

Curiosity: One Year on Mars

#1YearOnMars



1
00:00:03,170 --> 00:00:14,950
[Music]

2
00:00:25,480 --> 00:00:19,830
liftoff of the atlas 5 curiosity

3
00:00:48,630 --> 00:00:26,750
[Music]

4
00:00:54,549 --> 00:00:51,590
i'm dan mclease

5
00:00:57,189 --> 00:00:54,559
i'm jpl's chief scientist on on behalf

6
00:00:59,349 --> 00:00:57,199
of jpl's leadership team i'd like to

7
00:01:02,470 --> 00:00:59,359
welcome you to our celebration of

8
00:01:05,350 --> 00:01:02,480
curiosity one year on mars

9
00:01:07,429 --> 00:01:05,360
one year ago today believe it or not

10
00:01:10,630 --> 00:01:07,439
uh began one of the most daring

11
00:01:12,789 --> 00:01:10,640
adventures yet in planetary exploration

12
00:01:15,830 --> 00:01:12,799
certainly the most daring

13
00:01:18,070 --> 00:01:15,840

of our exploration steps for mars

14

00:01:20,469 --> 00:01:18,080

the thrill of the curiosity rover and

15

00:01:22,149 --> 00:01:20,479

its science payload hurtling toward the

16

00:01:25,030 --> 00:01:22,159

planet to a

17

00:01:26,550 --> 00:01:25,040

soft touchdown on six wheels remains

18

00:01:28,950 --> 00:01:26,560

with us today

19

00:01:31,670 --> 00:01:28,960

and we're reminded just what an

20

00:01:34,789 --> 00:01:31,680

incredible science and

21

00:01:36,870 --> 00:01:34,799

engineering feat this is

22

00:01:37,670 --> 00:01:36,880

i'm impressed by

23

00:01:39,510 --> 00:01:37,680

the

24

00:01:41,429 --> 00:01:39,520

work that's been done since those

25

00:01:43,910 --> 00:01:41,439

initial moments on the surface with

26

00:01:46,469 --> 00:01:43,920

everything worked perfectly

27

00:01:49,510 --> 00:01:46,479

i'm impressed by the work that's been

28

00:01:51,749 --> 00:01:49,520

done in the first year of exploration

29

00:01:53,350 --> 00:01:51,759

and the rover's performance has just

30

00:01:56,710 --> 00:01:53,360

been i think

31

00:02:00,230 --> 00:01:56,720

in excess of what the most optimistic of

32

00:02:02,389 --> 00:02:00,240

us had imagined it might be

33

00:02:04,630 --> 00:02:02,399

while learning to operate the amazing

34

00:02:06,389 --> 00:02:04,640

machine that the rover and science

35

00:02:07,429 --> 00:02:06,399

payload are

36

00:02:09,990 --> 00:02:07,439

the

37

00:02:12,309 --> 00:02:10,000

engineers and scientists have forged a

38

00:02:13,910 --> 00:02:12,319

partnership that includes the rover

39

00:02:15,830 --> 00:02:13,920

itself

40

00:02:17,350 --> 00:02:15,840

they've been testing and they've been

41

00:02:20,949 --> 00:02:17,360

utilizing

42

00:02:22,790 --> 00:02:20,959

thousands of rover and payload functions

43

00:02:27,270 --> 00:02:22,800

and what we have today is an

44

00:02:29,030 --> 00:02:27,280

astonishingly powerful tool for science

45

00:02:33,110 --> 00:02:29,040

we've been observing

46

00:02:35,110 --> 00:02:33,120

we've been measuring we've been sampling

47

00:02:37,990 --> 00:02:35,120

and in the background

48

00:02:39,830 --> 00:02:38,000

throughout laboratories across the globe

49

00:02:41,350 --> 00:02:39,840

there have been scientists working to

50

00:02:44,630 --> 00:02:41,360

help interpret the measurements that

51
00:02:49,190 --> 00:02:47,110
i think it's important to recognize that

52
00:02:51,589 --> 00:02:49,200
the questions that we ask address some

53
00:02:54,229 --> 00:02:51,599
of the most important questions in

54
00:02:55,990 --> 00:02:54,239
science and for mars one of the great

55
00:02:59,110 --> 00:02:56,000
mysteries and that is

56
00:03:01,030 --> 00:02:59,120
was this planet ever habitable

57
00:03:03,270 --> 00:03:01,040
our celebration of the success of

58
00:03:05,750 --> 00:03:03,280
curiosity's first year

59
00:03:08,790 --> 00:03:05,760
includes the anticipation of even more

60
00:03:11,190 --> 00:03:08,800
exciting years of discovery to come

61
00:03:11,990 --> 00:03:11,200
we have three conversations today for

62
00:03:14,229 --> 00:03:12,000
you

63
00:03:17,589 --> 00:03:14,239

one is about getting the amazing rover

64

00:03:19,670 --> 00:03:17,599

to the surface and making it work

65

00:03:23,190 --> 00:03:19,680

about the science that's been

66

00:03:25,430 --> 00:03:23,200

accomplished and that cut to come

67

00:03:26,949 --> 00:03:25,440

and we conclude with a look at the

68

00:03:29,670 --> 00:03:26,959

extraordinary

69

00:03:30,830 --> 00:03:29,680

public and worldwide impact that this

70

00:03:34,229 --> 00:03:30,840

mission has

71

00:03:36,149 --> 00:03:34,239

had but before getting started i'd like

72

00:03:37,910 --> 00:03:36,159

to quickly acknowledge

73

00:03:41,589 --> 00:03:37,920

the past and present leaders of

74

00:03:47,270 --> 00:03:43,750

the project managers

75

00:03:47,990 --> 00:03:47,280

are mike sander pete tysinger richard

76

00:03:50,789 --> 00:03:48,000

cook

77

00:03:53,990 --> 00:03:50,799

and jim erickson and project scientist

78

00:04:11,509 --> 00:03:54,000

ed stolper and john grotzinger gentlemen

79

00:04:14,470 --> 00:04:13,429

and i'd ask

80

00:04:16,789 --> 00:04:14,480

everyone

81

00:04:17,830 --> 00:04:16,799

who has been part of this amazing

82

00:04:21,270 --> 00:04:17,840

mission

83

00:04:23,510 --> 00:04:21,280

to please stand and be acknowledged

84

00:04:25,749 --> 00:04:23,520

please stand those of you who have been

85

00:04:28,560 --> 00:04:25,759

part of this mission and worked

86

00:04:42,310 --> 00:04:28,570

together with these individuals

87

00:04:44,629 --> 00:04:42,320

[Applause]

88

00:04:47,030 --> 00:04:44,639

so to frame our first conversation

89

00:04:48,469 --> 00:04:47,040

here's a short video that i think helps

90

00:04:49,510 --> 00:04:48,479

remind us

91

00:04:51,990 --> 00:04:49,520

what

92

00:04:59,749 --> 00:04:52,000

it took to get to the surface of mars

93

00:05:03,670 --> 00:05:00,629

that

94

00:05:05,830 --> 00:05:03,680

great things take

95

00:05:08,150 --> 00:05:05,840

many people working together to make

96

00:05:10,469 --> 00:05:08,160

them happen is one of the fantastic

97

00:05:12,230 --> 00:05:10,479

things of human existence

98

00:05:13,749 --> 00:05:12,240

not only we've driven the rover we've

99

00:05:15,590 --> 00:05:13,759

moved its arm put it all through its

100

00:05:18,070 --> 00:05:15,600

paces but it's been in a thermal vacuum

101
00:05:19,749 --> 00:05:18,080
chamber and kept very cold parts of it

102
00:05:22,230 --> 00:05:19,759
have been in a centrifuge

103
00:05:25,189 --> 00:05:22,240
we've done drop tests pull tests drive

104
00:05:26,790 --> 00:05:25,199
tests load tests stress tests

105
00:05:28,710 --> 00:05:26,800
it's just an amazing amount of testing

106
00:05:30,310 --> 00:05:28,720
this vehicle has gone through we've

107
00:05:32,310 --> 00:05:30,320
tried every way of operating at the

108
00:05:34,790 --> 00:05:32,320
vehicle using the software literally

109
00:05:36,469 --> 00:05:34,800
thousands and thousands of hours of

110
00:05:39,430 --> 00:05:36,479
software testing

111
00:05:42,070 --> 00:05:39,440
it's been just a an amazing several

112
00:05:43,909 --> 00:05:42,080
years really of constant testing and

113
00:05:51,110 --> 00:05:43,919

development finding problems fixing

114

00:06:00,070 --> 00:05:53,749

this is the problem on channel one lc

115

00:06:04,550 --> 00:06:01,749

am i confident that she's gonna go and

116

00:06:11,189 --> 00:06:04,560

she's gonna be successful absolutely

117

00:06:14,150 --> 00:06:12,950

we should have parachute deploy around

118

00:06:16,550 --> 00:06:14,160

1.7

119

00:06:18,820 --> 00:06:16,560

the parachute is deployed

120

00:06:33,029 --> 00:06:18,830

we are decelerating

121

00:06:33,039 --> 00:06:41,590

started

122

00:06:41,600 --> 00:06:46,760

touchdown

123

00:07:05,270 --> 00:07:00,110

[Applause]

124

00:07:08,710 --> 00:07:05,280

what a fantastic demonstration of what

125

00:07:10,710 --> 00:07:08,720

our nation and our agency can do

126
00:07:13,029 --> 00:07:10,720
i could only think of the words of teddy

127
00:07:15,110 --> 00:07:13,039
roosevelt as i was sitting there

128
00:07:17,510 --> 00:07:15,120
it is far better to their mighty things

129
00:07:19,430 --> 00:07:17,520
even so we might fail

130
00:07:22,070 --> 00:07:19,440
than to stay in the twilight that knows

131
00:07:24,260 --> 00:07:22,080
neither victory nor defeat and the team

132
00:07:25,620 --> 00:07:24,270
brought us victory

133
00:07:30,050 --> 00:07:25,630
[Applause]

134
00:07:39,430 --> 00:07:30,060
[Music]

135
00:07:41,430 --> 00:07:39,440
[Applause]

136
00:07:43,990 --> 00:07:41,440
so i'd like to introduce the host of

137
00:07:46,150 --> 00:07:44,000
today's first conversation

138
00:07:48,070 --> 00:07:46,160

the man who led the project that put

139

00:07:51,029 --> 00:07:48,080

spirit and opportunity

140

00:07:53,270 --> 00:07:51,039

on the surface of mars in 2004

141

00:07:55,589 --> 00:07:53,280

and again delivered the curiosity rover

142

00:07:58,380 --> 00:07:55,599

to mars in 2012.

