



1
00:05:07,270 --> 00:02:34,830

you

2
00:05:11,029 --> 00:05:09,670

as the countdown to mars continues the

3
00:05:12,870 --> 00:05:11,039

perseverance of humanity

4
00:05:56,230 --> 00:05:12,880

launching the next generation of robotic

5
00:06:01,189 --> 00:05:59,430

good afternoon nasa's mars perseverance

6
00:06:03,830 --> 00:06:01,199

rover launched from earth

7
00:06:04,790 --> 00:06:03,840

six months ago and now we are less than

8
00:06:07,590 --> 00:06:04,800

a day away

9
00:06:09,590 --> 00:06:07,600

from touchdown on the red planet the

10
00:06:11,029 --> 00:06:09,600

rover will attempt to land in jezreel

11
00:06:13,189 --> 00:06:11,039

crater tomorrow

12
00:06:14,070 --> 00:06:13,199

it's the most difficult landing site on

13
00:06:16,710 --> 00:06:14,080

mars ever

14

00:06:17,510 --> 00:06:16,720

attempted but the perseverance rover and

15

00:06:19,830 --> 00:06:17,520

the team

16

00:06:21,590 --> 00:06:19,840

are ready welcome to nasa's jet

17

00:06:22,629 --> 00:06:21,600

propulsion laboratory in southern

18

00:06:25,510 --> 00:06:22,639

california

19

00:06:27,189 --> 00:06:25,520

i'm marina jurica your host today as we

20

00:06:29,510 --> 00:06:27,199

bring you a closer look

21

00:06:31,270 --> 00:06:29,520

into perseverance's journey to search

22

00:06:33,909 --> 00:06:31,280

for signs of ancient life

23

00:06:34,629 --> 00:06:33,919

and how the next mission mars sample

24

00:06:36,550 --> 00:06:34,639

return

25

00:06:37,830 --> 00:06:36,560

will bring samples from the surface of

26

00:06:40,629 --> 00:06:37,840

mars back

27

00:06:42,950 --> 00:06:40,639

to earth as we are social distancing i

28

00:06:45,590 --> 00:06:42,960

will introduce you to our panel here

29

00:06:46,550 --> 00:06:45,600

and those joining us virtually on our

30

00:06:49,670 --> 00:06:46,560

panel today

31

00:06:50,309 --> 00:06:49,680

are nasa associate administrator for the

32

00:06:53,909 --> 00:06:50,319

science

33

00:06:55,990 --> 00:06:53,919

mission directorate thomas zurbukin

34

00:06:57,110 --> 00:06:56,000

jpl's director of solar system

35

00:07:01,029 --> 00:06:57,120

exploration

36

00:07:02,230 --> 00:07:01,039

bobby braun the european space agency

37

00:07:06,469 --> 00:07:02,240

director of human

38

00:07:09,589 --> 00:07:06,479

and robotic exploration david parker

39

00:07:14,070 --> 00:07:09,599

director of nasa's astrobiology program

40

00:07:17,430 --> 00:07:14,080

mary wojtek perseverance deputy project

41

00:07:20,070 --> 00:07:17,440

scientist ken williford

42

00:07:22,390 --> 00:07:20,080

sample return scientist and professor at

43

00:07:25,749 --> 00:07:22,400

university of nevada las vegas

44

00:07:27,510 --> 00:07:25,759

elizabeth hauswrath for anyone watching

45

00:07:29,990 --> 00:07:27,520

who would like to submit a question you

46

00:07:32,710 --> 00:07:30,000

can do so by using the countdown to mars

47

00:07:33,510 --> 00:07:32,720

hashtag our phone lines are now open to

48

00:07:35,749 --> 00:07:33,520

the media

49

00:07:37,830 --> 00:07:35,759

you can ask a question by pressing star

50

00:07:40,230 --> 00:07:37,840

one to enter the queue

51
00:07:41,029 --> 00:07:40,240
to start i'd like to welcome thomas

52
00:07:43,589 --> 00:07:41,039
zurbukin

53
00:07:44,070 --> 00:07:43,599
good afternoon dr z i'm so glad to be

54
00:07:46,790 --> 00:07:44,080
here

55
00:07:47,110 --> 00:07:46,800
marina thanks so much and i'm just in

56
00:07:50,150 --> 00:07:47,120
awe

57
00:07:53,029 --> 00:07:50,160
because we're like a day out uh

58
00:07:53,909 --> 00:07:53,039
from going back into history you know

59
00:07:57,430 --> 00:07:53,919
landing

60
00:08:00,629 --> 00:07:57,440
in this ancient lake bed in search

61
00:08:03,510 --> 00:08:00,639
for potential ancient life

62
00:08:05,270 --> 00:08:03,520
and that of course is a culmination of

63
00:08:08,230 --> 00:08:05,280

decades of work

64

00:08:09,110 --> 00:08:08,240

by nasa and the international community

65

00:08:12,629 --> 00:08:09,120

and

66

00:08:14,790 --> 00:08:12,639

is built by all directorates

67

00:08:16,070 --> 00:08:14,800

with many individuals around the united

68

00:08:18,469 --> 00:08:16,080

states and internationally

69

00:08:20,710 --> 00:08:18,479

contributing what we're going to talk

70

00:08:24,629 --> 00:08:20,720

about today has to do with this

71

00:08:26,710 --> 00:08:24,639

look at this right now it's

72

00:08:29,510 --> 00:08:26,720

a sample tube if i turn it around i see

73

00:08:31,670 --> 00:08:29,520

the number 53 on it i remember

74

00:08:32,550 --> 00:08:31,680

from various meetings i've been in that

75

00:08:34,870 --> 00:08:32,560

there's something like

76

00:08:35,990 --> 00:08:34,880

70 of those and some of them with

77

00:08:39,029 --> 00:08:36,000

specific numbers

78

00:08:41,909 --> 00:08:39,039

are right now hurling towards mars

79

00:08:43,909 --> 00:08:41,919

it's about that sample tube that so much

80

00:08:46,070 --> 00:08:43,919

of this panel will be about

81

00:08:48,710 --> 00:08:46,080

the goal of course is to collect

82

00:08:51,910 --> 00:08:48,720

promising samples in this

83

00:08:52,949 --> 00:08:51,920

super clean tube and it's analogs of

84

00:08:56,070 --> 00:08:52,959

course the ones

85

00:08:59,190 --> 00:08:56,080

up there toward going towards mars

86

00:09:00,710 --> 00:08:59,200

and really collecting those samples as a

87

00:09:02,949 --> 00:09:00,720

first step of the most

88

00:09:03,829 --> 00:09:02,959

difficult missions or one of the most

89

00:09:07,190 --> 00:09:03,839

difficult missions

90

00:09:10,550 --> 00:09:07,200

ever undertaken it's of course

91

00:09:12,150 --> 00:09:10,560

trying to make significant progress

92

00:09:14,470 --> 00:09:12,160

in answering one of the questions that

93

00:09:17,670 --> 00:09:14,480

has been with us

94

00:09:21,430 --> 00:09:17,680

for many centuries namely

95

00:09:24,389 --> 00:09:21,440

are we alone in the universe

96

00:09:26,630 --> 00:09:24,399

our robotic geologist and astrobiologist

97

00:09:30,230 --> 00:09:26,640

is poised to help find answers

98

00:09:32,550 --> 00:09:30,240

just like the great geologists on earth

99

00:09:35,110 --> 00:09:32,560

it's not just about the sample it's

100

00:09:36,949 --> 00:09:35,120

about the geologic context

101
00:09:38,710 --> 00:09:36,959
of that sample that will also be

102
00:09:42,070 --> 00:09:38,720
explored and

103
00:09:43,990 --> 00:09:42,080
it will do so at jezrow crater

104
00:09:46,070 --> 00:09:44,000
with a set of them some of the most

105
00:09:47,030 --> 00:09:46,080
advanced instruments ever conceived and

106
00:09:50,550 --> 00:09:47,040
designed

107
00:09:53,190 --> 00:09:50,560
supporting that amazing collection

108
00:09:54,310 --> 00:09:53,200
an amazing drilling and caching system

109
00:09:56,710 --> 00:09:54,320
is at the heart

110
00:09:57,350 --> 00:09:56,720
of our really the interface between the

111
00:09:59,509 --> 00:09:57,360
rock

112
00:10:01,190 --> 00:09:59,519
where all these treasures are and the

113
00:10:04,470 --> 00:10:01,200

samples that eventually

114

00:10:07,829 --> 00:10:04,480

will be with us these samples

115

00:10:09,190 --> 00:10:07,839

will be returned triple sealed and at

116

00:10:11,829 --> 00:10:09,200

the cleanliness level

117

00:10:12,790 --> 00:10:11,839

hardly ever achieved certainly in modern

118

00:10:15,750 --> 00:10:12,800

times

119

00:10:17,030 --> 00:10:15,760

uh in kind of and and ensure that the

120

00:10:20,389 --> 00:10:17,040

samples are pristine

121

00:10:24,389 --> 00:10:23,190

we're looking for ancient life as i said

122

00:10:26,790 --> 00:10:24,399

at the beginning

123

00:10:28,150 --> 00:10:26,800

mars surface today especially where

124

00:10:31,030 --> 00:10:28,160

we're going is

125

00:10:31,990 --> 00:10:31,040

not hospitable for life we believe

126
00:10:35,670 --> 00:10:32,000
because of the absence

127
00:10:37,030 --> 00:10:35,680
of water the freezing cold landscape and

128
00:10:39,269 --> 00:10:37,040
the radiation

129
00:10:41,269 --> 00:10:39,279
that constantly showers the surface as

130
00:10:43,269 --> 00:10:41,279
we see it there

131
00:10:44,870 --> 00:10:43,279
but we know due to the rovers and

132
00:10:47,509 --> 00:10:44,880
orbiters of the past

133
00:10:48,949 --> 00:10:47,519
and the present that mars has had a wet

134
00:10:52,470 --> 00:10:48,959
past

135
00:10:55,670 --> 00:10:52,480
and as we go to jezreel

136
00:10:58,949 --> 00:10:55,680
we go to the most promising site to

137
00:11:01,509 --> 00:10:58,959
really unlock the information about that

138
00:11:03,430 --> 00:11:01,519

web passed and the question was there

139

00:11:04,310 --> 00:11:03,440

ancient life during that period where on

140

00:11:07,430 --> 00:11:04,320

earth

141

00:11:10,069 --> 00:11:07,440

life was arising the mars sample return

142

00:11:13,350 --> 00:11:10,079

is of high importance to the agency

143

00:11:14,069 --> 00:11:13,360

the science community overall and it has

144

00:11:19,190 --> 00:11:14,079

been

145

00:11:22,389 --> 00:11:19,200

thinking about for decades

146

00:11:23,910 --> 00:11:22,399

and what we did is as we thought about

147

00:11:24,870 --> 00:11:23,920

more sample return i actually

148

00:11:27,590 --> 00:11:24,880

commissioned

149

00:11:28,389 --> 00:11:27,600

an independent review just a few months

150

00:11:30,790 --> 00:11:28,399

ago

151
00:11:31,509 --> 00:11:30,800
and asked some of the best minds all

152
00:11:34,550 --> 00:11:31,519
over

153
00:11:35,190 --> 00:11:34,560
at the u.s and beyond a simple question

154
00:11:38,550 --> 00:11:35,200
which is

155
00:11:40,870 --> 00:11:38,560
are we ready to proceed with mars

156
00:11:43,190 --> 00:11:40,880
sample return technically and the answer

157
00:11:45,990 --> 00:11:43,200
was really simple and it's an answer

158
00:11:46,630 --> 00:11:46,000
that uh we we are glad to receive and

159
00:11:50,069 --> 00:11:46,640
that is

160
00:11:51,269 --> 00:11:50,079
the committee told us we are ready and

161
00:11:53,030 --> 00:11:51,279
to do so

162
00:11:54,389 --> 00:11:53,040
as the international community in

163
00:11:57,910 --> 00:11:54,399

partnership with

164

00:12:01,110 --> 00:11:57,920

isa to really go and build that

165

00:12:03,110 --> 00:12:01,120

sample return so while we're awaiting a

166

00:12:05,030 --> 00:12:03,120

safe and successful landing

167

00:12:06,629 --> 00:12:05,040

we remember of course this is difficult

168

00:12:08,150 --> 00:12:06,639

to achieve there are many panels that

169

00:12:09,670 --> 00:12:08,160

have talked about this

170

00:12:11,829 --> 00:12:09,680

but i'm really excited to turn it over

171

00:12:14,710 --> 00:12:11,839

to my friend and colleague bobby brown

172

00:12:16,069 --> 00:12:14,720

to talk about the mars sample return

173

00:12:19,110 --> 00:12:16,079

campaign bobby

174

00:12:19,990 --> 00:12:19,120

great thank you thomas uh it's great to

175

00:12:22,230 --> 00:12:20,000

be here today

176

00:12:24,310 --> 00:12:22,240

and it's great to be with you it's a

177

00:12:25,829 --> 00:12:24,320

super exciting time here at the jet

178

00:12:28,230 --> 00:12:25,839

propulsion laboratory

179

00:12:29,910 --> 00:12:28,240

as we await perseverance's landing

180

00:12:31,430 --> 00:12:29,920

tomorrow

181

00:12:33,750 --> 00:12:31,440

i'm also really excited to get to

182

00:12:35,509 --> 00:12:33,760

represent the mars sample return program

183

00:12:36,870 --> 00:12:35,519

and all the people around the world that

184

00:12:39,590 --> 00:12:36,880

are working on that program

185

00:12:40,949 --> 00:12:39,600

already mars sample return is the

186

00:12:43,670 --> 00:12:40,959

planetary science

187

00:12:44,470 --> 00:12:43,680

endeavor of our generation it's

188

00:12:46,790 --> 00:12:44,480

ambitious

189

00:12:48,230 --> 00:12:46,800

it's challenging it's scientifically

190

00:12:50,949 --> 00:12:48,240

compelling goal

191

00:12:52,310 --> 00:12:50,959

that over decades we have been working

192

00:12:54,230 --> 00:12:52,320

towards and it's

193

00:12:55,910 --> 00:12:54,240

it's right there it's just within our

194

00:12:58,310 --> 00:12:55,920

reach and within

195

00:12:59,670 --> 00:12:58,320

with the launch and tomorrow's landing

196

00:13:01,590 --> 00:12:59,680

of perseverance

197

00:13:03,509 --> 00:13:01,600

the mars sample return science

198

00:13:06,790 --> 00:13:03,519

activities can begin

199

00:13:07,269 --> 00:13:06,800

on the surface of mars as an engineer

200

00:13:10,470 --> 00:13:07,279

i'm in

201
00:13:13,190 --> 00:13:10,480
awe of what the perseverance team

202
00:13:14,550 --> 00:13:13,200
has done over these past few years what

203
00:13:15,990 --> 00:13:14,560
they've accomplished

204
00:13:18,629 --> 00:13:16,000
but i'd like to take a minute and

205
00:13:19,910 --> 00:13:18,639
