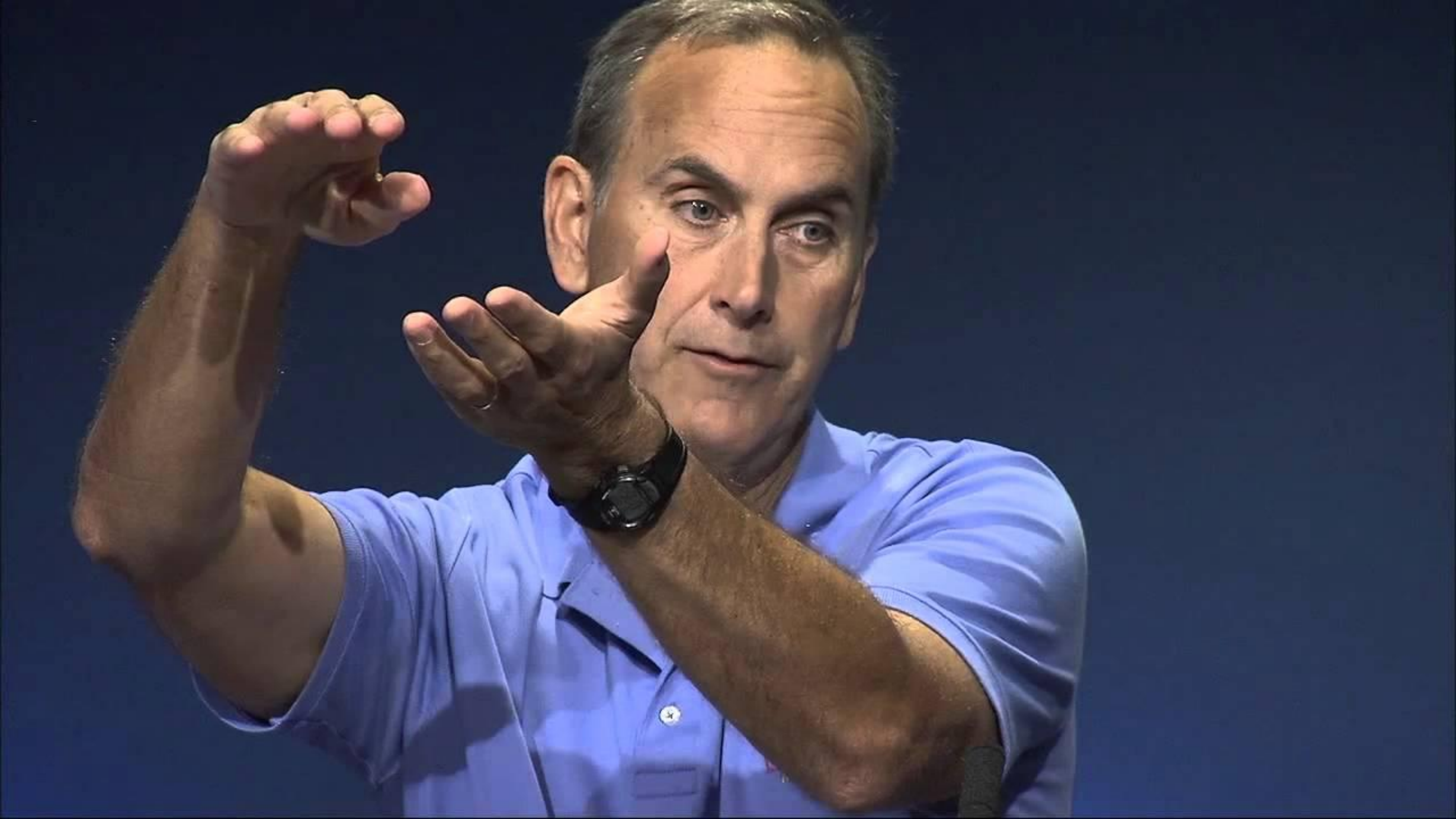

1
00:00:09,589 --> 00:00:07,749
good morning i'm jane platt with the

2
00:00:11,589 --> 00:00:09,599
media relations office at nasa's jet

3
00:00:14,629 --> 00:00:11,599
propulsion laboratory in pasadena

4
00:00:17,670 --> 00:00:14,639
california we are now just three days

5
00:00:20,150 --> 00:00:17,680
away from a very big day on mars this

6
00:00:22,150 --> 00:00:20,160
sunday august 5th pacific time late in

7
00:00:24,070 --> 00:00:22,160
the evening which is early morning

8
00:00:25,990 --> 00:00:24,080
august 6th on the east coast

9
00:00:28,630 --> 00:00:26,000
the mars science laboratory and its

10
00:00:31,589 --> 00:00:28,640
curiosity rover will touch down on the

11
00:00:34,229 --> 00:00:31,599
red planet the rover will investigate

12
00:00:36,470 --> 00:00:34,239
the landing area the site around it

13
00:00:38,950 --> 00:00:36,480

to see if it has ever provided any

14
00:00:40,470 --> 00:00:38,960
environment favorable for life

15
00:00:42,069 --> 00:00:40,480
today we're going to find out more about

16
00:00:43,590 --> 00:00:42,079
the science of the mission and i'd like

17
00:00:44,709 --> 00:00:43,600
to start out by introducing our

18
00:00:46,630 --> 00:00:44,719
panelists

19
00:00:48,389 --> 00:00:46,640
we're going to hear from michael meyer

20
00:00:50,630 --> 00:00:48,399
the lead scientist for the mars

21
00:00:55,510 --> 00:00:50,640
exploration program from nasa

22
00:00:59,110 --> 00:00:57,350
john grotzinger is the mars science

23
00:01:01,110 --> 00:00:59,120
laboratory project scientist with the

24
00:01:04,710 --> 00:01:01,120
california institute of technology in

25
00:01:08,230 --> 00:01:06,550
don hassler is the principal

26
00:01:10,789 --> 00:01:08,240
investigator for the radiation

27
00:01:12,390 --> 00:01:10,799
assessment detector on mars science lab

28
00:01:16,230 --> 00:01:12,400
he's with the southwest research

29
00:01:17,670 --> 00:01:16,240
institute in boulder colorado

30
00:01:19,910 --> 00:01:17,680
and michael malen the principal

31
00:01:22,230 --> 00:01:19,920
investigator for the mars descent imager

32
00:01:26,789 --> 00:01:22,240
on mars science lab and he's with malin

33
00:01:27,990 --> 00:01:26,799
space science systems in san diego

34
00:01:29,670 --> 00:01:28,000
we're going to start things off this

35
00:01:31,350 --> 00:01:29,680
morning with michael meyer

36
00:01:33,270 --> 00:01:31,360
well thank you

37
00:01:37,990 --> 00:01:33,280
i can't wait

38
00:01:41,030 --> 00:01:38,000

you know august 5th 10 31 8 p.m pacific

39
00:01:44,069 --> 00:01:41,040
time curiosity lands it's then when it

40
00:01:45,910 --> 00:01:44,079
begins its trek up mount sharp to unveil

41
00:01:47,990 --> 00:01:45,920
the present and past environments of

42
00:01:50,389 --> 00:01:48,000
mars

43
00:01:51,429 --> 00:01:50,399
i just can't wait

44
00:01:52,389 --> 00:01:51,439
um

45
00:01:54,870 --> 00:01:52,399
so

46
00:01:55,830 --> 00:01:54,880
mars has i mean curiosity has the goal

47
00:01:58,149 --> 00:01:55,840
of

48
00:02:00,069 --> 00:01:58,159
uh understanding and determining the

49
00:02:02,630 --> 00:02:00,079
habitability of mars

50
00:02:05,429 --> 00:02:02,640
and what do we mean by habitability well

51
00:02:08,630 --> 00:02:05,439
you need three things we think for life

52
00:02:10,790 --> 00:02:08,640
one is a solvent in this case water

53
00:02:12,949 --> 00:02:10,800
one is you need something for structure

54
00:02:15,030 --> 00:02:12,959
so we need carbon compounds

55
00:02:18,229 --> 00:02:15,040
and you need energy those are these

56
00:02:20,949 --> 00:02:18,239
those three things we believe are the

57
00:02:23,430 --> 00:02:20,959
the necessary ingredients for life

58
00:02:25,510 --> 00:02:23,440
interestingly enough over the last 15

59
00:02:27,990 --> 00:02:25,520
years we've been able to explore mars

60
00:02:30,949 --> 00:02:28,000
extensively from orbit and some on the

61
00:02:32,229 --> 00:02:30,959
surface and what this has shown at least

62
00:02:35,589 --> 00:02:32,239
in the past

63
00:02:38,150 --> 00:02:35,599

mars looks like it has been habitable it

64
00:02:41,509 --> 00:02:38,160
could have supported microbial life

65
00:02:43,670 --> 00:02:41,519
but this is from orbit and some

66
00:02:45,190 --> 00:02:43,680
roving on the surface

67
00:02:46,710 --> 00:02:45,200
and it's

68
00:02:47,990 --> 00:02:46,720
makes us believe that we're going in the

69
00:02:49,990 --> 00:02:48,000
right direction

70
00:02:52,070 --> 00:02:50,000
but you know you need to go and look and

71
00:02:54,630 --> 00:02:52,080
you need to ask the right questions and

72
00:02:56,470 --> 00:02:54,640
curiosity is a rover that's able to do

73
00:02:58,229 --> 00:02:56,480
that

74
00:03:00,229 --> 00:02:58,239
how do we narrow this down from looking

75
00:03:02,390 --> 00:03:00,239
at mars on the global scale of a

76
00:03:04,470 --> 00:03:02,400
potentially habitable planet to going to

77
00:03:05,830 --> 00:03:04,480
a specific place where we can test this

78
00:03:08,390 --> 00:03:05,840
hypothesis

79
00:03:09,910 --> 00:03:08,400
well over the last over four years we've

80
00:03:12,229 --> 00:03:09,920
had a science community looking at

81
00:03:13,910 --> 00:03:12,239
different landing sites on mars

82
00:03:15,830 --> 00:03:13,920
that have provided

83
00:03:18,070 --> 00:03:15,840
a wealth of information from our

84
00:03:19,509 --> 00:03:18,080
orbiter's odyssey mars reconnaissance

85
00:03:21,350 --> 00:03:19,519
orbiter

86
00:03:23,430 --> 00:03:21,360
from past missions like mars global

87
00:03:25,910 --> 00:03:23,440
surveyor and also information from our

88
00:03:27,990 --> 00:03:25,920

landers of spirit and opportunity have

89
00:03:29,830 --> 00:03:28,000
really helped us figure out what mars

90
00:03:31,509 --> 00:03:29,840
looks like and where what it looks like

91
00:03:34,229 --> 00:03:31,519
in specific places

92
00:03:35,910 --> 00:03:34,239
so what the science community has done

93
00:03:38,390 --> 00:03:35,920
is looked at all the potential landing

94
00:03:39,990 --> 00:03:38,400
sites narrowed it down to four prime

95
00:03:41,990 --> 00:03:40,000
sites

96
00:03:43,789 --> 00:03:42,000
all of which demonstrate

97
00:03:45,990 --> 00:03:43,799
evidence of water

98
00:03:47,270 --> 00:03:46,000
geomorphologically so it looks like it

99
00:03:49,430 --> 00:03:47,280
looks like there was a lake there looks

100
00:03:51,509 --> 00:03:49,440
like there was a river and also

101
00:03:54,390 --> 00:03:51,519
mineralogically so the minerals that we

102
00:03:57,030 --> 00:03:54,400
see are indicative of having interacted

103
00:03:59,030 --> 00:03:57,040
with water and minerals such as

104
00:04:01,670 --> 00:03:59,040
clays and sulfates

105
00:04:02,470 --> 00:04:01,680
so with that the four prime sites all of

106
00:04:05,429 --> 00:04:02,480
them

107
00:04:07,830 --> 00:04:05,439
suggest habitability in the past

108
00:04:10,390 --> 00:04:07,840
and then it was narrowing it down to one

109
00:04:12,149 --> 00:04:10,400
landing site and with that we ended up

110
00:04:15,270 --> 00:04:12,159
picking gale crater because in the

