,150 --> 00:39:34,160
lab since i was a graduate student and

752
00:39:37,990 --> 00:39:36,160
you know in our science community we've

753
00:39:40,470 --> 00:39:38,000
talked about mars sample return for

754
00:39:43,510 --> 00:39:40,480
decades and now it's actually starting

755
00:39:45,510 --> 00:39:43,520
to feel real these uh first core samples

756
00:39:46,950 --> 00:39:45,520
will actually be among tens of other

757
00:39:49,430 --> 00:39:46,960
samples that will be collected by the

758
00:39:53,270 --> 00:39:49,440
perseverance rover in the many

759
00:39:55,030 --> 00:39:53,280
months and and years to come and

760
00:39:57,430 --> 00:39:55,040
the point of collecting these really

761
00:39:59,190 --> 00:39:57,440
well documented rock soil and atmosphere

762
00:40:00,710 --> 00:39:59,200
samples though is to

763
00:40:03,109 --> 00:40:00,720

bring them back to earth so that we can

764
00:40:05,109 --> 00:40:03,119
analyze them here in the best and most

765
00:40:07,270 --> 00:40:05,119
capable earth-based laboratories so that

766
00:40:08,309 --> 00:40:07,280
we can answer some of humanity's biggest

767
00:40:10,790 --> 00:40:08,319
questions

768
00:40:12,950 --> 00:40:10,800
like was there ever life beyond earth in

769
00:40:15,309 --> 00:40:12,960
our solar system did life exist on

770
00:40:18,550 --> 00:40:15,319
ancient mars besides these um

771
00:40:20,710 --> 00:40:18,560
astrobiological uh questions of interest

772
00:40:22,390 --> 00:40:20,720
these samples will also give us a much

773
00:40:24,550 --> 00:40:22,400
better understanding of the geologic

774
00:40:26,950 --> 00:40:24,560
history and the history of water and

775
00:40:28,630 --> 00:40:26,960
climate on mars and so by returning

776
00:40:30,550 --> 00:40:28,640
these samples we'll be able to

777
00:40:33,190 --> 00:40:30,560
definitively address some of these high

778
00:40:35,109 --> 00:40:33,200
priority science questions by engaging

779
00:40:37,349 --> 00:40:35,119
the global community of scientists in

780
00:40:39,910 --> 00:40:37,359
their analysis using state-of-the-art

781
00:40:41,829 --> 00:40:39,920
analytical capabilities like this

782
00:40:44,230 --> 00:40:41,839
synchrotron radiation source facility

783
00:40:46,069 --> 00:40:44,240
that's shown here in the next image

784
00:40:48,550 --> 00:40:46,079
and this type of facility actually

785
00:40:49,829 --> 00:40:48,560
occupies the area of several city blocks

786
00:40:52,230 --> 00:40:49,839
it produces

787
00:40:54,950 --> 00:40:52,240
high energy high brightness x-ray beams

788
00:40:57,190 --> 00:40:54,960

that can be used to provide some unique

789
00:40:59,109 --> 00:40:57,200
chemical and mineralogic information for

790
00:41:01,109 --> 00:40:59,119
natural samples on extremely small

791
00:41:02,950 --> 00:41:01,119
spatial scales that are just not

792
00:41:04,630 --> 00:41:02,960
possible if you do these types of

793
00:41:06,630 --> 00:41:04,640
analyses or you try to do these types of

794
00:41:08,390 --> 00:41:06,640
analyses remotely so this is not

795
00:41:11,430 --> 00:41:08,400
something you can really take

796
00:41:13,030 --> 00:41:11,440
to mars on any kind of spacecraft

797
00:41:14,630 --> 00:41:13,040
this is just an example of the many

798
00:41:15,990 --> 00:41:14,640
types of advanced techniques that are

799
00:41:18,069 --> 00:41:16,000
available on

800
00:41:20,550 --> 00:41:18,079
in earth-based laboratories

801
00:41:23,430 --> 00:41:20,560
that you never really you know can send

802
00:41:24,790 --> 00:41:23,440
to mars because of mass volume and power

803
00:41:27,190 --> 00:41:24,800
considerations

804
00:41:29,510 --> 00:41:27,200
but such techniques can and will be used

805
00:41:31,109 --> 00:41:29,520
for analyzing return samples

806
00:41:33,349 --> 00:41:31,119
uh the other reason that we want to

807
00:41:35,589 --> 00:41:33,359
bring back samples from mars is that uh

808
00:41:37,190 --> 00:41:35,599
you know if we curate these samples well

809
00:41:39,510 --> 00:41:37,200
we'll be able to analyze them in the

810
00:41:41,510 --> 00:41:39,520
future using techniques that don't even

811
00:41:43,270 --> 00:41:41,520
exist today and address questions that

812
00:41:45,190 --> 00:41:43,280
perhaps we can't even think of asking

813
00:41:47,510 --> 00:41:45,200

based on what we know today

814
00:41:49,430 --> 00:41:47,520
this next image actually shows a sealed

815
00:41:51,670 --> 00:41:49,440
rock core that was collected on the moon

816
00:41:53,349 --> 00:41:51,680
during the apollo 17 mission nearly a

817
00:41:55,670 --> 00:41:53,359
half century ago

818
00:41:58,230 --> 00:41:55,680
this sample was carefully unsealed last

819
00:41:59,910 --> 00:41:58,240
year in nasa's lunar curation facility

820
00:42:01,510 --> 00:41:59,920
and is now being analyzed by a new

821
00:42:03,510 --> 00:42:01,520
generation of researchers using

822
00:42:06,390 --> 00:42:03,520
techniques that didn't even exist in the

823
00:42:08,630 --> 00:42:06,400
1970s to answer questions about the moon

824
00:42:11,109 --> 00:42:08,640
that could not be answered back then

825
00:42:13,190 --> 00:42:11,119
um for example like is there water in

826
00:42:15,510 --> 00:42:13,200
the interior of the moon and if so how

827
00:42:16,550 --> 00:42:15,520
much so it's really amazing in fact you

828
00:42:18,230 --> 00:42:16,560
know how

829
00:42:20,069 --> 00:42:18,240
how much we can continue to learn about

830
00:42:21,510 --> 00:42:20,079
the moon and about the earth moon system

831
00:42:23,589 --> 00:42:21,520
and about our solar system from

832
00:42:25,750 --> 00:42:23,599
analyzing these lunar rocks that were

833
00:42:27,670 --> 00:42:25,760
collected nearly 50 years ago so the

834
00:42:30,710 --> 00:42:27,680
samples that we bring back from mars

835
00:42:32,870 --> 00:42:30,720
will also enable incredible discoveries

836
00:42:34,390 --> 00:42:32,880
for decades to come

837
00:42:36,630 --> 00:42:34,400
so the next animation actually

838
00:42:38,950 --> 00:42:36,640

illustrates that the samples collected

839
00:42:41,030 --> 00:42:38,960
by perseverance represent the first

840
00:42:43,430 --> 00:42:41,040
phase of the msr campaign or the mars

841
00:42:45,589 --> 00:42:43,440
sample return campaign the next phase

842
00:42:48,069 --> 00:42:45,599
will involve collecting these samples

843
00:42:49,349 --> 00:42:48,079
and launching them into orbit around

844
00:42:51,910 --> 00:42:49,359
mars

845
00:42:53,270 --> 00:42:51,920
and then these orbiting samples would be

846
00:42:56,069 --> 00:42:53,280
captured

847
00:42:58,470 --> 00:42:56,079
and returned to earth in a sample return

848
00:43:00,470 --> 00:42:58,480
capsule

849
00:43:03,030 --> 00:43:00,480
so you can see this

850
00:43:06,069 --> 00:43:03,040
animation here showing the sample return

851
00:43:08,309 --> 00:43:06,079
capsule that would then

852
00:43:11,349 --> 00:43:08,319
be sent towards earth so this next phase

853
00:43:13,030 --> 00:43:11,359
is planned to begin no sooner than 2026

854
00:43:15,270 --> 00:43:13,040
and the samples are expected to return

855
00:43:16,710 --> 00:43:15,280
no sooner than about 2031.