describe to you how we're building upon

206
00:13:22,150 --> 00:13:19,920
perseverance perseverance's science

207
00:13:23,670 --> 00:13:22,160
mission in the development of the next

208
00:13:26,550 --> 00:13:23,680
two flight missions

209
00:13:27,590 --> 00:13:26,560
whose goal together is to return the

210
00:13:31,190 --> 00:13:27,600
perseverance

211
00:13:33,269 --> 00:13:31,200
acquired samples from er to earth

212
00:13:34,230 --> 00:13:33,279
to study in laboratories across the

213
00:13:36,470 --> 00:13:34,240

globe

214

00:13:39,350 --> 00:13:36,480

with instrumentation that just simply

215

00:13:42,870 --> 00:13:39,360

can't be miniaturized and qualified for

216

00:13:45,110 --> 00:13:42,880

space flight this next graphic shows

217

00:13:47,030 --> 00:13:45,120

the four elements of the mars sample

218

00:13:50,710 --> 00:13:47,040

return campaign

219

00:13:52,629 --> 00:13:50,720

perseverance on the left nearly on

220

00:13:53,829 --> 00:13:52,639

nearly at the mars surface about ready

221

00:13:56,710 --> 00:13:53,839

to begin this

222

00:13:58,710 --> 00:13:56,720

science journey and then the next two

223

00:13:59,590 --> 00:13:58,720

flight elements which are presently in

224

00:14:01,829 --> 00:13:59,600

development

225

00:14:02,949 --> 00:14:01,839

the sample retrieval lander mission and

226

00:14:04,870 --> 00:14:02,959

the earth return

227

00:14:06,150 --> 00:14:04,880

orbiter mission i'm going to describe

228

00:14:08,629 --> 00:14:06,160

those uh to you

229

00:14:10,389 --> 00:14:08,639

in a little bit more detail and then out

230

00:14:12,710 --> 00:14:10,399

of ways we're going to be work

231

00:14:13,670 --> 00:14:12,720

developing a sample return handling

232

00:14:17,110 --> 00:14:13,680

facility

233

00:14:18,310 --> 00:14:17,120

that will acquire and curate and even

234

00:14:21,189 --> 00:14:18,320

distribute

235

00:14:22,310 --> 00:14:21,199

the samples when they're back at earth

236

00:14:25,350 --> 00:14:22,320

three missions

237

00:14:27,910 --> 00:14:25,360

and one ground element working together

238

00:14:28,710 --> 00:14:27,920

to accomplish sample return now the

239

00:14:32,230 --> 00:14:28,720

thing that

240

00:14:34,310 --> 00:14:32,240

binds those missions together is sitting

241

00:14:35,910 --> 00:14:34,320

a mock-up at least is sitting here with

242

00:14:38,389 --> 00:14:35,920

me today

243

00:14:39,430 --> 00:14:38,399

this is the bottom half of the mars

244

00:14:42,230 --> 00:14:39,440

sample return

245

00:14:42,949 --> 00:14:42,240

sample container and you can see for

246

00:14:45,829 --> 00:14:42,959

scale

247

00:14:47,350 --> 00:14:45,839

i have two of the sample tubes that dr z

248

00:14:49,829 --> 00:14:47,360

just held up

249

00:14:50,949 --> 00:14:49,839

in placed in this container this

250

00:14:54,150 --> 00:14:50,959

container can can

251
00:14:57,350 --> 00:14:54,160
can hold up to 30 samples

252
00:14:58,069 --> 00:14:57,360
and it is much like the baton in a relay

253
00:15:00,470 --> 00:14:58,079
race

254
00:15:01,430 --> 00:15:00,480
this container is the heart of sample

255
00:15:03,269 --> 00:15:01,440
return

256
00:15:04,790 --> 00:15:03,279
because the sample tubes will be filled

257
00:15:07,910 --> 00:15:04,800
by perseverance

258
00:15:10,150 --> 00:15:07,920
the sample retrieval lander will

259
00:15:13,030 --> 00:15:10,160
house this container and they'll be

260
00:15:15,110 --> 00:15:13,040
placed within and then the third

261
00:15:16,710 --> 00:15:15,120
element the earth return orbiter will

262
00:15:20,310 --> 00:15:16,720
bring this container

263
00:15:23,269 --> 00:15:20,320

triply sealed uh back to the earth

264

00:15:25,110 --> 00:15:23,279

uh so this next slide uh describes the

265

00:15:26,470 --> 00:15:25,120

sample retrieval lander in a little more

266

00:15:29,269 --> 00:15:26,480

detail

267

00:15:30,069 --> 00:15:29,279

it like perseverance will be an amazing

268

00:15:33,189 --> 00:15:30,079

engineering

269

00:15:34,470 --> 00:15:33,199

achievement on its way to to mars it'll

270

00:15:36,629 --> 00:15:34,480

look a lot like

271

00:15:39,189 --> 00:15:36,639

perseverance does today buttoned up in

272

00:15:40,550 --> 00:15:39,199

its aeroshell with a cruise stage

273

00:15:42,389 --> 00:15:40,560

controlling its journey through

274

00:15:44,389 --> 00:15:42,399

interplanetary space

275

00:15:46,069 --> 00:15:44,399

it'll fly through the mars atmosphere

276

00:15:47,670 --> 00:15:46,079
with a aeroshell

277

00:15:50,949 --> 00:15:47,680
a heat shield if you will and a

278

00:15:53,590 --> 00:15:50,959
parachute as shown in this slide

279

00:15:56,470 --> 00:15:53,600
and those systems are built upon what

280

00:15:58,870 --> 00:15:56,480
perseverance will demonstrate tomorrow

281

00:16:01,030 --> 00:15:58,880
now the one addition from a technology

282

00:16:04,310 --> 00:16:01,040
standpoint

283

00:16:08,710 --> 00:16:04,320
for that lander is the is the

284

00:16:11,670 --> 00:16:08,720
inclusion of propellant to fly out

285

00:16:12,389 --> 00:16:11,680
errors and to do truly a pinpoint

286

00:16:14,790 --> 00:16:12,399
landing

287

00:16:16,550 --> 00:16:14,800
on the surface of mars because unlike

288

00:16:19,590 --> 00:16:16,560

perseverance which is a mission

289

00:16:21,509 --> 00:16:19,600

of exploration and discovery the sample

290

00:16:24,389 --> 00:16:21,519

retrieval lander will be sent

291

00:16:25,590 --> 00:16:24,399

to a specific spot on mars where

292

00:16:28,870 --> 00:16:25,600

perseverance has

293

00:16:31,189 --> 00:16:28,880

already cached its samples in a depot

294

00:16:33,110 --> 00:16:31,199

on the mars surface we're going to know

295

00:16:33,749 --> 00:16:33,120

before the sample retrieval lander

296

00:16:35,670 --> 00:16:33,759

launches

297

00:16:37,350 --> 00:16:35,680

exactly where that spot is and we're

298

00:16:40,150 --> 00:16:37,360

gonna land within

299

00:16:41,590 --> 00:16:40,160

about a hundred yards of that spot on

300

00:16:43,829 --> 00:16:41,600

the surface of mars

301
00:16:44,870 --> 00:16:43,839
this graphic the next one yeah this one

302
00:16:48,470 --> 00:16:44,880
shows

303
00:16:50,310 --> 00:16:48,480
uh a notional traverse of perseverance

304
00:16:51,430 --> 00:16:50,320
that may that it may take across the

305
00:16:53,269 --> 00:16:51,440
mars surface

306
00:16:54,470 --> 00:16:53,279
now today of course we don't know

307
00:16:56,710 --> 00:16:54,480
precisely

308
00:16:58,710 --> 00:16:56,720
how perseverance will venture across

309
00:17:01,829 --> 00:16:58,720
mars and what it will find

310
00:17:04,230 --> 00:17:01,839
but we've analyzed hundreds of traverses

311
00:17:06,309 --> 00:17:04,240
that it may take and across those

312
00:17:09,189 --> 00:17:06,319
traverses we've found places

313
00:17:11,510 --> 00:17:09,199

many safe zones where we can land with

314

00:17:13,990 --> 00:17:11,520

our pinpoint landing technology

315

00:17:15,270 --> 00:17:14,000

uh the largest lander that will have

316

00:17:17,350 --> 00:17:15,280

been sent to mars

317

00:17:19,350 --> 00:17:17,360

uh at that time the sample retrieval

318

00:17:22,949 --> 00:17:19,360

lander and we can deploy

319

00:17:23,590 --> 00:17:22,959

a fetch rover that can traverse the

320

00:17:26,470 --> 00:17:23,600

surface

321

00:17:26,870 --> 00:17:26,480

to the depot and bring those samples

322

00:17:28,870 --> 00:17:26,880

back

323

00:17:30,789 --> 00:17:28,880

to the lander so in this next slide

324

00:17:33,750 --> 00:17:30,799

which is a animation

325

00:17:35,750 --> 00:17:33,760

you'll see yeah go to the next slide

326

00:17:37,029 --> 00:17:35,760

there you go you'll see the sample fetch

327

00:17:39,830 --> 00:17:37,039

rover

328

00:17:41,750 --> 00:17:39,840

uh deployed on the surface and in this

329

00:17:43,750 --> 00:17:41,760

uh artist concept there's just

330

00:17:45,110 --> 00:17:43,760

one tube that it's picking up but you

331

00:17:46,789 --> 00:17:45,120

you see its tray there

332

00:17:48,549 --> 00:17:46,799

is already full because it's picked up

333

00:17:50,310 --> 00:17:48,559

quite a few others

334

00:17:52,630 --> 00:17:50,320

and then it's going to head back to the

335

00:17:55,669 --> 00:17:52,640

sample retrieval lander

336

00:17:58,870 --> 00:17:55,679

when its tray is full of of tubes

337

00:18:00,549 --> 00:17:58,880

go to the next slide please once this

338

00:18:01,990 --> 00:18:00,559

either the sample fetch rover or

339

00:18:05,350 --> 00:18:02,000

perseverance itself

340

00:18:07,990 --> 00:18:05,360

loads the samples into this canister

341

00:18:09,590 --> 00:18:08,000

the canister which is already inside the

342

00:18:13,110 --> 00:18:09,600

mars ascent vehicle

343

00:18:14,950 --> 00:18:13,120

a rocket on the mars surface that rocket

344

00:18:19,590 --> 00:18:14,960

will carry this canister

345

00:18:23,190 --> 00:18:19,600

sealed into orbit uh about mars

346

00:18:26,470 --> 00:18:23,200

on this next video that orbiting sample

347

00:18:26,870 --> 00:18:26,480

this container itself will be in mars

348

00:18:30,150 --> 00:18:26,880

orbit

349

00:18:30,950 --> 00:18:30,160

and will ultimately be captured by the

350

00:18:34,390 --> 00:18:30,960

earth return

351

00:18:36,230 --> 00:18:34,400

orbiter within the payload of the earth

352

00:18:37,029 --> 00:18:36,240

return orbiter it will be sealed yet

353

00:18:39,669 --> 00:18:37,039

again

354

00:18:40,950 --> 00:18:39,679

and placed inside the earth entry

355

00:18:43,990 --> 00:18:40,960

vehicle

356

00:18:44,870 --> 00:18:44,000

that'll contain the samples for its

357

00:18:46,470 --> 00:18:44,880

flight

358

00:18:48,630 --> 00:18:46,480

through the earth's atmosphere let's go

359

00:18:51,190 --> 00:18:48,640

to the next slide

360

00:18:52,950 --> 00:18:51,200

upon return to earth the earth return

361

00:18:55,110 --> 00:18:52,960

orbiter itself is a tremendous

362

00:18:57,590 --> 00:18:55,120

spacecraft it's the largest

363

00:18:58,549 --> 00:18:57,600

spacecraft we will have built and sent

364

00:19:01,510 --> 00:18:58,559

to mars

365

00:19:02,390 --> 00:19:01,520

specifically for this purpose our

366

00:19:05,750 --> 00:19:02,400

architecture

367

00:19:09,029 --> 00:19:05,760

allows us to send the lander mission and

368

00:19:13,190 --> 00:19:09,039

or the orbiter mission to mars in either

369

00:19:15,029 --> 00:19:13,200

2026 or 2028 and those two launches and

370

00:19:16,230 --> 00:19:15,039

those two missions are being managed

371

00:19:19,430 --> 00:19:16,240

together

372

00:19:21,590 --> 00:19:19,440

by nasa and the european space agency

373

00:19:23,750 --> 00:19:21,600

in fact today there's a large group of

374

00:19:24,710 --> 00:19:23,760

engineers and scientists across both

375

00:19:27,669 --> 00:19:24,720

nasa

376

00:19:29,430 --> 00:19:27,679

and european space agency sites that are

377

00:19:31,430 --> 00:19:29,440

already working

378

00:19:33,029 --> 00:19:31,440

on these missions and it's wonderful to

379

00:19:34,470 --> 00:19:33,039

be working in partnership with the

380

00:19:37,190 --> 00:19:34,480

european space agency

381

00:19:39,909 --> 00:19:37,200

on this endeavor and with that i'd like

382

00:19:40,870 --> 00:19:39,919

to turn the conversation over to david

383

00:19:43,270 --> 00:19:40,880

parker

384

00:19:45,270 --> 00:19:43,280

david is the issa director of human and

385

00:19:46,070 --> 00:19:45,280

robotic exploration and he'll tell you a

386

00:19:49,750 --> 00:19:46,080

little bit more

387

00:19:51,270 --> 00:19:49,760

about this journey david

388

00:19:53,669 --> 00:19:51,280

thank you very much bobby that was

389

00:19:54,630 --> 00:19:53,679

fascinating i think and i'm also really

390

00:19:55,990 --> 00:19:54,640

excited

391

00:19:57,909 --> 00:19:56,000

that we're just hours away from the

392

00:19:59,909 --> 00:19:57,919

landing perseverance

393

00:20:01,830 --> 00:19:59,919

any mission to mars is exciting but

394

00:20:03,430 --> 00:20:01,840

because it's the start of the mars

395

00:20:05,350 --> 00:20:03,440

sample return campaign

396

00:20:06,950 --> 00:20:05,360

it's super exciting and it's something

397

00:20:07,669 --> 00:20:06,960

i've been dreaming about for nearly 20

398

00:20:09,990 --> 00:20:07,679

years

399

00:20:10,950 --> 00:20:10,000

from when esa first started studies for

400

00:20:13,110 --> 00:20:10,960

such a mission

401
00:20:14,870 --> 00:20:13,120
now hopefully you know that esa the

402
00:20:17,909 --> 00:20:14,880
european space agency

403
00:20:20,070 --> 00:20:17,919
is a club of 22 countries who pull their

404
00:20:21,029 --> 00:20:20,080
efforts in exploring and using space for

405
00:20:22,789 --> 00:20:21,039
everyday life

406
00:20:24,630 --> 00:20:22,799
and canada is a long-standing

407
00:20:25,830 --> 00:20:24,640
