



1
00:00:56,830 --> 00:00:42,040
[Music]

2
00:00:56,840 --> 00:01:03,320
so

3
00:01:03,330 --> 00:03:02,830
[Music]

4
00:03:02,840 --> 00:03:08,300
so

5
00:03:08,310 --> 00:03:44,830
[Music]

6
00:03:52,440 --> 00:03:47,290
so

7
00:04:12,869 --> 00:04:06,960
[Music]

8
00:05:22,070 --> 00:04:28,290
this do

9
00:05:26,150 --> 00:05:24,310
often you get to say you work next to a

10
00:05:26,629 --> 00:05:26,160
robotic system that's going to mars

11
00:05:27,990 --> 00:05:26,639
right

12
00:05:29,430 --> 00:05:28,000
there's not many places in the world

13
00:05:31,270 --> 00:05:29,440

that you can do this my name is eric

14

00:05:32,710 --> 00:05:31,280

agular and i'm working on a robotic

15

00:05:34,390 --> 00:05:32,720

system that will be collecting martian

16

00:05:36,230 --> 00:05:34,400

rock samples so it can be studied on

17

00:05:38,629 --> 00:05:36,240

earth this is our hexapod testbed it's

18

00:05:40,469 --> 00:05:38,639

basically a rover body that allows us to

19

00:05:42,310 --> 00:05:40,479

attach you know the robotic arm the

20

00:05:42,790 --> 00:05:42,320

adaptive caching assembly the drill so

21

00:05:44,629 --> 00:05:42,800

that's why

22

00:05:46,550 --> 00:05:44,639

a lot of the testing happens uh behind

23

00:05:48,870 --> 00:05:46,560

me the sample caching system will

24

00:05:50,310 --> 00:05:48,880

use a robotic arm and drill to actually

25

00:05:52,390 --> 00:05:50,320

take samples out of the ground

26

00:05:54,150 --> 00:05:52,400

and we're looking for evidence of life

27

00:05:55,990 --> 00:05:54,160

that may have existed on mars on the

28

00:05:57,830 --> 00:05:56,000

smaller arm that lives inside the valley

29

00:05:59,830 --> 00:05:57,840

of the rover and is used to actually

30

00:06:01,189 --> 00:05:59,840

process the tubes as they come back with

31

00:06:03,270 --> 00:06:01,199

a sample inside we'll

32

00:06:05,189 --> 00:06:03,280

measure it take some pictures of it and

33

00:06:05,990 --> 00:06:05,199

get it sealed and stored for a future

34

00:06:07,749 --> 00:06:06,000

mission to pick

35

00:06:09,350 --> 00:06:07,759

them up you see the robotic arm

36

00:06:11,270 --> 00:06:09,360

stretched out and we have a bunch of

37

00:06:13,990 --> 00:06:11,280

engineers and technicians working on

38

00:06:15,909 --> 00:06:14,000

installing a model of our drill work in

39

00:06:16,309 --> 00:06:15,919

aerospace that was always a passion of

40

00:06:18,150 --> 00:06:16,319

mine

41

00:06:19,430 --> 00:06:18,160

what really draws me towards it is the

42

00:06:20,950 --> 00:06:19,440

engineering of it

43

00:06:22,710 --> 00:06:20,960

you know always working on something new

44

00:06:24,150 --> 00:06:22,720

and something's never been done before

45

00:06:26,230 --> 00:06:24,160

finding those problems getting them

46

00:06:28,150 --> 00:06:26,240

fixed is really something that i enjoy

47

00:06:29,670 --> 00:06:28,160

you know in 20 years children will be

48

00:06:35,909 --> 00:06:29,680

reading this in their science book and

49

00:06:40,469 --> 00:06:38,790

hi i'm required with nasa's jet

50

00:06:41,749 --> 00:06:40,479

propulsion laboratory in southern

51

00:06:44,629 --> 00:06:41,759

california

52

00:06:46,870 --> 00:06:44,639

jpl is where the mars 2020 mission and

53

00:06:49,029 --> 00:06:46,880

perseverance rover are managed

54

00:06:50,629 --> 00:06:49,039

now getting to mars is a test of

55

00:06:52,390 --> 00:06:50,639

perseverance in itself

56

00:06:55,110 --> 00:06:52,400

and we are joined today by one of the

57

00:06:57,990 --> 00:06:55,120

many faces behind the spacecraft

58

00:07:00,230 --> 00:06:58,000

eric aguilar is the mars 2020 assistant

59

00:07:00,950 --> 00:07:00,240

delivery manager for the sample caching

60

00:07:05,029 --> 00:07:00,960

system

61

00:07:06,870 --> 00:07:05,039

manager through extensive testing

62

00:07:09,830 --> 00:07:06,880

he's making sure perseverance will be

63

00:07:11,510 --> 00:07:09,840

able to fulfill its mission on mars

64

00:07:13,589 --> 00:07:11,520

he joins us live to answer some

65

00:07:14,870 --> 00:07:13,599

questions and if you have any questions

66

00:07:16,950 --> 00:07:14,880

you would like to ask

67

00:07:20,550 --> 00:07:16,960

you can leave them right here in the

68

00:07:23,510 --> 00:07:20,560

chat thanks for joining us today eric

69

00:07:24,629 --> 00:07:23,520

all right thank you raquel okay i want

70

00:07:26,550 --> 00:07:24,639

to get started with

71

00:07:28,070 --> 00:07:26,560

what we were talking about earlier how

72

00:07:31,270 --> 00:07:28,080

did your family

73

00:07:33,350 --> 00:07:31,280

influence your career path so

74

00:07:34,550 --> 00:07:33,360

my family was a huge influence on my

75

00:07:36,710 --> 00:07:34,560

career path uh

76

00:07:38,710 --> 00:07:36,720

you know my dad immigrated from costa

77

00:07:41,909 --> 00:07:38,720

rica to the united states

78

00:07:43,670 --> 00:07:41,919

um and my my mom's side my grandfather

79

00:07:45,110 --> 00:07:43,680

immigrated from mexico to the united

80

00:07:47,350 --> 00:07:45,120

states um

81

00:07:48,950 --> 00:07:47,360

you know eventually my parents met in

82

00:07:52,150 --> 00:07:48,960

the los angeles area and

83

00:07:52,629 --> 00:07:52,160

and you know i was born um but that sort

84

00:07:55,990 --> 00:07:52,639

of

85

00:07:57,909 --> 00:07:56,000

uh drive and and need to have uh

86

00:07:59,749 --> 00:07:57,919

you know provide for your family and and

87

00:08:00,869 --> 00:07:59,759

give them more opportunities and than

88

00:08:02,309 --> 00:08:00,879

you had

89

00:08:04,309 --> 00:08:02,319

um i think it's something that has

90

00:08:07,510 --> 00:08:04,319

always stuck with me and as

91

00:08:09,909 --> 00:08:07,520

has driven my help drive my career um

92

00:08:12,309 --> 00:08:09,919

you know my parents were very

93

00:08:14,469 --> 00:08:12,319

influential and making sure that i

94

00:08:15,830 --> 00:08:14,479

you know went to school to get all the

95

00:08:18,710 --> 00:08:15,840

opportunities i could get to

96

00:08:19,749 --> 00:08:18,720

right you know study hard you know get

97

00:08:22,390 --> 00:08:19,759

get to college

98

00:08:22,869 --> 00:08:22,400

um you know that they're you know being

99

00:08:25,830 --> 00:08:22,879

you know

100

00:08:26,869 --> 00:08:25,840

immigrants or from an immigrant family

101
00:08:29,589 --> 00:08:26,879
it's really been

102
00:08:30,710 --> 00:08:29,599
you know a testament and on how hard

103
00:08:33,829 --> 00:08:30,720
they work and to

104
00:08:37,430 --> 00:08:33,839
to provide for us right so um you know

105
00:08:40,310 --> 00:08:37,440