856
00:43:18,550 --> 00:43:16,720
so i've no doubt that the samples that

857
00:43:20,230 --> 00:43:18,560
we collect on mars with the perseverance

858
00:43:23,349 --> 00:43:20,240
rover and that we bring back to earth in

859
00:43:24,710 --> 00:43:23,359
the next decade or so will revolutionize

860
00:43:26,390 --> 00:43:24,720
our understanding of mars as a

861
00:43:28,790 --> 00:43:26,400
terrestrial planet including whether

862
00:43:30,630 --> 00:43:28,800
life once existed on that planet

863
00:43:32,790 --> 00:43:30,640

and with a collection of these first

864
00:43:35,190 --> 00:43:32,800
samples by the mars 2020 mission we're

865
00:43:36,230 --> 00:43:35,200
taking our very first steps towards that

866
00:43:38,069 --> 00:43:36,240
goal

867
00:43:39,990 --> 00:43:38,079
for myself i can say that i can't wait

868
00:43:41,829 --> 00:43:40,000
to analyze these samples in my lab at

869
00:43:43,589 --> 00:43:41,839
arizona state university and i know many

870
00:43:45,670 --> 00:43:43,599
scientists around the world are eagerly

871
00:43:48,390 --> 00:43:45,680
waiting for these samples too so the fun

872
00:43:49,750 --> 00:43:48,400
is just beginning and stay tuned so back

873
00:43:51,270 --> 00:43:49,760
to you raquel

874
00:43:55,190 --> 00:43:51,280
thanks minakshi

875
00:43:57,670 --> 00:43:55,200
we'll now move into q a now remember if

876
00:43:58,790 --> 00:43:57,680
you're a member of the media on the

877
00:44:00,150 --> 00:43:58,800
phone line

878
00:44:02,790 --> 00:44:00,160
you can press

879
00:44:04,790 --> 00:44:02,800
star one to get into the queue

880
00:44:08,150 --> 00:44:04,800
and if you're on social media you can

881
00:44:09,270 --> 00:44:08,160
use the hashtag asknasa for any

882
00:44:12,390 --> 00:44:09,280
questions

883
00:44:16,470 --> 00:44:12,400
now on the phone lines we have paul

884
00:44:20,309 --> 00:44:18,710
hi thanks very much um

885
00:44:21,750 --> 00:44:20,319
this might be jumping ahead a little bit

886
00:44:23,990 --> 00:44:21,760
but

887
00:44:26,470 --> 00:44:24,000
in terms of the next steps

888
00:44:29,349 --> 00:44:26,480

for the mission can you explain how and

889
00:44:31,589 --> 00:44:29,359
when uh you will decide to deposit

890
00:44:33,270 --> 00:44:31,599
samples on the surface and um

891
00:44:34,950 --> 00:44:33,280
is there any specific number of samples

892
00:44:37,270 --> 00:44:34,960
that you intend to collect before that

893
00:44:39,990 --> 00:44:37,280
first drop or will that be more

894
00:44:41,190 --> 00:44:40,000
dependent on the location of the rover

895
00:44:43,349 --> 00:44:41,200
um

896
00:44:45,829 --> 00:44:43,359
and i'm not sure who is the right person

897
00:44:48,550 --> 00:44:45,839
to direct that to so whoever wants to

898
00:44:50,950 --> 00:44:48,560
yeah i can take that one yeah so for the

899
00:44:53,109 --> 00:44:50,960
the prime mission of of perseverance we

900
00:44:56,630 --> 00:44:53,119
we plan to continue exploring jezreel

901
00:44:58,470 --> 00:44:56,640
crater um that prime mission is um

902
00:45:00,069 --> 00:44:58,480
uh one mars year about two earth years

903
00:45:01,829 --> 00:45:00,079
and the qualified lifetime of the rover

904
00:45:03,670 --> 00:45:01,839
is about one and a half mars years so we

905
00:45:05,910 --> 00:45:03,680
plan to explore jezreel for that period

906
00:45:08,150 --> 00:45:05,920
of time i think around that time

907
00:45:11,109 --> 00:45:08,160
we may be in a position to

908
00:45:12,710 --> 00:45:11,119
deposit our first cache of samples in

909
00:45:14,950 --> 00:45:12,720
jezreel and so that's about the time

910
00:45:16,950 --> 00:45:14,960
frame that we're looking for and

911
00:45:18,790 --> 00:45:16,960
we have a ways to go of course before we

912
00:45:20,470 --> 00:45:18,800
do that and and when that time comes

913
00:45:22,150 --> 00:45:20,480

we'll make decisions based on what the

914
00:45:22,950 --> 00:45:22,160
sample collection is in the rover at the

915
00:45:24,630 --> 00:45:22,960
time

916
00:45:26,069 --> 00:45:24,640
what we'd like to put down in that first

917
00:45:32,309 --> 00:45:26,079
cache and perhaps which samples we'd

918
00:45:40,150 --> 00:45:34,309
great thank you katie and next on the

919
00:45:44,150 --> 00:45:42,390
thank you all for doing this um and yeah

920
00:45:46,309 --> 00:45:44,160
yeah it's really a big moment so so i

921
00:45:49,109 --> 00:45:46,319
just want to say first of all can i can

922
00:45:51,030 --> 00:45:49,119
congratulations um and this is probably

923
00:45:54,150 --> 00:45:51,040
for matt um

924
00:45:55,589 --> 00:45:54,160
doing this those two sampling operations

925
00:45:57,910 --> 00:45:55,599
back to back and finding both of them

926
00:45:59,510 --> 00:45:57,920
were successful do you feel like i mean

927
00:46:01,829 --> 00:45:59,520
i know it's a small sample size if

928
00:46:03,750 --> 00:46:01,839
you're pardon the pun but um like do you

929
00:46:05,589 --> 00:46:03,760
feel like you really have it down now or

930
00:46:07,349 --> 00:46:05,599
do you need to

931
00:46:08,870 --> 00:46:07,359
to do some more tweaking to like really

932
00:46:10,630 --> 00:46:08,880
understand this process could you just