143

00:08:06,710 --> 00:07:58,390

ladies and gentlemen pete tysinger

144

00:08:11,430 --> 00:08:08,550

i really wish dan would stop reminding

145

00:08:13,350 --> 00:08:11,440

me how old i am

146

00:08:14,790 --> 00:08:13,360

you know you look at that video and i

147

00:08:17,029 --> 00:08:14,800

don't know about you but i've probably

148

00:08:18,469 --> 00:08:17,039

seen that video uh a hundred times in

149

00:08:19,430 --> 00:08:18,479

the last year

150

00:08:21,430 --> 00:08:19,440

and

151

00:08:23,189 --> 00:08:21,440

you still think about how you felt that

152

00:08:25,029 --> 00:08:23,199

night and still

153

00:08:27,670 --> 00:08:25,039

in wonderment that it really did what it

154

00:08:29,670 --> 00:08:27,680

did it's it's an amazing story

155

00:08:31,430 --> 00:08:29,680

so i brought with me three of uh three

156

00:08:34,230 --> 00:08:31,440

of my cohorts to talk to you a little

157

00:08:37,190 --> 00:08:34,240

bit about uh some of the engineering

158

00:08:39,269 --> 00:08:37,200

uh stories about getting curiosity to uh

159

00:08:41,269 --> 00:08:39,279

to the launch pad and and to the planet

160

00:08:42,469 --> 00:08:41,279

and and in preparation for the surface

161

00:08:44,550 --> 00:08:42,479

operations

162

00:08:46,710 --> 00:08:44,560

to my left is matt wallace he was the

163

00:08:49,509 --> 00:08:46,720

flight system manager uh

164

00:08:51,750 --> 00:08:49,519

on on the mission uh from beginning to

165

00:08:54,470 --> 00:08:51,760

end uh which means he probably has the

166

00:08:57,269 --> 00:08:54,480

least sleep of anybody on the mission

167

00:08:59,990 --> 00:08:57,279

uh to his left is alan chen uh he was an

168

00:09:01,590 --> 00:09:00,000

engineer on adl and you may remember him

169

00:09:03,430 --> 00:09:01,600

at the night of

170

00:09:04,630 --> 00:09:03,440

curiosity's landing as being the voice

171

00:09:06,710 --> 00:09:04,640

of edl

172

00:09:08,630 --> 00:09:06,720

i think he said something like where on

173

00:09:09,750 --> 00:09:08,640

mars everybody that was a nice nice

174

00:09:10,710 --> 00:09:09,760

thing to hear

175

00:09:16,790 --> 00:09:10,720

uh

176

00:09:18,310 --> 00:09:16,800

lead for surface operations during

177

00:09:19,829 --> 00:09:18,320

development and now leaves the

178

00:09:23,110 --> 00:09:19,839

engineering team and she'll talk a

179

00:09:25,190 --> 00:09:23,120

little bit about operations so matt

180

00:09:26,550 --> 00:09:25,200

thanks pete uh

181

00:09:28,389 --> 00:09:26,560

i know this is going to come as a shock

182

00:09:31,030 --> 00:09:28,399

to some of you but on every single

183

00:09:32,790 --> 00:09:31,040

memory i have of msl happens to be of

184

00:09:35,030 --> 00:09:32,800

sunshine and roses

185

00:09:37,269 --> 00:09:35,040

there were some tough times there

186

00:09:39,350 --> 00:09:37,279

and uh and so i thought i'd say a couple

187

00:09:40,230 --> 00:09:39,360

words about one of those periods um it

188

00:09:43,030 --> 00:09:40,240

was

189

00:09:45,030 --> 00:09:43,040

kind of late spring of 2011 and we were

190

00:09:47,750 --> 00:09:45,040

just a few months away from having to

191

00:09:49,350 --> 00:09:47,760

ship the the vehicle to the cape

192

00:09:50,470 --> 00:09:49,360

we had had a pretty good winter we had

193

00:09:52,870 --> 00:09:50,480

just gotten through

194

00:09:53,910 --> 00:09:52,880

a difficult rework activity on the

195

00:09:56,230 --> 00:09:53,920

vehicle

196

00:09:57,269 --> 00:09:56,240

we had all of our engineering hardware

197

00:09:59,190 --> 00:09:57,279

we had

198

00:10:02,070 --> 00:09:59,200

all of our science instruments finally

199

00:10:03,829 --> 00:10:02,080

on the vehicle it was up it was running

200

00:10:05,350 --> 00:10:03,839

it was working as an integrated system

201
00:10:07,030 --> 00:10:05,360
we got through a

202
00:10:09,269 --> 00:10:07,040
vibration test of the vehicle of

203
00:10:11,350 --> 00:10:09,279
curiosity we took it into the chamber

204
00:10:14,230 --> 00:10:11,360
there was a quick picture in the video

205
00:10:17,110 --> 00:10:14,240
of the vehicle in the chamber with the

206
00:10:18,949 --> 00:10:17,120
simulated sun shining down on it and we

207
00:10:20,389 --> 00:10:18,959
thought perhaps you know

208
00:10:23,110 --> 00:10:20,399
the sun in fact

209
00:10:25,750 --> 00:10:23,120
was shining on the project at that point

210
00:10:28,630 --> 00:10:25,760
um but there were clouds on the horizon

211
00:10:30,829 --> 00:10:28,640
unfortunately and perhaps even

212
00:10:33,990 --> 00:10:30,839
some severe tropical

213
00:10:35,750 --> 00:10:34,000

storms and within a month or so as you

214

00:10:37,910 --> 00:10:35,760

can see in this picture

215

00:10:39,750 --> 00:10:37,920

the rover was up on the blocks it was

216

00:10:41,910 --> 00:10:39,760

dead bugged we had ripped some wheels

217

00:10:44,310 --> 00:10:41,920

off the belly pan was off we were

218

00:10:46,710 --> 00:10:44,320

pulling harnessing out to fix some of

219

00:10:48,150 --> 00:10:46,720

the components that needed reliability

220

00:10:50,790 --> 00:10:48,160

had some reliable

221

00:10:52,870 --> 00:10:50,800

reliability issues we were

222

00:10:54,470 --> 00:10:52,880

we were pulling boxes out because we

223

00:10:56,790 --> 00:10:54,480

were electronic boxes we were worried

224

00:10:58,630 --> 00:10:56,800

about some of these boxes having a noise

225

00:10:59,990 --> 00:10:58,640

vulnerability that could have ended the

226

00:11:01,269 --> 00:11:00,000

mission during the entry descent and

227

00:11:03,190 --> 00:11:01,279

landing phase

228

00:11:04,949 --> 00:11:03,200

that you saw so successfully go through

229

00:11:06,310 --> 00:11:04,959

a year ago today

230

00:11:07,990 --> 00:11:06,320

so there were some

231

00:11:09,670 --> 00:11:08,000

significant issues we were also pulling

232

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

off our sampling system which has been

233

00:11:13,590 --> 00:11:11,839

doing such tremendous work on the

234

00:11:15,110 --> 00:11:13,600

surface of mars

235

00:11:16,790 --> 00:11:15,120

over the last uh

236

00:11:19,829 --> 00:11:16,800

sin over the last year

237

00:11:21,430 --> 00:11:19,839

and so uh it was a tense time and and

238

00:11:22,470 --> 00:11:21,440

some of us pete and i were trying to

239

00:11:24,389 --> 00:11:22,480

figure out

240

00:11:26,069 --> 00:11:24,399

where we were going to find enough time

241

00:11:29,110 --> 00:11:26,079

in the schedule to put this thing back

242

00:11:31,110 --> 00:11:29,120

together retest it get it down to the

243

00:11:33,670 --> 00:11:31,120

cape get the spacecraft free stacked and

244

00:11:34,949 --> 00:11:33,680

and into the uh and onto the launch

245

00:11:38,230 --> 00:11:34,959

vehicle

246

00:11:39,910 --> 00:11:38,240

and i i remember thinking to myself

247

00:11:42,550 --> 00:11:39,920

why are we struggling here why is this

248

00:11:45,190 --> 00:11:42,560

so hard you know what do we try to do

249

00:11:47,990 --> 00:11:45,200

this to ourselves and uh

250

00:11:50,310 --> 00:11:48,000

and and after after a little bit of time

251

00:11:52,150 --> 00:11:50,320

uh thinking in hindsight in fact that

252

00:11:54,230 --> 00:11:52,160

that is exactly what we did we did

253

00:11:56,150 --> 00:11:54,240

intend to do that to ourselves and the

254

00:11:58,389 --> 00:11:56,160

reason was from the first day i i

255

00:12:00,710 --> 00:11:58,399

started working on this project

256

00:12:02,550 --> 00:12:00,720

we designed this system we architected

257

00:12:04,230 --> 00:12:02,560

it to be robust

258

00:12:07,269 --> 00:12:04,240

to be

259

00:12:08,870 --> 00:12:07,279

reliable in flight for it to have the

260

00:12:10,949 --> 00:12:08,880

ability to

261

00:12:13,190 --> 00:12:10,959

take a punch from mars and stay on its

262

00:12:14,629 --> 00:12:13,200

feet you know and we saw that a year ago

263

00:12:17,670 --> 00:12:14,639

when we landed we went right down the

264

00:12:18,870 --> 00:12:17,680

middle we had a very successful landing

265

00:12:22,150 --> 00:12:18,880

and we've been watching that on the

266

00:12:24,069 --> 00:12:22,160

surface of mars i think this is a very

267

00:12:26,870 --> 00:12:24,079

um this is a this is a vehicle that

268

00:12:27,910 --> 00:12:26,880

likes to be on its way or on the surface

269

00:12:31,110 --> 00:12:27,920

of mars

270

00:12:33,829 --> 00:12:31,120

and uh the the the corollary to that of

271

00:12:35,350 --> 00:12:33,839

course is that it makes it you may have

272

00:12:36,790 --> 00:12:35,360

to build some very

273

00:12:38,230 --> 00:12:36,800

uh difficult things you may have to

274

00:12:39,190 --> 00:12:38,240

design and build some very difficult

275

00:12:40,069 --> 00:12:39,200

things

276

00:12:43,190 --> 00:12:40,079

and

277

00:12:44,230 --> 00:12:43,200

unfortunately um we have a we had a very

278

00:12:47,430 --> 00:12:44,240

uh

279

00:12:49,750 --> 00:12:47,440

strong and resilient team to do that

280

00:12:50,870 --> 00:12:49,760

and and that was at that period of time

281

00:12:52,389 --> 00:12:50,880

really called

282

00:12:53,910 --> 00:12:52,399

called on that team to do

283

00:12:55,990 --> 00:12:53,920

everything they could to get through

284

00:12:58,310 --> 00:12:56,000

that rebuild cycle

285

00:13:00,790 --> 00:12:58,320

as you can see here get the vehicle back

286

00:13:03,509 --> 00:13:00,800

together and get it down to the cape and

287

00:13:06,230 --> 00:13:03,519

and eventually in the next image you can

288

00:13:08,629 --> 00:13:06,240

see the spacecraft fully assembled ready

289

00:13:10,949 --> 00:13:08,639

for encapsulation uh

290

00:13:14,230 --> 00:13:10,959

inside the uh the launch vehicle

291

00:13:15,829 --> 00:13:14,240

uh so uh it was uh

292

00:13:18,150 --> 00:13:15,839

you know the the project brought all

293

00:13:20,790 --> 00:13:18,160

kinds of challenges absolutely but uh

294

00:13:23,030 --> 00:13:20,800

the story ends well as you all know

295

00:13:24,629 --> 00:13:23,040

and uh and and i want to once again just

296

00:13:27,269 --> 00:13:24,639

thank the the team here and at the

297

00:13:29,110 --> 00:13:27,279

various centers uh out in industry our

298

00:13:32,389 --> 00:13:29,120

international partners everybody that

299

00:13:34,870 --> 00:13:32,399

really made this uh this possible so

300

00:13:36,949 --> 00:13:34,880

thanks pete thank you matt

301
00:13:38,870 --> 00:13:36,959
um of course that was only one of the of

302
00:13:40,550 --> 00:13:38,880
the many stories and challenges that uh

303
00:13:41,590 --> 00:13:40,560
that happened to curiosity on the way to

304
00:13:43,990 --> 00:13:41,600
florida

305
00:13:46,310 --> 00:13:44,000
i can remember um

306
00:13:47,750 --> 00:13:46,320
talking with matt and and dave rule the

307
00:13:49,190 --> 00:13:47,760
head of atlo and

308
00:13:50,629 --> 00:13:49,200
talking about it including rework

309
00:13:51,829 --> 00:13:50,639
periods in the outlook schedule because

310
00:13:53,110 --> 00:13:51,839
we knew we were going to have problem

311
00:13:54,310 --> 00:13:53,120
failure reports we knew that some of

312
00:13:55,509 --> 00:13:54,320
those were going to require hardware

313
00:13:57,430 --> 00:13:55,519

changes and

314

00:14:00,870 --> 00:13:57,440

we thought we would you know preschedule

315

00:14:03,350 --> 00:14:00,880

some of that thing and and so we put the

316

00:14:04,949 --> 00:14:03,360

one of of the we put a reworked period

317

00:14:06,870 --> 00:14:04,959

in the outlook schedule and and the

318

00:14:09,189 --> 00:14:06,880

incident that matt talked about was

319

00:14:10,949 --> 00:14:09,199

number three of the one uh outlaw rework

320

00:14:13,829 --> 00:14:10,959

period that we had

321

00:14:15,509 --> 00:14:13,839

um i want to i want to uh echo matt's

322

00:14:17,110 --> 00:14:15,519

congratulations to the team that not

323

00:14:19,110 --> 00:14:17,120

only worked on the design of curiosity

324

00:14:21,110 --> 00:14:19,120

but also the atlo team

325

00:14:23,269 --> 00:14:21,120

that in so many of our missions uh save

326

00:14:25,670 --> 00:14:23,279

our our behinds because of the ability

327

00:14:28,150 --> 00:14:25,680

to compress schedule at the very end

328

00:14:30,470 --> 00:14:28,160

and also to the kennedy team who uh

329

00:14:31,829 --> 00:14:30,480

who uh in in in preparation of the

330

00:14:34,470 --> 00:14:31,839

fairing which had to be cleaned for

331

00:14:36,069 --> 00:14:34,480

planetary protection purposes and also

332

00:14:37,990 --> 00:14:36,079

in uh in the last integration of the

333

00:14:39,829 --> 00:14:38,000

vehicle did a fantastic job so that we

334

00:14:42,150 --> 00:14:39,839

launched in fact on the second

335

00:14:44,310 --> 00:14:42,160

geometrical opportunity and it was uh it

336

00:14:46,150 --> 00:14:44,320

was a very successful launch and that

337

00:14:47,670 --> 00:14:46,160

got us into cruise and of course you

338

00:14:49,189 --> 00:14:47,680

might think that that

339

00:14:51,910 --> 00:14:49,199

would have been an easy time but it was

340

00:14:53,110 --> 00:14:51,920

not really um we had uh we had flight

341

00:14:54,710 --> 00:14:53,120

software to

342

00:14:57,430 --> 00:14:54,720

to to do because we had the late flight

343

00:14:59,910 --> 00:14:57,440

software development we had a few cruise

344

00:15:01,990 --> 00:14:59,920

things to worry about we had the uh

345

00:15:03,590 --> 00:15:02,000

we had a computer issue early on that

346

00:15:05,670 --> 00:15:03,600

was that we solved with the help with

347

00:15:07,590 --> 00:15:05,680

the help of our baa partner

348

00:15:09,350 --> 00:15:07,600

and then we got to edl and alan we'll

349

00:15:11,269 --> 00:15:09,360

talk a little bit about that

350

00:15:12,710 --> 00:15:11,279

uh since it's been a year since landing

351

00:15:16,470 --> 00:15:12,720

i figured it would be a good time to

352

00:15:18,150 --> 00:15:16,480

make a bit of a public confession

353

00:15:19,350 --> 00:15:18,160

as pete mentioned i you know i had the

354

00:15:21,110 --> 00:15:19,360

honor of

355

00:15:22,949 --> 00:15:21,120

doing the play-by-play on the way down i

356

00:15:25,269 --> 00:15:22,959

kind of gave myself two guidelines one

357

00:15:26,790 --> 00:15:25,279

was to try not to say anything stupid

358

00:15:28,550 --> 00:15:26,800

the second was to try to report what i

359

00:15:30,069 --> 00:15:28,560

saw and report everything i saw and it's

360

00:15:31,670 --> 00:15:30,079

actually that second one which i didn't

361

00:15:33,350 --> 00:15:31,680

do

362

00:15:35,269 --> 00:15:33,360

it turns out uh you know if you're

363

00:15:36,550 --> 00:15:35,279

taking you back to that night uh a year

364

00:15:37,750 --> 00:15:36,560

ago

365

00:15:38,870 --> 00:15:37,760

you know we were watching telemetry

366

00:15:40,790 --> 00:15:38,880

coming in from the vehicle and we had

367

00:15:43,829 --> 00:15:40,800

two types we had these tones that that

368

00:15:46,150 --> 00:15:43,839

the one of these 256 notes that the the

369

00:15:47,670 --> 00:15:46,160

the uh that curiosity would send back to

370

00:15:49,749 --> 00:15:47,680

us to tell us what was going on and

371

00:15:51,829 --> 00:15:49,759

that's all we had for about you know 14

372

00:15:53,509 --> 00:15:51,839

15 minutes from around cruise stage

373

00:15:55,030 --> 00:15:53,519

separation until we got into the

374

00:15:58,230 --> 00:15:55,040

atmosphere and then after that we

375

00:15:59,829 --> 00:15:58,240

started picking up data from odyssey

376

00:16:01,590 --> 00:15:59,839

it's those tones that you know things

377

00:16:03,350 --> 00:16:01,600

were looking pretty good for a long time

378

00:16:05,509 --> 00:16:03,360

you know we had 10 minutes of pretty

379

00:16:06,870 --> 00:16:05,519

boring heartbeat tones i was like

380

00:16:08,629 --> 00:16:06,880

my blood pressure was up but you know

381

00:16:10,230 --> 00:16:08,639

this was calming down a little bit

382

00:16:12,870 --> 00:16:10,240

then uh shortly after we hit the

383

00:16:15,189 --> 00:16:12,880

atmosphere we got a tone called uh meads

384

00:16:17,590 --> 00:16:15,199

beta catastrophic

385

00:16:20,550 --> 00:16:17,600

usually bad when you get these these

386

00:16:21,990 --> 00:16:20,560

tones that come back saying catastrophic

387

00:16:23,749 --> 00:16:22,000

you know we had intended that tone to

388

00:16:26,629 --> 00:16:23,759

tell us that we were about to imminently

389

00:16:28,150 --> 00:16:26,639

lose the vehicle um these were uh it was

390

00:16:29,110 --> 00:16:28,160

based on uh you had to do a lot of

391

00:16:31,670 --> 00:16:29,120

processing because you couldn't send

392

00:16:33,670 --> 00:16:31,680

back raw telemetry in these tones

393

00:16:34,710 --> 00:16:33,680

and uh you know that really spiked my

394

00:16:36,470 --> 00:16:34,720

blood pressure i think i almost had a

395

00:16:38,389 --> 00:16:36,480

heart attack when i saw that

396

00:16:40,550 --> 00:16:38,399

you know what that meant was you know if

397

00:16:42,230 --> 00:16:40,560

it was true was that the uh the vehicle

398

00:16:44,629 --> 00:16:42,240

was either tumbling

399

00:16:46,949 --> 00:16:44,639

or not heat shield forward um toward the

400

00:16:48,069 --> 00:16:46,959

atmosphere uh we was using uh it's using

401
00:16:49,350 --> 00:16:48,079
the sensors actually you can see them on

402
00:16:51,030 --> 00:16:49,360
the heat shield there