111
00:04:18,469 --> 00:04:15,280
middle there's mount sharp a huge

112
00:04:21,189 --> 00:04:18,479
mound of sedimentary layers that provide

113
00:04:24,230 --> 00:04:21,199

us the opportunity to start in the past

114
00:04:27,189 --> 00:04:24,240
of gale crater and rove up the surface

115
00:04:29,350 --> 00:04:27,199
of mount sharp and come through time to

116
00:04:31,749 --> 00:04:29,360
see how the environments have changed on

117
00:04:33,909 --> 00:04:31,759
mars and to give us more specifics about

118
00:04:35,670 --> 00:04:33,919
the landing site and how curiosity we

119
00:04:36,629 --> 00:04:35,680
will investigate it i turn it over to

120
00:04:38,230 --> 00:04:36,639
john

121
00:04:40,790 --> 00:04:38,240
thanks very much michael

122
00:04:44,150 --> 00:04:40,800
um i am absolutely thrilled to have the

123
00:04:47,350 --> 00:04:44,160
chance to land the spacecraft on the the

124
00:04:49,430 --> 00:04:47,360
surface of mars and and when we do

125
00:04:52,150 --> 00:04:49,440
we will have started the era of a whole

126
00:04:54,390 --> 00:04:52,160
new dimension of space exploration and

127
00:04:56,469 --> 00:04:54,400
on the surface of other planet and this

128
00:05:00,310 --> 00:04:56,479
is the dimension of deep time time

129
00:05:03,510 --> 00:05:00,320
measured not in hours uh days years

130
00:05:05,749 --> 00:05:03,520
events that happen today or tomorrow but

131
00:05:08,150 --> 00:05:05,759
hundreds of millions to even billions of

132
00:05:10,390 --> 00:05:08,160
years of history recorded in the

133
00:05:11,830 --> 00:05:10,400
evolution of a planet that's kind of

134
00:05:14,950 --> 00:05:11,840
like our cousin

135
00:05:16,950 --> 00:05:14,960
and at the time that we will explore

136
00:05:18,710 --> 00:05:16,960
billions of years ago on the surface of

137
00:05:20,790 --> 00:05:18,720
mars we hope to

138
00:05:22,070 --> 00:05:20,800

investigate these possible habitable

139
00:05:24,469 --> 00:05:22,080
environments

140
00:05:27,350 --> 00:05:24,479
and we have chosen the most spectacular

141
00:05:28,870 --> 00:05:27,360
field site it just continues to give and

142
00:05:30,310 --> 00:05:28,880
what i want to do is finish today by

143
00:05:32,469 --> 00:05:30,320
showing you what the science team is

144
00:05:35,029 --> 00:05:32,479
doing this very moment as you all sit

145
00:05:36,550 --> 00:05:35,039
here they are working away at mapping

146
00:05:38,950 --> 00:05:36,560
some of the details that we'll have a

147
00:05:40,710 --> 00:05:38,960
chance to explore so let's go to the

148
00:05:42,150 --> 00:05:40,720
first graphic

149
00:05:43,510 --> 00:05:42,160
and this is something that you will have

150
00:05:47,029 --> 00:05:43,520
seen before

151
00:05:49,749 --> 00:05:47,039
uh it's a it's a mola topography map of

152
00:05:51,189 --> 00:05:49,759
the of the surface of mars

153
00:05:53,510 --> 00:05:51,199
and uh

154
00:05:55,189 --> 00:05:53,520
and what we see when it eventually comes

155
00:05:58,150 --> 00:05:55,199
up there we go

156
00:05:58,950 --> 00:05:58,160
uh is the dichotomy boundary which is

157
00:06:10,870 --> 00:05:58,960
the

158
00:06:11,909 --> 00:06:10,880
big ancient impact craters and you can

159
00:06:14,629 --> 00:06:11,919
see

160
00:06:17,189 --> 00:06:14,639
on that topographic image even the the

161
00:06:19,029 --> 00:06:17,199
topography of ancient rivers that flowed

162
00:06:21,909 --> 00:06:19,039
across the surface there

163
00:06:23,909 --> 00:06:21,919

so point number one is that

164
00:06:25,590 --> 00:06:23,919
without getting too clever the most

165
00:06:28,309 --> 00:06:25,600
basic observation you can make is a

166
00:06:30,629 --> 00:06:28,319
water flows downhill and we have chosen

167
00:06:33,110 --> 00:06:30,639
one of the lowest spots on mars that

168
00:06:34,870 --> 00:06:33,120
looks geologically fascinating to go to

169
00:06:37,430 --> 00:06:34,880
it's even lower in elevation than the

170
00:06:39,909 --> 00:06:37,440
floor of valles marineris which is often

171
00:06:42,309 --> 00:06:39,919
been viewed to be a great destination

172
00:06:44,790 --> 00:06:42,319
and so there in that sort of pink and

173
00:06:46,070 --> 00:06:44,800
white patch of topography that's where

174
00:06:47,830 --> 00:06:46,080
we're going to land right up there where

175
00:06:49,990 --> 00:06:47,840
the arrow points to now if we go ahead

176
00:06:51,909 --> 00:06:50,000
to the next graphic and zoom in

177
00:06:54,309 --> 00:06:51,919
here we are now at the landing ellipse

178
00:06:55,189 --> 00:06:54,319
and there's mount sharp the very peak of

179
00:06:57,189 --> 00:06:55,199
which

180
00:06:59,350 --> 00:06:57,199
if you go from the landing ellipse up to

181
00:07:01,029 --> 00:06:59,360
the top of mount sharp that has more

182
00:07:02,550 --> 00:07:01,039
elevation

183
00:07:04,790 --> 00:07:02,560
than mount whitney does which is the

184
00:07:06,070 --> 00:07:04,800
highest mountain in the lower 48 states

185
00:07:09,430 --> 00:07:06,080
here

186
00:07:11,670 --> 00:07:09,440
and so it's about five kilometers high

187
00:07:13,510 --> 00:07:11,680
and the most extraordinary thing about

188
00:07:16,309 --> 00:07:13,520

mount sharp is that it's layered the

189
00:07:18,070 --> 00:07:16,319
entire succession is layered giving us a

190
00:07:20,390 --> 00:07:18,080
recorded history

191
00:07:22,390 --> 00:07:20,400
of probably what represent hundreds of

192
00:07:24,550 --> 00:07:22,400
millions of years of time maybe even a

193
00:07:26,710 --> 00:07:24,560
billion years of time

194
00:07:28,950 --> 00:07:26,720
three to four billion years ago when the

195
00:07:32,070 --> 00:07:28,960
planet may have been more like earth had

196
00:07:33,670 --> 00:07:32,080
been okay so we're going to land in that

197
00:07:35,110 --> 00:07:33,680
ellipse and now what i want to do is

198
00:07:36,870 --> 00:07:35,120
turn your attention to the ellipse

199
00:07:39,189 --> 00:07:36,880
because we've said a lot about mount

200
00:07:40,469 --> 00:07:39,199
sharp and in previous meetings together

201
00:07:42,469 --> 00:07:40,479
and i want to tell you more about what's

202
00:07:44,629 --> 00:07:42,479
going to happen in the ellipse now okay

203
00:07:46,950 --> 00:07:44,639
next one please

204
00:07:48,869 --> 00:07:46,960
what we have realized as a geological

205
00:07:51,029 --> 00:07:48,879
community and this led to the selection

206
00:07:53,350 --> 00:07:51,039
of of gale as a landing site because

207
00:07:55,510 --> 00:07:53,360
gale is what we call a go-to you land in

208
00:07:57,589 --> 00:07:55,520
a flat place you drive somewhere else

209
00:07:59,189 --> 00:07:57,599
and and really what you expect is that

210
00:07:59,990 --> 00:07:59,199
all the excitement will be somewhere

211
00:08:01,909 --> 00:08:00,000
else

212
00:08:03,350 --> 00:08:01,919
but it turned out that you know we were

213
00:08:05,830 --> 00:08:03,360

concerned that if if there was an

214
00:08:07,589 --> 00:08:05,840
anomaly with the spacecraft and and we

215
00:08:09,270 --> 00:08:07,599
had to spend a big chunk of the mission

216
00:08:11,270 --> 00:08:09,280
in the landing ellipse we better have