933
00:46:12,150 --> 00:46:10,640
give us like an update on on where the

934
00:46:13,910 --> 00:46:12,160
sampling team stands about how the

935
00:46:17,270 --> 00:46:13,920
process is sort of going and what

936
00:46:20,550 --> 00:46:17,280
further tweaks need to be made thanks

937
00:46:22,390 --> 00:46:20,560
and that's a great question

938
00:46:23,990 --> 00:46:22,400

one thing that this is actually my third

939
00:46:25,750 --> 00:46:24,000
sampling mission and one thing that i've

940
00:46:29,510 --> 00:46:25,760
learned is that

941
00:46:31,589 --> 00:46:29,520
mars always can throw you curveballs so

942
00:46:33,910 --> 00:46:31,599
we will continue to look at

943
00:46:37,589 --> 00:46:33,920
potential analog samples

944
00:46:39,750 --> 00:46:37,599
for the rocks that we've seen so far

945
00:46:42,710 --> 00:46:39,760
and and to test those in our test lab

946
00:46:45,190 --> 00:46:42,720
and to tweak our algorithms that perform

947
00:46:46,950 --> 00:46:45,200
the sample acquisition

948
00:46:49,030 --> 00:46:46,960
i think science would potentially like

949
00:46:51,190 --> 00:46:49,040
to go back to rubion at some point and

950
00:46:53,030 --> 00:46:51,200
maybe acquire sample

951
00:46:55,349 --> 00:46:53,040
so we would like to figure out how we

952
00:46:59,190 --> 00:46:55,359
could potentially acquire that sample

953
00:47:01,990 --> 00:46:59,200
so we will investigate a test program to

954
00:47:04,710 --> 00:47:02,000
look at analogs that we can

955
00:47:08,309 --> 00:47:06,390
attempt to

956
00:47:10,390 --> 00:47:08,319
to successfully acquire a sample at

957
00:47:11,910 --> 00:47:10,400
rubion you just never know what you're

958
00:47:16,870 --> 00:47:11,920
going to encounter

959
00:47:30,710 --> 00:47:18,950
thank you

960
00:47:31,829 --> 00:47:30,720
doing this my question is

961
00:47:34,470 --> 00:47:31,839
um

962
00:47:38,470 --> 00:47:34,480
just just uh we got the press release a

963
00:47:40,150 --> 00:47:38,480

few uh moments ago and um uh we had a

964
00:47:42,150 --> 00:47:40,160
very nice quote there from ken foley

965
00:47:44,150 --> 00:47:42,160
saying that they reveal

966
00:47:46,390 --> 00:47:44,160
the first rocks reveal a potentially

967
00:47:47,990 --> 00:47:46,400
habitable sustained environment and it's

968
00:47:50,069 --> 00:47:48,000
a big deal that water was there for a

969
00:47:51,190 --> 00:47:50,079
long time could could you perhaps talk

970
00:47:52,470 --> 00:47:51,200
to

971
00:47:54,390 --> 00:47:52,480
where we are

972
00:47:56,630 --> 00:47:54,400
where we were scientifically about the

973
00:47:57,910 --> 00:47:56,640
habitability of this environment before

974
00:47:59,829 --> 00:47:57,920
and how

975
00:48:01,990 --> 00:47:59,839
much this these samples have advanced

976
00:48:06,870 --> 00:48:02,000
that

977
00:48:09,030 --> 00:48:06,880
so

978
00:48:11,349 --> 00:48:09,040
i believe every single surface mission

979
00:48:13,750 --> 00:48:11,359
to mars has observed what we believe to

980
00:48:15,190 --> 00:48:13,760
be an ancient habitable environment this

981
00:48:17,510 --> 00:48:15,200
was particularly hit home by the

982
00:48:19,270 --> 00:48:17,520
curiosity rover mission uh which

983
00:48:21,910 --> 00:48:19,280
discovered within the first year of its

984
00:48:24,069 --> 00:48:21,920
mission of conclusively habitable lake

985
00:48:26,549 --> 00:48:24,079
environment and we knew already that

986
00:48:27,990 --> 00:48:26,559
jezreel crater had such a habitable lake

987
00:48:29,750 --> 00:48:28,000
environment and that's what brought us

988
00:48:31,670 --> 00:48:29,760

there to jezreel

989
00:48:35,109 --> 00:48:31,680
but the big difference here is that now

990
00:48:37,190 --> 00:48:35,119
we have a sample of that potential

991
00:48:39,270 --> 00:48:37,200
habitable environments ready to come

992
00:48:40,950 --> 00:48:39,280
back to earth and the the mineral

993
00:48:42,790 --> 00:48:40,960
diversity of the sample that yulia

994
00:48:44,950 --> 00:48:42,800
talked about the presence of salts in

995
00:48:46,790 --> 00:48:44,960
these in these rocks salts are great

996
00:48:48,390 --> 00:48:46,800
minerals for preserving signs of ancient

997
00:48:50,950 --> 00:48:48,400
life here on earth and we expect the

998
00:48:53,430 --> 00:48:50,960
same may be true for rocks on mars and

999
00:48:55,030 --> 00:48:53,440
so the the major advances i think are

1000
00:48:57,270 --> 00:48:55,040
still to come when neat we get those

1001
00:48:59,510 --> 00:48:57,280
samples back to earth and can look into

1002
00:49:01,349 --> 00:48:59,520
that rock sample whether it's monday or

1003
00:49:02,390 --> 00:49:01,359
montana and look for those signs of

1004
00:49:04,549 --> 00:49:02,400
ancient life

1005
00:49:08,470 --> 00:49:04,559
in some of these what may be habitable

1006
00:49:17,030 --> 00:49:11,750
thank you

1007
00:49:19,589 --> 00:49:17,040
questions for loop on youtube asks

1008
00:49:21,829 --> 00:49:19,599
how did you prevent acquired samples

1009
00:49:23,829 --> 00:49:21,839
from cross-contaminating

1010
00:49:25,990 --> 00:49:23,839
considering the same bit is used to

1011
00:49:28,390 --> 00:49:26,000
drill all of them