i take that i take all the all of that

106
00:08:41,589 --> 00:08:40,320
all of that work ethic that they've

107
00:08:43,670 --> 00:08:41,599
instilled in me

108
00:08:45,350 --> 00:08:43,680
and and use it every day for when we're

109
00:08:47,110 --> 00:08:45,360
working at jpl from

110
00:08:48,710 --> 00:08:47,120
you know making sure that you know when

111
00:08:51,430 --> 00:08:48,720
we have difficult

112
00:08:52,790 --> 00:08:51,440
uh parts of the of the of the mission

113
00:08:53,590 --> 00:08:52,800

that we're trying to design or work

114

00:08:55,590 --> 00:08:53,600

through that

115

00:08:58,150 --> 00:08:55,600

we can just push through and really get

116

00:09:00,230 --> 00:08:58,160

that get over the hump and really

117

00:09:01,910 --> 00:09:00,240

get get everybody motivated and going

118

00:09:05,190 --> 00:09:01,920

right and so

119

00:09:07,190 --> 00:09:05,200

they've been a huge a huge um

120

00:09:09,269 --> 00:09:07,200

influence on my life and getting to

121

00:09:10,710 --> 00:09:09,279

where i'm at today at jpl and i thank

122

00:09:13,750 --> 00:09:10,720

him for that

123

00:09:15,190 --> 00:09:13,760

yeah my father is from bolivia so

124

00:09:17,750 --> 00:09:15,200

i understand what you mean when you say

125

00:09:19,269 --> 00:09:17,760

that work ethic is so strong and i'm

126

00:09:19,829 --> 00:09:19,279

sure they're really proud of you right

127

00:09:21,590 --> 00:09:19,839

now

128

00:09:23,750 --> 00:09:21,600

and can we kind of get more into what

129

00:09:27,269 --> 00:09:23,760

you studied at school and your path

130

00:09:30,949 --> 00:09:27,279

to jpl yeah well so

131

00:09:33,269 --> 00:09:30,959

um you know i i went to arizona state

132

00:09:36,630 --> 00:09:33,279

university where i graduated with a

133

00:09:39,750 --> 00:09:36,640

bachelor's in in electrical engineering

134

00:09:43,030 --> 00:09:39,760

i eventually got a master's in in

135

00:09:45,190 --> 00:09:43,040

business from university of redlands but

136

00:09:46,230 --> 00:09:45,200

when i was in school at arizona state

137

00:09:48,870 --> 00:09:46,240

university

138

00:09:50,389 --> 00:09:48,880

i also started working part-time as an

139

00:09:51,509 --> 00:09:50,399

academic part-time for honeywell

140

00:09:54,550 --> 00:09:51,519

aerospace

141

00:09:55,670 --> 00:09:54,560

um there i was working you know uh you

142

00:09:58,470 --> 00:09:55,680

know

143

00:09:58,949 --> 00:09:58,480

near full-time about 30 hours a week uh

144

00:10:02,069 --> 00:09:58,959

plus

145

00:10:04,470 --> 00:10:02,079

uh taking a full load at asu

146

00:10:05,110 --> 00:10:04,480

and in doing so i was able to um you

147

00:10:07,350 --> 00:10:05,120

know help

148

00:10:08,230 --> 00:10:07,360

pay for my college and get through that

149

00:10:11,030 --> 00:10:08,240

but then i i

150

00:10:13,110 --> 00:10:11,040

eventually um you know started working

151
00:10:16,870 --> 00:10:13,120
for them after i graduated

152
00:10:18,710 --> 00:10:16,880
however i still really had you know my

153
00:10:20,630 --> 00:10:18,720
what do i want to do like i really want

154
00:10:20,870 --> 00:10:20,640
to be in aerospace i you know that's one

155
00:10:24,069 --> 00:10:20,880
of

156
00:10:25,990 --> 00:10:24,079
know growing up

157
00:10:28,230 --> 00:10:26,000
and so i started looking for for work

158
00:10:31,269 --> 00:10:28,240
outside of outside of honeywell and

159
00:10:33,750 --> 00:10:31,279
and in the aerospace area um

160
00:10:35,269 --> 00:10:33,760
and i i found the company in pasadena

161
00:10:38,069 --> 00:10:35,279
that turns out was uh

162
00:10:39,590 --> 00:10:38,079
a contractor to jpl and so i interviewed

163
00:10:41,269 --> 00:10:39,600

with this company and you know obviously

164

00:10:44,550 --> 00:10:41,279

got hired and then

165

00:10:48,870 --> 00:10:44,560

uh i came i moved to pasadena and was

166

00:10:49,509 --> 00:10:48,880

working for jpl as a as a contractor and

167

00:10:52,550 --> 00:10:49,519

my first

168

00:10:53,910 --> 00:10:52,560

job through this contracting company was

169

00:10:56,710 --> 00:10:53,920

working on the mars

170

00:10:57,430 --> 00:10:56,720

exploration rover spirited opportunity

171

00:11:00,870 --> 00:10:57,440

and

172

00:11:03,269 --> 00:11:00,880

captures for their uh

173

00:11:04,310 --> 00:11:03,279

for the rover electronics module that

174

00:11:07,670 --> 00:11:04,320

was something that

175

00:11:08,550 --> 00:11:07,680

um that started off my career ever since

176

00:11:11,910 --> 00:11:08,560

then i've

177

00:11:15,190 --> 00:11:11,920

i've been on mars science laboratory uh

178

00:11:15,910 --> 00:11:15,200

the dawn spacecraft uh now march 2020

179

00:11:17,350 --> 00:11:15,920

and

180

00:11:19,030 --> 00:11:17,360

you know i've been here over uh just

181

00:11:21,430 --> 00:11:19,040

about 20 years now um

182

00:11:22,790 --> 00:11:21,440

it's been uh it's been quite a ride and

183

00:11:26,310 --> 00:11:22,800

quite an enjoyable ride

184

00:11:27,990 --> 00:11:26,320

at that wow so

185

00:11:29,990 --> 00:11:28,000

is this your favorite mission so far

186

00:11:32,550 --> 00:11:30,000

you'd say

187

00:11:34,310 --> 00:11:32,560

uh yeah i think i think they're all uh

188

00:11:35,829 --> 00:11:34,320

they're all my favorite but yeah this

189

00:11:37,509 --> 00:11:35,839

one has been uh

190

00:11:39,509 --> 00:11:37,519

this one has been a challenge right from

191

00:11:42,310 --> 00:11:39,519

working on the sample caching system

192

00:11:42,630 --> 00:11:42,320

you know developing a robotic system you

193

00:11:46,150 --> 00:11:42,640

know

194

00:11:49,829 --> 00:11:46,160

has been

195

00:11:53,509 --> 00:11:49,839

been more

196

00:11:54,150 --> 00:11:53,519

um just the team uh the team environment

197

00:11:57,110 --> 00:11:54,160

that we've been

198

00:11:58,870 --> 00:11:57,120

able to build you know within both both

199

00:11:59,430 --> 00:11:58,880

both tasks both the sample caching and

200

00:12:04,470 --> 00:11:59,440

the

201
00:12:05,190 --> 00:12:04,480
get a chance to work with a lot of

202
00:12:08,470 --> 00:12:05,200
incredible

203
00:12:10,150 --> 00:12:08,480
uh talented engineers and and we're able

204
00:12:12,870 --> 00:12:10,160
to really come together and

205
00:12:14,230 --> 00:12:12,880
and get this thing going so i'm uh yes i

206
00:12:15,829 --> 00:12:14,240
think that's what

207
00:12:18,310 --> 00:12:15,839
makes this one of my favorite projects

208
00:12:20,550 --> 00:12:18,320
that i've been able to work on

209
00:12:21,430 --> 00:12:20,560
and you were kind of mentioning that

210
00:12:24,389 --> 00:12:21,440