217
00:08:13,589 --> 00:08:11,280
something good there so we always knew

218
00:08:16,150 --> 00:08:13,599
this alluvial fan was there

219
00:08:18,150 --> 00:08:16,160
but what happened was about a month ago

220
00:08:20,230 --> 00:08:18,160
it became clear that we needed to do

221
00:08:22,469 --> 00:08:20,240
more work to tear into the details

222
00:08:24,230 --> 00:08:22,479
because where the landing ellipses is

223
00:08:25,589 --> 00:08:24,240
right out in front of that alluvial fan

224
00:08:27,510 --> 00:08:25,599
and there i think presents an

225
00:08:29,749 --> 00:08:27,520
extraordinary opportunity

226
00:08:31,909 --> 00:08:29,759
for what might be a really great science

227
00:08:34,469 --> 00:08:31,919
discovery early on this has lots of

228
00:08:35,589 --> 00:08:34,479
potential because an alluvial fan is a

229
00:08:38,630 --> 00:08:35,599
feature

230
00:08:40,469 --> 00:08:38,640
where water flows downhill and so when

231
00:08:43,509 --> 00:08:40,479
we look at that fan shape

232
00:08:45,350 --> 00:08:43,519
we descended topography about 150 meters

233
00:08:47,509 --> 00:08:45,360
from the top of the fan in the upper

234
00:08:50,150 --> 00:08:47,519
left of the screen and as we go down to

235
00:08:51,829 --> 00:08:50,160
the bottom we go downhill and downhill

236
00:08:54,310 --> 00:08:51,839
and this feature looks just like the

237
00:08:56,310 --> 00:08:54,320
kinds of things that that that are

238
00:08:58,389 --> 00:08:56,320

formed by water on earth and we've

239
00:08:59,910 --> 00:08:58,399
always wanted to land on something on

240
00:09:02,150 --> 00:08:59,920
mars where we looked like water was

241
00:09:03,509 --> 00:09:02,160
flowing in advance well here it is

242
00:09:05,509 --> 00:09:03,519
so there is some chance we could

243
00:09:07,269 --> 00:09:05,519
actually land right on this feature or

244
00:09:09,430 --> 00:09:07,279
land right out in front of it where you

245
00:09:11,590 --> 00:09:09,440
always wonder where does that water go

246
00:09:13,509 --> 00:09:11,600
after it if it goes down the alluvial

247
00:09:15,030 --> 00:09:13,519
fan maybe it goes right into where our

248
00:09:17,110 --> 00:09:15,040
landing ellipse was

249
00:09:19,509 --> 00:09:17,120
okay so that's a topographic map that

250
00:09:21,750 --> 00:09:19,519
shows you that we go downhill from the

251
00:09:23,750 --> 00:09:21,760
alluvial fan into the landing ellipse

252
00:09:26,870 --> 00:09:23,760
now the next image please

253
00:09:29,590 --> 00:09:26,880
superimposes on top of that topography a

254
00:09:31,509 --> 00:09:29,600
property that has been mapped uh pre on

255
00:09:32,710 --> 00:09:31,519
previous mars missions called thermal

256
00:09:35,509 --> 00:09:32,720
inertia

257
00:09:37,350 --> 00:09:35,519
and and what this really means is it's

258
00:09:40,070 --> 00:09:37,360
the property of a rock

259
00:09:41,829 --> 00:09:40,080
to basically retain heat relative to

260
00:09:43,750 --> 00:09:41,839
surrounding areas

261
00:09:45,829 --> 00:09:43,760
so with the themis instrument for

262
00:09:47,829 --> 00:09:45,839
example we can take images during the

263
00:09:49,430 --> 00:09:47,839

day we can take images during the night

264
00:09:51,829 --> 00:09:49,440
and what we see is that anything that's

265
00:09:53,990 --> 00:09:51,839
colored in red there tends to stay

266
00:09:55,910 --> 00:09:54,000
hotter longer as we go into the evening

267
00:09:57,670 --> 00:09:55,920
it keeps its heat now what kind of

268
00:09:59,269 --> 00:09:57,680
material could do that

269
00:10:01,030 --> 00:09:59,279
lots of non-uniqueness here there could

270
00:10:02,630 --> 00:10:01,040
be lots of things that could do that but

271
00:10:04,870 --> 00:10:02,640
one of the things that we're attracted

272
00:10:06,069 --> 00:10:04,880
to as a science hypothesis that we would

273
00:10:07,910 --> 00:10:06,079
like to test

274
00:10:11,110 --> 00:10:07,920
is the possibility that there were loose

275
00:10:13,590 --> 00:10:11,120
surfacial materials once transported by

276
00:10:15,750 --> 00:10:13,600
water that then became cemented

277
00:10:18,069 --> 00:10:15,760
in the presence of water and so right

278
00:10:20,389 --> 00:10:18,079
away we can start to look for minerals

279
00:10:22,630 --> 00:10:20,399
that bound the particles together that

280
00:10:24,470 --> 00:10:22,640
tell us about the the previous history

281
00:10:26,949 --> 00:10:24,480
of water there and that's an exciting

282
00:10:28,550 --> 00:10:26,959
possibility because that already begins

283
00:10:30,710 --> 00:10:28,560
to sort of sniff a little bit like a

284
00:10:33,350 --> 00:10:30,720
potentially habitable environment that

285
00:10:35,430 --> 00:10:33,360
was very old okay now if you just go

286
00:10:37,670 --> 00:10:35,440
back and forth here a little bit what we

287
00:10:39,829 --> 00:10:37,680
can see is there's a topography

288
00:10:41,190 --> 00:10:39,839

here comes the thermal inertia notice

289
00:10:44,230 --> 00:10:41,200
that that red

290
00:10:47,030 --> 00:10:44,240
is at the very end of the alluvial fan

291
00:10:49,670 --> 00:10:47,040
and out in front of the alluvial fan so

292
00:10:51,190 --> 00:10:49,680
there's a boundary where the morphology

293
00:10:53,269 --> 00:10:51,200
evidence ends

294
00:10:56,630 --> 00:10:53,279
and where the physical properties

295
00:10:58,550 --> 00:10:56,640
evidence sort of steps across the the

296
00:11:00,630 --> 00:10:58,560
alluvial fan there we're really excited

297
00:11:02,870 --> 00:11:00,640
about this and it suggests to us right

298
00:11:05,910 --> 00:11:02,880
away that we've got some cool geology to

299
00:11:08,230 --> 00:11:05,920
do ahead of us okay now in the next one

300
00:11:11,509 --> 00:11:08,240
so here's what we did we divided the

301
00:11:13,590 --> 00:11:11,519
area up and and and we started a sort of

302
00:11:16,550 --> 00:11:13,600
a crowdsourcing effort this is a science

303
00:11:18,630 --> 00:11:16,560
team of over 400 people some of them

304
00:11:21,030 --> 00:11:18,640
were really looking for something to do

305
00:11:24,230 --> 00:11:21,040
so we divided these quads up and

306
00:11:26,870 --> 00:11:24,240
basically what you see here are 0.025

307
00:11:29,110 --> 00:11:26,880
degrees of latitude and longitude

308
00:11:31,590 --> 00:11:29,120
dividing it all up and and then

309
00:11:33,030 --> 00:11:31,600
basically i sent an email to the team

310
00:11:34,949 --> 00:11:33,040
and i said anybody that wants to take a

311
00:11:37,110 --> 00:11:34,959
swipe at this is welcome to jump in roll

312
00:11:39,829 --> 00:11:37,120
up their sleeves and and start doing

313
00:11:41,430 --> 00:11:39,839

some mapping so they did that and and

314
00:11:43,269 --> 00:11:41,440
i'm i'm not going to show you today with

315
00:11:44,550 --> 00:11:43,279
the progress of of the mapping that

316
00:11:46,150 --> 00:11:44,560
we're doing but i'm going to show you

317
00:11:47,829 --> 00:11:46,160
why we're doing it

318
00:11:49,910 --> 00:11:47,839
and we're going to pick a quad that's

319
00:11:51,750 --> 00:11:49,920
right in the center there number 50.