403
00:16:52,310 --> 00:16:51,040
these pressure sensors to try to guess

404
00:16:53,670 --> 00:16:52,320
try to figure out what the attitude of

405
00:16:54,870 --> 00:16:53,680
the vehicle was

406
00:16:56,230 --> 00:16:54,880
um so

407
00:16:57,910 --> 00:16:56,240
i bet if you watch i haven't gone back

408
00:16:59,910 --> 00:16:57,920
and re-watched the video i can't stand

409
00:17:01,269 --> 00:16:59,920
watching myself but

410
00:17:04,069 --> 00:17:01,279
i bet if you go back and watch it you

411
00:17:06,150 --> 00:17:04,079
could probably see me seize up um i'm a

412
00:17:07,750 --> 00:17:06,160
terrible poker player and uh

413
00:17:08,949 --> 00:17:07,760

you know it's uh

414

00:17:11,029 --> 00:17:08,959

yeah that was definitely a

415

00:17:12,309 --> 00:17:11,039

heart-stopping moment for me

416

00:17:14,870 --> 00:17:12,319

and i thought about it for a second you

417

00:17:16,069 --> 00:17:14,880

know i had figured you know if

418

00:17:17,510 --> 00:17:16,079

you know if about to lose the vehicle i

419

00:17:21,429 --> 00:17:17,520

better not say anything dumb there back

420

00:17:23,750 --> 00:17:22,630

i was like you know this this just

421

00:17:25,110 --> 00:17:23,760

happened right after we hit the

422

00:17:27,590 --> 00:17:25,120

atmosphere there really shouldn't be

423

00:17:29,590 --> 00:17:27,600

much air at that point do i really

424

00:17:31,270 --> 00:17:29,600

believe this you know is there is there

425

00:17:33,350 --> 00:17:31,280

something going on here that's uh that's

426
00:17:35,750 --> 00:17:33,360
more than more than i was thinking about

427
00:17:36,710 --> 00:17:35,760
um you know because it's it's using uh

428
00:17:38,070 --> 00:17:36,720
you know it's trying to basically

429
00:17:39,110 --> 00:17:38,080
subtract off the pressures from two

430
00:17:40,789 --> 00:17:39,120
different sides of the heat shield to

431
00:17:42,310 --> 00:17:40,799
figure out what the attitude is but

432
00:17:43,669 --> 00:17:42,320
really there's not much error up there

433
00:17:44,950 --> 00:17:43,679
are we getting much pressure at all

434
00:17:46,950 --> 00:17:44,960
what's going on

435
00:17:48,230 --> 00:17:46,960
um so i figured let me sit on this one

436
00:17:49,750 --> 00:17:48,240
for a minute if we're about to lose the

437
00:17:51,350 --> 00:17:49,760
vehicle if we're about to you know we're

438
00:17:52,390 --> 00:17:51,360

about to hit peak deceleration and peak

439

00:17:53,350 --> 00:17:52,400

heating it's going to become pretty

440

00:17:56,230 --> 00:17:53,360

obvious if we're going to lose the

441

00:17:59,190 --> 00:17:56,240

vehicle in a minute or two

442

00:18:01,510 --> 00:17:59,200

so i sat on it and you know luckily

443

00:18:03,590 --> 00:18:01,520

everything else turned out okay

444

00:18:05,350 --> 00:18:03,600

um you know it turns out actually that

445

00:18:07,669 --> 00:18:05,360

the instrument is working fine but the

446

00:18:10,789 --> 00:18:07,679

uh we just had a calibration error and

447

00:18:12,549 --> 00:18:10,799

that was going about it um but uh yeah

448

00:18:15,029 --> 00:18:12,559

if i wasn't already sweating a lot then

449

00:18:17,430 --> 00:18:15,039

then i was super sweating after that

450

00:18:19,510 --> 00:18:17,440

definitely got the heart pounding so but

451
00:18:21,590 --> 00:18:19,520
you know as i like to say edl is really

452
00:18:23,750 --> 00:18:21,600
just the uh the middle of the story or

453
00:18:25,029 --> 00:18:23,760
even closer to the beginning really uh

454
00:18:27,909 --> 00:18:25,039
it's what's happened afterward that's

455
00:18:29,830 --> 00:18:27,919
kind of been the most rewarding for me

456
00:18:32,549 --> 00:18:29,840
thanks alan um

457
00:18:33,990 --> 00:18:32,559
i'm glad you didn't tell me

458
00:18:34,789 --> 00:18:34,000
i didn't want to kill anybody too on

459
00:18:36,470 --> 00:18:34,799
that

460
00:18:38,310 --> 00:18:36,480
and given all the taxes given all the

461
00:18:41,990 --> 00:18:38,320
vips that were there that night i'm glad

462
00:18:44,470 --> 00:18:42,000
you exercised a measure of restraint

463
00:18:46,230 --> 00:18:44,480

and for all that work for the seven

464

00:18:48,150 --> 00:18:46,240

years to get to that point in time for

465

00:18:49,270 --> 00:18:48,160

all the risk reduction that had happened

466

00:18:51,350 --> 00:18:49,280

all the

467

00:18:54,070 --> 00:18:51,360

the risk reduction during design and

468

00:18:55,750 --> 00:18:54,080

during assembly and and the fact of

469

00:18:57,590 --> 00:18:55,760

launch which has its own

470

00:19:00,070 --> 00:18:57,600

issues and crews

471

00:19:02,630 --> 00:19:00,080

and edl and we're finally on the surface

472

00:19:04,470 --> 00:19:02,640

and you need to realize at that point

473

00:19:07,029 --> 00:19:04,480

in your book that you're reading you've

474

00:19:07,830 --> 00:19:07,039

just passed the prologue

475

00:19:10,789 --> 00:19:07,840

okay

476
00:19:12,150 --> 00:19:10,799
because we do all that work so that the

477
00:19:14,230 --> 00:19:12,160
surface science and the service

478
00:19:16,230 --> 00:19:14,240
operations take place and jessica will

479
00:19:18,470 --> 00:19:16,240
talk a little bit about that so we've

480
00:19:21,270 --> 00:19:18,480
really been having an exciting time on

481
00:19:25,270 --> 00:19:21,280
the surface in this past year we've sent

482
00:19:28,310 --> 00:19:25,280
over 15 000 commands to the rover so far

483
00:19:29,510 --> 00:19:28,320
with an average of 600 to 800 commands a

484
00:19:32,070 --> 00:19:29,520
day

485
00:19:33,029 --> 00:19:32,080
which is a pretty impressive and our

486
00:19:36,150 --> 00:19:33,039
five

487
00:19:38,150 --> 00:19:36,160
samples that we've scooped and two drill

488
00:19:40,630 --> 00:19:38,160

rock targets where we delivered those

489

00:19:41,510 --> 00:19:40,640

samples to our analytical instruments

490

00:19:43,510 --> 00:19:41,520

and

491

00:19:45,830 --> 00:19:43,520

were approaching two kilometers or about

492

00:19:47,590 --> 00:19:45,840

one and three quarter kilometers

493

00:19:49,909 --> 00:19:47,600

and the countless number of science

494

00:19:51,590 --> 00:19:49,919

papers that the science team has been

495

00:19:53,350 --> 00:19:51,600

able to

496

00:19:55,110 --> 00:19:53,360

draft and present

497

00:19:56,950 --> 00:19:55,120

has really been a testament to how much

498

00:19:58,710 --> 00:19:56,960

we've been able to exercise the

499

00:20:00,070 --> 00:19:58,720

capabilities all the capabilities of

500

00:20:02,789 --> 00:20:00,080

this vehicle

501
00:20:04,950 --> 00:20:02,799
so we've been having a great time on the

502
00:20:07,029 --> 00:20:04,960
surface but kind of keeping in line with

503
00:20:09,190 --> 00:20:07,039
these challenges

504
00:20:11,750 --> 00:20:09,200
our our pro probably our biggest

505
00:20:13,750 --> 00:20:11,760
challenge arise about

506
00:20:15,830 --> 00:20:13,760
halfway into the year

507
00:20:17,510 --> 00:20:15,840
we had just finished our first drill

508
00:20:20,950 --> 00:20:17,520
sample

509
00:20:22,150 --> 00:20:20,960
at the john klein science target and

510
00:20:23,590 --> 00:20:22,160
had delivered

511
00:20:26,310 --> 00:20:23,600
some of those

512
00:20:27,350 --> 00:20:26,320
samples to the science instruments

513
00:20:28,789 --> 00:20:27,360

but

514

00:20:30,630 --> 00:20:28,799

on one of the afternoons when we

515

00:20:32,310 --> 00:20:30,640

received the data we were

516

00:20:34,070 --> 00:20:32,320

we saw that we actually weren't getting

517

00:20:35,909 --> 00:20:34,080

data products from the spacecraft and

518

00:20:37,510 --> 00:20:35,919

that's one of the main ways that we get

519

00:20:38,630 --> 00:20:37,520

the telemetry from what's happening on

520

00:20:39,669 --> 00:20:38,640

the rover

521

00:20:45,270 --> 00:20:39,679

and

522

00:20:47,110 --> 00:20:45,280

was a little hard to to make out what

523

00:20:48,870 --> 00:20:47,120

was going on with the data but we have a

524

00:20:51,590 --> 00:20:48,880

second overflight from the odyssey

525

00:20:53,669 --> 00:20:51,600

orbiter and and that data also showed us

526

00:20:56,310 --> 00:20:53,679

that the rover hadn't gone to sleep um

527

00:20:58,549 --> 00:20:56,320

in between the two times um from the mro

528

00:21:01,190 --> 00:20:58,559

pass and this odyssey pass

529

00:21:03,590 --> 00:21:01,200

so that got people worried and

530

00:21:06,149 --> 00:21:03,600

the conclusion was is that the

531

00:21:08,149 --> 00:21:06,159

spacecraft really wasn't operating how

532

00:21:10,710 --> 00:21:08,159

we were expecting it to and it wasn't

533

00:21:14,390 --> 00:21:10,720

performing its nominal functions so

534

00:21:15,909 --> 00:21:14,400

after a very long day and night and

535

00:21:18,230 --> 00:21:15,919

commanding into the middle of the night

536

00:21:20,149 --> 00:21:18,240

and we weren't uh we were no longer on

537

00:21:22,789 --> 00:21:20,159

mars time so everybody had already been

538

00:21:25,270 --> 00:21:22,799

there a long day um the team concluded

539

00:21:27,350 --> 00:21:25,280

that the most important thing was to get

540

00:21:29,990 --> 00:21:27,360

it back into the configuration that we

541

00:21:31,830 --> 00:21:30,000

know which is to swap the computers from

542

00:21:32,870 --> 00:21:31,840

the a-side computer over to the b-side

543

00:21:34,549 --> 00:21:32,880

computer

544

00:21:36,149 --> 00:21:34,559

and

545

00:21:38,149 --> 00:21:36,159

all this was happening

546

00:21:39,909 --> 00:21:38,159

and you know surface being this mission

547

00:21:42,470 --> 00:21:39,919

of you know science discovery and being

548

00:21:44,230 --> 00:21:42,480

led by whatever

549

00:21:46,630 --> 00:21:44,240

is in front of you i don't know if the

550

00:21:48,470 --> 00:21:46,640

team was just nostalgic for a deadline

551
00:21:51,510 --> 00:21:48,480
um because you know launch happened and

552
00:21:53,590 --> 00:21:51,520
cruise happened or edl happened and uh

553
00:21:55,909 --> 00:21:53,600
we had solar conjunction happening

554
00:21:57,830 --> 00:21:55,919
within a month from when this event

555
00:21:58,710 --> 00:21:57,840
occurred which meant we weren't going to

556
00:22:01,029 --> 00:21:58,720
see

557
00:22:04,070 --> 00:22:01,039
we weren't going to be able to command

558
00:22:06,310 --> 00:22:04,080
or really hear from the spacecraft in

559
00:22:08,870 --> 00:22:06,320
for about three weeks over

560
00:22:11,270 --> 00:22:08,880
the month of april so

561
00:22:13,270 --> 00:22:11,280
so here we were in march

562
00:22:14,950 --> 00:22:13,280
the team pulled together

563
00:22:16,710 --> 00:22:14,960

we had members

564

00:22:17,990 --> 00:22:16,720

past team members and current team

565

00:22:20,149 --> 00:22:18,000

members

566

00:22:21,830 --> 00:22:20,159

really coming together stepping up and

567

00:22:23,510 --> 00:22:21,840

doing all kinds of different jobs

568

00:22:25,270 --> 00:22:23,520

everybody kind of broke out into

569

00:22:28,149 --> 00:22:25,280

investigating the hardware side of what

570

00:22:30,390 --> 00:22:28,159

was going on in the software side

571

00:22:32,710 --> 00:22:30,400

and the ops process was even you know

572

00:22:35,669 --> 00:22:32,720

revamped to figure out how to channel or

573

00:22:39,350 --> 00:22:35,679

how to adapt to the anomaly at hand

574

00:22:41,830 --> 00:22:39,360

and just seeing the team come together

575

00:22:44,310 --> 00:22:41,840

like that i think was just a testament

576
00:22:46,789 --> 00:22:44,320
to the integrity and

577
00:22:49,270 --> 00:22:46,799
the commitment that we all have on these

578
00:22:51,510 --> 00:22:49,280
types of missions where you know you

579
00:22:53,190 --> 00:22:51,520
come back and you put

580
00:22:55,510 --> 00:22:53,200
put forward what

581
00:22:56,549 --> 00:22:55,520
what you bring what you know

582
00:23:00,390 --> 00:22:56,559
and

583
00:23:02,950 --> 00:23:00,400
i think

584
00:23:05,029 --> 00:23:02,960
being able to experience that and seeing

585
00:23:07,750 --> 00:23:05,039
all the faces kind of

586
00:23:10,310 --> 00:23:07,760
bring their piece to the table was

587
00:23:12,390 --> 00:23:10,320
was pretty exciting to go through that

588
00:23:14,390 --> 00:23:12,400

kind of harrowing time where we were

589

00:23:15,190 --> 00:23:14,400

against the clock

590

00:23:17,430 --> 00:23:15,200

so

591

00:23:19,590 --> 00:23:17,440

we recovered in a couple weeks and got

592

00:23:21,190 --> 00:23:19,600

science back up and running and we

593

00:23:23,350 --> 00:23:21,200

modified the flight software to be more

594

00:23:26,549 --> 00:23:23,360

robust so going into that conjunction

595

00:23:28,230 --> 00:23:26,559

period and we were prepared um should

596

00:23:29,750 --> 00:23:28,240

you know a problem like this happen

597

00:23:33,270 --> 00:23:29,760

again on the other computer that we were

598

00:23:36,230 --> 00:23:33,280

operating on but um but aside from that

599

00:23:38,230 --> 00:23:36,240

one you know kind of scary moment there

600

00:23:39,830 --> 00:23:38,240

the surface operation has just been

601
00:23:42,630 --> 00:23:39,840
fantastic in terms of what we're

602
00:23:44,230 --> 00:23:42,640
learning and uh and just

603
00:23:46,710 --> 00:23:44,240
all the the different

604
00:23:48,710 --> 00:23:46,720
uh suite of capabilities that this rover

605
00:23:50,310 --> 00:23:48,720
has that's the first time ever on mars

606
00:23:52,470 --> 00:23:50,320
stuff that we're doing so it's been

607
00:23:54,789 --> 00:23:52,480
pretty fun

608
00:23:57,350 --> 00:23:54,799
thank you jessica um i hadn't known it

609
00:23:58,789 --> 00:23:57,360
was a stormy night when that happened

610
00:24:01,750 --> 00:23:58,799
those of us that lived through the sole

611
00:24:04,149 --> 00:24:01,760
18 anomaly may have

612
00:24:06,149 --> 00:24:04,159
you know deja vu all over again with

613
00:24:09,590 --> 00:24:06,159

that whole with that whole story

614

00:24:11,110 --> 00:24:09,600

so um that's only one part of uh as a as

615

00:24:12,390 --> 00:24:11,120

an old television program used to say

616

00:24:13,909 --> 00:24:12,400

there are eight million stories in the

617

00:24:15,990 --> 00:24:13,919

naked city and there's certainly eight

618

00:24:18,710 --> 00:24:16,000

million stories in terms of getting

619

00:24:20,870 --> 00:24:18,720

curiosity to where it is in today and

620

00:24:22,630 --> 00:24:20,880

and i think that people would uh would

621

00:24:23,830 --> 00:24:22,640

would be disappointed if i didn't point

622

00:24:25,190 --> 00:24:23,840

out that for all this wonderful

623

00:24:26,870 --> 00:24:25,200

congratulations and for all this

624

00:24:28,390 --> 00:24:26,880

wonderful feeling and for this

625

00:24:30,070 --> 00:24:28,400

celebration the fact is we're halfway

626

00:24:32,230 --> 00:24:30,080

through the mission we have not yet

627

00:24:34,549 --> 00:24:32,240

leveled that final level 1 requirements

628

00:24:35,990 --> 00:24:34,559

and but but i think the science panel

629

00:24:37,830 --> 00:24:36,000

will be up next and we'll talk about

630

00:24:39,350 --> 00:24:37,840

what we have accomplished and

631

00:24:49,590 --> 00:24:39,360

and where we're going thank you very

632

00:24:54,710 --> 00:24:51,110

well thank you pete

633

00:24:57,269 --> 00:24:54,720

thank you matt alan and jessica

634

00:24:59,110 --> 00:24:57,279

uh in order to set up our discussion of

635

00:25:01,510 --> 00:24:59,120

some of the scientific achievements that

636

00:25:04,230 --> 00:25:01,520

we've seen thus far in the mission let's

637

00:25:07,060 --> 00:25:04,240

use some pictures to remind us of what's

638

00:25:17,830 --> 00:25:07,070

happened

639

00:25:21,510 --> 00:25:19,190

hello everybody

640

00:25:23,350 --> 00:25:21,520

good morning mr president

641

00:25:25,990 --> 00:25:23,360

i just want to call and say

642

00:25:28,149 --> 00:25:26,000

congratulations to the entire

643

00:25:29,990 --> 00:25:28,159

hard science laboratory team what what

644

00:25:32,070 --> 00:25:30,000

you've accomplished embodies the

645

00:25:34,310 --> 00:25:32,080

american spirit and your passion and

646

00:25:36,789 --> 00:25:34,320

your commitment is making a difference

647

00:25:39,510 --> 00:25:36,799

you guys have done an outstanding job

648

00:25:42,230 --> 00:25:39,520

you made a call proud curiosity is going

649

00:25:43,830 --> 00:25:42,240

to be telling us things that we did not

650

00:25:44,710 --> 00:25:43,840

know before and laying the groundwork

651
00:25:46,470 --> 00:25:44,720
for

652
00:25:47,830 --> 00:25:46,480
an even more audacious undertaking in

653
00:25:53,110 --> 00:25:47,840
the future and that's the human mission

654
00:25:57,590 --> 00:25:55,750
to recap here we have a set of go no go

655
00:26:00,310 --> 00:25:57,600
criteria we want to make sure that the

656
00:26:01,430 --> 00:26:00,320
vehicle is healthy and safe

657
00:26:03,269 --> 00:26:01,440
i will

658
00:26:04,549 --> 00:26:03,279
give everybody a heads up about 15

659
00:26:06,290 --> 00:26:04,559
minutes in advance of when we're

660
00:26:11,669 --> 00:26:06,300
expecting data

661
00:26:13,750 --> 00:26:11,679
[Music]

662
00:26:22,340 --> 00:26:13,760
uh images are coming down

663
00:26:37,750 --> 00:26:29,890

[Applause]

664

00:26:42,710 --> 00:26:39,909

congratulations everybody it looks like

665

00:26:51,370 --> 00:26:42,720

we've got some nice new images to look

666

00:26:51,380 --> 00:26:56,149

[Music]

667

00:27:05,920 --> 00:26:58,630

so

668

00:27:16,310 --> 00:27:14,390

[Applause]