cooperating state and this is important

408
00:20:28,390 --> 00:20:25,840
for me to mention

409
00:20:29,350 --> 00:20:28,400
because canada is also part of the msr

410
00:20:32,230 --> 00:20:29,360
campaign

411
00:20:33,990 --> 00:20:32,240
via esa now within the huge range of

412
00:20:36,230 --> 00:20:34,000
esa's projects and monitoring climate

413
00:20:37,909 --> 00:20:36,240

change with copernicus providing global

414

00:20:39,750 --> 00:20:37,919

navigation with galileo

415

00:20:41,909 --> 00:20:39,760

mars sample return is part of our

416

00:20:44,149 --> 00:20:41,919

growing space exploration program

417

00:20:46,470 --> 00:20:44,159

and we have the privilege to work with

418

00:20:47,590 --> 00:20:46,480

nasa every single day just as bobby

419

00:20:49,909 --> 00:20:47,600

mentioned

420

00:20:51,750 --> 00:20:49,919

our space exploration focuses on uh

421

00:20:52,789 --> 00:20:51,760

destinations where humans will one day

422

00:20:54,470 --> 00:20:52,799

live and work

423

00:20:56,870 --> 00:20:54,480

we're already living working low earth

424

00:20:59,190 --> 00:20:56,880

orbit aboard the space station of course

425

00:21:00,390 --> 00:20:59,200

and we're on our way going forward to

426
00:21:02,870 --> 00:21:00,400
mars

427
00:21:04,870 --> 00:21:02,880
and esa is also part of the artemis

428
00:21:06,950 --> 00:21:04,880
program working with nasa

429
00:21:09,110 --> 00:21:06,960
now as far as mars is concerned we

430
00:21:10,470 --> 00:21:09,120
already have two missions there

431
00:21:12,870 --> 00:21:10,480
starting with our mars express

432
00:21:15,750 --> 00:21:12,880
spacecraft back in 2003

433
00:21:17,909 --> 00:21:15,760
doing fantastic science and indeed mnr

434
00:21:19,590 --> 00:21:17,919
is about fantastic science mars sample

435
00:21:21,510 --> 00:21:19,600
return is a great science mission but

436
00:21:22,470 --> 00:21:21,520
for me it's also a voyage of exploration

437
00:21:25,270 --> 00:21:22,480
in the grand

438
00:21:27,510 --> 00:21:25,280

tradition we all look forward to boots

439

00:21:29,590 --> 00:21:27,520

on mars but before sending humans

440

00:21:31,669 --> 00:21:29,600

a round trip with robots will teach us a

441

00:21:33,830 --> 00:21:31,679

great deal it's kind of a scale model

442

00:21:35,909 --> 00:21:33,840

for an eventual human exploration

443

00:21:37,110 --> 00:21:35,919

it's the first round trip to the surface

444

00:21:38,630 --> 00:21:37,120

of another planet

445

00:21:40,789 --> 00:21:38,640

so let me take a few minutes just to

446

00:21:43,430 --> 00:21:40,799

explain the european mars program

447

00:21:44,070 --> 00:21:43,440

uh our two orbiters mars express exomars

448

00:21:46,230 --> 00:21:44,080

trace

449

00:21:47,430 --> 00:21:46,240

gas orbiter doing great science in fact

450

00:21:51,110 --> 00:21:47,440

just last week

451

00:21:53,750 --> 00:21:51,120

exomars made the front page of uh

452

00:21:55,029 --> 00:21:53,760

the journal yes next slide please the

453

00:21:57,510 --> 00:21:55,039

journal

454

00:21:59,669 --> 00:21:57,520

nature geosciences with the discovery of

455

00:22:00,230 --> 00:21:59,679

previously undetected hydrogen chloride

456

00:22:02,630 --> 00:22:00,240

gas

457

00:22:04,390 --> 00:22:02,640

in the atmosphere of mars it's mapped

458

00:22:07,270 --> 00:22:04,400

subsurface water to

459

00:22:09,430 --> 00:22:07,280

exquisite accuracy and it also relays

460

00:22:11,190 --> 00:22:09,440

about half the data back from nasa's

461

00:22:12,789 --> 00:22:11,200

existing rovers

462

00:22:14,870 --> 00:22:12,799

so meanwhile with our russian partner oz

463

00:22:16,390 --> 00:22:14,880

cosmos we are also preparing to launch

464

00:22:18,630 --> 00:22:16,400

next year a rover mission

465

00:22:20,230 --> 00:22:18,640

the rosalind franklin rover is an

466

00:22:23,029 --> 00:22:20,240

astrobiology probe

467

00:22:23,830 --> 00:22:23,039

to search for evidence of past life um

468

00:22:25,830 --> 00:22:23,840

using a drill

469

00:22:28,310 --> 00:22:25,840

penetrating six feet below the surface

470

00:22:30,149 --> 00:22:28,320

of mars and therefore below the damage

471

00:22:32,470 --> 00:22:30,159

caused by that radiation that thomas

472

00:22:34,630 --> 00:22:32,480

mentioned that destroys any organic

473

00:22:35,909 --> 00:22:34,640

chemicals close to the surface

474

00:22:37,909 --> 00:22:35,919

and then we have our contributions to

475

00:22:39,750 --> 00:22:37,919

mars sample return comprising

476

00:22:42,070 --> 00:22:39,760

the earth return orbiter the sample

477

00:22:43,669 --> 00:22:42,080

fetch rover the bobby as mentioned

478

00:22:45,590 --> 00:22:43,679

and also the robotic arm for

479

00:22:46,230 --> 00:22:45,600

transferring those samples between the

480

00:22:48,390 --> 00:22:46,240

rovers

481

00:22:50,230 --> 00:22:48,400

and into that special container that

482

00:22:51,590 --> 00:22:50,240

bobby showed us

483

00:22:53,350 --> 00:22:51,600

so let me say a little bit more about

484

00:22:54,149 --> 00:22:53,360

the rover and the orbiter so next slide

485

00:22:56,390 --> 00:22:54,159

please

486

00:22:57,990 --> 00:22:56,400

here's a picture of the sample fetch

487

00:22:59,190 --> 00:22:58,000

rover it's much smaller than

488

00:23:01,669 --> 00:22:59,200

perseverance

489

00:23:03,350 --> 00:23:01,679

its single task is to race out from the

490

00:23:05,830 --> 00:23:03,360

sample retrieval lander

491

00:23:07,590 --> 00:23:05,840

in this relay race find and collect

492

00:23:07,990 --> 00:23:07,600

those sample tubes and bring them back

493

00:23:13,510 --> 00:23:08,000

to

494

00:23:15,909 --> 00:23:13,520

travel 10 times

495

00:23:17,990 --> 00:23:15,919

faster than current rovers using its own

496

00:23:19,830 --> 00:23:18,000

ball on board intelligence

497

00:23:21,990 --> 00:23:19,840

development has already started with

498

00:23:23,669 --> 00:23:22,000

airbus defense and space in the uk

499

00:23:26,070 --> 00:23:23,679

building on know-how from the rosalind

500

00:23:27,350 --> 00:23:26,080

franklin rover so while the sample fetch

501
00:23:29,669 --> 00:23:27,360
rover is small and fast

502
00:23:31,830 --> 00:23:29,679
here's the earth return orbiter ero for

503
00:23:34,549 --> 00:23:31,840
short it's simply huge

504
00:23:36,789 --> 00:23:34,559
with a wingspan of about 120 feet is as

505
00:23:40,070 --> 00:23:36,799
big as an airliner launched an ariane

506
00:23:42,950 --> 00:23:40,080
6-4 rocket from uh european spaceport

507
00:23:45,350 --> 00:23:42,960
it this six and a half ton cargo ship is

508
00:23:47,990 --> 00:23:45,360
propelled by both chemical rockets

509
00:23:49,990 --> 00:23:48,000
and the most powerful iron drive

510
00:23:51,430 --> 00:23:50,000
electric propulsion system ever used in

511
00:23:53,510 --> 00:23:51,440
a deep space mission

512
00:23:55,269 --> 00:23:53,520
so it must scoop up the container as

513
00:23:57,669 --> 00:23:55,279

bobby described

514

00:23:58,390 --> 00:23:57,679

in orbit around miles and then do the

515

00:24:01,190 --> 00:23:58,400

home run

516

00:24:01,430 --> 00:24:01,200

back to earth so on its cargo deck will

517

00:24:04,149 --> 00:24:01,440

be

518

00:24:05,830 --> 00:24:04,159

nasa sample containment system an earth

519

00:24:07,029 --> 00:24:05,840

entry vehicle that will land back on

520

00:24:10,789 --> 00:24:07,039

earth

521

00:24:12,950 --> 00:24:10,799

already under contract we're already

522

00:24:14,789 --> 00:24:12,960

building it with the european dream team

523

00:24:16,630 --> 00:24:14,799

with expense extensive knowledge from

524

00:24:19,750 --> 00:24:16,640

deep space missions like the

525

00:24:21,590 --> 00:24:19,760

rosetta comet chaser beppy colombo which

526

00:24:23,830 --> 00:24:21,600

is our mission on the way to mercury

527

00:24:25,029 --> 00:24:23,840

and also the exomars trace gas orbiter

528

00:24:27,510 --> 00:24:25,039

itself so

529

00:24:28,070 --> 00:24:27,520

in summary um i hope i've convinced you

530

00:24:30,149 --> 00:24:28,080

that

531

00:24:31,990 --> 00:24:30,159

the european space agency is also super

532

00:24:34,230 --> 00:24:32,000

excited to be part of this

533

00:24:36,149 --> 00:24:34,240

may be my sample return campaign it's

534

00:24:38,549 --> 00:24:36,159

really the most extraordinary

535

00:24:39,830 --> 00:24:38,559

mind-bendingly complicated and will be

536

00:24:42,630 --> 00:24:39,840

history-making

537

00:24:44,230 --> 00:24:42,640

exploration campaign but having said all

538

00:24:46,950 --> 00:24:44,240

that you may also want to know

539

00:24:48,630 --> 00:24:46,960

why we so much want to do msr why do we

540

00:24:50,149 --> 00:24:48,640

want to bring the samples back

541

00:24:51,909 --> 00:24:50,159

so to answer that i would like to hand

542

00:24:55,669 --> 00:24:51,919

over to mary wojtek from

543

00:24:59,990 --> 00:24:58,950

thank you david well you've just heard

544

00:25:03,110 --> 00:25:00,000

details of this

545

00:25:04,470 --> 00:25:03,120

collaborative multi-generational truly

546

00:25:06,830 --> 00:25:04,480

bold mission

547

00:25:08,070 --> 00:25:06,840

including that we are sending a robotic

548

00:25:11,510 --> 00:25:08,080

astrobiologist

549

00:25:15,269 --> 00:25:11,520

what's astrobiology it's the study of

550

00:25:16,870 --> 00:25:15,279

how we get from materials from our star

551

00:25:19,029 --> 00:25:16,880

all the way through the steps that it

552

00:25:21,750 --> 00:25:19,039

takes to build habitable planets

553

00:25:23,110 --> 00:25:21,760

and support of an environment from which

554

00:25:26,310 --> 00:25:23,120

earth

555

00:25:29,029 --> 00:25:26,320

from which life could emerge um to

556

00:25:31,190 --> 00:25:29,039

a verdant planet like earth so that's

557

00:25:33,110 --> 00:25:31,200

what astrobiology is about

558

00:25:34,310 --> 00:25:33,120

and it answers three very important

559

00:25:38,149 --> 00:25:34,320

questions

560

00:25:40,630 --> 00:25:38,159

slide where did we come from

561

00:25:43,029 --> 00:25:40,640

how did we involve to inhabit the earth

562

00:25:45,430 --> 00:25:43,039

and is there anybody else out there

563

00:25:47,669 --> 00:25:45,440

this mission is going to look and

564

00:25:50,149 --> 00:25:47,679

address that final question

565

00:25:51,269 --> 00:25:50,159

and how have we been prepping for this

566

00:25:53,110 --> 00:25:51,279

well our strategy

567

00:25:54,950 --> 00:25:53,120

as astrobiologists have been to try to

568

00:25:57,269 --> 00:25:54,960

understand everything we possibly can

569

00:26:00,230 --> 00:25:57,279

about the biology here on earth

570

00:26:01,510 --> 00:26:00,240

so how did life emerge what are its

571

00:26:03,350 --> 00:26:01,520

requirements

572

00:26:05,110 --> 00:26:03,360

what are the environmental conditions

573

00:26:06,950 --> 00:26:05,120

that can support life or what are those

574

00:26:09,029 --> 00:26:06,960

limits where you might be able to find

575

00:26:10,950 --> 00:26:09,039

life here on on earth

576
00:26:13,110 --> 00:26:10,960
and indeed most of the places that we've

577
00:26:15,669 --> 00:26:13,120
looked we have found life no matter how

578
00:26:17,269 --> 00:26:15,679
harsh the environment is

579
00:26:18,950 --> 00:26:17,279
we combine can we go back to that other

580
00:26:22,390 --> 00:26:18,960
slide um

581
00:26:25,350 --> 00:26:22,400
thank you um maybe not there we go

582
00:26:27,029 --> 00:26:25,360
um we combined all that we understand

583
00:26:29,029 --> 00:26:27,039
about what life needs

584
00:26:30,950 --> 00:26:29,039
and we map that on to other places in

585
00:26:33,190 --> 00:26:30,960
our solar system and even beyond

586
00:26:34,710 --> 00:26:33,200
to try to determine other potential

587
00:26:36,549 --> 00:26:34,720
habitable environments and therefore

588
00:26:38,149 --> 00:26:36,559

targets for our missions

589

00:26:40,470 --> 00:26:38,159

now mars has been in focus since the

590

00:26:41,909 --> 00:26:40,480

very beginning of us talking about where

591

00:26:43,750 --> 00:26:41,919

we might find life

592

00:26:46,149 --> 00:26:43,760

and we've successfully flown orbiters

593

00:26:48,870 --> 00:26:46,159

landers and rovers to characterize mars

594

00:26:50,870 --> 00:26:48,880

and have studied environments related to

595

00:26:52,390 --> 00:26:50,880

mars-like conditions here on earth

596

00:26:55,029 --> 00:26:52,400

and in the next slide i just want to

597

00:26:58,149 --> 00:26:55,039

share a couple of those with you

598

00:26:59,590 --> 00:26:58,159

so i'm a microbiologist by training and

599

00:27:01,269 --> 00:26:59,600

i've studied life in in some of the

600

00:27:02,789 --> 00:27:01,279

harshest environments on earth

601
00:27:04,390 --> 00:27:02,799
and these are just photos from a few of

602
00:27:06,710 --> 00:27:04,400
the places that i've been