1012
00:49:29,990 --> 00:49:28,400
just come out would you like to take it

1013
00:49:33,510 --> 00:49:30,000

uh either way

1014
00:49:36,230 --> 00:49:33,520
so our our system is designed uh to

1015
00:49:39,829 --> 00:49:36,240
reuse uh coring bits we actually make

1016
00:49:42,150 --> 00:49:39,839
have a series of coring bits on board

1017
00:49:43,589 --> 00:49:42,160
so that we will change out bits over

1018
00:49:45,910 --> 00:49:43,599
time

1019
00:49:48,390 --> 00:49:45,920
but we also have quite a dynamic

1020
00:49:50,309 --> 00:49:48,400
environment that happens as we perform

1021
00:49:52,790 --> 00:49:50,319
the percussion activity within the

1022
00:49:55,990 --> 00:49:52,800
sample tube that sits inside of the bit

1023
00:49:57,349 --> 00:49:56,000
as well as uh cleaning events that we do

1024
00:49:59,510 --> 00:49:57,359
periodically

1025
00:50:01,589 --> 00:49:59,520
for the core itself matt i don't know if

1026
00:50:02,870 --> 00:50:01,599
you want to add to that the only

1027
00:50:05,109 --> 00:50:02,880
additional thing that i would add to

1028
00:50:07,589 --> 00:50:05,119
that is that we carry multiple drilling

1029
00:50:10,710 --> 00:50:07,599
bits with us so we have a total of six

1030
00:50:13,030 --> 00:50:10,720
drilling bits and if there was a special

1031
00:50:15,270 --> 00:50:13,040
sample that we wanted to acquire and we

1032
00:50:17,270 --> 00:50:15,280
wanted that to be a little more pristine

1033
00:50:19,829 --> 00:50:17,280
we could use potentially use a fresh

1034
00:50:21,990 --> 00:50:19,839
drilling bit for that one

1035
00:50:25,109 --> 00:50:22,000
and julia also has a comment and i'll

1036
00:50:27,270 --> 00:50:25,119
follow up from a science point of view

1037
00:50:29,990 --> 00:50:27,280
we are collecting samples on mars the

1038
00:50:32,309 --> 00:50:30,000

cross contamination between the samples

1039
00:50:34,630 --> 00:50:32,319
is not that big of a concern because we

1040
00:50:36,790 --> 00:50:34,640
have dust everywhere the dust covers the

1041
00:50:38,150 --> 00:50:36,800
martian surface it's going to get in

1042
00:50:40,950 --> 00:50:38,160
every tube

1043
00:50:42,549 --> 00:50:40,960
that we are going to uh to acquire our

1044
00:50:45,190 --> 00:50:42,559
samples in

1045
00:50:47,589 --> 00:50:45,200
what uh contamination really plays our

1046
00:50:50,630 --> 00:50:47,599
contamination control uh

1047
00:50:53,430 --> 00:50:50,640
plays a really big role is in how we

1048
00:50:55,190 --> 00:50:53,440
designed and prepared the hardware for

1049
00:50:57,270 --> 00:50:55,200
collection of the samples

1050
00:50:59,750 --> 00:50:57,280
the concern here is that

1051
00:51:02,710 --> 00:50:59,760
we didn't want to bring anything from

1052
00:51:03,670 --> 00:51:02,720
earth that could have been

1053
00:51:06,790 --> 00:51:03,680
could be

1054
00:51:08,870 --> 00:51:06,800
mistaken by martian organics for the

1055
00:51:10,390 --> 00:51:08,880
organic material once it's actually the

1056
00:51:13,510 --> 00:51:10,400
sample is back there

1057
00:51:16,230 --> 00:51:13,520
and for that for years the march 2020

1058
00:51:18,470 --> 00:51:16,240
team went through a great deal of

1059
00:51:20,630 --> 00:51:18,480
development of

1060
00:51:23,349 --> 00:51:20,640
both materials and the cleaning

1061
00:51:25,990 --> 00:51:23,359
procedures for that hardware so we can

1062
00:51:28,069 --> 00:51:26,000
assure that there is no terrestrial

1063
00:51:29,190 --> 00:51:28,079

contamination in the samples but with

1064
00:51:31,510 --> 00:51:29,200
respect to

1065
00:51:33,589 --> 00:51:31,520
cross-contamination between the samples

1066
00:51:35,829 --> 00:51:33,599
that's not that big of a concern for

1067
00:51:37,750 --> 00:51:35,839
science

1068
00:51:40,549 --> 00:51:37,760
thank you all for all your answers and

1069
00:51:42,150 --> 00:51:40,559
we have another question for lori glaze

1070
00:51:44,150 --> 00:51:42,160
but i'd like to open it up to everyone

1071
00:51:47,190 --> 00:51:44,160
else after her answer

1072
00:51:49,990 --> 00:51:47,200
siencia news on youtube asks

1073
00:51:53,990 --> 00:51:50,000
what is the importance of collecting

1074
00:51:58,549 --> 00:51:56,069
i think we've heard a couple of times

1075
00:52:00,390 --> 00:51:58,559
today just how important it is to

1076
00:52:03,270 --> 00:52:00,400
collect this first sample this is the

1077
00:52:06,390 --> 00:52:03,280
first time we have ever

1078
00:52:08,870 --> 00:52:06,400
collected a sample of a rock from

1079
00:52:11,670 --> 00:52:08,880
another planet with the intention to

1080
00:52:13,349 --> 00:52:11,680
bring that sample back to earth where we

1081
00:52:14,309 --> 00:52:13,359
can analyze it

1082
00:52:16,549 --> 00:52:14,319
and

1083
00:52:18,790 --> 00:52:16,559
it's not just the scientific importance

1084
00:52:20,870 --> 00:52:18,800
but the the technical achievement to be

1085
00:52:24,150 --> 00:52:20,880
able to do this i think um you know

1086
00:52:26,630 --> 00:52:24,160
jessica said that this is um perhaps the

1087
00:52:29,349 --> 00:52:26,640
most challenging thing we've ever tried

1088
00:52:32,309 --> 00:52:29,359

to do on another planet uh the

1089