669

00:27:19,029 --> 00:27:16,320

please

670

00:27:21,510 --> 00:27:19,039

help me welcome the project scientist

671

00:27:24,310 --> 00:27:21,520

for the mars science laboratory

672

00:27:27,029 --> 00:27:24,320

the man who leads an amazing team of

673

00:27:38,870 --> 00:27:27,039

science across our planet

674

00:27:45,590 --> 00:27:40,950

well it's a real pleasure to be here on

675

00:27:47,350 --> 00:27:45,600

behalf of our 468 science team members

676
00:27:48,950 --> 00:27:47,360
that work on the curiosity mission and

677
00:27:51,029 --> 00:27:48,960
i'd like to start by thanking our

678
00:27:53,269 --> 00:27:51,039
colleagues in engineering that have made

679
00:27:54,630 --> 00:27:53,279
this all possible it really has been

680
00:27:56,710 --> 00:27:54,640
spectacular what you all have

681
00:27:59,430 --> 00:27:56,720
accomplished so thank you for that

682
00:28:01,909 --> 00:27:59,440
i'm joined today by my colleagues on the

683
00:28:03,830 --> 00:28:01,919
mission uh ken edgett who is the

684
00:28:07,990 --> 00:28:03,840
principal investigator of the mali

685
00:28:10,630 --> 00:28:08,000
instrument and a lifelong mars scientist

686
00:28:13,669 --> 00:28:10,640
and bethany ellman another colleague on

687
00:28:16,310 --> 00:28:13,679
the mission who works as one of our

688
00:28:21,269 --> 00:28:18,789

leads called a science operation working

689

00:28:22,070 --> 00:28:21,279

group chair that that commands the rover

690

00:28:25,269 --> 00:28:22,080

and

691

00:28:26,870 --> 00:28:25,279

adjudicates between all the different

692

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

people that would like to do science

693

00:28:30,470 --> 00:28:28,880

each day and coming up with a final list

694

00:28:32,549 --> 00:28:30,480

of what needs to be done

695

00:28:34,549 --> 00:28:32,559

and ashwin vasavada who is an

696

00:28:37,430 --> 00:28:34,559

atmospheric scientist and the deputy

697

00:28:40,149 --> 00:28:37,440

project scientist along with joy crisp

698

00:28:42,789 --> 00:28:40,159

and ashwin does tactical work as well as

699

00:28:44,710 --> 00:28:42,799

strategic work and i think we widely

700

00:28:45,830 --> 00:28:44,720

appreciate him for pretty much running

701
00:28:48,470 --> 00:28:45,840
the mission

702
00:28:50,710 --> 00:28:48,480
and uh he does a terrific job

703
00:28:53,110 --> 00:28:50,720
i want to take you back to to the drill

704
00:28:54,950 --> 00:28:53,120
hole uh that that really has made

705
00:28:57,909 --> 00:28:54,960
history for this mission

706
00:29:00,230 --> 00:28:57,919
and it's shared as a major

707
00:29:02,630 --> 00:29:00,240
engineering accomplishment it wasn't

708
00:29:04,470 --> 00:29:02,640
seven minutes it took seven months

709
00:29:06,950 --> 00:29:04,480
and you know this was something that the

710
00:29:08,950 --> 00:29:06,960
team worked incredibly hard at and we

711
00:29:12,149 --> 00:29:08,960
approached this prospect with great

712
00:29:14,549 --> 00:29:12,159
anticipation because before we landed

713
00:29:17,190 --> 00:29:14,559

the science team made a map

714

00:29:18,789 --> 00:29:17,200

and with that map when we landed we

715

00:29:21,110 --> 00:29:18,799

decided to do something that completely

716

00:29:22,870 --> 00:29:21,120

baffled the media which was to drive in

717

00:29:24,710 --> 00:29:22,880

the opposite direction that we had told

718

00:29:25,990 --> 00:29:24,720

everybody we were going to be driving in

719

00:29:27,669 --> 00:29:26,000

we're supposed to be driving towards

720

00:29:30,149 --> 00:29:27,679

this mountain and now the science team

721

00:29:32,389 --> 00:29:30,159

is headed off in the opposite direction

722

00:29:34,389 --> 00:29:32,399

we had a few people to explain that to

723

00:29:36,710 --> 00:29:34,399

and and rationalize

724

00:29:39,190 --> 00:29:36,720

uh but the reason for that was is that

725

00:29:41,430 --> 00:29:39,200

that the team had done their homework

726

00:29:43,110 --> 00:29:41,440

and with all the incredible work that

727

00:29:44,230 --> 00:29:43,120

came down from mars reconnaissance

728

00:29:45,590 --> 00:29:44,240

orbiter

729

00:29:47,510 --> 00:29:45,600

the high-rise

730

00:29:49,830 --> 00:29:47,520

camera the christen

731

00:29:52,149 --> 00:29:49,840

hyperspectral camera we were able to

732

00:29:55,029 --> 00:29:52,159

come up with a very highly evolved

733

00:29:56,789 --> 00:29:55,039

understanding of what our options were

734

00:29:59,190 --> 00:29:56,799

so that when we landed we decided to

735

00:30:01,110 --> 00:29:59,200

execute one that took us on this path

736

00:30:02,789 --> 00:30:01,120

eventually down into a place called

737

00:30:03,590 --> 00:30:02,799

yellowknife bay where we drilled this

738

00:30:05,750 --> 00:30:03,600

hole

739

00:30:07,510 --> 00:30:05,760

and when we drilled into it we realized

740

00:30:09,510 --> 00:30:07,520

the scent was getting warmer and warmer

741

00:30:11,669 --> 00:30:09,520

and then as we got down in there

742

00:30:13,830 --> 00:30:11,679

we drilled it we looked at it and mars

743

00:30:15,510 --> 00:30:13,840

changed from red to gray and that told

744

00:30:16,710 --> 00:30:15,520

us that the iron was reduced which is

745

00:30:18,710 --> 00:30:16,720

something that's very important for

746

00:30:20,950 --> 00:30:18,720

microbial metabolism

747

00:30:23,029 --> 00:30:20,960

and basically what we got out of that

748

00:30:25,830 --> 00:30:23,039

was an understanding of a habitable

749

00:30:28,149 --> 00:30:25,840

environment which is not just yet again

750

00:30:30,549 --> 00:30:28,159

another discovery of water but

751
00:30:32,630 --> 00:30:30,559
characterizing that water and the rocks

752
00:30:35,590 --> 00:30:32,640
and the minerals that were there to tell

753
00:30:37,350 --> 00:30:35,600
us that if simple microorganisms

754
00:30:39,590 --> 00:30:37,360
so simple that they don't need sunlight

755
00:30:40,870 --> 00:30:39,600
they need only chemical energy they use

756
00:30:42,549 --> 00:30:40,880
rocks and minerals sort of like

757
00:30:45,669 --> 00:30:42,559
batteries and there's a transfer of

758
00:30:46,870 --> 00:30:45,679
electrons as the microorganism interacts

759
00:30:49,830 --> 00:30:46,880
with these

760
00:30:51,350 --> 00:30:49,840
chemical substances that are there and

761
00:30:53,830 --> 00:30:51,360
what we were able to do with the payload

762
00:30:55,990 --> 00:30:53,840
this was a truly integrated set of

763
00:30:58,070 --> 00:30:56,000

observations every instrument was

764

00:31:00,310 --> 00:30:58,080

involved in this the rem's instrument

765

00:31:01,990 --> 00:31:00,320

which is our atmospheric experiment

766

00:31:04,230 --> 00:31:02,000

actually has a ground temperature sensor

767

00:31:06,070 --> 00:31:04,240

so that when we crossed over this

768

00:31:08,630 --> 00:31:06,080

boundary that you had seen in the with

769

00:31:10,310 --> 00:31:08,640

themis data from orbiter from odyssey

770

00:31:12,549 --> 00:31:10,320

that predicted we would cross over in a

771

00:31:13,909 --> 00:31:12,559

high thermal inertia terrain

772

00:31:16,389 --> 00:31:13,919

when we crossed over that boundary

773

00:31:18,630 --> 00:31:16,399

within one saw the ground temperature

774

00:31:19,830 --> 00:31:18,640

sensor on rem's told us we were in the

775

00:31:22,710 --> 00:31:19,840

right terrain

776

00:31:25,110 --> 00:31:22,720

the remote sensing package the the

777

00:31:26,549 --> 00:31:25,120

chemcam instrument worked perfectly to

778

00:31:28,310 --> 00:31:26,559

tell us that suddenly there were

779

00:31:30,549 --> 00:31:28,320

sulfates there where we had seen none

780

00:31:31,990 --> 00:31:30,559

before and then after that as we went

781

00:31:34,389 --> 00:31:32,000

down even the rad instrument which

782

00:31:36,549 --> 00:31:34,399

measures the background radiation for

783

00:31:39,590 --> 00:31:36,559

for astronauts to do future exploration

784

00:31:41,590 --> 00:31:39,600

it made a measurement it all added up to

785

00:31:43,909 --> 00:31:41,600

understanding this environment as being

786

00:31:46,310 --> 00:31:43,919

chemically one that was favorable for

787

00:31:47,750 --> 00:31:46,320

life not in a in a harsh way but

788

00:31:49,909 --> 00:31:47,760

actually quite a benign environment

789

00:31:52,149 --> 00:31:49,919

that's very much like earth so we have

790

00:31:54,310 --> 00:31:52,159

this new understanding now that's what

791

00:31:56,230 --> 00:31:54,320

we found and i want to turn it over my

792

00:31:58,149 --> 00:31:56,240

colleague ken now who can take you back

793

00:32:00,630 --> 00:31:58,159

a little bit to talk about his

794

00:32:02,710 --> 00:32:00,640

experience and early observations of

795

00:32:04,630 --> 00:32:02,720

gail and what it's like to be the

796

00:32:05,850 --> 00:32:04,640

principal investigator on the mission

797

00:32:08,070 --> 00:32:05,860

that's a whole lot of stuff

798

00:32:09,750 --> 00:32:08,080

[Laughter]