troubleshooting

211
00:12:25,190 --> 00:12:24,399
is a big part of your job so what kind

212
00:12:26,629 --> 00:12:25,200
of hurdles

213
00:12:28,470 --> 00:12:26,639

have you had to overcome when you're

214

00:12:34,069 --> 00:12:28,480

testing

215

00:12:35,670 --> 00:12:34,079

finding problems that's exactly what i

216

00:12:36,870 --> 00:12:35,680

live for when i when i work on these

217

00:12:39,030 --> 00:12:36,880

missions um

218

00:12:41,030 --> 00:12:39,040

the the idea is that if we can flush it

219

00:12:41,509 --> 00:12:41,040

out here we can fix it we can mitigate

220

00:12:46,470 --> 00:12:41,519

it

221

00:12:48,310 --> 00:12:46,480

we get to mars or our final destination

222

00:12:49,910 --> 00:12:48,320

we would know you know we have

223

00:12:52,150 --> 00:12:49,920

confidence that this thing is that

224

00:12:54,150 --> 00:12:52,160

our spacecraft's not going to work and

225

00:12:55,750 --> 00:12:54,160

so one of the issues that that i'll

226

00:12:58,550 --> 00:12:55,760

bring up that we've had recently

227

00:13:00,389 --> 00:12:58,560

or over over the time with developing

228

00:13:03,430 --> 00:13:00,399

the sample caching system

229

00:13:06,790 --> 00:13:03,440

is within the robot is is in the um

230

00:13:08,870 --> 00:13:06,800

the drill on the drill um we have these

231

00:13:11,670 --> 00:13:08,880

uh ball lock mechanisms

232

00:13:12,150 --> 00:13:11,680

um that are uh used to hold the the

233

00:13:15,430 --> 00:13:12,160

drill

234

00:13:18,230 --> 00:13:15,440

know sort of as

235

00:13:19,190 --> 00:13:18,240

a gripping mechanism now when we're

236

00:13:21,509 --> 00:13:19,200

working with

237

00:13:23,350 --> 00:13:21,519

you know uh rocks you're gonna have fine

238

00:13:24,470 --> 00:13:23,360

powder and as you're as you're drilling

239

00:13:25,590 --> 00:13:24,480

into the rocks you're gonna have this

240

00:13:30,310 --> 00:13:25,600

fine powder

241

00:13:32,550 --> 00:13:30,320

and and and creep into crevices

242

00:13:33,509 --> 00:13:32,560

it's almost like uh you know when you go

243

00:13:35,110 --> 00:13:33,519

hiking

244

00:13:36,389 --> 00:13:35,120

and you start walking you start walking

245

00:13:37,750 --> 00:13:36,399

the trails and you start to kind of

246

00:13:40,790 --> 00:13:37,760

climb higher and higher into

247

00:13:42,470 --> 00:13:40,800

into your into your mountain trail um

248

00:13:44,069 --> 00:13:42,480

you're gonna you start to find out that

249

00:13:45,910 --> 00:13:44,079

you know your your hiking boots might

250

00:13:47,990 --> 00:13:45,920

actually get a little bit caked of

251

00:13:49,670 --> 00:13:48,000

of some of this finer dust as it as it

252

00:13:50,710 --> 00:13:49,680

kind of sits in there and gets in these

253

00:13:51,990 --> 00:13:50,720

crevices

254

00:13:55,189 --> 00:13:52,000

makes it for your shoes to be a little

255

00:13:57,509 --> 00:13:55,199

slippier uh uh slippery

256

00:13:59,030 --> 00:13:57,519

so what you do is you know is before you

257

00:14:01,590 --> 00:13:59,040

go on a narrow part of the

258

00:14:02,629 --> 00:14:01,600

of the uh hike or of the trail you're

259

00:14:04,550 --> 00:14:02,639

gonna tend to

260

00:14:05,750 --> 00:14:04,560

kind of kick your shoes a little bit and

261

00:14:07,829 --> 00:14:05,760

get that dust off and

262

00:14:09,670 --> 00:14:07,839

and that way it gives you a nice clean

263

00:14:11,509 --> 00:14:09,680

grip and you're back to where where you

264

00:14:13,430 --> 00:14:11,519

wanted it to be with your shoes

265

00:14:15,350 --> 00:14:13,440

so imagine the same thing where you have

266

00:14:17,430 --> 00:14:15,360

this powder that's flowing

267

00:14:19,509 --> 00:14:17,440

as we're interacting with rocks and and

268

00:14:22,790 --> 00:14:19,519

you've got a dusty and mars environment

269

00:14:23,590 --> 00:14:22,800

we have this really fine powder uh dirt

270

00:14:25,750 --> 00:14:23,600

that has been

271

00:14:27,430 --> 00:14:25,760

uh you know kind of being pushed around

272

00:14:28,949 --> 00:14:27,440

and circulating around the drill as

273

00:14:30,790 --> 00:14:28,959

we're operating it

274

00:14:32,389 --> 00:14:30,800

while this powder is getting into some

275

00:14:33,590 --> 00:14:32,399

of the crevices around the ball locks

276

00:14:36,790 --> 00:14:33,600

which is not letting them

277

00:14:38,790 --> 00:14:36,800

move as freely as as we like so

278

00:14:40,470 --> 00:14:38,800

when and during one of our tests we were

279

00:14:43,030 --> 00:14:40,480

trying to go and pick up a bit and we

280

00:14:45,189 --> 00:14:43,040

were unable to get past the ball locks

281

00:14:47,189 --> 00:14:45,199

we eventually can show that if we push

282

00:14:48,629 --> 00:14:47,199

on it hard enough it'll work but we want

283

00:14:50,710 --> 00:14:48,639

to understand

284

00:14:52,550 --> 00:14:50,720

why were the ball locks not free as we

285

00:14:55,110 --> 00:14:52,560

would have liked them to be so

286

00:14:55,910 --> 00:14:55,120

you know we're able to break our chamber

287

00:14:59,189 --> 00:14:55,920

and

288

00:15:00,870 --> 00:14:59,199

take a look inside

289

00:15:02,710 --> 00:15:00,880

and as we look inside we notice that

290

00:15:03,189 --> 00:15:02,720

there's this uh fine fine powder

291

00:15:05,990 --> 00:15:03,199

material

292

00:15:06,710 --> 00:15:06,000

around the ball locks and we we realized

293

00:15:10,470 --> 00:15:06,720

that well

294

00:15:13,509 --> 00:15:10,480

we we have a mitigation mitigation plan

295

00:15:15,990 --> 00:15:13,519

already that we can employ one of which

296

00:15:19,189 --> 00:15:16,000

is we call the percussive cleaning

297

00:15:20,870 --> 00:15:19,199

we bring when we get to mars one of the

298

00:15:22,470 --> 00:15:20,880

early things that we're going to do on

299

00:15:24,069 --> 00:15:22,480

the surface is to

300

00:15:25,509 --> 00:15:24,079

get the drill and do a percussive

301
00:15:27,350 --> 00:15:25,519
cleaning which is using the hammer

302
00:15:30,150 --> 00:15:27,360
that's built into the drill

303
00:15:31,350 --> 00:15:30,160
to sort of shake shake loose any any

304
00:15:32,629 --> 00:15:31,360
loose particulates

305
00:15:35,110 --> 00:15:32,639
that may have traveled with us from

306
00:15:36,389 --> 00:15:35,120
earth to mars and get it off the drill

307
00:15:37,829 --> 00:15:36,399
before we start trying to do any

308
00:15:40,069 --> 00:15:37,839
sampling

309
00:15:42,310 --> 00:15:40,079
and then so we decided that we're going

310
00:15:44,470 --> 00:15:42,320
to use that similar approach

311
00:15:47,189 --> 00:15:44,480