00:52:36,230 --> 00:52:32,319
complexity of that system of the the

1090
00:52:38,870 --> 00:52:36,240
sampling arm and the the drilling uh

1091
00:52:41,589 --> 00:52:38,880
the drilling uh apparatus and then the

1092
00:52:44,230 --> 00:52:41,599
ability to process the samples and cash

1093
00:52:46,950 --> 00:52:44,240
the samples on on the on the rover is

1094
00:52:49,190 --> 00:52:46,960
something that is incredibly complex

1095
00:52:52,069 --> 00:52:49,200
and it has an amazing potential to help

1096
00:52:54,549 --> 00:52:52,079
us better understand um

1097
00:52:58,069 --> 00:52:54,559
the the history of mars but also uh

1098
00:53:00,390 --> 00:52:58,079
potentially uh the possibility for

1099
00:53:02,950 --> 00:53:00,400
whether or not life existed on mars in

1100
00:53:04,549 --> 00:53:02,960
the past um so this is this it's an

1101
00:53:07,349 --> 00:53:04,559
incredible opportunity and of course we

1102
00:53:09,190 --> 00:53:07,359
already have uh samples of mars on earth

1103
00:53:11,589 --> 00:53:09,200
as meteorites which i'm sure many can

1104
00:53:14,870 --> 00:53:11,599
add to here and speak about

1105
00:53:16,390 --> 00:53:14,880
we have pieces of mars on earth but we

1106
00:53:18,470 --> 00:53:16,400
don't know where they came from we don't

1107
00:53:21,270 --> 00:53:18,480
know the context we don't have all of

1108
00:53:25,750 --> 00:53:21,280
that basic information and so this is

1109
00:53:31,030 --> 00:53:28,710
would anyone else like to add anything

1110
00:53:33,430 --> 00:53:31,040
all right

1111
00:53:35,990 --> 00:53:33,440
oh go ahead minnie go ahead no i was

1112
00:53:37,910 --> 00:53:36,000
just going to say that uh you know

1113
00:53:39,270 --> 00:53:37,920

lori really put this very well but you

1114
00:53:41,589 --> 00:53:39,280
know and we have these martian

1115
00:53:42,870 --> 00:53:41,599
meteorites but these meteorites have you

1116
00:53:45,270 --> 00:53:42,880
know by their very nature they've been

1117
00:53:47,190 --> 00:53:45,280
sitting sitting on the earth and bathed

1118
00:53:50,950 --> 00:53:47,200
in the earth environment for

1119
00:53:53,030 --> 00:53:50,960
sometimes many decades or longer and so

1120
00:53:54,870 --> 00:53:53,040
uh you know we don't have really

1121
00:53:56,870 --> 00:53:54,880
unaltered pristine

1122
00:53:58,630 --> 00:53:56,880
uh unaltered by earth contamination you

1123
00:54:00,069 --> 00:53:58,640
know materials from mars and so these

1124
00:54:02,470 --> 00:54:00,079
these samples you know when they come

1125
00:54:04,069 --> 00:54:02,480
back to us they'll they'll be just

1126
00:54:05,670 --> 00:54:04,079
incredible in terms of being able to

1127
00:54:07,910 --> 00:54:05,680
tell something especially about you know

1128
00:54:10,390 --> 00:54:07,920
whether there was any kind of

1129
00:54:12,069 --> 00:54:10,400
past life on mars and and also

1130
00:54:15,670 --> 00:54:12,079
important questions about the evolution

1131
00:54:17,829 --> 00:54:15,680
of mars uh its history and so uh you

1132
00:54:19,349 --> 00:54:17,839
know for me that it's really these first

1133
00:54:21,190 --> 00:54:19,359
samples are really important because

1134
00:54:23,829 --> 00:54:21,200
they really kind of kick off that mars

1135
00:54:26,150 --> 00:54:23,839
sample return campaign and so yeah i'm

1136
00:54:27,990 --> 00:54:26,160
super excited about that

1137
00:54:30,790 --> 00:54:28,000
and i actually have a follow-up question

1138
00:54:34,790 --> 00:54:30,800

for you wilco on facebook asks

1139
00:54:37,670 --> 00:54:35,910
yeah so

1140
00:54:41,190 --> 00:54:37,680
you know that the mars sample return

1141
00:54:43,910 --> 00:54:41,200
program is is currently in in um in its

1142
00:54:45,829 --> 00:54:43,920
uh concept and uh development and

1143
00:54:47,430 --> 00:54:45,839
technology development phase and so we

1144
00:54:48,710 --> 00:54:47,440
were in phase a right now and we're

1145
00:54:51,430 --> 00:54:48,720
really planning what we're planning to

1146
00:54:53,510 --> 00:54:51,440
do is to launch a couple of missions one

1147
00:54:55,589 --> 00:54:53,520
will be a sample retrieval lander which

1148
00:54:56,630 --> 00:54:55,599
will actually pick up the samples

1149
00:54:59,430 --> 00:54:56,640
that'll be

1150
00:55:01,990 --> 00:54:59,440
uh collected by the perseverance rover

1151
00:55:04,470 --> 00:55:02,000
and bring them into a mars orbit and

1152
00:55:06,549 --> 00:55:04,480
then there's a an orbiter the earth

1153
00:55:09,270 --> 00:55:06,559
return orbiter which will be basically

1154
00:55:11,190 --> 00:55:09,280
be capturing these uh orbiting samples

1155
00:55:12,950 --> 00:55:11,200
and then return those back to earth in

1156
00:55:15,190 --> 00:55:12,960
an earth's return capsule as was shown

1157
00:55:16,470 --> 00:55:15,200
in the animation that i showed so

1158
00:55:17,750 --> 00:55:16,480
so there's going to be a couple of these

1159
00:55:20,870 --> 00:55:17,760
missions that are hopefully going to be

1160
00:55:22,789 --> 00:55:20,880
launched and no sooner as i said in 2026

1161
00:55:26,309 --> 00:55:22,799
and hope to get these samples back

1162
00:55:28,870 --> 00:55:26,319
perhaps as early as 2031.