799

00:32:11,669 --> 00:32:09,760

first of all what it's like to be a

800

00:32:13,669 --> 00:32:11,679

principal investigator i'm just one of

801
00:32:16,389 --> 00:32:13,679
the team there's over 400 people on this

802
00:32:18,789 --> 00:32:16,399
team each one of us represents about 100

803
00:32:20,549 --> 00:32:18,799
plus of them just by sitting here we

804
00:32:22,230 --> 00:32:20,559
love them all and we work with them very

805
00:32:23,430 --> 00:32:22,240
carefully and closely

806
00:32:25,830 --> 00:32:23,440
uh

807
00:32:29,509 --> 00:32:25,840
i we none of us do this by ourselves

808
00:32:31,590 --> 00:32:29,519
this is a group effort and i am always

809
00:32:33,509 --> 00:32:31,600
always learning new things from the

810
00:32:35,190 --> 00:32:33,519
people i work with the people here that

811
00:32:37,830 --> 00:32:35,200
i've worked with it's a very

812
00:32:40,070 --> 00:32:37,840
overwhelming experience but what we have

813
00:32:42,549 --> 00:32:40,080

found is so stunning because if you

814

00:32:44,630 --> 00:32:42,559

asked me a year ago what are you going

815

00:32:46,070 --> 00:32:44,640

to find in the first year i wouldn't

816

00:32:48,870 --> 00:32:46,080

have ever said we're going to find what

817

00:32:50,389 --> 00:32:48,880

we went looking for we don't know mars

818

00:32:55,350 --> 00:32:50,399

that well

819

00:32:58,230 --> 00:32:55,360

i'm really still very surprised

820

00:33:01,110 --> 00:32:58,240

long ago if you think of a martian day

821

00:33:03,669 --> 00:33:01,120

as like a 24 hour clock and right now

822

00:33:05,830 --> 00:33:03,679

this moment is just some teeny fraction

823

00:33:06,710 --> 00:33:05,840

microsecond before midnight of the next

824

00:33:09,029 --> 00:33:06,720

day

825

00:33:11,750 --> 00:33:09,039

the rocks were looking at and exploring

826

00:33:15,029 --> 00:33:11,760

in gale are back somewhere around in the

827

00:33:17,029 --> 00:33:15,039

3 a.m to 6 a.m time frame of mars

828

00:33:19,029 --> 00:33:17,039

history so it's a very long time ago

829

00:33:21,590 --> 00:33:19,039

mars was a different place

830

00:33:23,750 --> 00:33:21,600

at that time there were larger craters

831

00:33:25,750 --> 00:33:23,760

forming on mars more frequently than now

832

00:33:28,230 --> 00:33:25,760

and there were volcanoes erupting and

833

00:33:31,190 --> 00:33:28,240

all of those things produce sediment and

834

00:33:33,190 --> 00:33:31,200

the atmosphere was thicker and wind

835

00:33:35,269 --> 00:33:33,200

transports sediment and then we now

836

00:33:37,190 --> 00:33:35,279

think and know from all the missions

837

00:33:38,950 --> 00:33:37,200

over the last 15 years that there was

838

00:33:41,190 --> 00:33:38,960

water there's still water it's frozen

839

00:33:43,509 --> 00:33:41,200

now but there was liquid water the water

840

00:33:45,029 --> 00:33:43,519

not only transports sediment it also

841

00:33:47,110 --> 00:33:45,039

causes rock to break down and

842

00:33:48,389 --> 00:33:47,120

disintegrate into other types of

843

00:33:50,789 --> 00:33:48,399

minerals and chemistries which

844

00:33:54,310 --> 00:33:50,799

precipitate out as other minerals and

845

00:33:57,269 --> 00:33:54,320

we're finding those minerals in gale

846

00:33:59,110 --> 00:33:57,279

gale's a hole in the ground sediments

847

00:34:01,669 --> 00:33:59,120

from this early time with all this stuff

848

00:34:03,509 --> 00:34:01,679

going on piled up in gale

849

00:34:05,269 --> 00:34:03,519

just like on many other craters on mars

850

00:34:06,950 --> 00:34:05,279

there are craters the size of gale and

851
00:34:09,190 --> 00:34:06,960
bigger that are still buried and we

852
00:34:10,389 --> 00:34:09,200
don't even know the crater exists

853
00:34:13,270 --> 00:34:10,399
gale though

854
00:34:15,430 --> 00:34:13,280
by some magical erosional process has

855
00:34:17,430 --> 00:34:15,440
somewhat exhumed itself and left behind

856
00:34:20,149 --> 00:34:17,440
this remnant this mountain that's three

857
00:34:23,190 --> 00:34:20,159
miles or five kilometers high of layered

858
00:34:24,069 --> 00:34:23,200
sedimentary rock we went there thinking

859
00:34:26,470 --> 00:34:24,079
that

860
00:34:27,990 --> 00:34:26,480
every layer is a page in a history book

861
00:34:30,149 --> 00:34:28,000
and we can

862
00:34:32,470 --> 00:34:30,159
go there and see not only are there

863
00:34:33,909 --> 00:34:32,480

habitable environments recorded in there

864

00:34:36,389 --> 00:34:33,919

but is

865

00:34:38,710 --> 00:34:36,399

how do the environments change over time

866

00:34:40,950 --> 00:34:38,720

as you go up the mountain you will see

867

00:34:43,669 --> 00:34:40,960

the the time getting closer and closer

868

00:34:45,990 --> 00:34:43,679

to now still a long time ago but it will

869

00:34:47,349 --> 00:34:46,000

get younger and younger so

870

00:34:48,950 --> 00:34:47,359

it's stunning i don't remember what else

871

00:34:51,349 --> 00:34:48,960

you asked me to talk about so you've

872

00:34:56,149 --> 00:34:53,190

we could all go on for a long time yeah

873

00:35:00,230 --> 00:34:56,159

so you you had been looking at gail for

874

00:35:02,150 --> 00:35:00,240

10 years 14 14. yeah and then we wound

875

00:35:04,470 --> 00:35:02,160

up there yeah what were you thinking i

876

00:35:06,950 --> 00:35:04,480

had the incredible privilege 14 years

877

00:35:10,230 --> 00:35:06,960

ago of being able to select targets for

878

00:35:11,910 --> 00:35:10,240

the camera on mars global surveyor and

879

00:35:14,150 --> 00:35:11,920

gale was one of the places that we

880

00:35:15,670 --> 00:35:14,160

stumbled on as holy cow look at this

881

00:35:18,470 --> 00:35:15,680

there are these layered sediments and

882

00:35:21,430 --> 00:35:18,480

then the story i just told evolved to

883

00:35:24,310 --> 00:35:21,440

actually land in one of the pictures you

884

00:35:26,550 --> 00:35:24,320

helped take 14 years ago and then the

885

00:35:28,710 --> 00:35:26,560

camera that you're now responsible for

886

00:35:30,950 --> 00:35:28,720

gets down and right up to the rocks like

887

00:35:32,710 --> 00:35:30,960

that and seize those rocks up that close

888

00:35:36,230 --> 00:35:32,720

after being three four hundred

889

00:35:39,109 --> 00:35:36,240

kilometers up it's just

890

00:35:40,069 --> 00:35:39,119

it's the 21st century people

891

00:35:41,270 --> 00:35:40,079

awesome

892

00:35:43,270 --> 00:35:41,280

so bethany

893

00:35:44,430 --> 00:35:43,280

tell us about what it's like in the day

894

00:35:47,510 --> 00:35:44,440

of a rover

895

00:35:49,190 --> 00:35:47,520

468 people all want to go left

896

00:35:51,030 --> 00:35:49,200

some want to go right

897

00:35:52,790 --> 00:35:51,040

how do you how do you wade through this

898

00:35:54,310 --> 00:35:52,800

process what kind of decisions and

899

00:35:56,470 --> 00:35:54,320

what's it like to operate the most

900

00:35:58,710 --> 00:35:56,480

complex vehicle that's ever landed on

901
00:36:00,470 --> 00:35:58,720
another planet yeah well uh well first

902
00:36:02,390 --> 00:36:00,480
of all it's a lot of fun to operate the

903
00:36:03,670 --> 00:36:02,400
most complex vehicle vehicle that's ever

904
00:36:06,470 --> 00:36:03,680
landed on another planet so it's

905
00:36:09,270 --> 00:36:06,480
enormous privilege to you know be

906
00:36:10,310 --> 00:36:09,280
a part of the team but also to be sort

907
00:36:12,069 --> 00:36:10,320
of in

908
00:36:13,670 --> 00:36:12,079
taking on this role in a day-to-day

909
00:36:15,589 --> 00:36:13,680
sense that really is kind of the nexus

910
00:36:17,109 --> 00:36:15,599
between science and engineering and

911
00:36:18,950 --> 00:36:17,119
getting these to work together to

912
00:36:21,670 --> 00:36:18,960
working with the engineers to implement

913
00:36:25,670 --> 00:36:21,680

the science desires in the best possible

914

00:36:27,829 --> 00:36:25,680

way uh utilizing the energy the the data

915

00:36:29,910 --> 00:36:27,839

downlink capacity and all of those other

916

00:36:31,670 --> 00:36:29,920

things that limit what we can do

917

00:36:33,270 --> 00:36:31,680

any given day how do we get the best

918

00:36:35,030 --> 00:36:33,280

science done

919

00:36:36,390 --> 00:36:35,040

but uh what's really interesting about

920

00:36:37,910 --> 00:36:36,400

this is before we can get to the

921

00:36:39,670 --> 00:36:37,920

question in the process of implementing

922

00:36:41,190 --> 00:36:39,680

the plan for how to get the best science

923

00:36:43,670 --> 00:36:41,200

done we kind of have to come to

924

00:36:45,670 --> 00:36:43,680

agreement as a team as to well what is

925

00:36:46,950 --> 00:36:45,680

the science that we should be doing

926

00:36:49,270 --> 00:36:46,960

anyway

927

00:36:51,430 --> 00:36:49,280

so part of this this whole process of

928

00:36:53,750 --> 00:36:51,440

operation is getting you know 400 and

929

00:36:55,430 --> 00:36:53,760

something science folks marching in the

930

00:36:58,069 --> 00:36:55,440

same direction or at least the same

931

00:37:00,230 --> 00:36:58,079

general direction and you know that's a

932

00:37:02,550 --> 00:37:00,240

process that that

933

00:37:05,190 --> 00:37:02,560

that folks lead both strategically and

934

00:37:07,030 --> 00:37:05,200

tactically so i remember kind of along

935

00:37:09,750 --> 00:37:07,040

the i don't know maybe it's around the

936

00:37:11,270 --> 00:37:09,760

100th saw on mars or so maybe a little

937

00:37:13,589 --> 00:37:11,280

bit before that

938

00:37:15,670 --> 00:37:13,599

there was a big push with with john and

939

00:37:17,670 --> 00:37:15,680

ashwin and joy and of the members of the

940

00:37:19,670 --> 00:37:17,680

project science group it was like okay

941

00:37:22,230 --> 00:37:19,680

we have this amazing stratigraphy these

942

00:37:23,750 --> 00:37:22,240

layers of rocks before us what is our

943

00:37:25,190 --> 00:37:23,760

strategy like what do we want to

944

00:37:26,950 --> 00:37:25,200

accomplish we all agree that this is

945

00:37:29,430 --> 00:37:26,960

like cool

946

00:37:31,510 --> 00:37:29,440

but what is it we want to do well and

947

00:37:33,670 --> 00:37:31,520

and it was even more profound than that

948

00:37:35,990 --> 00:37:33,680

some people were saying these are lake

949

00:37:38,150 --> 00:37:36,000

sediments other people were saying these

950

00:37:39,750 --> 00:37:38,160

are fluvially transported you know down

951
00:37:41,829 --> 00:37:39,760
from the rim of the crater deposited

952
00:37:44,950 --> 00:37:41,839
chaotically or maybe it's volcanic

953
00:37:46,870 --> 00:37:44,960
sediments or maybe it's air fall uh sort

954
00:37:49,190 --> 00:37:46,880
of an ash deposit

955
00:37:51,589 --> 00:37:49,200
okay so each each of us scientists comes

956
00:37:53,990 --> 00:37:51,599
in with our set of hypotheses about how

957
00:37:56,390 --> 00:37:54,000
mars works how these rock units relate

958
00:37:57,910 --> 00:37:56,400
to how mars works so then it's a process

959
00:37:59,910 --> 00:37:57,920
of figuring out okay well how do we sit

960
00:38:00,950 --> 00:37:59,920
down and test these ideas

961
00:38:02,310 --> 00:38:00,960
and that's really one of the amazing

962
00:38:04,790 --> 00:38:02,320
things about working on the science team

963
00:38:06,550 --> 00:38:04,800

is that even if we disagree completely

964

00:38:08,630 --> 00:38:06,560

about how a particular rock unit is

965

00:38:11,030 --> 00:38:08,640

formed we can still come to a consensus

966

00:38:15,030 --> 00:38:11,040

on okay well how is it we test out how

967

00:38:17,109 --> 00:38:15,040

these particular rock units form and if

968

00:38:18,550 --> 00:38:17,119

we sit down and we we have it out you

969

00:38:20,230 --> 00:38:18,560

know during the beginning of the mission

970

00:38:21,750 --> 00:38:20,240

it was every day we'd have science

971

00:38:23,190 --> 00:38:21,760

discussions about what we're thinking

972

00:38:24,950 --> 00:38:23,200

about how we're interpreting this

973

00:38:26,310 --> 00:38:24,960

different unit but what was interesting

974

00:38:27,910 --> 00:38:26,320

is that even if we disagreed

975

00:38:30,230 --> 00:38:27,920

scientifically about how something came

976
00:38:32,390 --> 00:38:30,240
to be we could agree that that place on

977
00:38:34,550 --> 00:38:32,400
mars is important and that is the place

978
00:38:36,150 --> 00:38:34,560
that we need to investigate and so it

979
00:38:37,910 --> 00:38:36,160
all comes down came down from these

980
00:38:39,829 --> 00:38:37,920
strategic decisions for where we need to

981
00:38:42,310 --> 00:38:39,839
go and then day to day sticking on the

982
00:38:44,470 --> 00:38:42,320
plan keeping in mind what is important

983
00:38:46,630 --> 00:38:44,480
to to to reach these high level

984
00:38:48,710 --> 00:38:46,640
objectives to to explore this particular

985
00:38:50,390 --> 00:38:48,720
rock unit then this one then this one

986
00:38:53,670 --> 00:38:50,400
retaining the sequence of events in your

987
00:38:55,349 --> 00:38:53,680
head as you plan each day on mars

988
00:38:57,430 --> 00:38:55,359

is there one moment that sticks out in

989

00:38:58,310 --> 00:38:57,440

your mind a science discovery that

990

00:39:03,270 --> 00:38:58,320

you'll

991

00:39:05,190 --> 00:39:03,280

well sort of my my my uh my absolute

992

00:39:08,069 --> 00:39:05,200

favorite my favorite set of pictures

993

00:39:10,230 --> 00:39:08,079

that that came down uh from the rover

994

00:39:12,550 --> 00:39:10,240

was when uh so we had we had been

995

00:39:14,870 --> 00:39:12,560

working our way down the stratigraphy

996

00:39:16,630 --> 00:39:14,880

into the yellowknife bay sediments that

997

00:39:18,630 --> 00:39:16,640

you mentioned where where we saw the

998

00:39:20,710 --> 00:39:18,640

picture of of the drill hole

999

00:39:22,550 --> 00:39:20,720

and for me before the drill what was

1000

00:39:23,990 --> 00:39:22,560

most amazing is it was after one of our

1001
00:39:26,870 --> 00:39:24,000
drives heading heading down the

1002
00:39:29,829 --> 00:39:26,880
depression into yellowknife bay

1003
00:39:32,310 --> 00:39:29,839
when the navcam images uh came down that

1004
00:39:33,990 --> 00:39:32,320
day onto the computers onto the the

1005
00:39:35,750 --> 00:39:34,000
software system that all of us used to

1006
00:39:37,510 --> 00:39:35,760
operate the rovers those pictures had

1007
00:39:38,950 --> 00:39:37,520
these little funny nodules or

1008
00:39:40,950 --> 00:39:38,960
concretions and then you could see these

1009
00:39:42,950 --> 00:39:40,960
light veins heading heading through the

1010
00:39:44,710 --> 00:39:42,960
rock and it was like oh this just got