603
00:27:07,750 --> 00:27:06,720
the top three pictures are from the dry

604
00:27:11,830 --> 00:27:07,760
valleys

605
00:27:15,510 --> 00:27:11,840
of antarctica near the mcmurdo sound

606
00:27:17,990 --> 00:27:15,520
this environment is dry extremely cold

607
00:27:19,430 --> 00:27:18,000
and yet you can find organisms here and

608
00:27:23,190 --> 00:27:19,440
they're metabolizing

609
00:27:26,230 --> 00:27:23,200
and um and and active but it looks a lot

610
00:27:27,909 --> 00:27:26,240
mineralogically like mars as well

611
00:27:29,350 --> 00:27:27,919
the two lower pictures are some

612
00:27:31,830 --> 00:27:29,360
svaldbard

613
00:27:33,909 --> 00:27:31,840

this is a place where i went with a

614

00:27:35,750 --> 00:27:33,919

number of scientists that were pis on

615

00:27:36,470 --> 00:27:35,760

instruments on curate the curiosity

616

00:27:40,549 --> 00:27:36,480

rover

617

00:27:42,789 --> 00:27:40,559

talked about

618

00:27:44,710 --> 00:27:42,799

they used this environment again which

619

00:27:47,269 --> 00:27:44,720

was very similar in temperature

620

00:27:48,549 --> 00:27:47,279

and mineralogical conditions to test

621

00:27:50,870 --> 00:27:48,559

their instruments

622

00:27:51,590 --> 00:27:50,880

put it through their paces see if the

623

00:27:55,510 --> 00:27:51,600

things could

624

00:27:58,549 --> 00:27:55,520

actually detect the chemicals and

625

00:28:00,230 --> 00:27:58,559

photograph the the textures and

626
00:28:00,789 --> 00:28:00,240
characterize the mineralogy of the

627
00:28:03,669 --> 00:28:00,799
environment

628
00:28:05,510 --> 00:28:03,679
as was needed in order for curiosity and

629
00:28:08,950 --> 00:28:05,520
in the future exomars

630
00:28:12,149 --> 00:28:08,960
um to carry out its mission

631
00:28:15,190 --> 00:28:12,159
now i mentioned the curiosity

632
00:28:18,630 --> 00:28:15,200
mission and that has has been

633
00:28:20,870 --> 00:28:18,640
an amazing uh one of our missions

634
00:28:23,350 --> 00:28:20,880
its original goal was to investigate

635
00:28:26,070 --> 00:28:23,360
habitability in gale crater

636
00:28:28,149 --> 00:28:26,080
or as my colleague conrad likes to say

637
00:28:29,669 --> 00:28:28,159
it's checking out the real estate

638
00:28:33,110 --> 00:28:29,679

but in this case instead of for looking

639

00:28:34,950 --> 00:28:33,120

for good schools or community services

640

00:28:37,350 --> 00:28:34,960

curiosity went up there to check out the

641

00:28:38,789 --> 00:28:37,360

climate look for sources of energy

642

00:28:40,470 --> 00:28:38,799

look for the elements that are the

643

00:28:42,789 --> 00:28:40,480

building blocks of life

644

00:28:44,230 --> 00:28:42,799

and found a number of areas that that

645

00:28:48,149 --> 00:28:44,240

would support life

646

00:28:51,830 --> 00:28:50,549

so in eight years of exploration it

647

00:28:53,590 --> 00:28:51,840

found areas that where there were

648

00:28:55,590 --> 00:28:53,600

clearly evidence of water

649

00:28:57,510 --> 00:28:55,600

there were clearly evidence of chemicals

650

00:28:58,789 --> 00:28:57,520

that could could be involved in energy

651
00:29:00,070 --> 00:28:58,799
transduction

652
00:29:02,389 --> 00:29:00,080
and there were the elements that are

653
00:29:03,909 --> 00:29:02,399
needed the primary ones carbon hydrogen

654
00:29:05,990 --> 00:29:03,919
nitrogen oxygen

655
00:29:07,590 --> 00:29:06,000
phosphorus and sulfur and as this

656
00:29:09,590 --> 00:29:07,600
periodic table

657
00:29:11,510 --> 00:29:09,600
is in the picture for life also needs

658
00:29:12,310 --> 00:29:11,520
small amounts from other elements as

659
00:29:13,830 --> 00:29:12,320
well

660
00:29:16,789 --> 00:29:13,840
and many of those were found in gal

661
00:29:19,669 --> 00:29:16,799
crater as well and that set us

662
00:29:21,909 --> 00:29:19,679
to select jezreel crater for this very

663
00:29:24,230 --> 00:29:21,919

important mission

664

00:29:25,990 --> 00:29:24,240

so perseverance is going to go to jeju

665

00:29:28,070 --> 00:29:26,000

crater it's going to characterize

666

00:29:29,029 --> 00:29:28,080

the environment much like curiosity did

667

00:29:31,909 --> 00:29:29,039

but it's going to start

668

00:29:33,669 --> 00:29:31,919

to look for evidence of past life now it

669

00:29:37,909 --> 00:29:33,679

has an incredible challenge and if i

670

00:29:41,990 --> 00:29:40,470

so the challenge is finding a

671

00:29:47,830 --> 00:29:42,000

biosignature

672

00:29:50,070 --> 00:29:47,840

and they can be take all sorts of forms

673

00:29:52,230 --> 00:29:50,080

they can be chemical they can be

674

00:29:54,230 --> 00:29:52,240

structures they can be modifications to

675

00:29:57,190 --> 00:29:54,240

the environment and

676
00:29:57,590 --> 00:29:57,200
in general one of the challenges are

677
00:30:02,870 --> 00:29:57,600
that

678
00:30:03,669 --> 00:30:02,880
are biosignatures can only be produced

679
00:30:05,750 --> 00:30:03,679
by life

680
00:30:06,870 --> 00:30:05,760
so if you look at the top left corner

681
00:30:10,549 --> 00:30:06,880
the lower box

682
00:30:13,590 --> 00:30:10,559
is clearly a fossil of a

683
00:30:14,789 --> 00:30:13,600
an ancient animal here on earth but the

684
00:30:16,630 --> 00:30:14,799
upper

685
00:30:18,870 --> 00:30:16,640
picture just above it that looks like a

686
00:30:21,269 --> 00:30:18,880
plant is actually formed by

687
00:30:21,990 --> 00:30:21,279
a biological processes that's just

688
00:30:24,149 --> 00:30:22,000

precipitation

689

00:30:25,269 --> 00:30:24,159

of minerals and yet it looks very much

690

00:30:27,110 --> 00:30:25,279

like life

691

00:30:29,269 --> 00:30:27,120

and so there are other processes besides

692

00:30:32,149 --> 00:30:29,279

life that can make a bio signature or

693

00:30:35,750 --> 00:30:32,159

something that looks like one

694

00:30:37,990 --> 00:30:35,760

there are other i

695

00:30:39,430 --> 00:30:38,000

this particular mission is finding

696

00:30:42,630 --> 00:30:39,440

itself in

697

00:30:45,430 --> 00:30:42,640

more the gray area where ambiguous

698

00:30:47,510 --> 00:30:45,440

features are what we'll be looking at

699

00:30:48,389 --> 00:30:47,520

those that could potentially be made by

700

00:30:50,149 --> 00:30:48,399

life

701
00:30:52,070 --> 00:30:50,159
there are also processes that we know

702
00:30:54,630 --> 00:30:52,080
that may also

703
00:30:56,310 --> 00:30:54,640
uh produce them a biologically but we're

704
00:30:58,230 --> 00:30:56,320
going to have instruments particularly

705
00:31:00,950 --> 00:30:58,240
when we bring the samples back

706
00:31:02,389 --> 00:31:00,960
that will be able to distinguish that so

707
00:31:03,990 --> 00:31:02,399
ken who's coming up next is going to

708
00:31:05,430 --> 00:31:04,000
talk a little bit about stromatolites

709
00:31:07,190 --> 00:31:05,440
which are in the upper right corner so

710
00:31:08,149 --> 00:31:07,200
i'm not talking much about that but i

711
00:31:10,470 --> 00:31:08,159
will mention

712
00:31:12,789 --> 00:31:10,480
the figure in the lower right is an

713
00:31:14,549 --> 00:31:12,799

example of the more complex

714

00:31:17,269 --> 00:31:14,559

measurements that we will be able to

715

00:31:19,430 --> 00:31:17,279

make with the samples that we return

716

00:31:21,029 --> 00:31:19,440

from this very important mission to try

717

00:31:23,509 --> 00:31:21,039

to really confirm

718

00:31:25,269 --> 00:31:23,519

if things that we believe the

719

00:31:28,149 --> 00:31:25,279

perseverance observed

720

00:31:29,269 --> 00:31:28,159

could be evidence of ancient life and

721

00:31:31,310 --> 00:31:29,279

with that

722

00:31:33,110 --> 00:31:31,320

i'd like to just say that we

723

00:31:35,909 --> 00:31:33,120

astrobiologists have been

724

00:31:37,350 --> 00:31:35,919

dreaming about this mission for decades

725

00:31:39,750 --> 00:31:37,360

and i'd like to turn it over to my

726
00:31:44,549 --> 00:31:39,760
fellow astrobiologists and the mars 2020

727
00:31:50,149 --> 00:31:47,909
thanks mary and hello everyone um

728
00:31:51,909 --> 00:31:50,159
i want to say like the others have how

729
00:31:54,710 --> 00:31:51,919
fortunate i feel

730
00:31:55,990 --> 00:31:54,720
uh to be in this in this place and at

731
00:31:58,870 --> 00:31:56,000
this place in time

732
00:31:59,509 --> 00:31:58,880
how excited i am to be literally on the

733
00:32:02,789 --> 00:31:59,519
eve

734
00:32:05,430 --> 00:32:02,799
of uh of this historic and really

735
00:32:07,269 --> 00:32:05,440
it's grand cooperation i mean it's an

736
00:32:09,909 --> 00:32:07,279
enormous undertaking

737
00:32:10,470 --> 00:32:09,919
uh that we're we're uh that's in front

738
00:32:12,549 --> 00:32:10,480

of us

739

00:32:13,590 --> 00:32:12,559

um and it has enormous scientific

740

00:32:17,269 --> 00:32:13,600

potential

741

00:32:20,470 --> 00:32:17,279

these are the

742

00:32:22,560 --> 00:32:20,480

truly big questions that we're after

743

00:32:23,830 --> 00:32:22,570

uh as you've heard

744

00:32:26,710 --> 00:32:23,840

[Music]

745

00:32:28,070 --> 00:32:26,720

you know we know from uh from prior

746

00:32:30,549 --> 00:32:28,080

rover missions and and

747

00:32:32,549 --> 00:32:30,559

work done from earth uh and from our

748

00:32:35,190 --> 00:32:32,559

orbiters around mars

749

00:32:37,110 --> 00:32:35,200

we have very strong evidence that mars

750

00:32:40,230 --> 00:32:37,120

could have supported life

751

00:32:44,549 --> 00:32:40,240

in its distant past the question

752

00:32:47,590 --> 00:32:44,559

is was mars ever a living planet

753

00:32:50,470 --> 00:32:47,600

you know um is earth which we know

754

00:32:51,909 --> 00:32:50,480

clearly is friendly to life today and as

755

00:32:52,630 --> 00:32:51,919

far as we can tell from the geologic

756

00:32:54,870 --> 00:32:52,640

record

757

00:32:56,950 --> 00:32:54,880

has been friendly to life uh throughout

758

00:32:59,430 --> 00:32:56,960

its uh its entire history

759

00:33:00,470 --> 00:32:59,440

nearly its entire history uh as far as

760

00:33:03,990 --> 00:33:00,480

we can tell

761

00:33:06,630 --> 00:33:04,000

uh is that just an anomaly is it a fluke

762

00:33:08,070 --> 00:33:06,640

are we alone in the darkness you know

763

00:33:10,230 --> 00:33:08,080

spinning around the sun

764

00:33:11,669 --> 00:33:10,240

spinning around the galactic center or

765

00:33:14,310 --> 00:33:11,679

are there other places

766

00:33:16,870 --> 00:33:14,320

out there uh that harbor life and and

767

00:33:19,190 --> 00:33:16,880

potentially even in our own solar system

768

00:33:20,630 --> 00:33:19,200

so that's what we're setting out to do

769

00:33:22,149 --> 00:33:20,640

starting tomorrow when we get to the

770

00:33:25,269 --> 00:33:22,159

surface of mars

771

00:33:27,509 --> 00:33:25,279

but what are we going to look for and uh

772

00:33:29,509 --> 00:33:27,519

you know to put it most basically we're

773

00:33:31,990 --> 00:33:29,519

looking for life-like patterns

774

00:33:32,789 --> 00:33:32,000

in the in the exploration environment so

775

00:33:35,190 --> 00:33:32,799

here you see an

776

00:33:36,470 --> 00:33:35,200

image i'm also gonna hold up the real

777

00:33:37,909 --> 00:33:36,480

deal here i don't know if i'll have it

778

00:33:40,230 --> 00:33:37,919

in the same orientation for you and

779

00:33:42,149 --> 00:33:40,240

hopefully my camera can get some focus

780

00:33:43,669 --> 00:33:42,159

this is as mary said she used the word

781

00:33:47,509 --> 00:33:43,679

stromatolite

782

00:33:48,950 --> 00:33:47,519

originally would have been like this

783

00:33:51,509 --> 00:33:48,960

when i picked it up

784

00:33:53,669 --> 00:33:51,519

like this it was a dome-shaped thing and

785

00:33:57,350 --> 00:33:53,679

so you're looking at the eroded

786

00:33:59,430 --> 00:33:57,360

top-down view of the internal structure

787

00:34:01,110 --> 00:33:59,440

of this thing and these finely wrinkled

788

00:34:03,830 --> 00:34:01,120

layers

789

00:34:04,950 --> 00:34:03,840

beautiful sort of organic looking if you

790

00:34:06,870 --> 00:34:04,960

like

791

00:34:08,550 --> 00:34:06,880

textures we use this word texture in

792

00:34:10,230 --> 00:34:08,560

geology to basically mean

793

00:34:11,589 --> 00:34:10,240

shape we sometimes call it say

794

00:34:14,310 --> 00:34:11,599

morphologies

795

00:34:16,069 --> 00:34:14,320

so these shapes these life-like patterns

796

00:34:17,109 --> 00:34:16,079

that we see in the rocks are obviously

797

00:34:19,589 --> 00:34:17,119

part of it

798

00:34:20,230 --> 00:34:19,599

what caused this pattern well this this

799

00:34:23,190 --> 00:34:20,240

uh

800

00:34:24,710 --> 00:34:23,200

fossil i picked up from an environment

801
00:34:26,790 --> 00:34:24,720
not at all dissimilar to

802
00:34:29,190 --> 00:34:26,800
to where we're going with mars 2020.