on the drill to help clear out any of

312
00:15:48,790 --> 00:15:47,199
this fine powder from these ball locks

313
00:15:50,629 --> 00:15:48,800

once we did that we're able to get the

314

00:15:50,949 --> 00:15:50,639

ball locks to actually operate back into

315

00:15:54,470 --> 00:15:50,959

the

316

00:15:55,910 --> 00:15:54,480

into a i'll say a clean state um to and

317

00:15:58,629 --> 00:15:55,920

they moved there freely again

318

00:16:00,230 --> 00:15:58,639

so it was something that uh um that we

319

00:16:02,550 --> 00:16:00,240

discovered here because we needed to

320

00:16:05,350 --> 00:16:02,560

really interact with the rocks to see it

321

00:16:06,310 --> 00:16:05,360

um and it's now something in our in our

322

00:16:09,430 --> 00:16:06,320

repertoire to

323

00:16:11,430 --> 00:16:09,440

to fix as or to to use while we're

324

00:16:13,509 --> 00:16:11,440

on the surface to help mitigate this

325

00:16:15,749 --> 00:16:13,519

issue

326

00:16:17,590 --> 00:16:15,759

and someone on social media actually has

327

00:16:20,230 --> 00:16:17,600

a really good follow-up question to that

328

00:16:21,350 --> 00:16:20,240

abdul on facebook wants to know is the

329

00:16:25,430 --> 00:16:21,360

martian ground

330

00:16:27,829 --> 00:16:25,440

sand or clay it's actually a

331

00:16:28,870 --> 00:16:27,839

mixture right um so there's actually a

332

00:16:31,670 --> 00:16:28,880

wide range of

333

00:16:33,509 --> 00:16:31,680

of uh types of rocks that we uh that we

334

00:16:34,470 --> 00:16:33,519

interact with there's there are clays

335

00:16:38,230 --> 00:16:34,480

for sure

336

00:16:41,990 --> 00:16:38,240

um there are um some some mudstones

337

00:16:44,389 --> 00:16:42,000

uh which is more like a clay uh

338

00:16:45,829 --> 00:16:44,399

uh you know harder harder rocks we also

339

00:16:47,430 --> 00:16:45,839

have regolith which is just you know

340

00:16:50,230 --> 00:16:47,440

like a scent you know sand

341

00:16:52,150 --> 00:16:50,240

uh consistency that you might see so we

342

00:16:53,030 --> 00:16:52,160

actually have a wide range of rocks that

343

00:16:54,790 --> 00:16:53,040

we have to

344

00:16:56,230 --> 00:16:54,800

be able to interact with and to take

345

00:16:58,470 --> 00:16:56,240

samples so

346

00:16:59,430 --> 00:16:58,480

we've actually developed uh algorithms

347

00:17:03,509 --> 00:16:59,440

to

348

00:17:05,029 --> 00:17:03,519

samples up

349

00:17:07,429 --> 00:17:05,039

too much as we're as we're trying to

350

00:17:09,429 --> 00:17:07,439

take a core sample so depending on how

351

00:17:10,789 --> 00:17:09,439

hard or soft the rock is

352

00:17:13,029 --> 00:17:10,799

we'll change our spindle and our

353

00:17:16,230 --> 00:17:13,039

percussive percussive frequency

354

00:17:18,630 --> 00:17:16,240

uh to adapt to the to the varying uh

355

00:17:21,270 --> 00:17:18,640

uh uh types of rocks that we might

356

00:17:26,710 --> 00:17:24,549

and tracy on facebook wants to know more

357

00:17:28,549 --> 00:17:26,720

about the samples that she wants to know

358

00:17:32,230 --> 00:17:28,559

will perseverance actually bring

359

00:17:34,630 --> 00:17:32,240

samples back to earth right so

360

00:17:35,430 --> 00:17:34,640

perseverance is not the return mission

361

00:17:38,549 --> 00:17:35,440

so our

362

00:17:40,549 --> 00:17:38,559

our job is to actually go and collect

363

00:17:41,510 --> 00:17:40,559

the samples whether it's a regolith or

364

00:17:44,549 --> 00:17:41,520

sand

365

00:17:46,630 --> 00:17:44,559

material or or actual rock samples

366

00:17:47,830 --> 00:17:46,640

once we actually take the rock sample

367

00:17:50,310 --> 00:17:47,840

out of the ground

368

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

we'll then hermetically seal the tube

369

00:17:55,750 --> 00:17:52,640

the tube will eventually be dropped off

370

00:17:57,990 --> 00:17:55,760

um at a site where a future mission

371

00:17:59,350 --> 00:17:58,000

um would be able to come and pick it up

372

00:18:01,190 --> 00:17:59,360

and and uh

373

00:18:02,470 --> 00:18:01,200

you know potentially bring the samples

374

00:18:05,190 --> 00:18:02,480

back um but

375

00:18:06,070 --> 00:18:05,200

our job is to actually uh collect the

376

00:18:07,590 --> 00:18:06,080

sample

377

00:18:09,190 --> 00:18:07,600

and keep it hermetic and make it

378

00:18:09,830 --> 00:18:09,200

hermetically sealed for a future

379

00:18:13,590 --> 00:18:09,840

mission's

380

00:18:13,990 --> 00:18:13,600

return then emily on facebook wants to

381

00:18:15,510 --> 00:18:14,000

know

382

00:18:17,669 --> 00:18:15,520

about that will the collection

383

00:18:18,950 --> 00:18:17,679

techniques for perseverance on mars be

384

00:18:22,789 --> 00:18:18,960

similar to the way

385

00:18:24,950 --> 00:18:22,799

osiris-rex sampled bennu

386

00:18:27,430 --> 00:18:24,960

uh no it's it's a little bit different

387

00:18:28,070 --> 00:18:27,440

um so we're actually taking a coring

388

00:18:31,110 --> 00:18:28,080

drill

389

00:18:32,070 --> 00:18:31,120

to to go up to about 70 millimeters deep

390

00:18:35,190 --> 00:18:32,080

into the

391

00:18:37,590 --> 00:18:35,200

right so

392

00:18:38,230 --> 00:18:37,600

we're actually planning on taking core

393

00:18:40,710 --> 00:18:38,240

samples

394

00:18:41,990 --> 00:18:40,720

out of the ground whereas i think in

395

00:18:45,029 --> 00:18:42,000

osiris-rex it's

396

00:18:45,350 --> 00:18:45,039

more of a uh they do some ingestion of

397

00:18:52,789 --> 00:18:45,360

the

398

00:18:53,430 --> 00:18:52,799

um ours is to actually um we will do

399

00:18:55,590 --> 00:18:53,440

some

400

00:18:57,830 --> 00:18:55,600

science ahead of time so we know which

401
00:18:59,190 --> 00:18:57,840
rocks we want to pick up and sample

402
00:19:01,350 --> 00:18:59,200
but we're actually going to go in and

403
00:19:03,909 --> 00:19:01,360
take a sample out of the ground

404
00:19:07,110 --> 00:19:03,919
um it's it's probably about the the

405
00:19:09,750 --> 00:19:07,120
width of your pinky or at least my pinky

406
00:19:10,310 --> 00:19:09,760
um and and you know about that that size

407
00:19:12,070 --> 00:19:10,320
too is

408
00:19:15,029 --> 00:19:12,080
as far as uh you know how much sample

409
00:19:17,110 --> 00:19:15,039
we're going to get out of the ground

410
00:19:18,630 --> 00:19:17,120
never thought of it that way before and

411
00:19:20,710 --> 00:19:18,640
thank you emily for

412
00:19:21,990 --> 00:19:20,720
keeping track of several missions at

413
00:19:24,950 --> 00:19:22,000

once too

414

00:19:26,710 --> 00:19:24,960