1011
00:39:46,550 --> 00:39:44,720
real interesting

1012
00:39:48,390 --> 00:39:46,560
in terms of the habitability story in

1013
00:39:49,829 --> 00:39:48,400

terms of the water on mars story so that

1014

00:39:51,349 --> 00:39:49,839

definitely was one of my favorite days

1015

00:39:52,230 --> 00:39:51,359

and favorite images

1016

00:39:55,670 --> 00:39:52,240

great

1017

00:39:57,190 --> 00:39:55,680

so so speaking of of water ashwin as

1018

00:39:59,030 --> 00:39:57,200

atmospheric scientists you've got all

1019

00:40:01,030 --> 00:39:59,040

these geologists and geochemists that

1020

00:40:02,150 --> 00:40:01,040

are you know always wanting to drill and

1021

00:40:03,750 --> 00:40:02,160

sample and do all that but the

1022

00:40:05,030 --> 00:40:03,760

atmosphere is a really important part of

1023

00:40:07,430 --> 00:40:05,040

it we're trying to get at the very

1024

00:40:09,510 --> 00:40:07,440

ancient atmosphere

1025

00:40:11,109 --> 00:40:09,520

we had this discovery of a conglomerate

1026
00:40:12,950 --> 00:40:11,119
we see this evidence for flowing water

1027
00:40:14,470 --> 00:40:12,960
and some people might say well we've

1028
00:40:16,550 --> 00:40:14,480
found evidence for flowing water from

1029
00:40:18,950 --> 00:40:16,560
the surface of mars but it's important

1030
00:40:20,950 --> 00:40:18,960
to confirm it from the surface what goes

1031
00:40:22,950 --> 00:40:20,960
through your mind now wondering because

1032
00:40:24,550 --> 00:40:22,960
it's not like we see some giant gusher

1033
00:40:27,109 --> 00:40:24,560
where it might have catastrophically

1034
00:40:28,390 --> 00:40:27,119
flowed out from mars this seems like the

1035
00:40:30,310 --> 00:40:28,400
climate might have been different then

1036
00:40:31,589 --> 00:40:30,320
what what were you thinking when you saw

1037
00:40:33,829 --> 00:40:31,599
that image

1038
00:40:35,910 --> 00:40:33,839

well as ken said you know mars is an

1039

00:40:37,430 --> 00:40:35,920

extremely different planet today than it

1040

00:40:39,510 --> 00:40:37,440

was in the past that's one of the

1041

00:40:41,349 --> 00:40:39,520

reasons we we go there so often we have

1042

00:40:42,150 --> 00:40:41,359

this idea that mars was a warmer wetter

1043

00:40:43,589 --> 00:40:42,160

place

1044

00:40:45,109 --> 00:40:43,599

may have been more friendly to life and

1045

00:40:47,109 --> 00:40:45,119

may have had an extremely different

1046

00:40:48,790 --> 00:40:47,119

environment back then

1047

00:40:50,550 --> 00:40:48,800

one that was able to support liquid

1048

00:40:53,109 --> 00:40:50,560

water flowing on the surface of course

1049

00:40:54,950 --> 00:40:53,119

we'd seen pictures for decades of mars

1050

00:40:56,390 --> 00:40:54,960

with these catastrophic flood channels

1051

00:40:59,109 --> 00:40:56,400

and river systems

1052

00:41:00,790 --> 00:40:59,119

uh but never had we seen uh you know

1053

00:41:02,309 --> 00:41:00,800

firm evidence of it up close with our

1054

00:41:06,150 --> 00:41:02,319

own eyes and

1055

00:41:08,710 --> 00:41:06,160

about a year and a half ago i was out in

1056

00:41:10,390 --> 00:41:08,720

back of jpl where's the arroyo and

1057

00:41:12,470 --> 00:41:10,400

filming an outreach video about why we

1058

00:41:14,630 --> 00:41:12,480

selected gale as a landing site and

1059

00:41:16,470 --> 00:41:14,640

walking around back there and uh you

1060

00:41:17,990 --> 00:41:16,480

know it was springtime and water was

1061

00:41:19,910 --> 00:41:18,000

coming down the san gabriel mountains

1062

00:41:21,910 --> 00:41:19,920

and forming a little stream through the

1063

00:41:23,670 --> 00:41:21,920

arroyo and carrying debris down from the

1064

00:41:24,870 --> 00:41:23,680

mountains and the stream was full of

1065

00:41:26,390 --> 00:41:24,880

little pebbles

1066

00:41:28,390 --> 00:41:26,400

you know rounded as they made their way

1067

00:41:30,150 --> 00:41:28,400

down the mountains and sand with them

1068

00:41:31,910 --> 00:41:30,160

and we're just sort of you know looking

1069

00:41:33,750 --> 00:41:31,920

around and i told the cameraman as we're

1070

00:41:35,190 --> 00:41:33,760

filming this video if we ever found

1071

00:41:37,750 --> 00:41:35,200

something like this on mars it would be

1072

00:41:40,390 --> 00:41:37,760

a home run and and like ken you know i

1073

00:41:41,829 --> 00:41:40,400

think all of us were um we'd say those

1074

00:41:43,990 --> 00:41:41,839

things but in our heart of hearts you

1075

00:41:45,670 --> 00:41:44,000

know we we knew it was it was a long

1076

00:41:47,190 --> 00:41:45,680

shot you know it wasn't like we took it

1077

00:41:49,670 --> 00:41:47,200

for granted

1078

00:41:51,030 --> 00:41:49,680

and then you fast forward to landing a

1079

00:41:53,109 --> 00:41:51,040

year ago and

1080

00:41:54,950 --> 00:41:53,119

uh you know as as the rover's landing

1081

00:41:57,270 --> 00:41:54,960

it's its rocket engines are scouring

1082

00:42:00,069 --> 00:41:57,280

away the gravel and the next morning you

1083

00:42:02,710 --> 00:42:00,079

know we we get these pictures from mars

1084

00:42:03,750 --> 00:42:02,720

and and we look in the in the the scour

1085

00:42:05,829 --> 00:42:03,760

mark and

1086

00:42:08,790 --> 00:42:05,839

what do you know it's bedrock a

1087

00:42:11,030 --> 00:42:08,800

conglomerate a rock made up of rounded

1088

00:42:13,190 --> 00:42:11,040

pebbles and sand cemented together you

1089

00:42:15,030 --> 00:42:13,200

know even before curiosity landed she

1090

00:42:17,430 --> 00:42:15,040

had already hit this home run for us and

1091

00:42:19,670 --> 00:42:17,440

and revealed this ancient mars to us

1092

00:42:20,790 --> 00:42:19,680

that we were hoping to find so we drove

1093

00:42:22,710 --> 00:42:20,800

literally

1094

00:42:23,910 --> 00:42:22,720

through a stream bed on mars that flowed

1095

00:42:26,150 --> 00:42:23,920

ankle deep

1096

00:42:27,910 --> 00:42:26,160

you know a few billion years ago that's

1097

00:42:28,829 --> 00:42:27,920

just i'm getting goosebumps just telling

1098

00:42:32,150 --> 00:42:28,839

you about

1099

00:42:33,990 --> 00:42:32,160

it so for me you know my interest is in

1100

00:42:36,870 --> 00:42:34,000

the atmosphere but really of the past

1101

00:42:39,109 --> 00:42:36,880

climate of mars and we knew that even if

1102

00:42:41,190 --> 00:42:39,119

we never found life with this mission we

1103

00:42:42,870 --> 00:42:41,200

would have this incredible

1104

00:42:45,589 --> 00:42:42,880

secondary ability with this rover to

1105

00:42:47,750 --> 00:42:45,599

explore a beautiful site that can help

1106

00:42:49,670 --> 00:42:47,760

find and that would tell us about this

1107

00:42:51,109 --> 00:42:49,680

ancient environment of mars that that's

1108

00:42:52,630 --> 00:42:51,119

that's just uh you know we're just

1109

00:42:54,550 --> 00:42:52,640

archaeologists sort of trying to piece

1110

00:42:56,150 --> 00:42:54,560

that together with this rover

1111

00:42:57,270 --> 00:42:56,160

so how would that how is this going to

1112

00:42:58,870 --> 00:42:57,280

feed into

1113

00:42:59,750 --> 00:42:58,880

the maven mission

1114

00:43:01,829 --> 00:42:59,760

yeah

1115

00:43:02,790 --> 00:43:01,839

what's exciting is that we're here on

1116

00:43:04,069 --> 00:43:02,800

the ground

1117

00:43:05,670 --> 00:43:04,079

sort of getting this ground truth of

1118

00:43:07,910 --> 00:43:05,680

what the atmosphere and climate would

1119

00:43:10,230 --> 00:43:07,920

have been like billions of years ago

1120

00:43:11,750 --> 00:43:10,240

and it fits into this general theory

1121

00:43:13,670 --> 00:43:11,760

that we have about mars atmosphere that

1122

00:43:16,230 --> 00:43:13,680

it's lost over time and one of the

1123

00:43:18,150 --> 00:43:16,240

primary reasons we think it was lost is

1124

00:43:20,230 --> 00:43:18,160

mars magnetic field went away and

1125

00:43:21,910 --> 00:43:20,240

exposed made mars atmosphere vulnerable

1126
00:43:23,349 --> 00:43:21,920
to being stripped away by the solar wind

1127
00:43:25,510 --> 00:43:23,359
by the sun

1128
00:43:27,270 --> 00:43:25,520
and so we're sort of seeing that we're

1129
00:43:29,190 --> 00:43:27,280
painting together the story from the

1130
00:43:31,670 --> 00:43:29,200
ground up of how that may have happened

1131
00:43:34,150 --> 00:43:31,680
maven an orbiter will arrive at mars i

1132
00:43:36,230 --> 00:43:34,160
think next year and begin studying the

1133
00:43:38,630 --> 00:43:36,240
atmosphere from the top down watching in

1134
00:43:40,710 --> 00:43:38,640
real time as the sun continues to road

1135
00:43:43,589 --> 00:43:40,720
away the atmosphere and together the two

1136
00:43:46,390 --> 00:43:43,599
missions will help understand early mars

1137
00:43:49,109 --> 00:43:46,400
great thanks guys so you know that gives

1138
00:43:51,510 --> 00:43:49,119

us a view of how a curiosity's mission

1139

00:43:53,510 --> 00:43:51,520

will pass on to the to the next mission

1140

00:43:54,470 --> 00:43:53,520

and i'll just finish up with a few words

1141

00:43:56,950 --> 00:43:54,480

about

1142

00:43:59,349 --> 00:43:56,960

what curiosity we'll do now i think the

1143

00:44:00,230 --> 00:43:59,359

part of this as as you've heard all of

1144

00:44:02,710 --> 00:44:00,240

us

1145

00:44:04,150 --> 00:44:02,720

we really we have these hopes you don't

1146

00:44:06,309 --> 00:44:04,160

know that it's you're really going to

1147

00:44:08,870 --> 00:44:06,319

find this stuff and i think the most

1148

00:44:10,790 --> 00:44:08,880

extraordinary thing really is that we

1149

00:44:12,950 --> 00:44:10,800

found it all so quickly and that

1150

00:44:15,190 --> 00:44:12,960

decision to drive 500 meters in the

1151
00:44:16,470 --> 00:44:15,200
opposite direction obviously paid off uh

1152
00:44:18,550 --> 00:44:16,480
very well

1153
00:44:20,790 --> 00:44:18,560
and we haven't even gotten towards our

1154
00:44:22,870 --> 00:44:20,800
prime goal yet we selected gail out of

1155
00:44:25,190 --> 00:44:22,880
the four finalists for one simple reason

1156
00:44:27,910 --> 00:44:25,200
it was a unanimous decision to pick the

1157
00:44:30,150 --> 00:44:27,920
gale site because it's so diverse so by

1158
00:44:32,390 --> 00:44:30,160
driving now to mount sharp we will

1159
00:44:34,309 --> 00:44:32,400
return to our initial objective

1160
00:44:36,950 --> 00:44:34,319
which is to explore these foothills that

1161
00:44:38,710 --> 00:44:36,960
you can see here that are the size think

1162
00:44:41,190 --> 00:44:38,720
about driving around the lab here you've

1163
00:44:43,829 --> 00:44:41,200

got buildings that are sort of one to

1164

00:44:45,270 --> 00:44:43,839

three to five stories tall with narrow

1165

00:44:47,430 --> 00:44:45,280

corridors between them that's this

1166

00:44:49,030 --> 00:44:47,440

terrain that you're looking at there

1167

00:44:50,790 --> 00:44:49,040

that'll that'll be what it's like as we

1168

00:44:53,109 --> 00:44:50,800

get into that terrain it's going to be

1169

00:44:55,109 --> 00:44:53,119

we think visually quite beautiful

1170

00:44:56,710 --> 00:44:55,119

but those layers that you see there we

1171

00:44:58,230 --> 00:44:56,720

know from orbit from the chrim data

1172

00:45:00,230 --> 00:44:58,240

that they have clays we know that

1173

00:45:02,069 --> 00:45:00,240

there's hematite we know that there's

1174

00:45:04,630 --> 00:45:02,079

sulfate so we hope to be able to sample

1175

00:45:06,550 --> 00:45:04,640

a number of what could be

1176

00:45:08,309 --> 00:45:06,560

a different habitable environments and

1177

00:45:10,230 --> 00:45:08,319

maybe revisit some old friends that

1178

00:45:11,270 --> 00:45:10,240

we've seen from previous missions things

1179

00:45:13,990 --> 00:45:11,280

like that

1180

00:45:15,750 --> 00:45:14,000

so we're all really excited uh to carry

1181

00:45:17,990 --> 00:45:15,760

on with the mission we have a long drive

1182

00:45:20,230 --> 00:45:18,000

we think that it could take if we stop

1183

00:45:22,390 --> 00:45:20,240

to smell the roses a little bit it could

1184

00:45:23,990 --> 00:45:22,400

take till the end of the nominal mission

1185

00:45:25,910 --> 00:45:24,000

and we know that nasa is going to back

1186

00:45:27,829 --> 00:45:25,920

us and and so we have confidence that

1187

00:45:30,470 --> 00:45:27,839

we'll continue on with this great

1188

00:45:33,360 --> 00:45:30,480

exploration mission and uh thanks to

1189

00:45:44,630 --> 00:45:33,370

everybody for supporting us

1190

00:45:48,630 --> 00:45:44,640

[Applause]

1191

00:45:50,710 --> 00:45:48,640

well thank you john ken bethany anashwan

1192

00:45:52,710 --> 00:45:50,720

you know the public excitement and

1193

00:45:54,710 --> 00:45:52,720

involvement in this mission is something

1194

00:45:57,190 --> 00:45:54,720

that's really touched us all

1195

00:46:00,790 --> 00:45:57,200

and we have a video now that will remind

1196

00:46:08,610 --> 00:46:00,800

us of some of the events which show how

1197

00:46:13,430 --> 00:46:11,430

[Music]

1198

00:46:15,750 --> 00:46:13,440

this big huge parachute that we've got

1199

00:46:17,270 --> 00:46:15,760

it'll only slow us down to about 200

1200

00:46:18,870 --> 00:46:17,280

miles an hour but we've got to cut it

1201
00:46:20,680 --> 00:46:18,880
off

1202
00:46:23,670 --> 00:46:20,690
and then come down and rock us

1203
00:46:25,710 --> 00:46:23,680
[Applause]

1204
00:46:28,309 --> 00:46:25,720
they're never going to make

1205
00:46:30,470 --> 00:46:28,319
[Applause]

1206
00:46:33,349 --> 00:46:30,480
what happens

1207
00:46:35,349 --> 00:46:33,359
nation it is a proud day for america our

1208
00:46:36,950 --> 00:46:35,359
flags are flying and we're singing that

1209
00:46:38,950 --> 00:46:36,960
verse of the national anthem with all

1210
00:46:42,470 --> 00:46:38,960
the curse words in this

1211
00:46:46,309 --> 00:46:42,480
because at 1 30 a.m america standard

1212
00:46:53,250 --> 00:46:46,319
time nasa's curiosity rover touched down

1213
00:46:53,260 --> 00:46:59,860

[Applause]

1214

00:47:10,790 --> 00:47:06,460

[Music]

1215

00:47:12,550 --> 00:47:10,800

space nerds and gamers

1216

00:47:15,430 --> 00:47:12,560

the space agency has teamed up with

1217

00:47:39,850 --> 00:47:15,440

microsoft to create a mars rover landing

1218

00:47:46,069 --> 00:47:42,710

[Music]

1219

00:47:48,069 --> 00:47:46,079

we are more than proud to honor nasa's

1220

00:47:50,710 --> 00:47:48,079

jet propulsion laboratory as this year's

1221

00:48:12,710 --> 00:47:50,720

webby and people's voice winner for

1222

00:48:12,720 --> 00:48:20,600

let's go

1223

00:48:47,109 --> 00:48:28,100

[Music]