803
00:34:30,230 --> 00:34:29,200
this was from a 2.7 billion-year-old

804
00:34:32,629 --> 00:34:30,240
lake deposit

805
00:34:34,629 --> 00:34:32,639
in western australia an area called the

806
00:34:37,750 --> 00:34:34,639
tombiana formation

807
00:34:40,629 --> 00:34:37,760
uh and so so these rocks were deposited

808
00:34:42,389 --> 00:34:40,639
long before billions of years before

809
00:34:44,869 --> 00:34:42,399
complex multicellular

810
00:34:45,829 --> 00:34:44,879
uh life arose on or things like animals

811
00:34:48,069 --> 00:34:45,839
and plants

812
00:34:50,470 --> 00:34:48,079
and so when we find fossils in rocks of

813
00:34:53,190 --> 00:34:50,480

of this age especially ancient

814

00:34:54,629 --> 00:34:53,200

age they were made completely from

815

00:34:56,710 --> 00:34:54,639

microorganisms so these are

816

00:34:59,589 --> 00:34:56,720

single-celled organisms that sometimes

817

00:35:01,510 --> 00:34:59,599

join together in communities that live

818

00:35:01,990 --> 00:35:01,520

in layers one on top of the other and

819

00:35:04,069 --> 00:35:02,000

sometimes

820

00:35:05,030 --> 00:35:04,079

exuding sticky substances from their

821

00:35:07,510 --> 00:35:05,040

cells

822

00:35:08,150 --> 00:35:07,520

in which sediment particles can be

823

00:35:11,109 --> 00:35:08,160

trapped

824

00:35:13,190 --> 00:35:11,119

and bound also the organisms themselves

825

00:35:16,470 --> 00:35:13,200

can stimulate precipitation

826

00:35:19,510 --> 00:35:16,480

of minerals onto their little bodies

827

00:35:20,950 --> 00:35:19,520

which then creates a fossil uh

828

00:35:23,510 --> 00:35:20,960

right there in place and so you're

829

00:35:25,430 --> 00:35:23,520

looking at a fossilized microbial mat

830

00:35:27,829 --> 00:35:25,440

uh that formed on the edge of a lake you

831

00:35:28,790 --> 00:35:27,839

know nearly three billion years ago

832

00:35:30,950 --> 00:35:28,800

so that's the kind of thing we're

833

00:35:33,030 --> 00:35:30,960

looking for but as mary pointed out

834

00:35:35,750 --> 00:35:33,040

looks can be deceiving right we have to

835

00:35:38,550 --> 00:35:35,760

be very careful not to fool ourselves

836

00:35:40,230 --> 00:35:38,560

and so looks are almost never enough and

837

00:35:42,310 --> 00:35:40,240

as mary said also

838

00:35:44,310 --> 00:35:42,320

you know we may get so lucky as to find

839

00:35:46,069 --> 00:35:44,320

something uh you know so beautifully

840

00:35:46,870 --> 00:35:46,079

preserved as this stromatolite that i

841

00:35:49,190 --> 00:35:46,880

showed you

842

00:35:51,589 --> 00:35:49,200

but far more likely is that anything we

843

00:35:53,910 --> 00:35:51,599

find will be much more ambiguous that's

844

00:35:55,270 --> 00:35:53,920

typically the case on on earth as well

845

00:35:56,390 --> 00:35:55,280

and so we have to look at the

846

00:35:58,790 --> 00:35:56,400

compositions

847

00:36:00,550 --> 00:35:58,800

we're looking for lifelike shapes and

848

00:36:02,310 --> 00:36:00,560

lifelike compositions chemical

849

00:36:05,030 --> 00:36:02,320

compositions so the elements

850

00:36:06,870 --> 00:36:05,040

the minerals the molecules the organic

851
00:36:08,710 --> 00:36:06,880
molecules that we know are associated

852
00:36:10,069 --> 00:36:08,720
with life we're looking for all those

853
00:36:11,750 --> 00:36:10,079
things occurring together

854
00:36:13,670 --> 00:36:11,760
and this is why we have this incredibly

855
00:36:16,150 --> 00:36:13,680
capable scientific payload

856
00:36:16,790 --> 00:36:16,160
on our rover but this is only the

857
00:36:18,470 --> 00:36:16,800
beginning

858
00:36:20,069 --> 00:36:18,480
of course as you've heard the exciting

859
00:36:22,550 --> 00:36:20,079
part all that engineering happens

860
00:36:23,910 --> 00:36:22,560
we get the samples back on earth uh

861
00:36:26,390 --> 00:36:23,920
someday and we have

862
00:36:27,589 --> 00:36:26,400
uh folks on our team now a group of

863
00:36:30,310 --> 00:36:27,599

people called the return

864

00:36:30,630 --> 00:36:30,320

sample science participating scientists

865

00:36:32,870 --> 00:36:30,640

who

866

00:36:34,710 --> 00:36:32,880

are representing the interests of those

867

00:36:36,230 --> 00:36:34,720

those future workers and so i'll pass it

868

00:36:37,990 --> 00:36:36,240

now to libby hauserath

869

00:36:39,750 --> 00:36:38,000

who is is one of our return sample

870

00:36:40,550 --> 00:36:39,760

science participating scientists to tell

871

00:36:43,910 --> 00:36:40,560

you more about

872

00:36:44,550 --> 00:36:43,920

how all that's going to work thank you

873

00:36:47,270 --> 00:36:44,560

ken

874

00:36:49,270 --> 00:36:47,280

as others have said i am very excited to

875

00:36:50,470 --> 00:36:49,280

be one of the return sample scientists

876

00:36:53,430 --> 00:36:50,480

working on the mars

877

00:36:55,430 --> 00:36:53,440

2020 mission my job is to represent the

878

00:36:57,270 --> 00:36:55,440

interests of these future scientists

879

00:36:58,870 --> 00:36:57,280

who will study these samples once

880

00:36:59,510 --> 00:36:58,880

they're returned using cutting-edge

881

00:37:02,550 --> 00:36:59,520

techniques

882

00:37:03,270 --> 00:37:02,560

in earth's laboratories in selecting the

883

00:37:05,510 --> 00:37:03,280

samples

884

00:37:07,270 --> 00:37:05,520

we're going to try to address this main

885

00:37:09,109 --> 00:37:07,280

one of these main goals of the mission

886

00:37:11,670 --> 00:37:09,119

which is to determine whether ancient

887

00:37:13,270 --> 00:37:11,680

life existed at jezreel crater

888

00:37:15,990 --> 00:37:13,280

we will use the instruments on the

889

00:37:17,589 --> 00:37:16,000

mission this is an artist's rendition of

890

00:37:19,910 --> 00:37:17,599

the super cam instrument

891

00:37:21,990 --> 00:37:19,920

to select samples to try to be able to

892

00:37:24,069 --> 00:37:22,000

answer that question

893

00:37:25,990 --> 00:37:24,079

as many mentioned we will look for

894

00:37:27,589 --> 00:37:26,000

samples that have evidence of past

895

00:37:31,109 --> 00:37:27,599

habitable conditions

896

00:37:31,589 --> 00:37:31,119

next slide please this is an image

897

00:37:33,349 --> 00:37:31,599

showing

898

00:37:34,710 --> 00:37:33,359

the characteristics that can indicate

899

00:37:36,630 --> 00:37:34,720

past habitability

900

00:37:38,550 --> 00:37:36,640

such as evidence of liquid water which

901
00:37:41,270 --> 00:37:38,560
is needed for all life as we know it

902
00:37:42,069 --> 00:37:41,280
all raw materials energy sources and

903
00:37:46,470 --> 00:37:42,079
sufficiently

904
00:37:48,550 --> 00:37:46,480
favorable conditions next slide please

905
00:37:49,990 --> 00:37:48,560
we will also look for samples that have

906
00:37:52,790 --> 00:37:50,000
evidence of conditions that can

907
00:37:54,870 --> 00:37:52,800
preserve past evidence of life past

908
00:37:57,270 --> 00:37:54,880
evidence of life can include organics

909
00:37:59,349 --> 00:37:57,280
minerals morphology and structure

910
00:38:01,670 --> 00:37:59,359
chemistry and isotopes

911
00:38:02,630 --> 00:38:01,680
and some materials such as clay minerals

912
00:38:04,790 --> 00:38:02,640
and silica

913
00:38:06,630 --> 00:38:04,800

are very good at preserving ancient life

914

00:38:07,829 --> 00:38:06,640

on earth and so we will look for these

915

00:38:13,589 --> 00:38:07,839

types of materials

916

00:38:17,589 --> 00:38:15,910

these samples with the potential past

917

00:38:20,550 --> 00:38:17,599

life that they may contain within

918

00:38:21,910 --> 00:38:20,560

them represent an amazing opportunity

919

00:38:23,829 --> 00:38:21,920

for future scientists

920

00:38:25,829 --> 00:38:23,839

and so i'd like to say a few words to

921

00:38:29,030 --> 00:38:25,839

future scientists who may be students

922

00:38:30,470 --> 00:38:29,040

or even children right now we all know

923

00:38:32,550 --> 00:38:30,480

that studying science

924

00:38:33,750 --> 00:38:32,560

and doing science can sometimes be

925

00:38:36,390 --> 00:38:33,760

discouraging

926

00:38:37,430 --> 00:38:36,400

science is hard science is hard for

927

00:38:39,510 --> 00:38:37,440

everybody

928

00:38:41,109 --> 00:38:39,520

so just because it's hard for you

929

00:38:42,310 --> 00:38:41,119

doesn't mean that you aren't going to be

930

00:38:44,310 --> 00:38:42,320

good at it

931

00:38:46,230 --> 00:38:44,320

it might be that you aren't as good at

932

00:38:48,710 --> 00:38:46,240

it yet as you will be

933

00:38:50,150 --> 00:38:48,720

and more practice and more experience

934

00:38:52,630 --> 00:38:50,160

will be helpful

935

00:38:53,510 --> 00:38:52,640

it might be that you are good at it

936

00:38:55,670 --> 00:38:53,520

right now

937

00:38:57,589 --> 00:38:55,680

and it's just hard and so what i would

938

00:39:00,150 --> 00:38:57,599

like to say to the future scientists

939

00:39:01,910 --> 00:39:00,160

is that perseverance is well named

940

00:39:02,790 --> 00:39:01,920

perseverance is what it takes to be a

941

00:39:04,390 --> 00:39:02,800

scientist

942

00:39:06,150 --> 00:39:04,400

and i would encourage everybody who's

943

00:39:08,230 --> 00:39:06,160

interested in studying science

944

00:39:10,150 --> 00:39:08,240

to please persevere if you feel

945

00:39:10,710 --> 00:39:10,160

discouraged perhaps reach out to a

946

00:39:13,109 --> 00:39:10,720

mentor

947

00:39:14,550 --> 00:39:13,119

or seek peer support because when these

948

00:39:16,870 --> 00:39:14,560

samples come back

949

00:39:17,670 --> 00:39:16,880

we need the best scientists from all

950

00:39:19,670 --> 00:39:17,680

backgrounds

951
00:39:21,430 --> 00:39:19,680
to help us work on these amazing

952
00:39:24,470 --> 00:39:21,440
scientific questions

953
00:39:28,310 --> 00:39:26,550
because when the samples come back we

954
00:39:30,950 --> 00:39:28,320
will be able to analyze them here

955
00:39:33,190 --> 00:39:30,960
in the best laboratories on earth this

956
00:39:35,349 --> 00:39:33,200
is an image of a synchrotron facility

957
00:39:36,550 --> 00:39:35,359
and for scale those are cars in the

958
00:39:38,870 --> 00:39:36,560
parking lot

959
00:39:40,150 --> 00:39:38,880
we can't take this to mars with us but

960
00:39:42,710 --> 00:39:40,160
what we can do

961
00:39:43,270 --> 00:39:42,720
is bring the samples back as you have

962
00:39:44,950 --> 00:39:43,280
seen

963
00:39:46,870 --> 00:39:44,960

the samples will be about the size of a

964

00:39:47,829 --> 00:39:46,880

piece of chalk and we will be able to

965

00:39:50,390 --> 00:39:47,839

analyzing them

966

00:39:51,109 --> 00:39:50,400

using techniques that require such small

967

00:39:54,150 --> 00:39:51,119

amounts

968

00:39:55,670 --> 00:39:54,160

it's difficult to see this is an image

969

00:39:57,910 --> 00:39:55,680

of one of our samples

970

00:39:59,589 --> 00:39:57,920

that was analyzed at the synchrotron on

971

00:40:01,670 --> 00:39:59,599

the tip of the capillary tube

972

00:40:02,950 --> 00:40:01,680

that is so small it's hard to see in

973

00:40:05,109 --> 00:40:02,960

this photo

974

00:40:07,109 --> 00:40:05,119

so when we can analyze these samples

975

00:40:08,390 --> 00:40:07,119

using these fine scale techniques back

976

00:40:10,710 --> 00:40:08,400

here on earth

977

00:40:13,589 --> 00:40:10,720

that is when the story really begins

978

00:40:15,670 --> 00:40:13,599

back to you marina

979

00:40:17,109 --> 00:40:15,680

thank you so much libby and thank you so

980

00:40:19,829 --> 00:40:17,119

much to all of our panelist

981

00:40:21,270 --> 00:40:19,839

presenters we are now ready to take a

982

00:40:23,750 --> 00:40:21,280

media questions

983

00:40:24,630 --> 00:40:23,760

remember to press star one to get put in

984

00:40:27,030 --> 00:40:24,640

the queue

985

00:40:28,230 --> 00:40:27,040

and please direct your questions to one

986

00:40:30,550 --> 00:40:28,240

of the panelists

987

00:40:31,750 --> 00:40:30,560

we're also taking questions through the

988

00:40:35,109 --> 00:40:31,760

hashtag

989

00:40:37,589 --> 00:40:35,119

countdown to mars our first

990

00:40:40,710 --> 00:40:37,599

question comes from jeff faust with

991

00:40:43,670 --> 00:40:40,720

space news good afternoon jeff

992

00:40:44,470 --> 00:40:43,680

good afternoon a question for thomas or

993

00:40:46,309 --> 00:40:44,480

bobby

994

00:40:47,910 --> 00:40:46,319

you mentioned the independent review

995

00:40:50,150 --> 00:40:47,920

board report

996

00:40:52,550 --> 00:40:50,160

that included a number of findings and

997

00:40:53,670 --> 00:40:52,560

recommendations about potential changes

998

00:40:56,309 --> 00:40:53,680

to the architecture

999

00:40:57,670 --> 00:40:56,319

cost schedule from our sample return i

1000

00:40:59,510 --> 00:40:57,680

wanted to see if you could provide an

1001

00:41:01,510 --> 00:40:59,520

update in terms of what nasa is

1002

00:41:03,109 --> 00:41:01,520

doing to review or implement those

1003

00:41:04,550 --> 00:41:03,119

recommendations and when we might see

1004

00:41:06,790 --> 00:41:04,560

any sort of changes

1005

00:41:08,710 --> 00:41:06,800

or decisions not to change uh the

1006

00:41:09,190 --> 00:41:08,720

overall architecture from our sample

1007

00:41:12,790 --> 00:41:09,200

return

1008

00:41:13,510 --> 00:41:12,800

thanks thanks jeff that's a a great

1009

00:41:16,230 --> 00:41:13,520

question

1010

00:41:17,670 --> 00:41:16,240

very well informed uh so that the board

1011

00:41:19,990 --> 00:41:17,680

that thomas referenced

1012

00:41:22,230 --> 00:41:20,000

was an outstanding board and we've we're

1013

00:41:25,349 --> 00:41:22,240

taking the findings and recommendations

1014

00:41:26,630 --> 00:41:25,359

uh from that report very seriously so

1015

00:41:28,390 --> 00:41:26,640

the program now the

1016

00:41:29,829 --> 00:41:28,400

the flight missions that i was referring

1017

00:41:32,550 --> 00:41:29,839

to that are in development

1018

00:41:32,950 --> 00:41:32,560

we're in what's called phase a and phase

1019

00:41:36,870 --> 00:41:32,960

a

1020

00:41:39,750 --> 00:41:36,880

missions

1021

00:41:41,109 --> 00:41:39,760

we don't have a firm baseline at nasa

1022

00:41:42,630 --> 00:41:41,119

for the way we're going to do these

1023

00:41:45,750 --> 00:41:42,640

missions until the end

1024

00:41:47,030 --> 00:41:45,760

of of phase a and so as part of our

1025

00:41:49,910 --> 00:41:47,040

phase a studies

1026

00:41:51,190 --> 00:41:49,920

we are we've incorporated the findings

1027

00:41:53,510 --> 00:41:51,200

and recommendations

1028

00:41:55,030 --> 00:41:53,520

uh from that board report so we're still

1029

00:41:56,390 --> 00:41:55,040

looking at a number of trades we were

1030

00:41:57,990 --> 00:41:56,400

looking at a number of

1031

00:42:00,550 --> 00:41:58,000

different trades ourselves and we've

1032

00:42:01,510 --> 00:42:00,560

added uh to that trade space based on

1033

00:42:04,150 --> 00:42:01,520

the report

1034

00:42:04,790 --> 00:42:04,160

and we plan to respond uh fully to all

1035

00:42:07,270 --> 00:42:04,800

of those

1036

00:42:08,309 --> 00:42:07,280

uh actions by the end of this this phase

1037

00:42:10,230 --> 00:42:08,319

that we're in now

1038

00:42:12,069 --> 00:42:10,240

and that'll be at the uh you know

1039

00:42:16,150 --> 00:42:12,079

somewhere around october

1040

00:42:18,230 --> 00:42:16,160

of 2021.