and now we have sandy on facebook asking

415

00:19:28,310 --> 00:19:26,720

what will we be able to learn about the

416

00:19:30,230 --> 00:19:28,320

samples collected

417

00:19:33,270 --> 00:19:30,240

prior to bringing the samples back to

418

00:19:34,870 --> 00:19:33,280

earth for further study

419

00:19:37,510 --> 00:19:34,880

uh so we have a couple different

420

00:19:40,710 --> 00:19:37,520

instruments that we'll be doing

421

00:19:41,510 --> 00:19:40,720

x-ray uh spectroscopy um to actually

422

00:19:44,710 --> 00:19:41,520

determine

423

00:19:45,990 --> 00:19:44,720

um what sort of uh content might be in

424

00:19:47,830 --> 00:19:46,000

those rocks right so

425

00:19:49,510 --> 00:19:47,840

um the idea is that we're gonna go

426
00:19:52,390 --> 00:19:49,520
around and we are gonna look

427
00:19:52,870 --> 00:19:52,400
you know at different rock samples now

428
00:19:55,510 --> 00:19:52,880
right

429
00:19:57,270 --> 00:19:55,520
rocks may have different shapes and may

430
00:19:58,070 --> 00:19:57,280
look a little bit different based on on

431
00:20:00,310 --> 00:19:58,080
where they're at

432
00:20:01,270 --> 00:20:00,320
and and but some of the chemical

433
00:20:03,430 --> 00:20:01,280
composition

434
00:20:04,950 --> 00:20:03,440
may be the same between between rocks

435
00:20:06,230 --> 00:20:04,960
that look look different

436
00:20:08,149 --> 00:20:06,240
so the idea is that we're going to

437
00:20:10,149 --> 00:20:08,159
actually go ahead and and we will do

438
00:20:11,750 --> 00:20:10,159

potentially in a braided patch first

439

00:20:12,310 --> 00:20:11,760

where we might clear off some of the

440

00:20:14,870 --> 00:20:12,320

initial

441

00:20:15,750 --> 00:20:14,880

i'll say the weathering um that that's

442

00:20:18,789 --> 00:20:15,760

happened on

443

00:20:19,669 --> 00:20:18,799

on mars over the time and get down and

444

00:20:21,350 --> 00:20:19,679

make uh

445

00:20:23,430 --> 00:20:21,360

make a judgment on whether or not we

446

00:20:26,230 --> 00:20:23,440

actually want uh that rock

447

00:20:27,110 --> 00:20:26,240

so um the scientists have a whole uh

448

00:20:29,750 --> 00:20:27,120

collection of

449

00:20:30,710 --> 00:20:29,760

of uh of instruments that they're gonna

450

00:20:32,950 --> 00:20:30,720

use to

451
00:20:36,390 --> 00:20:32,960
to pick up uh you know decide which

452
00:20:40,870 --> 00:20:39,350
and then this one is from maikiki and it

453
00:20:43,110 --> 00:20:40,880
kind of goes back to what we first

454
00:20:43,909 --> 00:20:43,120
touched on they ask did you always have

455
00:20:46,630 --> 00:20:43,919
a love for

456
00:20:49,510 --> 00:20:46,640
jet propulsion and or the aerospace

457
00:20:51,750 --> 00:20:49,520
engineering industry

458
00:20:53,110 --> 00:20:51,760
so so i'll be a little embarrassed on

459
00:20:56,710 --> 00:20:53,120
this one right i think

460
00:20:59,430 --> 00:20:56,720
my initial love was aerospace because i

461
00:21:01,270 --> 00:20:59,440
didn't know that the jet propulsion

462
00:21:02,070 --> 00:21:01,280
existed in the way it does today right

463
00:21:05,750 --> 00:21:02,080

so

464

00:21:07,830 --> 00:21:05,760

uh now that i'm at jpl it's

465

00:21:09,029 --> 00:21:07,840

you know by far this is this is where i

466

00:21:11,430 --> 00:21:09,039

want it to be

467

00:21:12,950 --> 00:21:11,440

uh nowhere else right so this is this is

468

00:21:17,430 --> 00:21:12,960

one of those things where

469

00:21:19,669 --> 00:21:17,440

you know i just didn't know i was not as

470

00:21:20,470 --> 00:21:19,679

as kid into you know the different

471

00:21:22,310 --> 00:21:20,480

centers and

472

00:21:23,669 --> 00:21:22,320

and what everybody does but you know the

473

00:21:26,310 --> 00:21:23,679

work that we do here the

474

00:21:27,669 --> 00:21:26,320

the our ability to be hands-on and work

475

00:21:29,270 --> 00:21:27,679

and design and

476
00:21:31,590 --> 00:21:29,280
and build and get your hands dirty that

477
00:21:34,710 --> 00:21:31,600
that's what really makes it for me so um

478
00:21:36,470 --> 00:21:34,720
yeah so i you know as much as i'd like

479
00:21:39,430 --> 00:21:36,480
to say jpl was always my

480
00:21:41,430 --> 00:21:39,440
my go-to my number one it i just i just

481
00:21:43,350 --> 00:21:41,440
wasn't aware of it when i was first

482
00:21:44,630 --> 00:21:43,360
getting out of college and and looking

483
00:21:47,110 --> 00:21:44,640
around so

484
00:21:48,470 --> 00:21:47,120
um so yeah so sorry i guess aerospace

485
00:21:51,669 --> 00:21:48,480
but

486
00:21:54,549 --> 00:21:51,679
you know jpl opened my eyes to to the

487
00:21:56,070 --> 00:21:54,559
how fun this work could really be it's

488
00:21:58,149 --> 00:21:56,080

okay admitting that you didn't know

489

00:21:59,350 --> 00:21:58,159

lots of kids that are watching right now

490

00:22:01,590 --> 00:21:59,360

might wonder

491

00:22:03,830 --> 00:22:01,600

how do you get involved or how do you

492

00:22:05,510 --> 00:22:03,840

learn about the different types

493

00:22:07,510 --> 00:22:05,520

of engineering that's involved in the

494

00:22:10,710 --> 00:22:07,520

industry

495

00:22:12,390 --> 00:22:10,720

well i mean the thing is is you know

496

00:22:14,149 --> 00:22:12,400

there's probably every type of

497

00:22:17,110 --> 00:22:14,159

engineering that you can imagine is

498

00:22:18,230 --> 00:22:17,120

and and science is is part of part of

499

00:22:21,029 --> 00:22:18,240

jpl

500

00:22:21,990 --> 00:22:21,039

um you know i i know that i've talked to

501
00:22:25,350 --> 00:22:22,000

people that

502
00:22:26,789 --> 00:22:25,360

develop software um you know electrical

503
00:22:27,350 --> 00:22:26,799

engineering of course mechanical

504
00:22:30,149 --> 00:22:27,360

engineering

505
00:22:31,029 --> 00:22:30,159

aerospace um you know chemical

506
00:22:33,110 --> 00:22:31,039

engineering

507
00:22:34,549 --> 00:22:33,120

you know from you know chemists to

508
00:22:36,630 --> 00:22:34,559

physicists

509
00:22:38,149 --> 00:22:36,640

you know i think we probably hit the

510
00:22:39,990 --> 00:22:38,159

range i don't know that there's an

511
00:22:42,070 --> 00:22:40,000

engineering discipline

512
00:22:45,029 --> 00:22:42,080

that you can probably ask is is this one

513
00:22:48,230 --> 00:22:45,039

that's relevant to jpl then we'd say no

514

00:22:49,510 --> 00:22:48,240

because we do rely on on outside you

515

00:22:50,149 --> 00:22:49,520

know thinking out of the box and

516

00:22:54,070 --> 00:22:50,159

bringing in

517

00:22:55,669 --> 00:22:54,080

outside i'll say views into

518

00:22:57,750 --> 00:22:55,679

into solving some of these problems