1224

00:48:51,589 --> 00:48:49,349

if you want to know whether curiosity is

1225

00:48:53,510 --> 00:48:51,599

part of the culture of the world i think

1226
00:48:55,990 --> 00:48:53,520
that pretty much sums it up the answer

1227
00:48:58,549 --> 00:48:56,000
is you bet

1228
00:49:01,750 --> 00:48:58,559
you know more people have been involved

1229
00:49:03,829 --> 00:49:01,760
in the stories of curiosity

1230
00:49:07,190 --> 00:49:03,839
than in any mission that we've sent to a

1231
00:49:09,670 --> 00:49:07,200
planet yet and one of the people who has

1232
00:49:11,750 --> 00:49:09,680
played such a critical role in getting

1233
00:49:13,510 --> 00:49:11,760
out to the world the stories of

1234
00:49:15,430 --> 00:49:13,520
curiosity

1235
00:49:19,190 --> 00:49:15,440
is the manager

1236
00:49:20,470 --> 00:49:19,200
of news and social media for jpl

1237
00:49:30,549 --> 00:49:20,480
please welcome

1238
00:49:33,750 --> 00:49:31,910

i have to start off well first of all

1239

00:49:34,790 --> 00:49:33,760

let me introduce the um the rest of my

1240

00:49:36,549 --> 00:49:34,800

panel up here because we're gonna have a

1241

00:49:37,990 --> 00:49:36,559

lot of fun talking about social media

1242

00:49:40,150 --> 00:49:38,000

and memes and everything else i have

1243

00:49:42,470 --> 00:49:40,160

babak ferdowsi of course he was flight

1244

00:49:45,750 --> 00:49:42,480

director on landing night

1245

00:49:48,069 --> 00:49:45,760

adam steltzner the phase lead for entry

1246

00:49:51,510 --> 00:49:48,079

descent and landing

1247

00:49:53,430 --> 00:49:51,520

and anita sengupta the parachute systems

1248

00:49:54,230 --> 00:49:53,440

engineer for curiosity

1249

00:49:55,829 --> 00:49:54,240

so we're going to have a little

1250

00:49:58,150 --> 00:49:55,839

conversation about social media but i

1251
00:50:00,950 --> 00:49:58,160
want to start out by saying that this

1252
00:50:03,349 --> 00:50:00,960
entire campaign to make this mission

1253
00:50:06,069 --> 00:50:03,359
um ingrained in the in the public and in

1254
00:50:07,430 --> 00:50:06,079
popular culture and to engage the public

1255
00:50:09,670 --> 00:50:07,440
and bring them into this mission has

1256
00:50:12,390 --> 00:50:09,680
been an incredible effort across the

1257
00:50:13,670 --> 00:50:12,400
laboratory and it's not just

1258
00:50:15,589 --> 00:50:13,680
my group

1259
00:50:17,430 --> 00:50:15,599
doing news and social media but the

1260
00:50:20,390 --> 00:50:17,440
outreach team public engagement the

1261
00:50:21,750 --> 00:50:20,400
visualization experts the videographers

1262
00:50:24,870 --> 00:50:21,760
and editors

1263
00:50:27,349 --> 00:50:24,880

and working in conjunction with people

1264

00:50:29,270 --> 00:50:27,359

like these and all of you out there

1265

00:50:30,950 --> 00:50:29,280

because you know that for a few years

1266

00:50:33,990 --> 00:50:30,960

before we even landed we were knocking

1267

00:50:35,750 --> 00:50:34,000

on your doors and asking you to help us

1268

00:50:37,589 --> 00:50:35,760

get that word out to the public and you

1269

00:50:40,470 --> 00:50:37,599

all volunteered your time either doing

1270

00:50:43,589 --> 00:50:40,480

talks or doing chats online

1271

00:50:44,950 --> 00:50:43,599

uh being interviewed for our videos and

1272

00:50:47,270 --> 00:50:44,960

that made all the difference in the

1273

00:50:50,230 --> 00:50:47,280

world it made this a success

1274

00:50:52,069 --> 00:50:50,240

so let's talk a little bit about um

1275

00:50:54,309 --> 00:50:52,079

you know we started out we did curiosity

1276

00:50:56,870 --> 00:50:54,319

cam for those who didn't know we were we

1277

00:50:59,670 --> 00:50:56,880

had a camera up in the gallery while the

1278

00:51:01,990 --> 00:50:59,680

rover was being built we had about 4.5

1279

00:51:04,470 --> 00:51:02,000

million views of that camera

1280

00:51:06,150 --> 00:51:04,480

by the time that we shipped out to ksc

1281

00:51:07,990 --> 00:51:06,160

and that we did a public chat every

1282

00:51:09,829 --> 00:51:08,000

single day that we had that camera up

1283

00:51:11,670 --> 00:51:09,839

there every working day at least

1284

00:51:13,430 --> 00:51:11,680

and then i would say the next big hit

1285

00:51:15,109 --> 00:51:13,440

for the public to get even a bigger

1286

00:51:16,630 --> 00:51:15,119

group involved in the mission was seven

1287

00:51:18,790 --> 00:51:16,640

minutes of terror

1288

00:51:20,790 --> 00:51:18,800

adam anita you two were in seven minutes

1289

00:51:23,510 --> 00:51:20,800

of terror what did you think about the

1290

00:51:25,109 --> 00:51:23,520

impact that video had

1291

00:51:27,510 --> 00:51:25,119

i had a major impact and i think had an

1292

00:51:28,950 --> 00:51:27,520

impact on school children especially so

1293

00:51:30,630 --> 00:51:28,960

i have a lot of educators who are my

1294

00:51:32,069 --> 00:51:30,640

friends who ended up showing that video

1295

00:51:34,230 --> 00:51:32,079

to their school children it made them

1296

00:51:36,230 --> 00:51:34,240

all want to be engineers and scientists

1297

00:51:38,150 --> 00:51:36,240

and are incredibly interested in mars

1298

00:51:40,069 --> 00:51:38,160

exploration so

1299

00:51:41,829 --> 00:51:40,079

yeah i was i was surprised i can

1300

00:51:44,150 --> 00:51:41,839

remember when

1301
00:51:46,630 --> 00:51:44,160
when uh john was putting the video

1302
00:51:48,710 --> 00:51:46,640
together and it i didn't have any i sent

1303
00:51:50,950 --> 00:51:48,720
sense that it would

1304
00:51:53,190 --> 00:51:50,960
end up hitting

1305
00:51:54,950 --> 00:51:53,200
a nerve like it did

1306
00:51:56,710 --> 00:51:54,960
and uh

1307
00:51:58,630 --> 00:51:56,720
and you know forever people are just

1308
00:52:00,630 --> 00:51:58,640
always mentioning the seven minutes of

1309
00:52:02,470 --> 00:52:00,640
terror in fact people were tweeting

1310
00:52:05,270 --> 00:52:02,480
thanks for the terror

1311
00:52:08,309 --> 00:52:05,280
hashtag thanks for terror

1312
00:52:10,230 --> 00:52:08,319
so that's been phenomenal yeah and it

1313
00:52:11,750 --> 00:52:10,240

taught all of us a lot as well and i

1314

00:52:12,870 --> 00:52:11,760

have even heard people here at jpl

1315

00:52:15,510 --> 00:52:12,880

saying they weren't afraid until they

1316

00:52:19,829 --> 00:52:17,349

because all of a sudden you saw it all

1317

00:52:22,150 --> 00:52:19,839

there um every little movement that had

1318

00:52:24,470 --> 00:52:22,160

the river had to take to avoid

1319

00:52:26,870 --> 00:52:24,480

catastrophe it was really exciting

1320

00:52:29,270 --> 00:52:26,880

now the next thing um that we did to

1321

00:52:31,430 --> 00:52:29,280

engage the public in this mission was

1322

00:52:34,069 --> 00:52:31,440

tweet ups or nasa socials we did one at

1323

00:52:36,710 --> 00:52:34,079

launch and we did one at landing we had

1324

00:52:39,030 --> 00:52:36,720

invited members of the public to come in

1325

00:52:41,990 --> 00:52:39,040

here at jpl and also at other nasa

1326

00:52:44,549 --> 00:52:42,000

centers across the country for

1327

00:52:46,790 --> 00:52:44,559

an opportunity to interact directly with

1328

00:52:49,990 --> 00:52:46,800

the mission team members and to get a

1329

00:52:51,829 --> 00:52:50,000

tour and go see the mars yard and go see

1330

00:52:54,230 --> 00:52:51,839

the mission control areas it was really

1331

00:52:55,109 --> 00:52:54,240

exciting and you two also spoke at that

1332

00:52:57,670 --> 00:52:55,119

did you

1333

00:52:59,430 --> 00:52:57,680

sense also there that that was making a

1334

00:53:01,190 --> 00:52:59,440

difference

1335

00:53:02,870 --> 00:53:01,200

oh the tweet of itself oh it was

1336

00:53:04,069 --> 00:53:02,880

incredible yeah i mean the outpouring of

1337

00:53:05,750 --> 00:53:04,079

support we got from the public by our

1338

00:53:07,270 --> 00:53:05,760

twitter i mean it's it's immediate it

1339

00:53:09,349 --> 00:53:07,280

happens within a few seconds of every

1340

00:53:11,349 --> 00:53:09,359

single tweet that goes out but um i've

1341

00:53:12,710 --> 00:53:11,359

had wonderful experiences interacting

1342

00:53:13,990 --> 00:53:12,720

with people from around the country and

1343

00:53:15,990 --> 00:53:14,000

actually around the world because of

1344

00:53:17,990 --> 00:53:16,000

twitter and so i've been able to

1345

00:53:20,230 --> 00:53:18,000

interact with a lot of school children a

1346

00:53:21,829 --> 00:53:20,240

lot of teachers a lot of universities as

1347

00:53:23,030 --> 00:53:21,839

a result of twitter so it was a really

1348

00:53:26,790 --> 00:53:23,040

major impact

1349

00:53:28,390 --> 00:53:26,800

and you um again you were the parachute

1350

00:53:30,309 --> 00:53:28,400

systems engineer lead on this and we

1351
00:53:31,030 --> 00:53:30,319
have a picture of you um doing one of

1352
00:53:33,990 --> 00:53:31,040
your

1353
00:53:35,910 --> 00:53:34,000
tests out there in the field um

1354
00:53:39,190 --> 00:53:35,920
and i can imagine also that that mro

1355
00:53:40,710 --> 00:53:39,200
picture uh that was taken just after or

1356
00:53:41,990 --> 00:53:40,720
taken during landing and released just

1357
00:53:44,870 --> 00:53:42,000
after must have

1358
00:53:46,630 --> 00:53:44,880
had a huge uh impact on on on you just

1359
00:53:48,870 --> 00:53:46,640
seeing that for all of you in fact to

1360
00:53:51,030 --> 00:53:48,880
see that picture come down that night

1361
00:53:52,390 --> 00:53:51,040
um but back during the tweet up i

1362
00:53:53,990 --> 00:53:52,400
remember there was a gentleman who asked

1363
00:53:55,670 --> 00:53:54,000

you a question and that kind of set a

1364

00:53:56,470 --> 00:53:55,680

lot of things into motion explain what

1365

00:53:58,630 --> 00:53:56,480

happened

1366

00:54:00,150 --> 00:53:58,640

oh he had asked how can we get more

1367

00:54:01,750 --> 00:54:00,160

girls involved in engineering and

1368

00:54:02,950 --> 00:54:01,760

science and specifically his daughter he

1369

00:54:04,710 --> 00:54:02,960

wanted to know how that we can do that

1370

00:54:05,910 --> 00:54:04,720

and so as a result a lot of people kind

1371

00:54:07,510 --> 00:54:05,920

of picked up on that and there were

1372

00:54:09,910 --> 00:54:07,520

certain people actually in st louis

1373

00:54:11,190 --> 00:54:09,920

missouri who picked up on that who then

1374

00:54:13,190 --> 00:54:11,200

had a whole bunch of events that they

1375

00:54:15,589 --> 00:54:13,200

scheduled to support mars exploration

1376

00:54:17,750 --> 00:54:15,599

and curiosity as a result of that so and

1377

00:54:18,790 --> 00:54:17,760

i and now in my spare time i actually do

1378

00:54:20,230 --> 00:54:18,800

a lot of educational outreach

1379

00:54:22,150 --> 00:54:20,240

specifically talking about how to get

1380

00:54:23,670 --> 00:54:22,160

more science and women and girls

1381

00:54:25,349 --> 00:54:23,680

involved in engineering

1382

00:54:27,589 --> 00:54:25,359

we're showing a picture right now of

1383

00:54:29,510 --> 00:54:27,599

some of the women you've spoken to do

1384

00:54:31,430 --> 00:54:29,520

you remember what this group was uh

1385

00:54:32,870 --> 00:54:31,440

this was in boston um so i went out to

1386

00:54:34,230 --> 00:54:32,880

boston which is where i went and did my

1387

00:54:35,750 --> 00:54:34,240

undergraduate degree so i went and met

1388

00:54:37,589 --> 00:54:35,760

with all of the engineering students at

1389

00:54:39,030 --> 00:54:37,599

boston university and specifically the

1390

00:54:41,430 --> 00:54:39,040

engineering

1391

00:54:42,710 --> 00:54:41,440

university an opportunity to go to the

1392

00:54:44,630 --> 00:54:42,720

museum of science and talk about

1393

00:54:46,230 --> 00:54:44,640

curiosity and i do a lot of stuff in the

1394

00:54:47,670 --> 00:54:46,240

local la area as well specifically

1395

00:54:49,349 --> 00:54:47,680

talking about how to get more girls

1396

00:54:51,510 --> 00:54:49,359

involved in science and engineering

1397

00:54:52,790 --> 00:54:51,520

something we really need yes

1398

00:54:55,190 --> 00:54:52,800

adam what about you at the tweet up i

1399

00:54:57,030 --> 00:54:55,200

remember you announced uh you were

1400

00:55:00,069 --> 00:54:57,040

starting your twitter again that was my

1401

00:55:02,710 --> 00:55:00,079

first tweet was at the tweet up uh

1402

00:55:04,710 --> 00:55:02,720

trisha my wife strongly recommended that

1403

00:55:06,390 --> 00:55:04,720

i get a twitter account before i went go

1404

00:55:07,910 --> 00:55:06,400

to the tweet up i did

1405

00:55:10,230 --> 00:55:07,920

and uh

1406

00:55:11,349 --> 00:55:10,240

that was friday and by

1407

00:55:13,030 --> 00:55:11,359

by

1408

00:55:14,630 --> 00:55:13,040

the following monday i had eight

1409

00:55:15,910 --> 00:55:14,640

thousand followers

1410

00:55:18,470 --> 00:55:15,920

of course

1411

00:55:19,670 --> 00:55:18,480

nothing compares

1412

00:55:21,910 --> 00:55:19,680

we're gonna get to get

1413

00:55:24,950 --> 00:55:21,920

to to the followers that some of us have

1414

00:55:27,030 --> 00:55:24,960

picked up but um

1415

00:55:28,390 --> 00:55:27,040

i was kind of amazed you know it's an

1416

00:55:29,430 --> 00:55:28,400

interesting uh it's actually very

1417

00:55:31,349 --> 00:55:29,440

interesting

1418

00:55:33,190 --> 00:55:31,359

uh communication format the restriction

1419

00:55:35,349 --> 00:55:33,200

of the 140 characters is a little bit

1420

00:55:37,990 --> 00:55:35,359

like a haiku or something you sort of

1421

00:55:38,710 --> 00:55:38,000

condense it into uh into a small amount

1422

00:55:41,910 --> 00:55:38,720

of

1423

00:55:44,950 --> 00:55:41,920

very

1424

00:55:46,549 --> 00:55:44,960

fun for me to interact with uh with

1425

00:55:48,630 --> 00:55:46,559

a sort of a wide

1426
00:55:51,190 --> 00:55:48,640
variety of folks around the nation and

1427
00:55:54,150 --> 00:55:51,200
actually the world all via this small

1428
00:55:56,470 --> 00:55:54,160
little portal it's fun

1429
00:55:57,589 --> 00:55:56,480
so um since then

1430
00:56:00,789 --> 00:55:57,599
tell me a little bit more about your

1431
00:56:01,990 --> 00:56:00,799
role getting word out um since landing i

1432
00:56:06,710 --> 00:56:02,000
know you've actually done i've been

1433
00:56:12,630 --> 00:56:09,430
you know as you see some faces

1434
00:56:14,390 --> 00:56:12,640
sort of there's a big like uh it's

1435
00:56:15,670 --> 00:56:14,400
you know the lottery bowl where they've

1436
00:56:17,109 --> 00:56:15,680
got a whole bunch of numbers and a

1437
00:56:19,430 --> 00:56:17,119
couple of the ping pong balls with the

1438
00:56:22,390 --> 00:56:19,440

numbers come rolling out well some of

1439

00:56:23,349 --> 00:56:22,400

the faces come rolling out of the random

1440

00:56:26,630 --> 00:56:23,359

you know

1441

00:56:28,710 --> 00:56:26,640

societal interest bin and

1442

00:56:30,150 --> 00:56:28,720

and all of a sudden you're exposed to a

1443

00:56:31,910 --> 00:56:30,160

lot of folks a lot of people are looking

1444

00:56:33,910 --> 00:56:31,920

to you for for

1445

00:56:35,670 --> 00:56:33,920

for input about what this means what

1446

00:56:37,030 --> 00:56:35,680

this means for society

1447

00:56:40,549 --> 00:56:37,040

and uh

1448

00:56:42,829 --> 00:56:40,559

it's been very stimulating

1449

00:56:47,030 --> 00:56:42,839

sometimes a bit exhausting

1450

00:56:47,829 --> 00:56:47,040

but uh very moving for me uh to see how

1451
00:56:49,750 --> 00:56:47,839
how

1452
00:56:50,789 --> 00:56:49,760
curiosity has impacted

1453
00:56:53,829 --> 00:56:50,799
uh

1454
00:56:57,270 --> 00:56:53,839
our society

1455
00:56:59,910 --> 00:56:57,280
let's talk about you bobbik um

1456
00:57:02,309 --> 00:56:59,920
you were the internet's choice i would

1457
00:57:04,390 --> 00:57:02,319
say and if we had voted a person most

1458
00:57:06,789 --> 00:57:04,400
likely to become a meme before landing

1459
00:57:09,589 --> 00:57:06,799
we might have selected you only we were

1460
00:57:12,549 --> 00:57:09,599
a little bit used to your hairstyle um

1461
00:57:16,390 --> 00:57:12,559
but uh i went back and you know pictures

1462
00:57:18,230 --> 00:57:16,400
of you in mission control were on the

1463
00:57:20,950 --> 00:57:18,240

internet and circulating a couple of

1464

00:57:21,990 --> 00:57:20,960
hours before we even landed

1465

00:57:24,150 --> 00:57:22,000
did you

1466

00:57:26,390 --> 00:57:24,160
notice anything going on was your phone

1467

00:57:27,670 --> 00:57:26,400
going crazy i got a few texts from

1468

00:57:29,349 --> 00:57:27,680
friends saying hey there's like this

1469

00:57:31,349 --> 00:57:29,359
article about your hair

1470

00:57:33,430 --> 00:57:31,359
on the web

1471

00:57:35,030 --> 00:57:33,440
um but i don't think i really fully

1472

00:57:36,390 --> 00:57:35,040
understood uh what was going on until

1473

00:57:37,430 --> 00:57:36,400
the following i gotta point out one

1474

00:57:39,030 --> 00:57:37,440
correction though i was not flight

1475

00:57:41,349 --> 00:57:39,040
director on landing night keith come

1476

00:57:42,390 --> 00:57:41,359

over there that gentleman uh keith i

1477

00:57:44,230 --> 00:57:42,400

don't know if you mind standing up and

1478

00:57:45,290 --> 00:57:44,240

maybe reenacting your celebration from

1479

00:57:58,390 --> 00:57:45,300

landing

1480

00:57:58,390 --> 00:57:58,400

[Applause]