320
00:11:54,470 --> 00:11:51,760
very close we could actually land on

321
00:11:55,590 --> 00:11:54,480
that one so here we go and what you've

322
00:11:57,509 --> 00:11:55,600
got here

323
00:11:59,350 --> 00:11:57,519
is is really kind of a geologist

324
00:12:01,590 --> 00:11:59,360
paradise this is in the middle of the

325
00:12:04,389 --> 00:12:01,600
landing ellipse you've got a crater

326
00:12:06,470 --> 00:12:04,399
there which is 250 meters diameter which

327
00:12:08,870 --> 00:12:06,480
is about halfway in size between

328
00:12:10,389 --> 00:12:08,880
endurance crater and victoria crater

329
00:12:11,990 --> 00:12:10,399
remember those are what we explored with

330
00:12:13,110 --> 00:12:12,000
opportunity about seven or eight years

331
00:12:15,269 --> 00:12:13,120
ago

332
00:12:17,590 --> 00:12:15,279
and in there in the crater you see the

333
00:12:19,750 --> 00:12:17,600
layering so right away we know we've got

334
00:12:22,069 --> 00:12:19,760
something good to look for there

335
00:12:24,150 --> 00:12:22,079
but wait because there's a scarp that

336
00:12:25,829 --> 00:12:24,160
runs along through the image as well and

337
00:12:27,269 --> 00:12:25,839
that's the kind of terrain that spirit

338
00:12:29,509 --> 00:12:27,279

explored so when we went to a place

339
00:12:31,910 --> 00:12:29,519
called home plate the home plate was

340
00:12:34,069 --> 00:12:31,920
sort of a circular outclock outcrop kind

341
00:12:36,389 --> 00:12:34,079
of looked like a home plate but it had a

342
00:12:38,389 --> 00:12:36,399
scarp about a meter or two in elevation

343
00:12:40,150 --> 00:12:38,399
and this is probably a little bit less

344
00:12:42,629 --> 00:12:40,160
than a meter or two it could be half a

345
00:12:45,030 --> 00:12:42,639
meter to a meter in elevation

346
00:12:48,230 --> 00:12:45,040
and and basically we get the best of

347
00:12:51,110 --> 00:12:48,240
both rovers from mer we get craters to

348
00:12:53,670 --> 00:12:51,120
to have punched into the bedrock and we

349
00:12:56,550 --> 00:12:53,680
also have probably wind-driven abrasion

350
00:12:58,470 --> 00:12:56,560
of the bedrock to expose these layers no

351
00:13:01,030 --> 00:12:58,480
matter where we land what we now know

352
00:13:02,150 --> 00:13:01,040
from studying the details of these quads

353
00:13:03,430 --> 00:13:02,160
is that we're going to have something

354
00:13:05,430 --> 00:13:03,440
exciting to do

355
00:13:07,509 --> 00:13:05,440
so that's that's it and i'm going to

356
00:13:09,750 --> 00:13:07,519
turn it over to don to talk about the

357
00:13:11,829 --> 00:13:09,760
science we've been doing in cruz

358
00:13:14,069 --> 00:13:11,839
thank you john so one of the unique

359
00:13:16,310 --> 00:13:14,079
things about msl is that we've actually

360
00:13:18,470 --> 00:13:16,320
been doing science during cruise

361
00:13:21,030 --> 00:13:18,480
since about 10 days after launch

362
00:13:23,350 --> 00:13:21,040
the radiation assessment detector or rad

363
00:13:24,389 --> 00:13:23,360

was turned on on december 6th and we've

364
00:13:26,230 --> 00:13:24,399
collected

365
00:13:27,990 --> 00:13:26,240
a little over seven months of data

366
00:13:31,430 --> 00:13:28,000
before we were turned off in preparation

367
00:13:32,949 --> 00:13:31,440
for for landing and so the objective the

368
00:13:35,110 --> 00:13:32,959
primary objective of the radiation

369
00:13:37,350 --> 00:13:35,120
assessment detector is to characterize

370
00:13:39,590 --> 00:13:37,360
the radiation environment on the surface

371
00:13:41,269 --> 00:13:39,600
of mars and that's essential to

372
00:13:44,790 --> 00:13:41,279
understanding habitability because it's

373
00:13:46,629 --> 00:13:44,800
a life limiting factor to habitability

374
00:13:48,550 --> 00:13:46,639
but we also realize that we had this

375
00:13:51,030 --> 00:13:48,560
opportunity to collect data and take

376
00:13:53,430 --> 00:13:51,040
observations uh during the cruise phase

377
00:13:55,509 --> 00:13:53,440
and that's essential also because as in

378
00:13:57,590 --> 00:13:55,519
planning for future human exploration of

379
00:13:59,110 --> 00:13:57,600
mars we need to understand what the

380
00:14:00,949 --> 00:13:59,120
radiation environment that asks future

381
00:14:03,590 --> 00:14:00,959
astronauts will experience both during

382
00:14:06,150 --> 00:14:03,600
cruise but also during the surface so if

383
00:14:07,430 --> 00:14:06,160
you have the first slide please

384
00:14:10,870 --> 00:14:07,440
basically

385
00:14:12,230 --> 00:14:10,880
all the planets earth mars are

386
00:14:14,790 --> 00:14:12,240
bathed in

387
00:14:16,389 --> 00:14:14,800
two types of radiation galactic cosmic

388
00:14:18,550 --> 00:14:16,399

rays which come from

389
00:14:21,509 --> 00:14:18,560
supernova remnants deep in the galaxy

390
00:14:22,870 --> 00:14:21,519
and they vary on long time scales

391
00:14:25,030 --> 00:14:22,880
we're also

392
00:14:27,110 --> 00:14:25,040
bathed in solar energetic particles

393
00:14:29,189 --> 00:14:27,120
which come from the sun or or flares or

394
00:14:30,389 --> 00:14:29,199
explosions on the sun which happen

395
00:14:32,629 --> 00:14:30,399
episodically

396
00:14:35,670 --> 00:14:32,639
with the solar cycle and they can be

397
00:14:37,590 --> 00:14:35,680
very short uh but also very intense and

398
00:14:40,069 --> 00:14:37,600
so characterizing this radiation

399
00:14:42,310 --> 00:14:40,079
environment on the surface of mars and

400
00:14:43,829 --> 00:14:42,320
in space during crews is the primary

401
00:14:45,030 --> 00:14:43,839
objective of rad so if we have the next

402
00:14:46,550 --> 00:14:45,040
graphic

403
00:14:48,550 --> 00:14:46,560
the real question is so why do we need

404
00:14:49,990 --> 00:14:48,560
to measure this on the surface of mars

405
00:14:51,509 --> 00:14:50,000
well the the radiation environment on

406
00:14:53,750 --> 00:14:51,519
mars is fundamentally different for two

407
00:14:56,470 --> 00:14:53,760
reasons one is mars doesn't have a

408
00:14:58,550 --> 00:14:56,480
global magnetic field protecting it from

409
00:15:01,110 --> 00:14:58,560
the charged particle radiation in space

410
00:15:03,350 --> 00:15:01,120
like the earth does um mars lost its

411
00:15:05,990 --> 00:15:03,360
magnetic field several billion years ago

412
00:15:07,750 --> 00:15:06,000
and so it's it's pretty much bare and

413
00:15:10,150 --> 00:15:07,760

and vulnerable to the deep space

414
00:15:12,870 --> 00:15:10,160