1163
00:55:32,549 --> 00:55:28,880

great thank you and up next on the phone

1164
00:55:35,190 --> 00:55:32,559
lines is marcia smith from space policy

1165
00:55:37,349 --> 00:55:35,200
online

1166
00:55:38,309 --> 00:55:37,359
thanks so much i had two questions for

1167
00:55:40,069 --> 00:55:38,319
lori

1168
00:55:41,430 --> 00:55:40,079
and one has to do with what many was

1169
00:55:44,069 --> 00:55:41,440
just talking about in terms of the

1170
00:55:46,390 --> 00:55:44,079
schedule for getting this done does nasa

1171
00:55:49,710 --> 00:55:46,400
have all the money it needs in its

1172
00:55:52,549 --> 00:55:49,720
budget run out to support a launch in

1173
00:55:55,910 --> 00:55:52,559
2026 and when are you going to decide if

1174
00:55:58,069 --> 00:55:55,920
it's going to be 2026 or 2028 and then a

1175
00:55:59,990 --> 00:55:58,079
very different kind of question is

1176
00:56:02,710 --> 00:56:00,000
what do you do with these scientific

1177
00:56:04,870 --> 00:56:02,720
results as part of nasa's plan to send

1178
00:56:07,109 --> 00:56:04,880
humans to mars someday

1179
00:56:09,430 --> 00:56:07,119
if you find that these areas

1180
00:56:11,589 --> 00:56:09,440
are habitable does that mean that you're

1181
00:56:13,109 --> 00:56:11,599
not going to send astronauts there

1182
00:56:15,990 --> 00:56:13,119
because you don't want to contaminate

1183
00:56:17,510 --> 00:56:16,000
the area or you will send astronauts

1184
00:56:21,030 --> 00:56:17,520
there because that's exactly what you

1185
00:56:25,349 --> 00:56:23,589
marsha those are two great questions um

1186
00:56:28,630 --> 00:56:25,359
i'll start with the first one

1187
00:56:30,789 --> 00:56:28,640
um so as as many said we are in the

1188
00:56:32,789 --> 00:56:30,799

phase a of the development right now the

1189
00:56:33,829 --> 00:56:32,799
concept development

1190
00:56:35,829 --> 00:56:33,839
we are

1191
00:56:39,270 --> 00:56:35,839
extremely pleased with the the budget

1192
00:56:43,270 --> 00:56:39,280
request that the president put forward

1193
00:56:44,950 --> 00:56:43,280
for fiscal year 2022 and beyond

1194
00:56:46,789 --> 00:56:44,960
and i think we are in a really good

1195
00:56:48,309 --> 00:56:46,799
place right at this moment

1196
00:56:49,990 --> 00:56:48,319
with what the funding that we have of

1197
00:56:51,589 --> 00:56:50,000
course as part of phase a we are

1198
00:56:53,990 --> 00:56:51,599
exploring a bunch of different trades

1199
00:56:57,670 --> 00:56:54,000
and trying to best understand how we can

1200
00:56:58,710 --> 00:56:57,680
execute this mission um so i think i you

1201
00:57:01,190 --> 00:56:58,720
know we're

1202
00:57:02,069 --> 00:57:01,200
we're where we should be right right now

1203
00:57:14,309 --> 00:57:02,079
um

1204
00:57:16,470 --> 00:57:14,319
very strong that exploration

1205
00:57:19,349 --> 00:57:16,480
drive that we have

1206
00:57:21,510 --> 00:57:19,359
i really believe that uh you know we are

1207
00:57:23,510 --> 00:57:21,520
going to do that one way or another and

1208
00:57:24,789 --> 00:57:23,520
once we understand better understand the

1209
00:57:26,630 --> 00:57:24,799
environment on mars and better

1210
00:57:28,950 --> 00:57:26,640
understand whether or not there was

1211
00:57:29,990 --> 00:57:28,960
potentially life there in the past will

1212
00:57:31,829 --> 00:57:30,000
help us

1213
00:57:33,750 --> 00:57:31,839

design where we want to go and how we

1214
00:57:38,710 --> 00:57:33,760
want to go but i think it's definitely

1215
00:57:46,309 --> 00:57:42,069
great thank you and up next is leo

1216
00:57:51,430 --> 00:57:48,390
thanks very much uh raquel

1217
00:57:54,549 --> 00:57:51,440
this is for katie uh kj we're talking

1218
00:57:57,030 --> 00:57:54,559
about the high scientific potential

1219
00:57:59,190 --> 00:57:57,040
of this sample and i'm assuming the fact

1220
00:58:01,030 --> 00:57:59,200
that you're now talking about perhaps

1221
00:58:03,270 --> 00:58:01,040
going back to rubio

1222
00:58:04,710 --> 00:58:03,280
means those words were chosen quite

1223
00:58:07,030 --> 00:58:04,720
deliberately

1224
00:58:09,270 --> 00:58:07,040
can you be a bit more specific about why

1225
00:58:12,549 --> 00:58:09,280
you're excited by this sample in

1226
00:58:16,950 --> 00:58:12,559
particular um does this unequivocally

1227
00:58:18,870 --> 00:58:16,960
say that the lava flow um predates

1228
00:58:21,270 --> 00:58:18,880
the delta itself

1229
00:58:24,230 --> 00:58:21,280
and the fact that the lava does have

1230
00:58:26,630 --> 00:58:24,240
these uh the souls in it um you know is

1231
00:58:28,950 --> 00:58:26,640
that what is getting you excited

1232
00:58:30,950 --> 00:58:28,960
yes thanks for that question um so first

1233
00:58:33,910 --> 00:58:30,960
of all we we're excited about these

1234
00:58:36,390 --> 00:58:33,920
rocks uh whether it was uh rubion or

1235
00:58:39,430 --> 00:58:36,400
rochet because volcanic rocks have the

1236
00:58:41,190 --> 00:58:39,440
potential to provide age constraints on

1237
00:58:43,349 --> 00:58:41,200
the jezreel delta and and there have

1238
00:58:45,190 --> 00:58:43,359

been different models for what the age

1239
00:58:47,589 --> 00:58:45,200
and relative age of the crater floor

1240
00:58:49,349 --> 00:58:47,599
rocks are with respect to the delta but

1241
00:58:51,990 --> 00:58:49,359
i think the current prevailing idea is

1242
00:58:54,630 --> 00:58:52,000
that these rocks of the crater floor are

1243
00:58:57,190 --> 00:58:54,640
perhaps uh are are just older than the

1244
00:58:58,069 --> 00:58:57,200
delta so if we were able to get an age

1245
00:58:59,670 --> 00:58:58,079
for

1246
00:59:02,549 --> 00:58:59,680
the these crater floor rocks that we've

1247
00:59:05,270 --> 00:59:02,559
just collected we would be able to put

1248
00:59:07,349 --> 00:59:05,280
a you know older than date uh no older

1249
00:59:09,190 --> 00:59:07,359
than date on the the timing of the

1250
00:59:11,270 --> 00:59:09,200
jezreel lake and that would be an

1251
00:59:13,670 --> 00:59:11,280
incredibly important uh thing to