1041

00:42:19,270 --> 00:42:18,240

thank you jeff and thank you bobby our

1042

00:42:22,150 --> 00:42:19,280

next caller is

1043

00:42:23,990 --> 00:42:22,160

mike wall with space.com good afternoon

1044

00:42:27,670 --> 00:42:24,000

mike

1045

00:42:29,349 --> 00:42:27,680

yep yeah yeah hi thank you all um

1046

00:42:31,430 --> 00:42:29,359

and yeah yeah i mean best of luck

1047

00:42:33,990 --> 00:42:31,440

tomorrow to everyone um

1048

00:42:36,069 --> 00:42:34,000

i'm i'm interested in there's there's

1049

00:42:37,430 --> 00:42:36,079

like there's one aspect of the return to

1050

00:42:38,870 --> 00:42:37,440

earth that i don't think we've

1051
00:42:40,790 --> 00:42:38,880
talked about that much and that's where

1052
00:42:43,829 --> 00:42:40,800
these samples are are going to be housed

1053
00:42:45,109 --> 00:42:43,839
the the like new sample return facility

1054
00:42:47,349 --> 00:42:45,119
so i just like i mean

1055
00:42:49,270 --> 00:42:47,359
like is there any news about what the

1056
00:42:49,670 --> 00:42:49,280
planning for that involves at the moment

1057
00:42:52,309 --> 00:42:49,680
and

1058
00:42:53,990 --> 00:42:52,319
when what the timeline is for um for

1059
00:42:56,150 --> 00:42:54,000
when that facility is going to be

1060
00:42:57,430 --> 00:42:56,160
sort of greenlit and built and what it's

1061
00:42:59,670 --> 00:42:57,440
going to look like what what

1062
00:43:01,270 --> 00:42:59,680
what sort of buildings are you using as

1063
00:43:02,150 --> 00:43:01,280

a model for that facility down the road

1064

00:43:04,390 --> 00:43:02,160

do you think

1065

00:43:05,990 --> 00:43:04,400

thank you i'm going to start answering

1066

00:43:07,990 --> 00:43:06,000

the question i'll kick it over to bobby

1067

00:43:10,550 --> 00:43:08,000

for more technical details

1068

00:43:11,270 --> 00:43:10,560

but you should know just as part of the

1069

00:43:13,589 --> 00:43:11,280

kind of

1070

00:43:15,829 --> 00:43:13,599

response relative as part of that phase

1071

00:43:18,710 --> 00:43:15,839

a work that bobby referred to

1072

00:43:19,430 --> 00:43:18,720

we're also looking at the ground systems

1073

00:43:21,750 --> 00:43:19,440

now

1074

00:43:22,790 --> 00:43:21,760

and we're kicking that off as a really

1075

00:43:24,790 --> 00:43:22,800

deliberate study

1076

00:43:26,870 --> 00:43:24,800

uh looking with the international

1077

00:43:29,430 --> 00:43:26,880

community and what needs to happen

1078

00:43:30,710 --> 00:43:29,440

considering all the elements that are

1079

00:43:32,230 --> 00:43:30,720

there remember

1080

00:43:33,990 --> 00:43:32,240

when they hit the ground from the

1081

00:43:36,230 --> 00:43:34,000

beginning we want to make sure that we

1082

00:43:37,349 --> 00:43:36,240

are protected against all eventualities

1083

00:43:40,309 --> 00:43:37,359

and needless to say

1084

00:43:40,790 --> 00:43:40,319

there's a lot of knowledge we can gain

1085

00:43:43,990 --> 00:43:40,800

from

1086

00:43:46,710 --> 00:43:44,000

other people who are dealing with uh

1087

00:43:47,829 --> 00:43:46,720

with unknown kind of chemicals unknown

1088

00:43:49,430 --> 00:43:47,839

engines and that's

1089

00:43:52,470 --> 00:43:49,440

that's kind of the first phase kind of

1090

00:43:53,030 --> 00:43:52,480

the sample uh retrieving facility phase

1091

00:43:54,710 --> 00:43:53,040

and then

1092

00:43:56,790 --> 00:43:54,720

you know there's a process by which we

1093

00:43:57,190 --> 00:43:56,800

release those samples with a very very

1094

00:43:59,829 --> 00:43:57,200

high

1095

00:44:00,550 --> 00:43:59,839

likelihood and kind of very freely uh

1096

00:44:02,870 --> 00:44:00,560

with you know

1097

00:44:04,710 --> 00:44:02,880

according to to the various uh

1098

00:44:05,030 --> 00:44:04,720

principles that we're setting out so

1099

00:44:07,349 --> 00:44:05,040

we're

1100

00:44:09,030 --> 00:44:07,359

right in the middle of this and and just

1101
00:44:11,670 --> 00:44:09,040
like we said uh this is

1102
00:44:13,030 --> 00:44:11,680
not yet uh concluded but that bobby

1103
00:44:15,589 --> 00:44:13,040
anything you wanted to add

1104
00:44:17,270 --> 00:44:15,599
yeah just very quickly add um you know

1105
00:44:18,870 --> 00:44:17,280
just the time frame here right so the

1106
00:44:20,069 --> 00:44:18,880
new missions that we're talking about

1107
00:44:23,030 --> 00:44:20,079
will launch in

1108
00:44:23,430 --> 00:44:23,040
26 or 28 the samples will come back to

1109
00:44:26,390 --> 00:44:23,440
earth

1110
00:44:27,190 --> 00:44:26,400
in the early 2030s so there's a good bit

1111
00:44:29,349 --> 00:44:27,200
there's a decade

1112
00:44:30,710 --> 00:44:29,359
between now and the time that the

1113
00:44:32,870 --> 00:44:30,720

samples would be

1114

00:44:33,990 --> 00:44:32,880

needed to go into the facility we are

1115

00:44:36,870 --> 00:44:34,000

looking at both

1116

00:44:37,990 --> 00:44:36,880

modification to existing facilities and

1117

00:44:40,309 --> 00:44:38,000

creation

1118

00:44:41,430 --> 00:44:40,319

of new facilities but that's a study

1119

00:44:44,550 --> 00:44:41,440

that's uh

1120

00:44:47,910 --> 00:44:44,560

you know just ongoing thank you

1121

00:44:51,030 --> 00:44:47,920

to dr zian to bobby next caller is

1122

00:44:53,030 --> 00:44:51,040

keith cowing from nasa watch good

1123

00:44:54,790 --> 00:44:53,040

afternoon keith

1124

00:44:57,510 --> 00:44:54,800

good afternoon can you hear me yes we

1125

00:44:59,910 --> 00:44:57,520

can hear you okay for dr zabukin with

1126
00:45:02,230 --> 00:44:59,920
regard to the exploration of mars

1127
00:45:03,910 --> 00:45:02,240
just as is the case with the moon

1128
00:45:06,069 --> 00:45:03,920
there's a growing international presence

1129
00:45:08,069 --> 00:45:06,079
in orbit on the surface indeed the uae

1130
00:45:08,790 --> 00:45:08,079
and china joined the mars club just last

1131
00:45:10,150 --> 00:45:08,800
week

1132
00:45:12,069 --> 00:45:10,160
but just as things are becoming more

1133
00:45:14,309 --> 00:45:12,079
complex with lunar exploration

1134
00:45:15,670 --> 00:45:14,319
when the issues of planetary protection

1135
00:45:16,790 --> 00:45:15,680
orbital traffic management

1136
00:45:18,710 --> 00:45:16,800
communications

1137
00:45:20,950 --> 00:45:18,720
and science collaborations demonstrate a

1138
00:45:22,309 --> 00:45:20,960

need for the establishment of

1139

00:45:24,630 --> 00:45:22,319

what many people would call good

1140

00:45:26,630 --> 00:45:24,640

practices on mars especially in advance

1141

00:45:28,309 --> 00:45:26,640

of possible commercial human missions

1142

00:45:29,990 --> 00:45:28,319

specifically should something akin to

1143

00:45:30,790 --> 00:45:30,000

the artemis accords which were developed

1144

00:45:32,230 --> 00:45:30,800

for the moon

1145

00:45:35,510 --> 00:45:32,240

also be a good thing to think about

1146

00:45:37,030 --> 00:45:35,520

establishing for the exploration of mars

1147

00:45:39,270 --> 00:45:37,040

thanks so much keith for your uh

1148

00:45:42,150 --> 00:45:39,280

question you are of course correct

1149

00:45:43,670 --> 00:45:42,160

that is that kind of exploration of mars

1150

00:45:45,670 --> 00:45:43,680

is one that has

1151
00:45:47,510 --> 00:45:45,680
many players now and we're so excited

1152
00:45:49,109 --> 00:45:47,520
about the two missions that arrived only

1153
00:45:52,390 --> 00:45:49,119
days or weeks

1154
00:45:54,069 --> 00:45:52,400
ago you know we celebrate all peaceful

1155
00:45:55,510 --> 00:45:54,079
exploration of outer space and

1156
00:45:56,870 --> 00:45:55,520
especially as it's done kind of

1157
00:45:59,109 --> 00:45:56,880
individual countries

1158
00:46:00,069 --> 00:45:59,119
kind of spending their own treasure

1159
00:46:01,510 --> 00:46:00,079
towards

1160
00:46:03,270 --> 00:46:01,520
you know benefiting the science

1161
00:46:05,030 --> 00:46:03,280
community as a whole so

1162
00:46:07,670 --> 00:46:05,040
we're really glad for that it is also

1163
00:46:09,910 --> 00:46:07,680

true that as we already have a number of

1164

00:46:11,910 --> 00:46:09,920

spacecraft in orbit around

1165

00:46:13,750 --> 00:46:11,920

mars for example we've had actually a

1166

00:46:14,870 --> 00:46:13,760

number of discussions and bilateral

1167

00:46:16,710 --> 00:46:14,880

discussions

1168

00:46:18,790 --> 00:46:16,720

with a community overall just to make

1169

00:46:19,430 --> 00:46:18,800

sure that these assets are safe as

1170

00:46:21,670 --> 00:46:19,440

they're

1171

00:46:23,190 --> 00:46:21,680

in orbit around it so it's discussions

1172

00:46:25,430 --> 00:46:23,200

of that type as a

1173

00:46:26,870 --> 00:46:25,440

the community overall needs to really

1174

00:46:29,349 --> 00:46:26,880

focus on

1175

00:46:30,069 --> 00:46:29,359

just for the benefit of all players that

1176

00:46:32,630 --> 00:46:30,079

are uh

1177

00:46:33,430 --> 00:46:32,640

you know in orbit uh right now it's also

1178

00:46:35,510 --> 00:46:33,440

true

1179

00:46:36,470 --> 00:46:35,520

that uh with the artemis accords as you

1180

00:46:39,829 --> 00:46:36,480

said uh

1181

00:46:41,910 --> 00:46:39,839

uh jeff gorsa uh sorry keith uh

1182

00:46:43,430 --> 00:46:41,920

of course is that uh with the artemis

1183

00:46:45,910 --> 00:46:43,440

accords we're really

1184

00:46:47,589 --> 00:46:45,920

seeking to kind of create a platform for

1185

00:46:49,829 --> 00:46:47,599

that with multiple

1186

00:46:51,109 --> 00:46:49,839

signees already uh in the national

1187

00:46:53,670 --> 00:46:51,119

community i think we're

1188

00:46:55,349 --> 00:46:53,680

as we're getting experience uh from the

1189

00:46:56,069 --> 00:46:55,359

moon you know it's very much worth

1190

00:46:57,990 --> 00:46:56,079

thinking about

1191

00:47:00,550 --> 00:46:58,000

what the framework is in which we expand

1192

00:47:01,910 --> 00:47:00,560

that uh going forward especially

1193

00:47:03,430 --> 00:47:01,920

as we would expect because of the

1194

00:47:04,309 --> 00:47:03,440

excitement of mars there will be

1195

00:47:07,190 --> 00:47:04,319

multiple

1196

00:47:08,550 --> 00:47:07,200

players still that will uh enter kind of

1197

00:47:14,069 --> 00:47:08,560

the community of

1198

00:47:17,349 --> 00:47:15,910

thank you so much keith and thank you to

1199

00:47:20,069 --> 00:47:17,359

dr z remember to

1200

00:47:21,829 --> 00:47:20,079

press star one to get into the queue if

1201
00:47:24,390 --> 00:47:21,839
you are on the phone lines we are now

1202
00:47:27,270 --> 00:47:24,400
going to turn to a social media question

1203
00:47:29,910 --> 00:47:27,280
genie on facebook asks how long will

1204
00:47:30,309 --> 00:47:29,920
perseverance be collecting those samples

1205
00:47:51,430 --> 00:47:30,319
on

1206
00:47:52,150 --> 00:47:51,440
two earth years um and so we're all

1207
00:47:55,190 --> 00:47:52,160
signed up

1208
00:47:57,829 --> 00:47:55,200
to to a mission that uh you know allows

1209
00:48:00,069 --> 00:47:57,839
us to explore the jezro system for

1210
00:48:00,950 --> 00:48:00,079
for about two earth years collecting

1211
00:48:03,990 --> 00:48:00,960
samples

1212
00:48:04,790 --> 00:48:04,000
um and assembling a returnable cache of

1213
00:48:07,349 --> 00:48:04,800

samples

1214

00:48:08,950 --> 00:48:07,359

uh if we're fortunate enough to have a

1215

00:48:10,230 --> 00:48:08,960

functioning spacecraft and all the

1216

00:48:13,109 --> 00:48:10,240

resources

1217

00:48:15,030 --> 00:48:13,119

we need to do to accomplish it we'd like

1218

00:48:17,589 --> 00:48:15,040