radiation uh which is present

415
00:15:14,949 --> 00:15:12,880
also mars doesn't have uh uh well it has

416
00:15:17,110 --> 00:15:14,959
a much thinner atmosphere than earth

417
00:15:19,910 --> 00:15:17,120
it's about one percent the thickness of

418
00:15:22,389 --> 00:15:19,920
the earth's uh atmosphere so there isn't

419
00:15:25,350 --> 00:15:22,399
as much uh effective shielding or or

420
00:15:27,430 --> 00:15:25,360
mass to absorb uh the particle radiation

421
00:15:28,949 --> 00:15:27,440
uh coming to it so

422
00:15:30,389 --> 00:15:28,959
characterizing the radiation environment

423
00:15:32,870 --> 00:15:30,399
measuring the radiation environment on

424
00:15:35,110 --> 00:15:32,880
the surface of mars is essential for

425
00:15:37,430 --> 00:15:35,120
understanding uh questions of

426
00:15:39,430 --> 00:15:37,440
habitability in terms of life-limiting

427
00:15:42,069 --> 00:15:39,440
elements of habitability but also in

428
00:15:44,150 --> 00:15:42,079
planning for uh future human exploration

429
00:15:45,509 --> 00:15:44,160
so if we have the next slide

430
00:15:47,590 --> 00:15:45,519
um so

431
00:15:49,430 --> 00:15:47,600
this this graphic shows uh two

432
00:15:52,150 --> 00:15:49,440
spacecraft one on the left is the mars

433
00:15:55,030 --> 00:15:52,160
science laboratory during cruise it has

434
00:15:56,230 --> 00:15:55,040
the the descent stage the heat shield um

435
00:15:58,710 --> 00:15:56,240
the back shell

436
00:16:01,670 --> 00:15:58,720
but it also looks uh curiously similar

437
00:16:05,269 --> 00:16:01,680
to the orion spacecraft which uh future

438
00:16:07,110 --> 00:16:05,279

astronauts uh will use to uh to journey

439
00:16:09,910 --> 00:16:07,120
off into deep space to

440
00:16:11,430 --> 00:16:09,920
the asteroids and and uh potentially

441
00:16:14,150 --> 00:16:11,440
mars down the road

442
00:16:16,150 --> 00:16:14,160
20 30 years so measuring the radiation

443
00:16:17,749 --> 00:16:16,160
environment inside the spacecraft was

444
00:16:19,749 --> 00:16:17,759
something that we actually realized

445
00:16:21,670 --> 00:16:19,759
about a year ago uh we weren't

446
00:16:23,350 --> 00:16:21,680
originally planning to take observations

447
00:16:24,710 --> 00:16:23,360
during cruise and about a year ago we

448
00:16:26,230 --> 00:16:24,720
realized that this was a great

449
00:16:27,990 --> 00:16:26,240
opportunity because most of the time

450
00:16:29,269 --> 00:16:28,000
when you when you want to measure the

451
00:16:30,389 --> 00:16:29,279
radiation environment or the energetic

452
00:16:32,069 --> 00:16:30,399
particle environment you put your

453
00:16:33,829 --> 00:16:32,079
detectors on the outside of the

454
00:16:35,829 --> 00:16:33,839
spacecraft to measure the pure

455
00:16:37,829 --> 00:16:35,839
interplanetary environment but rad is

456
00:16:39,990 --> 00:16:37,839
deep inside the spacecraft in the in the

457
00:16:42,069 --> 00:16:40,000
in the belly of the spacecraft basically

458
00:16:43,670 --> 00:16:42,079
as a future astronaut would be tucked in

459
00:16:48,069 --> 00:16:43,680
the belly of their spacecraft on a

460
00:16:51,430 --> 00:16:49,590
we we took these seven months of data

461
00:16:54,470 --> 00:16:51,440
and if you show the next graphic this

462
00:16:56,949 --> 00:16:54,480
shows sort of a summary result of of the

463
00:16:58,790 --> 00:16:56,959

particle flux that we observed uh during

464
00:17:00,150 --> 00:16:58,800
cruise phase so it started on december

465
00:17:02,470 --> 00:17:00,160
6th

466
00:17:05,350 --> 00:17:02,480
10 days after launch and it went about

467
00:17:07,029 --> 00:17:05,360
seven months and a week until july 13th

468
00:17:08,630 --> 00:17:07,039
when we we finally turned off and you

469
00:17:11,350 --> 00:17:08,640
can see two things in this plot you can

470
00:17:13,350 --> 00:17:11,360
see um the this is a particle flux

471
00:17:15,669 --> 00:17:13,360
versus time and you can see the galactic

472
00:17:18,230 --> 00:17:15,679
cosmic ray background which varies

473
00:17:19,909 --> 00:17:18,240
slowly over an 11-year solar cycle and

474
00:17:21,829 --> 00:17:19,919
then you can see these spikes there's

475
00:17:24,150 --> 00:17:21,839
about five spikes on the graph which

476
00:17:25,909 --> 00:17:24,160
show uh the results of solar energetic

477
00:17:28,230 --> 00:17:25,919
particle events as a result of solar

478
00:17:30,870 --> 00:17:28,240
flares or explosions on the sun giant

479
00:17:32,710 --> 00:17:30,880
storms on the sun and these came with

480
00:17:34,789 --> 00:17:32,720
without a moment's notice they

481
00:17:37,110 --> 00:17:34,799
they happened very quickly they lasted a

482
00:17:38,549 --> 00:17:37,120
few days and uh and then they were gone

483
00:17:41,270 --> 00:17:38,559
but you can see that the particle

484
00:17:43,750 --> 00:17:41,280
particle flux that rad observed even

485
00:17:46,390 --> 00:17:43,760
deep inside the spacecraft went up over

486
00:17:48,070 --> 00:17:46,400
an order of magnitude so let's focus on

487
00:17:51,350 --> 00:17:48,080
one of the large events in march if you

488
00:17:55,510 --> 00:17:53,909

just centering in on this region here in

489
00:17:57,590 --> 00:17:55,520
march there were there were two storms

490
00:17:59,190 --> 00:17:57,600
two events back to back and if we have

491
00:18:01,430 --> 00:17:59,200
the next graphic

492
00:18:03,270 --> 00:18:01,440
this shows a blow up of this region so

493
00:18:05,430 --> 00:18:03,280
the white data is is the the rad

494
00:18:07,029 --> 00:18:05,440
observations which as i mentioned they

495
00:18:08,950 --> 00:18:07,039
increased by about an order of magnitude

496
00:18:10,950 --> 00:18:08,960
in terms of the particle flux density

497
00:18:12,710 --> 00:18:10,960
but the red is the is the pure deep

498
00:18:14,549 --> 00:18:12,720
space environment measured from the cis

499
00:18:16,950 --> 00:18:14,559
instrument on the ace satellite

500
00:18:18,950 --> 00:18:16,960
which is pretty much along the line that

501
00:18:21,510 --> 00:18:18,960
the storm came from the sun so the

502
00:18:23,350 --> 00:18:21,520
measurements that we see in red would be

503
00:18:24,950 --> 00:18:23,360
what rad would experience or what an

504
00:18:26,230 --> 00:18:24,960
astronaut would experience if they're on

505
00:18:28,230 --> 00:18:26,240
a space walk

506
00:18:30,310 --> 00:18:28,240
in deep space and so the shielding or

507
00:18:31,909 --> 00:18:30,320
the protection from the spacecraft uh

508