519

00:22:58,310 --> 00:22:57,760

they're not all just kind of black and

520

00:23:00,310 --> 00:22:58,320

white and

521

00:23:02,230 --> 00:23:00,320

purely mechanical pretty electrical as

522

00:23:03,350 --> 00:23:02,240

robotics i mean it's it's all over the

523

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

place and

524

00:23:07,510 --> 00:23:05,840

and um so i don't know that there's a a

525

00:23:09,350 --> 00:23:07,520

bad engineering it's more

526

00:23:10,950 --> 00:23:09,360

making sure you do something that you

527

00:23:12,630 --> 00:23:10,960

really enjoy

528

00:23:14,230 --> 00:23:12,640

because that's where when you really

529

00:23:15,669 --> 00:23:14,240

enjoy what you're doing that's where the

530

00:23:18,310 --> 00:23:15,679

work really shines

531

00:23:19,830 --> 00:23:18,320

and that's where we're able to to you

532

00:23:22,630 --> 00:23:19,840

know to really show that

533

00:23:24,470 --> 00:23:22,640

you know how exceptional or work can be

534

00:23:26,390 --> 00:23:24,480

because i think everybody that that does

535

00:23:28,470 --> 00:23:26,400

a work here really enjoys

536

00:23:31,110 --> 00:23:28,480

um you know their their engineering and

537

00:23:33,590 --> 00:23:31,120

they have a passion for what they do

538

00:23:37,830 --> 00:23:33,600

and then nabil on youtube wants to know

539

00:23:41,029 --> 00:23:37,840

how did you develop your soft skills

540

00:23:45,269 --> 00:23:41,039

oh a lot of trial and error it was

541

00:23:46,870 --> 00:23:45,279

uh you know i've i've had to uh you know

542

00:23:48,549 --> 00:23:46,880

work with teams right we always work

543

00:23:51,190 --> 00:23:48,559

with teams um

544

00:23:53,190 --> 00:23:51,200

we work as a as a fairly large you know

545

00:23:55,510 --> 00:23:53,200

community of of engineers

546

00:23:56,950 --> 00:23:55,520

uh working to get things through and and

547

00:23:59,110 --> 00:23:56,960

you know over time

548

00:24:00,630 --> 00:23:59,120

you know i i've made my mistakes and you

549

00:24:01,590 --> 00:24:00,640

know maybe come down a little too hard

550

00:24:04,310 --> 00:24:01,600

on somebody or

551
00:24:05,909 --> 00:24:04,320
or vice versa and so i've learned and i

552
00:24:07,990 --> 00:24:05,919
i try to learn from

553
00:24:10,149 --> 00:24:08,000
other managers that i've worked for you

554
00:24:10,710 --> 00:24:10,159
know i i you know i may take a piece

555
00:24:15,350 --> 00:24:10,720
from

556
00:24:18,470 --> 00:24:15,360
and try to get that to sort of become

557
00:24:19,350 --> 00:24:18,480
mine and so yeah it's it's a it's a

558
00:24:21,669 --> 00:24:19,360
learned process

559
00:24:23,510 --> 00:24:21,679
and and uh you know one thing i think

560
00:24:25,269 --> 00:24:23,520
i've learned at jpl is we're not afraid

561
00:24:26,630 --> 00:24:25,279
to make mistakes or or to

562
00:24:29,110 --> 00:24:26,640
get something wrong we just want to

563
00:24:30,950 --> 00:24:29,120

learn from it uh and then move on

564

00:24:32,789 --> 00:24:30,960

and and and do better about it the next

565

00:24:34,870 --> 00:24:32,799

time so that's i think i'd say

566

00:24:35,830 --> 00:24:34,880

during date on the job and interacting

567

00:24:38,870 --> 00:24:35,840

with the teams and

568

00:24:39,750 --> 00:24:38,880

and and you know emulating some people

569

00:24:42,950 --> 00:24:39,760

that i admire

570

00:24:44,710 --> 00:24:42,960

at jpl that's great and

571

00:24:46,149 --> 00:24:44,720

liesel on youtube wants to know if you

572

00:24:49,350 --> 00:24:46,159

have any tips for women

573

00:24:50,070 --> 00:24:49,360

wanting to get into engineering well i

574

00:24:53,350 --> 00:24:50,080

mean

575

00:24:55,350 --> 00:24:53,360

you know it's same i'll say the same

576
00:24:56,630 --> 00:24:55,360
thing right is make sure you enjoy what

577
00:24:58,950 --> 00:24:56,640
you're doing

578
00:25:00,390 --> 00:24:58,960
um if you have the passion for it you

579
00:25:03,909 --> 00:25:00,400
know i know

580
00:25:07,190 --> 00:25:03,919
uh there's been a lot of uh you know

581
00:25:09,350 --> 00:25:07,200
you know females on my team for sure and

582
00:25:11,510 --> 00:25:09,360
you know i'll say you know they're just

583
00:25:13,750 --> 00:25:11,520
as good as everybody else right

584
00:25:15,990 --> 00:25:13,760
um oftentimes i feel you know that

585
00:25:19,990 --> 00:25:16,000
they're they come in and they bring in

586
00:25:23,110 --> 00:25:20,000
a a uh you know solid understanding of

587
00:25:24,230 --> 00:25:23,120
everything that we do um you know as as

588
00:25:26,390 --> 00:25:24,240

coming in and just

589

00:25:28,870 --> 00:25:26,400

just kicking butt right uh you know i'm

590

00:25:31,350 --> 00:25:28,880

a proud dad of two girls

591

00:25:32,070 --> 00:25:31,360

and i i can't wait to see them uh get

592

00:25:35,110 --> 00:25:32,080

out there and

593

00:25:38,549 --> 00:25:35,120

and make an impact this is great proud

594

00:25:42,310 --> 00:25:41,830

and how is testing coming along sc on

595

00:25:46,390 --> 00:25:42,320

youtube

596

00:25:49,190 --> 00:25:46,400

asks are you still testing right now

597

00:25:49,909 --> 00:25:49,200

yes um that's one thing i think that we

598

00:25:52,149 --> 00:25:49,919

always do

599

00:25:53,750 --> 00:25:52,159

right we test and test and test because

600

00:25:55,350 --> 00:25:53,760

we want to find

601
00:25:57,750 --> 00:25:55,360
all the corner cases we want to make

602
00:26:01,029 --> 00:25:57,760
sure this thing is going to work

603
00:26:03,190 --> 00:26:01,039
um you know when we go and an

604
00:26:04,789 --> 00:26:03,200
unknown environment right we don't know

605
00:26:07,510 --> 00:26:04,799
what we might encounter right

606
00:26:10,310 --> 00:26:07,520
um so we want to test we want to test as

607
00:26:11,909 --> 00:26:10,320
much as we can so we will be testing um

608
00:26:13,430 --> 00:26:11,919
you know our introducing and landing

609
00:26:15,430 --> 00:26:13,440
we're going to be testing that all the

610
00:26:17,430 --> 00:26:15,440
way into just about we land

611
00:26:19,110 --> 00:26:17,440
and and making sure that our our

612
00:26:20,310 --> 00:26:19,120
software our sensors everything is

613
00:26:22,950 --> 00:26:20,320

robust to

614

00:26:24,230 --> 00:26:22,960

to anything that we might see coming in

615

00:26:26,149 --> 00:26:24,240

additionally

616

00:26:27,510 --> 00:26:26,159

you know we have a bunch of we have

617

00:26:29,110 --> 00:26:27,520

rocks that we're still

618

00:26:31,190 --> 00:26:29,120

working and testing with our sample

619

00:26:33,110 --> 00:26:31,200

caching system we're still making

620