1252
00:59:15,190 --> 00:59:13,680
understand especially if we

1253
00:59:16,630 --> 00:59:15,200
go forward in the mission and as we

1254
00:59:18,950 --> 00:59:16,640
search for signs of ancient life in

1255
00:59:20,470 --> 00:59:18,960
those delta rocks

1256
00:59:22,309 --> 00:59:20,480
we also mentioned and yulia talked about

1257
00:59:24,630 --> 00:59:22,319
and i'll pass it to her in a moment

1258
00:59:27,109 --> 00:59:24,640
our excitement about these the mineral

1259
00:59:30,150 --> 00:59:27,119
diversity of of both the rochette

1260
00:59:30,950 --> 00:59:30,160
samples as well as rubion and and rubion

1261
00:59:33,270 --> 00:59:30,960
was

1262
00:59:34,870 --> 00:59:33,280
an interesting rock because the thing

1263
00:59:36,870 --> 00:59:34,880

that makes it most interesting might

1264
00:59:38,870 --> 00:59:36,880
have also made it one of the the things

1265
00:59:39,990 --> 00:59:38,880
that was made it difficult to to acquire

1266
00:59:41,510 --> 00:59:40,000
into core

1267
00:59:44,789 --> 00:59:41,520
and so at

1268
00:59:46,470 --> 00:59:44,799
ruby rubion we had a lot of salts there

1269
00:59:48,710 --> 00:59:46,480
and julia talked about the significance

1270
00:59:50,870 --> 00:59:48,720
of that and and so i'll pass it to her

1271
00:59:53,030 --> 00:59:50,880
to talk a little bit more about why we

1272
00:59:54,870 --> 00:59:53,040
were particularly excited about rubion

1273
00:59:56,950 --> 00:59:54,880
and the extent of alteration that that

1274
00:59:58,710 --> 00:59:56,960
rock saw but why we also think that

1275
01:00:00,390 --> 00:59:58,720
rochet is an important sample to have in

1276
01:00:02,549 --> 01:00:00,400
our sample collection

1277
01:00:04,950 --> 01:00:02,559
well casey you pretty much answer the

1278
01:00:08,230 --> 01:00:04,960
question uh but the importance is

1279
01:00:10,870 --> 01:00:08,240
that the rocks in general rudian and

1280
01:00:11,910 --> 01:00:10,880
rochette are very similar if not the

1281
01:00:15,190 --> 01:00:11,920
same

1282
01:00:17,430 --> 01:00:15,200
but they do exp or they did experience

1283
01:00:19,190 --> 01:00:17,440
different degrees of the aqueous

1284
01:00:21,349 --> 01:00:19,200
alteration or different degree of

1285
01:00:22,549 --> 01:00:21,359
exposure to water

1286
01:00:23,990 --> 01:00:22,559
rudian

1287
01:00:25,670 --> 01:00:24,000
has

1288
01:00:28,470 --> 01:00:25,680

much more souls

1289
01:00:30,069 --> 01:00:28,480
that we observed with our with our

1290
01:00:33,109 --> 01:00:30,079
rubber instruments

1291
01:00:35,510 --> 01:00:33,119
and much more alteration which is uh

1292
01:00:37,589 --> 01:00:35,520
changing the minerals within the rock

1293
01:00:40,710 --> 01:00:37,599
within the volcanic rock

1294
01:00:42,549 --> 01:00:40,720
uh with with exposure to water

1295
01:00:46,230 --> 01:00:42,559
and as such

1296
01:00:47,349 --> 01:00:46,240
that rock has even bigger potential

1297
01:00:49,430 --> 01:00:47,359
to

1298
01:00:53,270 --> 01:00:49,440
deliver the sample

1299
01:00:54,230 --> 01:00:53,280
that is full of of those salts

1300
01:00:57,349 --> 01:00:54,240
that

1301
01:00:59,430 --> 01:00:57,359
may have uh the inclusions of liquid

1302
01:01:01,910 --> 01:00:59,440
water within them

1303
01:01:03,910 --> 01:01:01,920
that we actually can can look at and

1304
01:01:06,630 --> 01:01:03,920
learn about the wet

1305
01:01:09,030 --> 01:01:06,640
time in adjacent history

1306
01:01:11,670 --> 01:01:09,040
and at the same time it is still an

1307
01:01:14,150 --> 01:01:11,680
igneous or a volcanic rock and provide

1308
01:01:15,750 --> 01:01:14,160
potentially provides information

1309
01:01:17,990 --> 01:01:15,760
of age

1310
01:01:19,589 --> 01:01:18,000
especially in combination with the field

1311
01:01:23,190 --> 01:01:19,599
observations that katie was talking

1312
01:01:25,349 --> 01:01:23,200
about we don't take just the rock and

1313
01:01:27,990 --> 01:01:25,359

learned about its chemistry

1314
01:01:29,670 --> 01:01:28,000
this is a rock in a context so we look

1315
01:01:32,309 --> 01:01:29,680
at the relationship between different

1316
01:01:34,870 --> 01:01:32,319
units which one is older which one is

1317
01:01:36,309 --> 01:01:34,880
younger how they relate to each other

1318
01:01:38,710 --> 01:01:36,319
and these are all field notes and

1319
01:01:40,549 --> 01:01:38,720
observations that we are taking as we

1320
01:01:42,789 --> 01:01:40,559
are on the surface of mars

1321
01:01:46,230 --> 01:01:42,799
and the sample is to test that

1322
01:01:51,030 --> 01:01:46,240
hypothesis and to provide the data once

1323
01:01:58,230 --> 01:01:53,190
thank you and up next on the phone lines

1324
01:01:59,670 --> 01:01:58,240
is ken cremer with space up close

1325
01:02:02,150 --> 01:01:59,680
hi thank you for doing this and

1326
01:02:03,270 --> 01:02:02,160
congratulations on the core sample

1327
01:02:05,190 --> 01:02:03,280
um

1328
01:02:07,750 --> 01:02:05,200
what my question i think is for katie

1329
01:02:10,549 --> 01:02:07,760
stack morgan but for anyone else too can

1330
01:02:13,670 --> 01:02:10,559
you talk a little bit about the future

1331
01:02:15,750 --> 01:02:13,680
route that the rover is going to take

1332
01:02:18,150 --> 01:02:15,760
and when do you think you will get to

1333
01:02:20,470 --> 01:02:18,160
the cerradolite region which was your

1334
01:02:23,349 --> 01:02:20,480
main target

1335
01:02:26,630 --> 01:02:23,359
and and where that is located thanks

1336
01:02:29,910 --> 01:02:26,640
yes great question uh so we are

1337
01:02:31,670 --> 01:02:29,920
uh just planning today a drive away from

1338
01:02:33,589 --> 01:02:31,680

the citadel region where we acquired

1339
01:02:37,430 --> 01:02:33,599
these two core samples and we'll be

1340
01:02:40,069 --> 01:02:37,440
heading into a region that we call seita

1341
01:02:42,549 --> 01:02:40,079
and we think what really is exciting to

1342
01:02:44,470 --> 01:02:42,559
us about this area are two main things

1343
01:02:46,789 --> 01:02:44,480
the potential that this area has

1344
01:02:47,589 --> 01:02:46,799