00:18:33,990 --> 00:18:31,919
reduced the radiation environment by

509
00:18:36,230 --> 00:18:34,000
about two orders of magnitude and and

510
00:18:37,430 --> 00:18:36,240
that's that's essentially um

511
00:18:38,870 --> 00:18:37,440
what we're going to learn from these

512
00:18:40,230 --> 00:18:38,880
cruise observations in addition to

513
00:18:41,830 --> 00:18:40,240

comparing it with these other events

514
00:18:43,830 --> 00:18:41,840
that are observed from other spacecraft

515
00:18:46,310 --> 00:18:43,840
but but the the lesson here is that

516
00:18:48,950 --> 00:18:46,320
these these events happen very quickly

517
00:18:50,789 --> 00:18:48,960
and they can be very intense but uh with

518
00:18:53,110 --> 00:18:50,799
with the proper shielding you know we

519
00:18:55,510 --> 00:18:53,120
can help plan for and prepare for uh

520
00:18:57,430 --> 00:18:55,520
future missions to mars so i'll pass it

521
00:18:59,830 --> 00:18:57,440
on to michael to talk about the cameras

522
00:19:01,270 --> 00:18:59,840
which we'll we'll be observing as we

523
00:19:02,390 --> 00:19:01,280
come through the atmosphere thank you

524
00:19:04,950 --> 00:19:02,400
don

525
00:19:06,630 --> 00:19:04,960
i'm here actually representing

526
00:19:09,430 --> 00:19:06,640
about

527
00:19:11,110 --> 00:19:09,440
three or four different teams

528
00:19:13,350 --> 00:19:11,120
i'm the principal investigator of the

529
00:19:15,830 --> 00:19:13,360
mast cam which are the science color

530
00:19:17,750 --> 00:19:15,840
cameras on the mast of the rover i'm

531
00:19:20,390 --> 00:19:17,760
also here as the principal investigator

532
00:19:23,270 --> 00:19:20,400
of the descent imaging system which will

533
00:19:25,190 --> 00:19:23,280
take pictures during the descent

534
00:19:26,950 --> 00:19:25,200
can ken edgett is the principal

535
00:19:30,549 --> 00:19:26,960
investigator of the mars hand lens

536
00:19:33,669 --> 00:19:30,559
camera which is a molly it's called

537
00:19:35,830 --> 00:19:33,679
roger wiens is the pi of chemcam

538
00:19:37,990 --> 00:19:35,840

which is the laser that measures

539
00:19:39,430 --> 00:19:38,000
composition but it also has a camera

540
00:19:41,750 --> 00:19:39,440
called the remote

541
00:19:44,150 --> 00:19:41,760
microscopic imager which will observe

542
00:19:46,549 --> 00:19:44,160
the actual location where the

543
00:19:48,870 --> 00:19:46,559
where the laser blasts and finally

544
00:19:50,789 --> 00:19:48,880
justin mackey who is the lead for the

545
00:19:52,950 --> 00:19:50,799
engineering cameras which are really the

546
00:19:54,549 --> 00:19:52,960
workhorse cameras on the on the

547
00:20:00,230 --> 00:19:54,559
spacecraft

548
00:20:02,390 --> 00:20:00,240
you might ask why are there 17

549
00:20:05,909 --> 00:20:02,400
the first graphic shows uh

550
00:20:07,270 --> 00:20:05,919
me 39 29 years 39 years ago walking

551
00:20:11,270 --> 00:20:07,280
across a uh

552
00:20:14,149 --> 00:20:11,280
a a stream in in alaska and it looks

553
00:20:16,789 --> 00:20:14,159
like i'm carrying someone i'm actually

554
00:20:17,590 --> 00:20:16,799
because my boots are around my neck but

555
00:20:21,029 --> 00:20:17,600
the

556
00:20:23,510 --> 00:20:21,039
pack

557
00:20:26,070 --> 00:20:23,520
and at the very top of that is a camera

558
00:20:28,310 --> 00:20:26,080
is a bag with four cameras geologists go

559
00:20:30,310 --> 00:20:28,320
in the field today these days with lots

560
00:20:32,310 --> 00:20:30,320
of cameras and

561
00:20:35,029 --> 00:20:32,320
the next graphic shows

562
00:20:37,430 --> 00:20:35,039
the rover and it has lots of cameras

563
00:20:39,750 --> 00:20:37,440

that can be grouped into three different

564
00:20:41,430 --> 00:20:39,760
types of groups of cameras on the mast

565
00:20:44,630 --> 00:20:41,440
which you see at the upper left of the

566
00:20:47,110 --> 00:20:44,640
of the graphic there are nine cameras or

567
00:20:48,390 --> 00:20:47,120
excuse me seven cameras on the mast

568
00:20:51,270 --> 00:20:48,400
those are two

569
00:20:52,390 --> 00:20:51,280
two pairs of navigation pairs because

570
00:20:55,270 --> 00:20:52,400
there are

571
00:20:58,710 --> 00:20:55,280
two sides of the rover computer so each

572
00:21:01,190 --> 00:20:58,720
side can control one set of lenses one

573
00:21:04,149 --> 00:21:01,200
set of cameras and there are pairs of

574
00:21:06,630 --> 00:21:04,159
them because they're taking stereo data

575
00:21:07,590 --> 00:21:06,640
so there are two pairs of navigation

576
00:21:12,710 --> 00:21:07,600
cameras

577
00:21:16,149 --> 00:21:12,720
but in fact they're really two different

578
00:21:17,669 --> 00:21:16,159
cameras one is a sort of a 34 it's a 34

579
00:21:19,510 --> 00:21:17,679
millimeter camera which is very much

580
00:21:21,270 --> 00:21:19,520
like a 35 millimeter camera that you

581
00:21:23,110 --> 00:21:21,280
would normally have on your digital

582
00:21:25,909 --> 00:21:23,120
camera the other is 100 millimeter

583
00:21:27,990 --> 00:21:25,919
telephoto lens and then the rmi is

584
00:21:28,870 --> 00:21:28,000
inside the chem cam at the very top

585
00:21:33,590 --> 00:21:28,880
there

586
00:21:35,510 --> 00:21:33,600
the mali that camera can get very very

587
00:21:37,590 --> 00:21:35,520
close to the surface it can resolve

588
00:21:40,549 --> 00:21:37,600

things when it's at its closest that are

589
00:21:43,350 --> 00:21:40,559
only a few tens of microns across

590
00:21:45,430 --> 00:21:43,360
and then fixed to the body of the rover

591
00:21:48,149 --> 00:21:45,440
and they can't move other than with the

592
00:21:50,710 --> 00:21:48,159
rover as it moves around are the

593
00:21:52,070 --> 00:21:50,720
haz cams the hazard cameras which are

594
00:21:54,630 --> 00:21:52,080
used to

595
00:21:56,310 --> 00:21:54,640
look for where to put the robotic arm

596
00:21:59,590 --> 00:21:56,320
and also to look for hazards as the

597
00:22:02,390 --> 00:21:59,600
vehicle is driving there are two pairs

598
00:22:04,390 --> 00:22:02,400
on the front and two pairs on the back

599
00:22:06,390 --> 00:22:04,400
uh and finally there's the descent

600
00:22:07,590 --> 00:22:06,400
camera the marty which is off on the

601
00:22:09,190 --> 00:22:07,600
side there

602
00:22:13,110 --> 00:22:09,200
and one of the wheels will actually show

603
00:22:15,350 --> 00:22:13,120
up in the marty data the next graphic

604
00:22:17,990 --> 00:22:15,360
shows i think is a video which we made

605
00:22:20,549 --> 00:22:18,000