to continue that exploration

1219

00:48:19,750 --> 00:48:17,599

in fact onto the crater rim and and even

1220

00:48:21,190 --> 00:48:19,760

beyond jezreel where there are some

1221

00:48:23,430 --> 00:48:21,200

incredibly exciting

1222

00:48:25,270 --> 00:48:23,440

uh rocks that are quite different uh

1223

00:48:27,109 --> 00:48:25,280

from the rocks in jezreel crater

1224

00:48:29,430 --> 00:48:27,119

and would allow us to to massively

1225

00:48:32,950 --> 00:48:29,440

expand the the scientific value

1226

00:48:34,390 --> 00:48:32,960

um of our cash and so you know that that

1227

00:48:36,790 --> 00:48:34,400

could be a number of years but as you've

1228

00:48:37,670 --> 00:48:36,800

heard from um from the others on the

1229

00:48:40,309 --> 00:48:37,680

panel

1230

00:48:41,430 --> 00:48:40,319

uh we've got a ways to go before that uh

1231

00:48:44,549 --> 00:48:41,440

sample retrieval

1232

00:48:47,829 --> 00:48:44,559

lander arrives

1233

00:48:48,870 --> 00:48:47,839

thank you ken our next caller is ken

1234

00:48:52,630 --> 00:48:48,880

creamer from

1235

00:48:54,309 --> 00:48:52,640

space up close good afternoon ken

1236

00:48:56,069 --> 00:48:54,319

ah good afternoon thank you thanks for

1237

00:48:56,870 --> 00:48:56,079

taking my question and good luck again

1238

00:49:01,030 --> 00:48:56,880

to everybody

1239

00:49:03,190 --> 00:49:01,040

um kind of a question about the

1240

00:49:04,790 --> 00:49:03,200

facility why you already have the lunar

1241

00:49:08,230 --> 00:49:04,800

planetary lab i'm curious

1242

00:49:09,990 --> 00:49:08,240

why do you need a new facility

1243

00:49:12,549 --> 00:49:10,000

if you could go into that a little bit

1244

00:49:13,270 --> 00:49:12,559

and uh also why is the earth's return

1245

00:49:18,150 --> 00:49:13,280

orbiter

1246

00:49:22,390 --> 00:49:21,109

yeah okay thank you for your question uh

1247

00:49:23,990 --> 00:49:22,400

so

1248

00:49:26,309 --> 00:49:24,000

what i tried to say earlier was that we

1249

00:49:27,109 --> 00:49:26,319

were considering multiple options for

1250

00:49:29,349 --> 00:49:27,119

the facility

1251
00:49:30,309 --> 00:49:29,359
including modification of existing

1252
00:49:33,589 --> 00:49:30,319
facilities

1253
00:49:37,109 --> 00:49:33,599
and the potential for a new facility

1254
00:49:39,430 --> 00:49:37,119
there will need to be in place protocols

1255
00:49:40,309 --> 00:49:39,440
for the creation of these samples that's

1256
00:49:42,790 --> 00:49:40,319
a bit different

1257
00:49:43,510 --> 00:49:42,800
than the existing protocols for instance

1258
00:49:47,190 --> 00:49:43,520
from

1259
00:49:49,109 --> 00:49:47,200
lunar samples because of the science uh

1260
00:49:50,630 --> 00:49:49,119
and and the origin of the samples

1261
00:49:53,030 --> 00:49:50,640
themselves

1262
00:49:54,309 --> 00:49:53,040
uh in terms of the earth return orbiter

1263
00:49:55,750 --> 00:49:54,319

i'll i'll start

1264

00:49:58,630 --> 00:49:55,760

since i'm speaking i'll start and i'll

1265

00:50:00,790 --> 00:49:58,640

kick it over to david in just a minute

1266

00:50:01,670 --> 00:50:00,800

but the size of the solar arrays is

1267

00:50:03,990 --> 00:50:01,680

driven

1268

00:50:05,510 --> 00:50:04,000

by the timeline constraints from earth

1269

00:50:07,750 --> 00:50:05,520

to mars

1270

00:50:09,190 --> 00:50:07,760

and the fact that it's a low thrust

1271

00:50:11,910 --> 00:50:09,200

propulsion system

1272

00:50:13,750 --> 00:50:11,920

that allows flexibility for us to

1273

00:50:15,910 --> 00:50:13,760

maneuver and rendezvous with the

1274

00:50:18,470 --> 00:50:15,920

the sample system uh david did you want

1275

00:50:20,470 --> 00:50:18,480

to add to that in any way

1276

00:50:21,750 --> 00:50:20,480

yeah uh maybe the simplest way of

1277

00:50:23,510 --> 00:50:21,760

answering the question is say it's the

1278

00:50:25,910 --> 00:50:23,520

laws of physics because this is the

1279

00:50:28,230 --> 00:50:25,920

the first time a mild spacecraft doesn't

1280

00:50:29,589 --> 00:50:28,240

have to just get in go to mars get into

1281

00:50:31,589 --> 00:50:29,599

orbit around mars

1282

00:50:32,790 --> 00:50:31,599

it's got to leave the orbit of mars and

1283

00:50:34,870 --> 00:50:32,800

come back again

1284

00:50:36,870 --> 00:50:34,880

so all the propellant you need to come

1285

00:50:37,670 --> 00:50:36,880

back we have to take with us on the way

1286

00:50:39,910 --> 00:50:37,680

out there

1287

00:50:42,309 --> 00:50:39,920

which is why the spacecraft the aero is

1288

00:50:44,950 --> 00:50:42,319

actually in two pieces it has a stage

1289

00:50:46,549 --> 00:50:44,960

that is left behind after the initial

1290

00:50:49,190 --> 00:50:46,559

orbit insertion at mars

1291

00:50:50,309 --> 00:50:49,200

so that's the big chemical propulsion

1292

00:50:53,109 --> 00:50:50,319

module

1293

00:50:55,030 --> 00:50:53,119

that's does the first orbit insertion

1294

00:50:56,230 --> 00:50:55,040

then we spiral down with the electric

1295

00:50:59,349 --> 00:50:56,240

propulsion system

1296

00:50:59,990 --> 00:50:59,359

to a low mars orbit do the sample

1297

00:51:02,549 --> 00:51:00,000

capture

1298

00:51:03,510 --> 00:51:02,559

uh process and then spiral back out

1299

00:51:06,950 --> 00:51:03,520

again and then

1300

00:51:08,710 --> 00:51:06,960

depart for for earth so it's because we

1301
00:51:10,630 --> 00:51:08,720
have so many more maneuvers to do than

1302
00:51:13,670 --> 00:51:10,640
any previous mars mission

1303
00:51:15,510 --> 00:51:13,680
and that drives the size of it thank you

1304
00:51:16,549 --> 00:51:15,520
bobby and david our next question on

1305
00:51:19,270 --> 00:51:16,559
social media

1306
00:51:20,870 --> 00:51:19,280
is aaron on facebook from his

1307
00:51:23,829 --> 00:51:20,880
nine-year-old son

1308
00:51:24,470 --> 00:51:23,839
if you find any sort of life form what

1309
00:51:26,950 --> 00:51:24,480
would be

1310
00:51:30,549 --> 00:51:26,960
the next step mary would you like to

1311
00:51:37,270 --> 00:51:33,829
sure i'd be happy to so um

1312
00:51:39,510 --> 00:51:37,280
i think as we've tried to to show you

1313
00:51:40,630 --> 00:51:39,520

it's going to be a real challenge

1314

00:51:44,470 --> 00:51:40,640

finding

1315

00:51:45,990 --> 00:51:44,480

a definitive evidence of past life

1316

00:51:47,589 --> 00:51:46,000

we're not really equipped in this

1317

00:51:50,150 --> 00:51:47,599

mission to actually look for

1318

00:51:51,829 --> 00:51:50,160

something that is living at present and

1319

00:51:53,510 --> 00:51:51,839

we don't think that we would find it in

1320

00:51:55,109 --> 00:51:53,520

this particular site where we're going

1321

00:51:58,549 --> 00:51:55,119

to investigate

1322

00:51:59,030 --> 00:51:58,559

this is a great site for an ancient lake

1323

00:52:01,030 --> 00:51:59,040

bed

1324

00:52:03,510 --> 00:52:01,040

where we could find evidence of ancient

1325

00:52:05,430 --> 00:52:03,520

life uh it's going to take

1326
00:52:07,430 --> 00:52:05,440
the measurements that we make actually

1327
00:52:09,990 --> 00:52:07,440
on the planet as well as

1328
00:52:11,750 --> 00:52:10,000
measurements made by many scientists

1329
00:52:12,950 --> 00:52:11,760
around the world when the samples are

1330
00:52:14,390 --> 00:52:12,960
brought back

1331
00:52:16,870 --> 00:52:14,400
it's also going to take a lot of

1332
00:52:18,950 --> 00:52:16,880
discussion because as we mentioned

1333
00:52:19,910 --> 00:52:18,960
some of the things that we observe can

1334
00:52:22,950 --> 00:52:19,920
be deceiving

1335
00:52:24,790 --> 00:52:22,960
because it can be come from life but it

1336
00:52:26,309 --> 00:52:24,800
can also come from something that isn't

1337
00:52:28,470 --> 00:52:26,319
related to life

1338
00:52:30,549 --> 00:52:28,480

and so we've got our work cut out with

1339

00:52:32,069 --> 00:52:30,559

for us not just in collecting the right

1340

00:52:34,870 --> 00:52:32,079

samples but once they come

1341

00:52:35,990 --> 00:52:34,880

back as well and i just want you to know

1342

00:52:39,030 --> 00:52:36,000

that

1343

00:52:40,470 --> 00:52:39,040

nasa and nasa scientists

1344

00:52:42,150 --> 00:52:40,480

and all the scientists around the world

1345

00:52:43,190 --> 00:52:42,160

that are working on this are going to

1346

00:52:46,150 --> 00:52:43,200

apply

1347

00:52:48,549 --> 00:52:46,160

the highest rigor in the analysis of

1348

00:52:51,510 --> 00:52:48,559

this sample before we

1349

00:52:53,910 --> 00:52:51,520

release any interpretation one way or

1350

00:52:55,589 --> 00:52:53,920

the other

1351
00:52:56,950 --> 00:52:55,599
so i just wanted to add something for

1352
00:52:58,870 --> 00:52:56,960
this uh

1353
00:53:00,230 --> 00:52:58,880
nine-year-old future scientist you know

1354
00:53:02,230 --> 00:53:00,240
let me just tell you what my first

1355
00:53:03,750 --> 00:53:02,240
question will be if you found life some

1356
00:53:06,630 --> 00:53:03,760
somewhere else the first question would

1357
00:53:07,030 --> 00:53:06,640
be is it the same life we have on earth

1358
00:53:09,829 --> 00:53:07,040
as

1359
00:53:11,270 --> 00:53:09,839
or is it entirely different and let me

1360
00:53:12,390 --> 00:53:11,280
tell you i'm asking that question you

1361
00:53:14,309 --> 00:53:12,400
know there's a really

1362
00:53:16,870 --> 00:53:14,319
important fact about life on earth which

1363
00:53:18,870 --> 00:53:16,880

is all life is related

1364

00:53:20,069 --> 00:53:18,880

can you imagine that whether you have

1365

00:53:22,790 --> 00:53:20,079

like a mouse

1366

00:53:23,430 --> 00:53:22,800

where you have some small kind of small

1367

00:53:25,829 --> 00:53:23,440

cell

1368

00:53:28,150 --> 00:53:25,839

things or a giraffe or a human being all

1369

00:53:30,790 --> 00:53:28,160

life is related somehow if you look

1370

00:53:32,150 --> 00:53:30,800

kind of under a microscope life is looks

1371

00:53:33,750 --> 00:53:32,160

kind of the same

1372

00:53:35,190 --> 00:53:33,760

and so for me the first question would

1373

00:53:37,829 --> 00:53:35,200

be is that

1374

00:53:38,710 --> 00:53:37,839

life that was found there the different

1375

00:53:42,549 --> 00:53:38,720

life

1376

00:53:45,109 --> 00:53:42,559

get if you go from

1377

00:53:47,589 --> 00:53:45,119

one thing to many things it's just a

1378

00:53:49,990 --> 00:53:47,599

huge step forward and i still remember

1379

00:53:52,069 --> 00:53:50,000

the first time we found planetary

1380

00:53:54,630 --> 00:53:52,079

systems around another star

1381

00:53:57,349 --> 00:53:54,640

the only solar system we knew was our

1382

00:53:59,990 --> 00:53:57,359

solar system and kind of in the mid 90s

1383

00:54:02,150 --> 00:54:00,000

well before you were born we went to

1384

00:54:02,710 --> 00:54:02,160

many planeteer systems we learned so

1385

00:54:05,510 --> 00:54:02,720

much

1386

00:54:07,270 --> 00:54:05,520

not just about these systems but our own

1387

00:54:08,069 --> 00:54:07,280

system and it's that kind of huge

1388

00:54:11,750 --> 00:54:08,079

transition

1389

00:54:12,309 --> 00:54:11,760

that we would focus on thank you mary

1390

00:54:14,790 --> 00:54:12,319

and dr

1391

00:54:16,069 --> 00:54:14,800

z our next question along the same lines

1392

00:54:18,549 --> 00:54:16,079

about focusing

1393

00:54:19,510 --> 00:54:18,559

on searching for that past life holden

1394

00:54:21,670 --> 00:54:19,520

asks

1395

00:54:24,230 --> 00:54:21,680

would you let the public know if

1396

00:54:29,109 --> 00:54:24,240