00:26:33,990 --> 00:26:33,120

progress there and we're still trying to

621

00:26:35,669 --> 00:26:34,000

define

622

00:26:37,430 --> 00:26:35,679

you know all the corner cases and making

623

00:26:39,350 --> 00:26:37,440

sure that that there's nothing that can

624

00:26:41,909 --> 00:26:39,360

surprise us on mars we want to

625

00:26:44,470 --> 00:26:41,919

you know often times we try to stress

626

00:26:46,630 --> 00:26:44,480

the the system out and get to its

627

00:26:48,630 --> 00:26:46,640

um you know three times life on things

628

00:26:51,190 --> 00:26:48,640

that move we want to make sure that

629

00:26:52,549 --> 00:26:51,200

if it was designed for to last a year

630

00:26:54,390 --> 00:26:52,559

that we can we can actually

631

00:26:56,870 --> 00:26:54,400

operate it for three years to make sure

632

00:26:59,269 --> 00:26:56,880

that we have a robust design that

633

00:27:01,350 --> 00:26:59,279

that can complete the mission as planned

634

00:27:04,149 --> 00:27:01,360

so yeah we always test and and

635

00:27:05,590 --> 00:27:04,159

um you know like i said this is uh you

636

00:27:05,990 --> 00:27:05,600

know something that we do all the time

637

00:27:09,110 --> 00:27:06,000

right we

638

00:27:09,510 --> 00:27:09,120

really just plow through and and and

639

00:27:14,870 --> 00:27:09,520

test

640

00:27:16,470 --> 00:27:14,880

we ever get tired of that

641

00:27:18,870 --> 00:27:16,480

catherine has a perfect follow-up

642

00:27:21,029 --> 00:27:18,880

question for that on facebook she asks

643

00:27:21,990 --> 00:27:21,039

when designing and engineering this

644

00:27:24,870 --> 00:27:22,000

project

645

00:27:25,909 --> 00:27:24,880

were the same ideas used from curiosity

646

00:27:29,909 --> 00:27:25,919

or do you start it

647

00:27:33,909 --> 00:27:29,919

all from scratch that's a good question

648

00:27:34,389 --> 00:27:33,919

this mission was curiosity was a basis

649

00:27:39,990 --> 00:27:34,399

for

650

00:27:41,669 --> 00:27:40,000

try to do is we try to we try to reuse a

651
00:27:43,909 --> 00:27:41,679
lot of the electronics and some

652
00:27:45,430 --> 00:27:43,919
and you know some of the hardware uh the

653
00:27:48,950 --> 00:27:45,440
mechanical structures that we could

654
00:27:51,190 --> 00:27:48,960
we could fit um and part of it was

655
00:27:52,389 --> 00:27:51,200
um you know we're getting to the point

656
00:27:54,870 --> 00:27:52,399
on our current

657
00:27:56,630 --> 00:27:54,880
technology of how big we can actually

658
00:27:58,950 --> 00:27:56,640
have these rovers what's the mass that

659
00:28:01,590 --> 00:27:58,960
we can safely land on another planet

660
00:28:03,029 --> 00:28:01,600
um and so we want to kind of stay within

661
00:28:05,110 --> 00:28:03,039
those constraints

662
00:28:06,310 --> 00:28:05,120
the sample caching system however was

663
00:28:08,549 --> 00:28:06,320

was brand new

664

00:28:09,430 --> 00:28:08,559

so that was something that we had to

665

00:28:11,990 --> 00:28:09,440

develop from

666

00:28:14,149 --> 00:28:12,000

from scratch if you will um you know we

667

00:28:17,669 --> 00:28:14,159

did have the robotic arm and the drill

668

00:28:20,549 --> 00:28:17,679

or a version of the drill from from msl

669

00:28:21,909 --> 00:28:20,559

my mark science laboratory um but we

670

00:28:22,950 --> 00:28:21,919

actually had to make improvements on

671

00:28:25,669 --> 00:28:22,960

that to make sure

672

00:28:27,430 --> 00:28:25,679

um you know we were able to uh to meet

673

00:28:29,830 --> 00:28:27,440

the mission requirements right so

674

00:28:30,870 --> 00:28:29,840

every part of the sample caching system

675

00:28:33,590 --> 00:28:30,880

i would argue is

676
00:28:35,430 --> 00:28:33,600
is new whether in in redesigning and

677
00:28:36,149 --> 00:28:35,440
making it lighter like the robotic arm

678
00:28:38,630 --> 00:28:36,159
bed

679
00:28:39,350 --> 00:28:38,640
or making a more capable drill for for

680
00:28:41,190 --> 00:28:39,360
what we have

681
00:28:43,909 --> 00:28:41,200
for taking cores and of course all the

682
00:28:47,110 --> 00:28:43,919
adaptive cache and assembly

683
00:28:50,230 --> 00:28:47,120
hardware inside the rover and

684
00:28:54,310 --> 00:28:50,240
liesel on youtube asks can dust on mars

685
00:29:00,950 --> 00:28:57,510
uh i i would say

686
00:29:04,950 --> 00:29:00,960
arguably maybe um i i don't i

687
00:29:08,230 --> 00:29:04,960
we are typically all of our connectors

688
00:29:11,110 --> 00:29:08,240

wires cables um the belly pan

689

00:29:12,789 --> 00:29:11,120

everything is is sealed up with uh you

690

00:29:15,350 --> 00:29:12,799

know so it's going to have

691

00:29:16,470 --> 00:29:15,360

you know we may get some dust in there

692

00:29:18,630 --> 00:29:16,480

but the idea is that

693

00:29:19,990 --> 00:29:18,640

you know we you know we use uh like for

694

00:29:22,470 --> 00:29:20,000

the electronics

695

00:29:23,430 --> 00:29:22,480

um things are typically uh conformally

696

00:29:25,830 --> 00:29:23,440

coated

697

00:29:26,710 --> 00:29:25,840

um which means that there's a a thin

698

00:29:28,230 --> 00:29:26,720

film uh

699

00:29:30,470 --> 00:29:28,240

coating that gets added to all the

700

00:29:32,789 --> 00:29:30,480

electronics to keep things from like

701

00:29:35,269 --> 00:29:32,799

from any fog to enter and potentially

702

00:29:37,350 --> 00:29:35,279

damage electronics short something out

703

00:29:38,630 --> 00:29:37,360

um so that's that's the one thing is you

704

00:29:41,669 --> 00:29:38,640

know the dust might have an

705

00:29:45,029 --> 00:29:41,679

impact but i haven't really seen it much

706

00:29:47,350 --> 00:29:45,039

outside of uh gunking up

707

00:29:49,350 --> 00:29:47,360

gears and things of that nature not not

708

00:29:51,350 --> 00:29:49,360

so much on the electronics

709

00:29:52,630 --> 00:29:51,360

but again i you know i i don't know that

710

00:29:53,990 --> 00:29:52,640

i can say that for sure that

711

00:29:56,549 --> 00:29:54,000

dust will not have an impact on the

712

00:30:00,310 --> 00:29:56,559

electronics uh but yeah so it's a

713

00:30:02,470 --> 00:30:00,320

soft answer it works though i

714

00:30:03,909 --> 00:30:02,480

have a follow-up question too that they

715

00:30:06,950 --> 00:30:03,919

want to know does it ever get

716

00:30:10,470 --> 00:30:06,960

frustrating testing so much

717

00:30:13,350 --> 00:30:10,480

uh yes it does sometimes

718

00:30:14,789 --> 00:30:13,360

um because sometimes and sometimes it's

719

00:30:17,029 --> 00:30:14,799

because the problems come

720

00:30:18,549 --> 00:30:17,039