of during a test where we show why we

606
00:22:21,830 --> 00:22:20,559
have so many different cameras it's

607
00:22:23,669 --> 00:22:21,840
going to be a zooming in this is a

608
00:22:25,830 --> 00:22:23,679
navigation camera

609
00:22:28,230 --> 00:22:25,840
and it shows you sort of where it can

610
00:22:30,710 --> 00:22:28,240
what we get with it this is the 34

611
00:22:32,549 --> 00:22:30,720
millimeter mass cam

612
00:22:34,549 --> 00:22:32,559
this is now this is going to transition

613
00:22:36,630 --> 00:22:34,559

to the 100 millimeter nascam

614
00:22:37,510 --> 00:22:36,640
and finally with the view that molly can

615
00:22:39,590 --> 00:22:37,520
get

616
00:22:41,270 --> 00:22:39,600
and we'll zoom in on that as well so the

617
00:22:44,230 --> 00:22:41,280
idea is that we can cover a range of

618
00:22:46,870 --> 00:22:44,240
resolutions from

619
00:22:50,390 --> 00:22:46,880
a few millimeters down to microns in

620
00:22:53,669 --> 00:22:50,400
scale and the 100 millimeter mast cam at

621
00:22:55,990 --> 00:22:53,679
a thousand meters distance has a seven

622
00:22:58,149 --> 00:22:56,000
and a half meter seven half centimeter

623
00:23:01,110 --> 00:22:58,159
pixel which means something about this

624
00:23:03,510 --> 00:23:01,120
big could be easily resolved about six

625
00:23:05,669 --> 00:23:03,520
tenths of a mile away

626
00:23:07,590 --> 00:23:05,679
the next graphic now i'm going to switch

627
00:23:08,950 --> 00:23:07,600
gears and start talking about

628
00:23:11,750 --> 00:23:08,960
my baby

629
00:23:13,909 --> 00:23:11,760
is the marty the mars ascent imager

630
00:23:15,909 --> 00:23:13,919
give you an idea of the size

631
00:23:18,149 --> 00:23:15,919
this is the same knife as you see in the

632
00:23:20,070 --> 00:23:18,159
picture geologists almost always use

633
00:23:22,310 --> 00:23:20,080
their pocket knife as a

634
00:23:23,830 --> 00:23:22,320
as a scale for small things normally

635
00:23:25,110 --> 00:23:23,840
they also use rock cameras but i didn't

636
00:23:28,230 --> 00:23:25,120
bring that with me

637
00:23:31,669 --> 00:23:28,240
um the marty is going to take is a fixed

638
00:23:33,990 --> 00:23:31,679

camera fixed focal length fixed aperture

639
00:23:35,350 --> 00:23:34,000
it takes images at about four frames per

640
00:23:37,909 --> 00:23:35,360
second

641
00:23:39,830 --> 00:23:37,919
and it they're they're color they take

642
00:23:42,549 --> 00:23:39,840
color the same way your consumer camera

643
00:23:44,950 --> 00:23:42,559
takes color it has a color filter on top

644
00:23:46,070 --> 00:23:44,960
of the detector and that color filter is

645
00:23:48,310 --> 00:23:46,080
then used

646
00:23:52,149 --> 00:23:48,320
we interpolate between the color filters

647
00:23:54,149 --> 00:23:52,159
to make a full 3d full color image

648
00:23:56,549 --> 00:23:54,159
as marty moves across the surface during

649
00:23:58,870 --> 00:23:56,559
the set it will in fact take stereo

650
00:23:59,990 --> 00:23:58,880
images mostly because the descent system

651
00:24:01,430 --> 00:24:00,000
is moving

652
00:24:03,590 --> 00:24:01,440
the next slide

653
00:24:06,070 --> 00:24:03,600
shows uh how we're going to get the data

654
00:24:08,070 --> 00:24:06,080
back or what's the pattern of it you'll

655
00:24:10,710 --> 00:24:08,080
be hearing later today i think about the

656
00:24:12,630 --> 00:24:10,720
descent by the edl itself

657
00:24:14,950 --> 00:24:12,640
i had to learn a lot about edl in order

658
00:24:16,710 --> 00:24:14,960
to be able to figure out how to take how

659
00:24:18,789 --> 00:24:16,720
to get the images back because once

660
00:24:20,390 --> 00:24:18,799
we've taken them they're stored then we

661
00:24:22,549 --> 00:24:20,400
have to figure out what sequence to

662
00:24:25,510 --> 00:24:22,559
bring them back in this graphic shows

663
00:24:26,870 --> 00:24:25,520

the basic phases of the descent and my

664
00:24:30,070 --> 00:24:26,880
attempt to

665
00:24:32,310 --> 00:24:30,080
bracket all the possible dissents

666
00:24:35,909 --> 00:24:32,320
the issue is really that the parachute

667
00:24:38,470 --> 00:24:35,919
descent takes longer uh than everything

668
00:24:40,710 --> 00:24:38,480
else and it also can vary by a large

669
00:24:42,230 --> 00:24:40,720
amount so the

670
00:24:44,549 --> 00:24:42,240
sky crane which you'll hear a little bit

671
00:24:47,190 --> 00:24:44,559
more this after this morning

672
00:24:50,390 --> 00:24:47,200
takes about 15 plus or minus three

673
00:24:52,630 --> 00:24:50,400
seconds it's a very very well prescribed

674
00:24:54,230 --> 00:24:52,640
set of things that happens and it's a

675
00:24:56,950 --> 00:24:54,240
very short interval

676
00:24:59,190 --> 00:24:56,960
the power descent takes about 53 seconds

677
00:25:01,830 --> 00:24:59,200
plus a minus three seconds so there's a

678
00:25:04,470 --> 00:25:01,840
very very well defined period of time

679
00:25:06,710 --> 00:25:04,480
when we know the vehicle is under power

680
00:25:08,310 --> 00:25:06,720
and when i could know which images would

681
00:25:10,310 --> 00:25:08,320
be coming back

682
00:25:13,269 --> 00:25:10,320
however the parachute descent could take

683
00:25:14,789 --> 00:25:13,279
anything from 45 seconds if the vehicle

684
00:25:15,750 --> 00:25:14,799
comes in low

685
00:25:19,029 --> 00:25:15,760
to

686
00:25:19,909 --> 00:25:19,039
200 215 seconds if the vehicle comes in

687
00:25:22,789 --> 00:25:19,919
high

688
00:25:25,269 --> 00:25:22,799

that is a huge uncertainty for me to

689
00:25:26,950 --> 00:25:25,279
know which pictures will have the most

690
00:25:29,269 --> 00:25:26,960
important information

691
00:25:31,590 --> 00:25:29,279
so what i did is i took the absolute

692
00:25:34,630 --> 00:25:31,600
longest and absolute shortest time that

693
00:25:37,110 --> 00:25:34,640
was ever simulated by the edl team and

694
00:25:39,430 --> 00:25:37,120
those bracket the one percent

695
00:25:42,310 --> 00:25:39,440
probability at either end and also the

696
00:25:43,190 --> 00:25:42,320
middle so these five bars here are those

697
00:25:45,909 --> 00:25:43,200
five

698
00:25:48,549 --> 00:25:45,919
cases of the one percent uh long or

699
00:25:50,950 --> 00:25:48,559
short and the in the 50

700
00:25:52,149 --> 00:25:50,960
time and then the maximum minimum and i

701
00:25:54,830 --> 00:25:52,159
said okay

702
00:25:58,310 --> 00:25:54,840
uh project how many pictures can i get

703
00:25:59,830 --> 00:25:58,320
back and we agreed that i'd get 18.