evidence of past life was found

1397

00:54:31,109 --> 00:54:29,119

if so how soon after finding it

1398

00:54:33,109 --> 00:54:31,119

one of the things we really believe in

1399

00:54:34,870 --> 00:54:33,119

at nasa and i know our european space

1400

00:54:36,069 --> 00:54:34,880

agency friends are exactly the same and

1401
00:54:37,750 --> 00:54:36,079
that is that

1402
00:54:39,750 --> 00:54:37,760
the work that we're finding the research

1403
00:54:42,470 --> 00:54:39,760
that we're finding will be made public

1404
00:54:43,349 --> 00:54:42,480
and the answer therefore is absolutely

1405
00:54:45,109 --> 00:54:43,359
we would

1406
00:54:46,470 --> 00:54:45,119
with the due diligence that we always

1407
00:54:48,710 --> 00:54:46,480
use in science and

1408
00:54:49,589 --> 00:54:48,720
our peer review that is so critical to

1409
00:54:51,430 --> 00:54:49,599
make sure

1410
00:54:52,630 --> 00:54:51,440
that it's not an individual's opinion

1411
00:54:55,750 --> 00:54:52,640
alone but really

1412
00:54:57,670 --> 00:54:55,760
work that kind of kind of

1413
00:54:59,349 --> 00:54:57,680

reflects the scrutiny that we want in

1414

00:55:00,630 --> 00:54:59,359

science that once we're through that

1415

00:55:03,829 --> 00:55:00,640

gate of course we would

1416

00:55:05,990 --> 00:55:03,839

communicate to the entire uh you know

1417

00:55:07,510 --> 00:55:06,000

scientific and the broad community so

1418

00:55:10,710 --> 00:55:07,520

absolutely

1419

00:55:12,870 --> 00:55:10,720

and david would you like to add to that

1420

00:55:14,789 --> 00:55:12,880

yeah absolutely thank you i mean one of

1421

00:55:16,390 --> 00:55:14,799

the aspects of mild sample return why

1422

00:55:19,109 --> 00:55:16,400

it's so important is that we'll have

1423

00:55:21,589 --> 00:55:19,119

samples not that won't just be studied

1424

00:55:23,270 --> 00:55:21,599

by one scientist in one laboratory but

1425

00:55:24,549 --> 00:55:23,280

by scientists and laboratories all

1426

00:55:27,030 --> 00:55:24,559

around the world

1427

00:55:28,230 --> 00:55:27,040

because if we believe we found evidence

1428

00:55:30,950 --> 00:55:28,240

of ancient life

1429

00:55:33,030 --> 00:55:30,960

that's a very extraordinary claim and

1430

00:55:34,549 --> 00:55:33,040

therefore we need extraordinary evidence

1431

00:55:37,030 --> 00:55:34,559

and we would expect different

1432

00:55:38,789 --> 00:55:37,040

laboratories studying in different ways

1433

00:55:41,349 --> 00:55:38,799

the same samples

1434

00:55:43,190 --> 00:55:41,359

to give us the same message if only one

1435

00:55:44,309 --> 00:55:43,200

lab laboratory says yes and all the

1436

00:55:47,589 --> 00:55:44,319

others say no

1437

00:55:49,430 --> 00:55:47,599

then we have to keep looking thank you

1438

00:55:52,309 --> 00:55:49,440

dr zian david

1439

00:55:53,670 --> 00:55:52,319

next a mark on facebook asks how will

1440

00:55:56,630 --> 00:55:53,680

the future missions

1441

00:55:57,109 --> 00:55:56,640

find these samples wouldn't dust cover

1442

00:55:59,990 --> 00:55:57,119

them

1443

00:56:01,270 --> 00:56:00,000

bobby uh yeah that's actually a great

1444

00:56:02,950 --> 00:56:01,280

question and something that we've

1445

00:56:06,390 --> 00:56:02,960

studied at depth and the

1446

00:56:09,349 --> 00:56:06,400

the simple answer is no when

1447

00:56:10,470 --> 00:56:09,359

perseverance uh places the samples down

1448

00:56:12,390 --> 00:56:10,480

on the mars surface

1449

00:56:13,510 --> 00:56:12,400

we're going to know precisely where

1450

00:56:16,950 --> 00:56:13,520

perseverance

1451

00:56:19,750 --> 00:56:16,960

is and so where the samples are placed

1452

00:56:20,549 --> 00:56:19,760

there may be some dust that accumulates

1453

00:56:22,870 --> 00:56:20,559

but the

1454

00:56:25,030 --> 00:56:22,880

sample tubes themselves are not going to

1455

00:56:29,109 --> 00:56:25,040

move across the surface so they'll be

1456

00:56:31,190 --> 00:56:29,119

basically tagged located for all time

1457

00:56:33,030 --> 00:56:31,200

and then we will land the sample

1458

00:56:33,589 --> 00:56:33,040

retrieval lander and the sample fetch

1459

00:56:36,230 --> 00:56:33,599

rover

1460

00:56:38,069 --> 00:56:36,240

as close to those to those locations as

1461

00:56:40,230 --> 00:56:38,079

possible

1462

00:56:42,150 --> 00:56:40,240

thank you bobby our next question comes

1463

00:56:44,230 --> 00:56:42,160

from nathan on instagram

1464

00:56:46,390 --> 00:56:44,240

asking what will the scientist's

1465

00:56:47,030 --> 00:56:46,400

approach be when the samples return to

1466

00:56:50,150 --> 00:56:47,040

earth

1467

00:56:53,349 --> 00:56:50,160

will they ever be displayed in a museum

1468

00:56:57,430 --> 00:56:53,359

libby would you take that one

1469

00:56:59,589 --> 00:56:57,440

sure i'd be happy to um in terms of the

1470

00:57:03,030 --> 00:56:59,599

app like to echo many of the things

1471

00:57:05,030 --> 00:57:03,040

that um have been said about uh the

1472

00:57:06,150 --> 00:57:05,040

importance of multiple lines of evidence

1473

00:57:07,430 --> 00:57:06,160

so scientists

1474

00:57:09,510 --> 00:57:07,440

will use one of the reasons the

1475

00:57:10,950 --> 00:57:09,520

biosignature figure that i did

1476

00:57:13,270 --> 00:57:10,960

is that one of the things scientists

1477

00:57:13,990 --> 00:57:13,280

will be looking for is multiple lines of

1478

00:57:17,510 --> 00:57:14,000

evidence

1479

00:57:19,750 --> 00:57:17,520

for um for life and i don't know as

1480

00:57:20,950 --> 00:57:19,760

others have talked about the the plans

1481

00:57:23,910 --> 00:57:20,960

for the sample

1482

00:57:25,510 --> 00:57:23,920

um are are still in the work i am i

1483

00:57:29,190 --> 00:57:25,520

imagine that it will be possible to see

1484

00:57:35,430 --> 00:57:32,630

great thank you so much libby and darius

1485

00:57:36,390 --> 00:57:35,440

on twitter asks how will information

1486

00:57:38,549 --> 00:57:36,400

from this mission

1487

00:57:40,309 --> 00:57:38,559

help with the challenge of getting

1488

00:57:43,589 --> 00:57:40,319

humans to mars

1489

00:57:47,829 --> 00:57:45,270

we're really excited about this mission

1490

00:57:49,910 --> 00:57:47,839

because in so many ways it opens doors

1491

00:57:51,670 --> 00:57:49,920

for new technologies that are exactly

1492

00:57:53,910 --> 00:57:51,680

doing what is being asked

1493

00:57:55,270 --> 00:57:53,920

getting trying to for us to learn how to

1494

00:57:57,670 --> 00:57:55,280

get humans to mars

1495

00:57:59,270 --> 00:57:57,680

in part that has to do with the precise

1496

00:58:01,510 --> 00:57:59,280

landing technology that

1497

00:58:03,910 --> 00:58:01,520

bobby already talked about it's also

1498

00:58:06,789 --> 00:58:03,920

about the moxie instrument which uh

1499

00:58:09,349 --> 00:58:06,799

of course is trying to take uh carbon

1500

00:58:11,750 --> 00:58:09,359

dioxide you know the atmosphere of

1501
00:58:13,910 --> 00:58:11,760
mars and making breathable oxygen out of

1502
00:58:16,309 --> 00:58:13,920
it or oxygen we could be using

1503
00:58:17,990 --> 00:58:16,319
for fuel but i think the other thing i

1504
00:58:20,230 --> 00:58:18,000
also want to talk about is

1505
00:58:22,309 --> 00:58:20,240
is whenever we land with humans we want

1506
00:58:24,950 --> 00:58:22,319
to know what we're going to meet kind of

1507
00:58:26,950 --> 00:58:24,960
in terms of the history but also in

1508
00:58:29,270 --> 00:58:26,960
terms of the composition overall

1509
00:58:30,390 --> 00:58:29,280
and the samples in many ways even from

1510
00:58:32,710 --> 00:58:30,400
that perspective

1511
00:58:33,750 --> 00:58:32,720
are really adding important information

1512
00:58:35,750 --> 00:58:33,760
to address

1513
00:58:37,750 --> 00:58:35,760

that question so that the perseverance

1514

00:58:39,990 --> 00:58:37,760

mission and especially together

1515

00:58:41,430 --> 00:58:40,000

with its more sample return partner with

1516

00:58:44,150 --> 00:58:41,440

all the technologies that

1517

00:58:45,750 --> 00:58:44,160

were being talked about earlier really

1518

00:58:46,950 --> 00:58:45,760

are a step in the direction of human

1519

00:58:50,150 --> 00:58:46,960

exploration

1520

00:58:52,470 --> 00:58:50,160

to mars thank you so much dr zia truly

1521

00:58:53,670 --> 00:58:52,480

exciting time ahead of us for sure well

1522

00:58:55,990 --> 00:58:53,680

we unfortunately

1523

00:58:58,150 --> 00:58:56,000

can't answer all the media questions on

1524

00:58:58,870 --> 00:58:58,160

air for those of you with additional

1525

00:59:01,670 --> 00:58:58,880

questions

1526
00:59:02,390 --> 00:59:01,680
please call jpl's digital news and media

1527
00:59:04,549 --> 00:59:02,400
office

1528
00:59:06,549 --> 00:59:04,559
we'll also continue to answer social

1529
00:59:08,710 --> 00:59:06,559
media questions online

1530
00:59:10,069 --> 00:59:08,720
thank you for your questions and thank

1531
00:59:12,789 --> 00:59:10,079
you to our panelists

1532
00:59:15,510 --> 00:59:12,799
for joining us today perseverance is set

1533
00:59:16,230 --> 00:59:15,520
to land on mars tomorrow with commentary

1534
00:59:19,270 --> 00:59:16,240
beginning

1535
00:59:22,230 --> 00:59:19,280
at 11 15 a.m pacific standard time

1536
00:59:22,950 --> 00:59:22,240
2 15 p.m eastern standard time and we

1537
00:59:25,910 --> 00:59:22,960
are offering

1538
00:59:28,470 --> 00:59:25,920

lots of ways to ride along with us to

1539

00:59:29,589 --> 00:59:28,480

join the virtual nasa social and virtual

1540

00:59:31,589 --> 00:59:29,599

guest events

1541

00:59:32,710 --> 00:59:31,599

register for the mission to mars student

1542

00:59:35,950 --> 00:59:32,720

challenge and

1543

00:59:37,430 --> 00:59:35,960

live stream the mars landing visit

1544

00:59:40,230 --> 00:59:37,440

go.nasa.gov

1545

00:59:41,990 --> 00:59:40,240

mars 2020 toolkit for those of you

1546

00:59:44,470 --> 00:59:42,000

interested in a deeper dive

1547

00:59:45,270 --> 00:59:44,480

we have a new press kit available online

1548

00:59:47,190 --> 00:59:45,280

too with

1549

00:59:48,710 --> 00:59:47,200

lots of information and graphics

1550

00:59:51,030 --> 00:59:48,720

describing the rover

1551

00:59:53,270 --> 00:59:51,040

and its mission there you'll also have a

1552

00:59:53,910 --> 00:59:53,280

chance to sign up to send your name to

1553

00:59:56,710 --> 00:59:53,920

mars

1554

00:59:57,670 --> 00:59:56,720

on nasa's next flight to the red planet

1555

00:59:59,430 --> 00:59:57,680

and put yourself

1556

01:00:01,190 --> 00:59:59,440

right into the action with our

1557

01:00:03,750 --> 01:00:01,200

perseverance photo booth

1558

01:00:04,309 --> 01:00:03,760

you can pose next to the rover place

1559

01:00:07,109 --> 01:00:04,319

yourself

1560

01:00:09,349 --> 01:00:07,119

in our mission control and even see what

1561

01:00:10,710 --> 01:00:09,359

you might look like taking a selfie on

1562

01:00:13,789 --> 01:00:10,720

the red planet

1563

01:00:15,589 --> 01:00:13,799

again it's all available at go

1564

01:00:18,789 --> 01:00:15,599

go.nasa.gov

1565

01:00:19,270 --> 01:00:18,799

mars 2020 toolkit if you're on social

1566

01:00:21,270 --> 01:00:19,280

media

1567

01:00:23,030 --> 01:00:21,280

join the conversation with the mission

1568

01:00:25,990 --> 01:00:23,040

on facebook and twitter

1569

01:00:26,950 --> 01:00:26,000

follow at nasa persevere and use the

1570

01:00:29,670 --> 01:00:26,960

hashtag

1571

01:00:31,829 --> 01:00:29,680

countdown to mars thank you so much for