1481

00:58:02,069 --> 00:58:01,030

uh keith did a great job of of uh of

1482

00:58:04,069 --> 00:58:02,079

controlling the room that night and

1483

00:58:06,150 --> 00:58:04,079

making sure that uh we had adequate time

1484

00:58:09,270 --> 00:58:06,160

to go to the bathroom yeah also also

1485

00:58:10,870 --> 00:58:09,280

getting our jobs on yeah um but no so i

1486

00:58:13,030 --> 00:58:10,880

just you know it was yeah it was the

1487

00:58:14,710 --> 00:58:13,040

next morning when i woke up and i you

1488

00:58:16,549 --> 00:58:14,720

know did the morning routine of checking

1489

00:58:18,630 --> 00:58:16,559

my email and everything else

1490

00:58:19,829 --> 00:58:18,640

and realized my gmail just had thousands

1491

00:58:20,950 --> 00:58:19,839

of messages because i had never turned

1492

00:58:23,750 --> 00:58:20,960

off the feature or twitter says hey you

1493

00:58:25,510 --> 00:58:23,760

have a new follower um

1494

00:58:26,870 --> 00:58:25,520

because i had like 50 followers before

1495

00:58:29,030 --> 00:58:26,880

you know or maybe like 100 followers

1496

00:58:30,950 --> 00:58:29,040

before the the night of landing

1497

00:58:34,309 --> 00:58:30,960

um little did i realize what was going

1498

00:58:38,390 --> 00:58:36,069

and what was really interesting about

1499

00:58:40,150 --> 00:58:38,400

that though is uh the doors that that

1500

00:58:42,789 --> 00:58:40,160

opened for you now to become an

1501
00:58:44,390 --> 00:58:42,799
ambassador for the mission um and to go

1502
00:58:46,710 --> 00:58:44,400
out and talk to a lot of different

1503
00:58:49,270 --> 00:58:46,720
groups be invited to a lot of different

1504
00:58:51,270 --> 00:58:49,280
events like the national science fair

1505
00:58:53,109 --> 00:58:51,280
where you're doing a lot of work now

1506
00:58:54,870 --> 00:58:53,119
really encouraging and supporting

1507
00:58:57,030 --> 00:58:54,880
students to get involved in in

1508
00:58:59,190 --> 00:58:57,040
engineering and science tell us about

1509
00:59:00,390 --> 00:58:59,200
some of the great events you've done

1510
00:59:01,430 --> 00:59:00,400
yeah i mean it's been an incredible

1511
00:59:03,829 --> 00:59:01,440
experience and i think one of the

1512
00:59:04,789 --> 00:59:03,839
amazing things for me is just kind of

1513
00:59:06,390 --> 00:59:04,799

showing

1514

00:59:10,630 --> 00:59:06,400

kids and people that you can look

1515

00:59:13,589 --> 00:59:12,470

or a scientist and so this is this is a

1516

00:59:15,030 --> 00:59:13,599

picture of me it's mckinley it's

1517

00:59:16,150 --> 00:59:15,040

actually a local school here in pasadena

1518

00:59:17,349 --> 00:59:16,160

but it was just a kind of incredible

1519

00:59:18,390 --> 00:59:17,359

experience they built this whole lego

1520

00:59:19,910 --> 00:59:18,400

model of

1521

00:59:21,190 --> 00:59:19,920

missions to mars and everything and it's

1522

00:59:22,870 --> 00:59:21,200

really cool to see it and have their own

1523

00:59:24,950 --> 00:59:22,880

little curiosity like row where they can

1524

00:59:26,549 --> 00:59:24,960

drive around and things like that um

1525

00:59:28,069 --> 00:59:26,559

i've just yeah it's been such a

1526
00:59:29,589 --> 00:59:28,079
wonderful experience going out there

1527
00:59:30,789 --> 00:59:29,599
talking to kids seeing the excitement

1528
00:59:32,789 --> 00:59:30,799
they have and i think kids are all like

1529
00:59:34,230 --> 00:59:32,799
really naturally super excited but they

1530
00:59:36,630 --> 00:59:34,240
just don't have something to latch on to

1531
00:59:38,309 --> 00:59:36,640
always um so it's been it's been you

1532
00:59:40,230 --> 00:59:38,319
know just awesome for me to feel like i

1533
00:59:41,589 --> 00:59:40,240
can actually contribute that and uh you

1534
00:59:42,950 --> 00:59:41,599
know every once in a while some parent

1535
00:59:44,390 --> 00:59:42,960
will like tweet me or send me a picture

1536
00:59:46,870 --> 00:59:44,400
of their kid with a mohawk or tell me

1537
00:59:48,230 --> 00:59:46,880
that the kid wants to get a mohawk yes i

1538
00:59:49,910 --> 00:59:48,240

did it

1539

00:59:52,230 --> 00:59:49,920

um i hope that i'm not a bad influence

1540

00:59:54,710 --> 00:59:52,240

guys i'm trying yeah

1541

00:59:56,470 --> 00:59:54,720

um do you all feel that this public

1542

00:59:59,030 --> 00:59:56,480

interest and involvement is still as

1543

01:00:01,349 --> 00:59:59,040

strong today as it was back on landing

1544

01:00:04,630 --> 01:00:01,359

night i'm kind of amazed at the staying

1545

01:00:06,470 --> 01:00:04,640

power i can remember i worked on mer and

1546

01:00:09,670 --> 01:00:06,480

i can remember that we were

1547

01:00:12,150 --> 01:00:09,680

top on cnn's you know things going on

1548

01:00:14,230 --> 01:00:12,160

list for about 36 hours

1549

01:00:16,630 --> 01:00:14,240

and then britney spears got out of a

1550

01:00:18,390 --> 01:00:16,640

limousine wearing an unusual set of

1551
01:00:19,430 --> 01:00:18,400
clothing or not wearing an unusual set

1552
01:00:21,829 --> 01:00:19,440
of clothing

1553
01:00:22,870 --> 01:00:21,839
and all of a sudden we were no longer on

1554
01:00:24,710 --> 01:00:22,880
the top

1555
01:00:25,670 --> 01:00:24,720
things to to track

1556
01:00:30,789 --> 01:00:25,680
and i

1557
01:00:36,549 --> 01:00:33,270
maybe that came out wrong

1558
01:00:38,230 --> 01:00:36,559
but that uh i think it really is social

1559
01:00:40,069 --> 01:00:38,240
media you know

1560
01:00:41,349 --> 01:00:40,079
nightly news has four or five things

1561
01:00:43,030 --> 01:00:41,359
they're going to tell you

1562
01:00:44,549 --> 01:00:43,040
and if you're number six

1563
01:00:46,150 --> 01:00:44,559

you didn't happen

1564

01:00:47,589 --> 01:00:46,160

and so

1565

01:00:50,549 --> 01:00:47,599

i'm

1566

01:00:53,349 --> 01:00:50,559

constantly amazed that we

1567

01:00:54,549 --> 01:00:53,359

are out there still sticking i'm still

1568

01:00:57,829 --> 01:00:54,559

having people

1569

01:00:59,990 --> 01:00:57,839

tweet me and and and follow me and

1570

01:01:03,109 --> 01:01:00,000

uh and show up when i talk

1571

01:01:05,190 --> 01:01:03,119

i think that there's a a lot of

1572

01:01:06,950 --> 01:01:05,200

interest out there and and i think

1573

01:01:08,950 --> 01:01:06,960

social media has a lot to do with it i

1574

01:01:10,630 --> 01:01:08,960

agree well since we are talking about

1575

01:01:12,549 --> 01:01:10,640

social media we did put out the question

1576

01:01:13,990 --> 01:01:12,559

on twitter a few days ago asking people

1577

01:01:15,109 --> 01:01:14,000

to send us some questions because we're

1578

01:01:17,910 --> 01:01:15,119

going to talk about social media we

1579

01:01:22,630 --> 01:01:17,920

might as well do it right

1580

01:01:28,150 --> 01:01:25,030

i know dr astra which is anita's handle

1581

01:01:29,750 --> 01:01:28,160

on twitter is doing iss research um or

1582

01:01:31,670 --> 01:01:29,760

you're working on something that'll be

1583

01:01:33,430 --> 01:01:31,680

going to the iss soon and they ask what

1584

01:01:35,109 --> 01:01:33,440

what is everyone else up to so really

1585

01:01:37,270 --> 01:01:35,119

fast tell us what you're doing now so

1586

01:01:38,390 --> 01:01:37,280

i'm a project manager for a payload that

1587

01:01:39,990 --> 01:01:38,400

we're delivering to the international

1588

01:01:41,270 --> 01:01:40,000

space station called the cold adam

1589

01:01:43,829 --> 01:01:41,280

laboratory and it's going to demonstrate

1590

01:01:45,829 --> 01:01:43,839

laser cooling in space um and form an

1591

01:01:47,510 --> 01:01:45,839

ultra cold quantum gas

1592

01:01:49,349 --> 01:01:47,520

oh and let me just say that so spouse

1593

01:01:50,950 --> 01:01:49,359

monkey i met by a twitter and so last

1594

01:01:52,710 --> 01:01:50,960

time i was in houston we actually met up

1595

01:01:54,950 --> 01:01:52,720

in the flesh and had pizza and beer

1596

01:01:56,789 --> 01:01:54,960

together

1597

01:01:58,950 --> 01:01:56,799

that's great adam

1598

01:02:01,910 --> 01:01:58,960

i'm doing a variety of trying to help

1599

01:02:05,030 --> 01:02:01,920

out with edl related stuff and

1600

01:02:08,390 --> 01:02:05,040

and and thinking about how we might

1601
01:02:10,870 --> 01:02:08,400
collect samples uh for eventual return

1602
01:02:13,190 --> 01:02:10,880
to earth in our next expedition to the

1603
01:02:14,630 --> 01:02:13,200
surface of mars all right

1604
01:02:16,230 --> 01:02:14,640
i still i'm very fortunate to work with

1605
01:02:18,069 --> 01:02:16,240
a group of people who you know operate

1606
01:02:19,430 --> 01:02:18,079
this this rover on mars and

1607
01:02:20,950 --> 01:02:19,440
and uh you know the science team

1608
01:02:22,950 --> 01:02:20,960
everybody has been great about keeping

1609
01:02:24,309 --> 01:02:22,960
us in the loop and learning all the the

1610
01:02:25,510 --> 01:02:24,319
science i don't think i had a real

1611
01:02:26,789 --> 01:02:25,520
appreciation of everything that was

1612
01:02:27,750 --> 01:02:26,799
going to happen on this mission until we

1613
01:02:29,670 --> 01:02:27,760

actually went and they started

1614

01:02:32,470 --> 01:02:29,680

explaining it to us and it's been an

1615

01:02:35,589 --> 01:02:32,480

amazing uh experience just learning uh

1616

01:02:37,750 --> 01:02:35,599

actual actual science

1617

01:02:40,030 --> 01:02:37,760

uh let's see

1618

01:02:44,710 --> 01:02:42,710

pokerface36025s or chris sheldon taylor

1619

01:02:49,030 --> 01:02:44,720

he asks what is each person's favorite

1620

01:02:50,549 --> 01:02:49,040

picture sent back to earth and why

1621

01:02:52,150 --> 01:02:50,559

mine's obvious it's the parachute from

1622

01:02:53,349 --> 01:02:52,160

landing night because that means it

1623

01:02:55,510 --> 01:02:53,359

worked

1624

01:02:58,069 --> 01:02:55,520

so that was a relief

1625

01:03:01,109 --> 01:02:58,079

a mine is the very first image the rear

1626
01:03:02,710 --> 01:03:01,119
has cam image that we took back

1627
01:03:03,910 --> 01:03:02,720
while we were still have the have the

1628
01:03:06,870 --> 01:03:03,920
odyssey link

1629
01:03:08,630 --> 01:03:06,880
the first image of a new place on mars

1630
01:03:10,069 --> 01:03:08,640
i i mean i kind of i agree that that

1631
01:03:11,430 --> 01:03:10,079
picture is amazing and that was the

1632
01:03:12,870 --> 01:03:11,440
picture was like that from pathfinder

1633
01:03:15,270 --> 01:03:12,880
was some of the reasons why i work here

1634
01:03:16,789 --> 01:03:15,280
today um i think my favorite picture is

1635
01:03:19,109 --> 01:03:16,799
actually the the

1636
01:03:20,470 --> 01:03:19,119
zoom uh mass cam image of

1637
01:03:21,990 --> 01:03:20,480
the foothills of mountain shark and just

1638
01:03:23,670 --> 01:03:22,000

seeing the i mean it's the incredible

1639

01:03:25,029 --> 01:03:23,680

analogy in my head like that looks like

1640

01:03:26,390 --> 01:03:25,039

the grand canyon that looks like a place

1641

01:03:27,589 --> 01:03:26,400

that i could see on earth and that makes

1642

01:03:29,349 --> 01:03:27,599

it so much more

1643

01:03:30,870 --> 01:03:29,359

kind of interesting to me i guess like

1644

01:03:32,390 --> 01:03:30,880

now i can start seeing

1645

01:03:33,990 --> 01:03:32,400

you know why it's so exciting that we're

1646

01:03:35,109 --> 01:03:34,000

there

1647

01:03:37,029 --> 01:03:35,119

and you'll probably be able to answer

1648

01:03:40,150 --> 01:03:37,039

this one as well it is what has been the

1649

01:03:41,670 --> 01:03:40,160

most challenging of mars curiosity's

1650

01:03:43,670 --> 01:03:41,680

assignments during its first year on

1651
01:03:45,750 --> 01:03:43,680
mars and since you're still working on

1652
01:03:48,309 --> 01:03:45,760
the team i guess uh jessica's story

1653
01:03:51,029 --> 01:03:48,319
earlier of the challenge around saw 200

1654
01:03:53,109 --> 01:03:51,039
of our our computer anomaly was probably

1655
01:03:55,190 --> 01:03:53,119
one of the more exciting and scary

1656
01:03:56,150 --> 01:03:55,200
things but you know we've done a lot of

1657
01:03:57,270 --> 01:03:56,160
we've been fortunate that we've been

1658
01:03:58,549 --> 01:03:57,280
able to do a lot of homework and getting

1659
01:04:00,390 --> 01:03:58,559
ready for the other things like the

1660
01:04:01,510 --> 01:04:00,400
first drill was a tremendous effort from

1661
01:04:02,950 --> 01:04:01,520
the whole team

1662
01:04:04,630 --> 01:04:02,960
um and obviously a lot of effort went

1663
01:04:05,910 --> 01:04:04,640

into and work went into that but i yeah

1664

01:04:06,950 --> 01:04:05,920

i would say that the the biggest

1665

01:04:08,470 --> 01:04:06,960

challenge is probably been recovering

1666

01:04:11,270 --> 01:04:08,480

from that there's some folks right over

1667

01:04:13,270 --> 01:04:11,280

there who who are a big part of that

1668

01:04:14,470 --> 01:04:13,280

all right um so we've talked about

1669

01:04:16,630 --> 01:04:14,480

social media definitely has had this

1670

01:04:17,829 --> 01:04:16,640

huge impact with getting our word out

1671

01:04:19,750 --> 01:04:17,839

and not just getting our word out to the

1672

01:04:21,190 --> 01:04:19,760

public but to get them back in and to

1673

01:04:23,510 --> 01:04:21,200

get them involved and feel like they can

1674

01:04:24,630 --> 01:04:23,520

hold these conversations but adam why do

1675

01:04:26,549 --> 01:04:24,640

you think

1676

01:04:28,950 --> 01:04:26,559

what's what struck the chord why did

1677

01:04:30,950 --> 01:04:28,960

people start following

1678

01:04:32,630 --> 01:04:30,960

yeah that's a great question i i've been

1679

01:04:34,710 --> 01:04:32,640

actually asking that a lot of myself

1680

01:04:37,029 --> 01:04:34,720

even prior to landing i was asking this

1681

01:04:38,710 --> 01:04:37,039

question of why we do what we're doing

1682

01:04:42,230 --> 01:04:38,720

and why it might make

1683

01:04:43,910 --> 01:04:42,240

might be important for us um

1684

01:04:46,069 --> 01:04:43,920

i you know

1685

01:04:48,549 --> 01:04:46,079

earlier in the videos you saw an image

1686

01:04:50,870 --> 01:04:48,559

of uh of times square at 1 30 in the

1687

01:04:54,150 --> 01:04:50,880

morning on on monday

1688

01:04:56,309 --> 01:04:54,160

with thousands of people waiting to land

1689

01:04:57,589 --> 01:04:56,319

waiting to see if we could successfully

1690

01:05:00,230 --> 01:04:57,599

land

1691

01:05:01,750 --> 01:05:00,240

and although we go there for the science

1692

01:05:03,670 --> 01:05:01,760

questions i don't think they were there

1693

01:05:05,589 --> 01:05:03,680

at 1 30 in the morning because they're

1694

01:05:07,750 --> 01:05:05,599

dying to know about the ph and salinity

1695

01:05:09,270 --> 01:05:07,760

of the ancient aqueous environment on

1696

01:05:11,270 --> 01:05:09,280

the surface of mars

1697

01:05:13,109 --> 01:05:11,280

they're they're there maybe for that but

1698

01:05:16,789 --> 01:05:13,119

for more

1699

01:05:19,430 --> 01:05:16,799

um i think when we explore we're kind of

1700

01:05:24,150 --> 01:05:19,440

asking questions about ourselves as

1701

01:05:26,710 --> 01:05:24,160

individuals and as a society as a people

1702

01:05:28,789 --> 01:05:26,720

a neil armstrong i think hinted at that

1703

01:05:29,510 --> 01:05:28,799

with the words that he chose to say when

1704

01:05:34,950 --> 01:05:29,520

he

1705

01:05:40,069 --> 01:05:34,960

man

1706

01:05:42,549 --> 01:05:40,079

hinting at was that he was carrying us

1707

01:05:45,029 --> 01:05:42,559

with him in that exploration

1708

01:05:45,990 --> 01:05:45,039

i think curiosity carries us with

1709

01:05:48,390 --> 01:05:46,000

her

1710

01:05:51,910 --> 01:05:48,400

when she's on the surface of mars

1711

01:05:54,870 --> 01:05:51,920

and so she helps us ask questions about

1712

01:05:56,870 --> 01:05:54,880

who we are how grand we are what

1713

01:05:59,029 --> 01:05:56,880

questions might we dare ask and hope to

1714

01:06:00,230 --> 01:05:59,039

be able to answer

1715

01:06:05,029 --> 01:06:00,240

so

1716

01:06:06,230 --> 01:06:05,039

sticks is because this act of

1717

01:06:06,950 --> 01:06:06,240

exploration

1718

01:06:09,990 --> 01:06:06,960

is

1719

01:06:12,150 --> 01:06:10,000

sort of important to us

1720

01:06:14,630 --> 01:06:12,160

i think through it

1721

01:06:15,589 --> 01:06:14,640

we dream a little bigger

1722

01:06:20,470 --> 01:06:15,599

maybe

1723

01:06:23,430 --> 01:06:20,480

aspire a little higher and in some sense

1724

01:06:24,870 --> 01:06:23,440

we're a little better a teeny eatsy bit

1725

01:06:27,109 --> 01:06:24,880

better

1726

01:06:29,589 --> 01:06:27,119

so the idea

1727

01:06:32,630 --> 01:06:29,599

that 50 or 100 million people in this

1728

01:06:35,430 --> 01:06:32,640

country are a little bit better by the

1729

01:06:38,069 --> 01:06:35,440

acts that the people in this room

1730

01:06:41,270 --> 01:06:38,079

put our shoulders to to make happen

1731

01:06:42,150 --> 01:06:41,280

is uh it's a tremendous honor for me and

1732

01:06:42,870 --> 01:06:42,160

uh

1733

01:06:57,829 --> 01:06:42,880

i

1734

01:07:05,109 --> 01:06:57,839

what else can you say after that so

1735

01:07:09,670 --> 01:07:06,390

well thank you

1736

01:07:11,589 --> 01:07:09,680

veronica bobby adam and anita thank you

1737

01:07:13,349 --> 01:07:11,599

very much

1738

01:07:14,950 --> 01:07:13,359

so as we

1739

01:07:16,470 --> 01:07:14,960

come to the conclusion of our

1740

01:07:18,230 --> 01:07:16,480

celebration

1741

01:07:21,029 --> 01:07:18,240

i'd just like you to reflect for a

1742

01:07:23,190 --> 01:07:21,039

moment how fortunate we are

1743

01:07:25,670 --> 01:07:23,200

to be

1744

01:07:28,630 --> 01:07:25,680

part of the dawn of earth's adventures

1745

01:07:31,670 --> 01:07:28,640

of the solar system and beyond

1746

01:07:34,950 --> 01:07:31,680

it's truly incredible what we've seen

1747

01:07:37,430 --> 01:07:34,960

from curiosity alone in terms of the

1748

01:07:40,390 --> 01:07:37,440

development of the marvelous tools that

1749

01:07:43,029 --> 01:07:40,400

we now use to explore the planets

1750

01:07:44,309 --> 01:07:43,039

and what we've learned

1751
01:07:46,789 --> 01:07:44,319
so

1752
01:07:49,829 --> 01:07:46,799
i just like to thank you for

1753
01:07:51,589 --> 01:07:49,839
participating in our celebration

1754
01:07:53,349 --> 01:07:51,599
i hope that it's given you an

1755
01:07:56,630 --> 01:07:53,359
opportunity to

1756
01:07:59,190 --> 01:07:56,640
think about the scope and magnitude of

1757
01:08:00,390 --> 01:07:59,200
nasa's exceptional team of

1758
01:08:01,910 --> 01:08:00,400
dreamers

1759
01:08:03,990 --> 01:08:01,920
doers

1760
01:08:05,910 --> 01:08:04,000
and what they've accomplished so far and

1761
01:08:08,150 --> 01:08:05,920
what's ahead of us

1762
01:08:09,510 --> 01:08:08,160
so on behalf of

1763
01:08:13,510 --> 01:08:09,520

nasa's

1764

01:08:17,110 --> 01:08:13,520

and caltech's jet propulsion laboratory

1765

01:08:18,550 --> 01:08:17,120

i'd like to um again say thanks for

1766

01:08:19,430 --> 01:08:18,560

coming

1767

01:08:21,990 --> 01:08:19,440

there's

1768

01:08:24,870 --> 01:08:22,000

really something to be seen here in a

1769

01:08:27,349 --> 01:08:24,880

little short video we have to close

1770

01:08:29,990 --> 01:08:27,359

that sort of sends us off

1771

01:08:32,229 --> 01:08:30,000

looking at where we've been on mars with

1772

01:08:35,430 --> 01:08:32,239

curiosity by viewing

1773

01:08:36,470 --> 01:08:35,440

mars through the navigation camera

1774

01:08:37,669 --> 01:08:36,480

so

1775

01:08:39,349 --> 01:08:37,679

thanks again

1776

01:08:41,490 --> 01:08:39,359

the adventure of exploring mars

1777

01:08:49,490 --> 01:08:41,500

continues

1778

01:08:59,790 --> 01:08:49,500

[Applause]

1779

01:09:00,870 --> 01:08:59,800

[Music]

1780

01:09:02,019 --> 01:09:00,880

[Applause]

1781

01:09:15,599 --> 01:09:02,029

um

1782

01:09:25,820 --> 01:09:23,749

[Music]

1783

01:10:15,450 --> 01:09:25,830

so