up and they're really hard to to figure

721

00:30:20,630 --> 00:30:18,559

out and diagnose

722

00:30:22,310 --> 00:30:20,640

uh you know coming to the root cause of

723

00:30:23,830 --> 00:30:22,320

the problem

724

00:30:25,669 --> 00:30:23,840

is sometimes you know extremely

725

00:30:27,269 --> 00:30:25,679

difficult and

726

00:30:28,950 --> 00:30:27,279

and so it gets a little frustrating

727

00:30:31,190 --> 00:30:28,960

sometimes and and uh

728

00:30:32,470 --> 00:30:31,200

but i know over over the years that i've

729

00:30:34,710 --> 00:30:32,480

been working there

730

00:30:37,430 --> 00:30:34,720

i've learned how to sort of take a step

731

00:30:39,909 --> 00:30:37,440

back from time to time and

732

00:30:41,590 --> 00:30:39,919

and just underst you know kind of take a

733

00:30:42,149 --> 00:30:41,600

step back and and take a breath and say

734

00:30:43,430 --> 00:30:42,159

okay

735

00:30:45,909 --> 00:30:43,440

this is what you're doing you're working

736

00:30:47,909 --> 00:30:45,919

on a rover that's about to go to mars

737

00:30:49,750 --> 00:30:47,919

okay take a deep breath now get back

738

00:30:51,510 --> 00:30:49,760

into it and and don't let this problem

739

00:30:54,389 --> 00:30:51,520

beat you right so

740

00:30:55,190 --> 00:30:54,399

that's one of the things that i think uh

741

00:30:56,950 --> 00:30:55,200

you know that

742

00:30:58,549 --> 00:30:56,960

yeah it gets frustrating sometimes but i

743

00:30:59,509 --> 00:30:58,559

think if we just all take a step back

744

00:31:01,430 --> 00:30:59,519

and a breath

745

00:31:02,549 --> 00:31:01,440

we can overcome these problems and in

746

00:31:05,110 --> 00:31:02,559

general you know

747

00:31:06,630 --> 00:31:05,120

we might have a problem that shows up um

748

00:31:08,470 --> 00:31:06,640

but typically we've already known about

749

00:31:11,269 --> 00:31:08,480

it and already ready to mitigate it as

750

00:31:13,269 --> 00:31:11,279

as it comes out so um so yeah it's a

751

00:31:17,269 --> 00:31:13,279

little frustrating sometimes

752

00:31:19,830 --> 00:31:17,279

it's to be prepared yeah

753

00:31:21,269 --> 00:31:19,840

the final question we have is what

754

00:31:22,950 --> 00:31:21,279

technical skills do you think are the

755

00:31:26,230 --> 00:31:22,960

most important especially now that

756

00:31:29,750 --> 00:31:26,240

you're leading such a huge project

757

00:31:33,190 --> 00:31:29,760

oh technical skills um you know i think

758

00:31:35,430 --> 00:31:33,200

i think one of the biggest things is

759

00:31:37,190 --> 00:31:35,440

is to rely on your team it's not so much

760

00:31:39,029 --> 00:31:37,200

a technical skill right

761

00:31:41,909 --> 00:31:39,039

my my expertise is electrical

762

00:31:43,110 --> 00:31:41,919

engineering integration and tests and

763

00:31:44,950 --> 00:31:43,120

and you know some of the system

764

00:31:47,669 --> 00:31:44,960

designing

765

00:31:48,389 --> 00:31:47,679

but i don't know everything you know and

766

00:31:50,389 --> 00:31:48,399

and uh

767

00:31:52,549 --> 00:31:50,399

i don't i i don't pretend to know

768

00:31:54,950 --> 00:31:52,559

everything so i i make sure that

769

00:31:56,310 --> 00:31:54,960

the team is comprised of folks that are

770

00:31:59,590 --> 00:31:56,320

willing to be collaborative

771

00:32:00,549 --> 00:31:59,600

and want to work together and and as a

772

00:32:02,870 --> 00:32:00,559

team

773

00:32:04,789 --> 00:32:02,880

we come together and and and make the

774

00:32:06,389 --> 00:32:04,799

right choices and and oftentimes you

775

00:32:07,669 --> 00:32:06,399

know i i may have to make the last

776

00:32:10,310 --> 00:32:07,679

decision on something

777

00:32:10,950 --> 00:32:10,320

before it goes to my boss to to decide

778

00:32:14,310 --> 00:32:10,960

um

779

00:32:16,389 --> 00:32:14,320

and so it's it's the ability to you know

780

00:32:18,470 --> 00:32:16,399

understand the different points of views

781

00:32:20,630 --> 00:32:18,480

uh try to synthesize all that and then

782

00:32:22,070 --> 00:32:20,640

and then make a good decision

783

00:32:23,750 --> 00:32:22,080

that you know it's beneficial to the

784

00:32:25,830 --> 00:32:23,760

project and not just you know

785

00:32:27,110 --> 00:32:25,840

uh you know set aside because that's the

786

00:32:28,310 --> 00:32:27,120

way i want to do it or i just don't

787

00:32:30,710 --> 00:32:28,320

understand something

788

00:32:32,470 --> 00:32:30,720

so you know i think i really i don't

789

00:32:34,230 --> 00:32:32,480

know if there's any real

790

00:32:35,590 --> 00:32:34,240

technical stuff i mean when when it

791

00:32:37,509 --> 00:32:35,600

comes to electrical stuff

792

00:32:39,669 --> 00:32:37,519

electrical engineering i am definitely

793

00:32:42,389 --> 00:32:39,679

there and and providing my opinion

794

00:32:43,110 --> 00:32:42,399

and and where we're at but when it comes

795

00:32:44,950 --> 00:32:43,120

to

796

00:32:47,269 --> 00:32:44,960

you know potentially a mechanical

797

00:32:49,190 --> 00:32:47,279

failure that you know i have to rely on

798

00:32:50,389 --> 00:32:49,200

on on the folks on my team that are

799

00:32:52,630 --> 00:32:50,399

experts or uh

800

00:32:54,549 --> 00:32:52,640

in that area to help uh guide the

801
00:32:57,430 --> 00:32:54,559
decision process right so

802
00:32:58,630 --> 00:32:57,440
um i don't know if it's if it's just you

803
00:33:00,310 --> 00:32:58,640
know one

804
00:33:01,909 --> 00:33:00,320
it is technical to actually be able to

805
00:33:03,990 --> 00:33:01,919
understand everything but it's more

806
00:33:05,750 --> 00:33:04,000
uh i'll say it goes back to some of the

807
00:33:08,549 --> 00:33:05,760
soft skills as being able to

808
00:33:08,870 --> 00:33:08,559
uh synthesize all that and and come to a

809
00:33:14,310 --> 00:33:08,880
good

810
00:33:15,430 --> 00:33:14,320
wrap up all the questions thank you for

811
00:33:17,430 --> 00:33:15,440
your questions at home

812
00:33:19,190 --> 00:33:17,440
and thank you so much for joining us

813
00:33:22,230 --> 00:33:19,200

today eric

814

00:33:24,470 --> 00:33:22,240

thank you raquel and the rover

815

00:33:27,269 --> 00:33:24,480

is currently on its way to mars and set

816

00:33:30,149 --> 00:33:27,279

to land on the red planet on february 18

817

00:33:31,909 --> 00:33:30,159

2021 for the latest on the mission

818

00:33:33,909 --> 00:33:31,919

follow at nasa persevere

819

00:33:36,070 --> 00:33:33,919

on twitter and facebook and you can

820

00:33:37,269 --> 00:33:36,080

watch all of the behind the spacecraft

821

00:33:40,470 --> 00:33:37,279

video profiles