fine-grained sedimentary rocks and we

1345
01:02:49,109 --> 01:02:47,599
see

1346
01:02:50,230 --> 01:02:49,119
layering that suggests that that could

1347
01:02:52,549 --> 01:02:50,240
be true

1348
01:02:55,829 --> 01:02:52,559
we also see in this area a very distinct

1349
01:02:57,910 --> 01:02:55,839
olivine signal um in in the

1350
01:02:59,829 --> 01:02:57,920
orbital spectroscopy data and they're

1351
01:03:02,150 --> 01:02:59,839
only very specific types of rocks that

1352
01:03:03,829 --> 01:03:02,160
we have here on earth that have such

1353
01:03:05,430 --> 01:03:03,839
olivine signals and olivine bearing

1354
01:03:07,190 --> 01:03:05,440
signals and so we're excited to check

1355
01:03:09,109 --> 01:03:07,200
out those rocks which also may be

1356
01:03:10,230 --> 01:03:09,119
amongst the oldest that we have exposed

1357
01:03:12,309 --> 01:03:10,240
in the crater

1358
01:03:14,710 --> 01:03:12,319
after we go to south seta and do what we

1359
01:03:17,109 --> 01:03:14,720
hope to be sample collection there

1360
01:03:19,510 --> 01:03:17,119
we'll then go around that outcrop that

1361
01:03:20,789 --> 01:03:19,520
big area exposure and head straight to

1362
01:03:22,630 --> 01:03:20,799
the delta

1363
01:03:23,910 --> 01:03:22,640

and and we will begin our exploration of

1364
01:03:25,589 --> 01:03:23,920
the delta

1365
01:03:27,190 --> 01:03:25,599
and you mentioned stromatolites so now

1366
01:03:29,190 --> 01:03:27,200
we don't know for sure

1367
01:03:31,029 --> 01:03:29,200
that there are stromatolites or ancient

1368
01:03:32,870 --> 01:03:31,039
fossilized microbial mats here in

1369
01:03:34,549 --> 01:03:32,880
jezreel although it would be certainly

1370
01:03:36,950 --> 01:03:34,559
fantastic if we were to find something

1371
01:03:39,109 --> 01:03:36,960
that we thought could be that

1372
01:03:40,630 --> 01:03:39,119
the the jezro delta itself particularly

1373
01:03:42,870 --> 01:03:40,640
the lower layers that we think were

1374
01:03:44,870 --> 01:03:42,880
deposited in a very quiet calm lake

1375
01:03:47,510 --> 01:03:44,880
environment are a great place to look

1376
01:03:49,430 --> 01:03:47,520
for potential ancient biosignatures

1377
01:03:51,270 --> 01:03:49,440
and so we will have the opportunity to

1378
01:03:52,789 --> 01:03:51,280
explore that once we get to the delta

1379
01:03:54,789 --> 01:03:52,799
and you might also have been referring

1380
01:03:56,870 --> 01:03:54,799
to what we've been calling the marginal

1381
01:03:58,630 --> 01:03:56,880
carbonate unit within jezreel and these

1382
01:04:01,109 --> 01:03:58,640
are the deposits around the inner rim of

1383
01:04:03,190 --> 01:04:01,119
the crater and carbonate minerals here

1384
01:04:05,430 --> 01:04:03,200
on earth are also great preservers of

1385
01:04:06,870 --> 01:04:05,440
ancient biosignatures

1386
01:04:08,710 --> 01:04:06,880
and many

1387
01:04:11,190 --> 01:04:08,720
stromatolite examples are found in

1388
01:04:13,109 --> 01:04:11,200

carbonate-bearing rocks and so after we

1389
01:04:15,349 --> 01:04:13,119
explore the delta we'll likely move on

1390
01:04:17,510 --> 01:04:15,359
to the marginal carbonates and that will

1391
01:04:19,430 --> 01:04:17,520
probably be around the time of the end

1392
01:04:20,870 --> 01:04:19,440
of our exploration of jezreel crater and

1393
01:04:24,549 --> 01:04:20,880
perhaps beyond that we'll be able to

1394
01:04:29,270 --> 01:04:27,270
thank you

1395
01:04:32,069 --> 01:04:29,280
great we have another social media

1396
01:04:33,750 --> 01:04:32,079
question coming in and uh i think matt

1397
01:04:35,190 --> 01:04:33,760
you should get your sample ready how

1398
01:04:37,990 --> 01:04:35,200
large are the samples that have been

1399
01:04:43,910 --> 01:04:38,000
collected and do you expect that will be

1400
01:04:49,750 --> 01:04:47,029
so this is a core sample from our test

1401
01:04:52,069 --> 01:04:49,760
program and our test bed on earth

1402
01:04:53,270 --> 01:04:52,079
as we were developing our sampling

1403
01:04:55,510 --> 01:04:53,280
system

1404
01:04:56,390 --> 01:04:55,520
it's roughly

1405
01:05:02,069 --> 01:04:56,400
two

1406
01:05:04,630 --> 01:05:02,079
all the core samples aren't going to

1407
01:05:06,870 --> 01:05:04,640
look quite as intact as this one they

1408
01:05:09,349 --> 01:05:06,880
may break up into little chips

1409
01:05:12,390 --> 01:05:09,359
but this is representative of a

1410
01:05:14,069 --> 01:05:12,400
particular rock sample

1411
01:05:16,789 --> 01:05:14,079
but even if it breaks up into little

1412
01:05:19,109 --> 01:05:16,799
chips it's still a very scientifically

1413
01:05:20,950 --> 01:05:19,119

valuable sample and they can still do a

1414
01:05:22,390 --> 01:05:20,960
whole lot with it and it's still very

1415
01:05:24,309 --> 01:05:22,400
interesting so

1416
01:05:26,630 --> 01:05:24,319
you wouldn't expect all the core samples

1417
01:05:30,549 --> 01:05:26,640
basically to look quite like this

1418
01:05:32,470 --> 01:05:30,559
um as a one solid piece but we do expect

1419
01:05:34,309 --> 01:05:32,480
them to be about the same length of

1420
01:05:37,270 --> 01:05:34,319
roughly about

1421
01:05:39,829 --> 01:05:37,280
two inches or so

1422
01:05:41,990 --> 01:05:39,839
thank you and that is all the time we

1423
01:05:44,630 --> 01:05:42,000
have for questions today i'd like to

1424
01:05:47,670 --> 01:05:44,640
thank all our panelists for joining us

1425
01:05:48,829 --> 01:05:47,680
and for more information on the mission

1426
01:05:52,190 --> 01:05:48,839
visit

1427
01:05:53,910 --> 01:05:52,200
nasa.gov perseverance and

1428
01:05:55,270 --> 01:05:53,920
mars.nasa.gov

1429
01:05:57,349 --> 01:05:55,280
perseverance

1430
01:06:00,069 --> 01:05:57,359
you can also check out the latest raw

1431
01:06:02,829 --> 01:06:00,079
images being taken by the rover at

1432
01:06:05,029 --> 01:06:02,839
go.nasa.gov

1433
01:06:06,470 --> 01:06:05,039
perseverance dash raw

1434
01:06:08,950 --> 01:06:06,480
dash images

1435
01:06:13,430 --> 01:06:08,960
and don't forget to follow us on social