704
00:26:01,909 --> 00:25:59,840
so those

705
00:26:05,590 --> 00:26:01,919
white lines that you see there numbered

706
00:26:08,070 --> 00:26:05,600
1 through 18 are my attempt to divvy up

707
00:26:11,110 --> 00:26:08,080
all the pictures that i can bring back

708
00:26:12,310 --> 00:26:11,120
in the earlier early phase of the pro

709
00:26:14,070 --> 00:26:12,320
of the mission

710
00:26:16,390 --> 00:26:14,080
uh those are

711
00:26:19,269 --> 00:26:16,400
images that will get something no matter

712
00:26:22,149 --> 00:26:19,279
what we land so or how long it takes to

713
00:26:24,710 --> 00:26:22,159

land so you can see that in the short

714
00:26:27,350 --> 00:26:24,720
duration landing 109 seconds

715
00:26:29,269 --> 00:26:27,360
only images through seven are actually

716
00:26:31,430 --> 00:26:29,279
taken while the vehicle is above the

717
00:26:33,350 --> 00:26:31,440
ground and everything from seven to

718
00:26:34,789 --> 00:26:33,360
eighteen are taken after the vehicle is

719
00:26:37,110 --> 00:26:34,799
landed

720
00:26:38,950 --> 00:26:37,120
but then as you move out to uh to the

721
00:26:41,430 --> 00:26:38,960
longer ones you can see more images come

722
00:26:43,750 --> 00:26:41,440
back and i spaced these so that i would

723
00:26:44,950 --> 00:26:43,760
i would ensure that we would get at the

724
00:26:47,269 --> 00:26:44,960
very least

725
00:26:50,070 --> 00:26:47,279
three images during parachute

726
00:26:53,110 --> 00:26:50,080
three images during power descent uh one

727
00:26:55,750 --> 00:26:53,120
image during sky crane and potentially

728
00:26:57,909 --> 00:26:55,760
one image of the dust being raised as

729
00:27:00,870 --> 00:26:57,919
during the flyway phase and that's sort

730
00:27:04,070 --> 00:27:00,880
of why those are variously spaced and

731
00:27:06,549 --> 00:27:04,080
and not equally spaced along the line uh

732
00:27:07,830 --> 00:27:06,559
so the the hope is that by by pulling

733
00:27:09,430 --> 00:27:07,840
these back

734
00:27:12,789 --> 00:27:09,440
out out of this long sequence the

735
00:27:16,870 --> 00:27:12,799
sequence is 1504 images in length which

736
00:27:19,590 --> 00:27:16,880
is like 600 6 minutes and 25 seconds or

737
00:27:21,750 --> 00:27:19,600
more um that's how long we'll be taking

738
00:27:23,669 --> 00:27:21,760

the video during the descent but most of

739
00:27:25,830 --> 00:27:23,679
that's going to be on the ground and

740
00:27:27,669 --> 00:27:25,840
we'll be watching dust and other things

741
00:27:31,350 --> 00:27:27,679
in the sky

742
00:27:32,710 --> 00:27:31,360
i think i have one last graphic yes so

743
00:27:35,590 --> 00:27:32,720
in

744
00:27:38,389 --> 00:27:35,600
an attempt to lower your expectations

745
00:27:41,029 --> 00:27:38,399
these are all going to be thumbnail

746
00:27:43,110 --> 00:27:41,039
the thumbnails for the science cameras

747
00:27:47,029 --> 00:27:43,120
are bigger than they are for the for the

748
00:27:50,870 --> 00:27:47,039
engineering cameras they're 192 by 144

749
00:27:52,470 --> 00:27:50,880
pixels so they're sort of youtube sort

750
00:27:53,269 --> 00:27:52,480
of resolution

751
00:27:55,190 --> 00:27:53,279
uh

752
00:27:56,870 --> 00:27:55,200
the poorer youtube

753
00:27:58,070 --> 00:27:56,880
and they're going to be

754
00:28:00,310 --> 00:27:58,080
in color

755
00:28:02,389 --> 00:28:00,320
uh they will have they are jpeg

756
00:28:05,269 --> 00:28:02,399
compressed for those of you or who are

757
00:28:08,710 --> 00:28:05,279
knowledgeable about what your cameras do

758
00:28:10,310 --> 00:28:08,720
our cameras have a raw form and a jpeg

759
00:28:12,389 --> 00:28:10,320
form and the jpeg can be a different

760
00:28:14,870 --> 00:28:12,399
quality just like you can set your

761
00:28:17,430 --> 00:28:14,880
consumer camera to a different quality

762
00:28:19,909 --> 00:28:17,440
these will be coming back at quality

763
00:28:22,789 --> 00:28:19,919

very good but not excellent

764
00:28:25,510 --> 00:28:22,799
and so they're a little bit smaller and

765
00:28:27,669 --> 00:28:25,520
small is good in terms of downlink

766
00:28:30,630 --> 00:28:27,679
so they'll be

767
00:28:32,389 --> 00:28:30,640
they'll have artifacts they'll be small

768
00:28:34,470 --> 00:28:32,399
but we hope that we'll be able to

769
00:28:36,070 --> 00:28:34,480
actually tell where we land within the

770
00:28:37,190 --> 00:28:36,080
first few minutes of having them back on

771
00:28:39,350 --> 00:28:37,200
the ground

772
00:28:41,029 --> 00:28:39,360
with that i'll turn it back to you

773
00:28:42,789 --> 00:28:41,039
all right thank you and thanks to all

774
00:28:45,430 --> 00:28:42,799
our panelists this morning we're going

775
00:28:46,789 --> 00:28:45,440
to start the reporter q a session now

776
00:28:48,549 --> 00:28:46,799
and we do have some reporters who are

777
00:28:50,230 --> 00:28:48,559
listening and watching from other

778
00:28:52,549 --> 00:28:50,240
locations but we're going to start right

779
00:28:55,190 --> 00:28:52,559
here at jpl if you do have a question

780
00:28:56,870 --> 00:28:55,200
please raise your hand and wait for the

781
00:28:59,269 --> 00:28:56,880
mic to come to you

782
00:29:03,190 --> 00:28:59,279
and when you do get the mic please state

783
00:29:25,350 --> 00:29:05,750
okay let's get a mic over here to row

784
00:29:28,070 --> 00:29:26,549
uh um

785
00:29:29,590 --> 00:29:28,080
from the recent past can you describe

786
00:29:31,190 --> 00:29:29,600
when you think in mars history the

787
00:29:33,669 --> 00:29:31,200
alluvial fan was made

788
00:29:35,430 --> 00:29:33,679

and you know presumably this is a drier

789
00:29:36,950 --> 00:29:35,440
time in mars history so how could there

790
00:29:39,590 --> 00:29:36,960
have even been

791
00:29:41,990 --> 00:29:39,600
significant water to to to take these

792
00:29:43,669 --> 00:29:42,000
sediments down down the crater wall eric

793
00:29:45,110 --> 00:29:43,679
we we only heard the last part of that

794
00:29:48,310 --> 00:29:45,120
uh question could you just repeat the

795
00:29:50,870 --> 00:29:48,320
very first part uh describe the the the

796
00:29:54,870 --> 00:29:50,880
timing and environment of this alluvial

797
00:29:56,389 --> 00:29:54,880
fan uh and and when it occurred well as

798
00:29:59,029 --> 00:29:56,399
you might guess eric you know we we

799
00:30:01,669 --> 00:29:59,039
don't have an easy way to to get really

800
00:30:03,830 --> 00:30:01,679
absolute dates on on mars independent of

801
00:30:05,350 --> 00:30:03,840
the the crater impacting record and if

802
00:30:07,110 --> 00:30:05,360
you have a very small surface the

803
00:30:10,230 --> 00:30:07,120
uncertainties go way up in your estimate

804
00:30:11,430 --> 00:30:10,240
of that the the somewhat longer answer

805
00:30:13,510 --> 00:30:11,440
is that

806
00:30:16,710 --> 00:30:13,520
this is one of the things that we really

807
00:30:18,470 --> 00:30:16,720
want to do with the mission is because

808
00:30:20,870 --> 00:30:18,480
that alluvial fan

809
00:30:22,950 --> 00:30:20,880
and the time equivalent deposit that's

810
00:30:26,630 --> 00:30:22,960
downhill of it where you can let your

811
00:30:28,310 --> 00:30:26,640
imagination guess what might be there

812
00:30:32,070 --> 00:30:28,320
we want to know whether or not that

813
00:30:34,389 --> 00:30:32,080

package will then run under mount sharp

814
00:30:37,909 --> 00:30:34,399
and actually be the older thing

815
00:30:40,310 --> 00:30:37,919
that we have discovered or investigated

816
00:30:43,269 --> 00:30:40,320
and the other hypothesis is is that it

817
00:30:44,389 --> 00:30:43,279
is the younger deposit and we expect it

818
00:30:47,430 --> 00:30:44,399
to abut

819
00:30:49,510 --> 00:30:47,440
and onlap the mound go like this against

820
00:30:51,029 --> 00:30:49,520
the mound and we'll see a geometric

821
00:30:53,110 --> 00:30:51,039
relationship

822
00:30:55,750 --> 00:30:53,120
we really won't get into that question

823
00:30:58,149 --> 00:30:55,760
until we've driven to what we call this

824
00:31:00,310 --> 00:30:58,159
mound skirting units the very base of

825
00:31:01,990 --> 00:31:00,320
the mound and and that's going to be a

826
00:31:03,509 --> 00:31:02,000
big part of this mapping exercise that

827
00:31:06,149 --> 00:31:03,519
we're doing right now is to try to find

828
00:31:08,710 --> 00:31:06,159
the key places where we could go to to

829
00:31:10,070 --> 00:31:08,720
see whether it does this or whether it

830
00:31:11,750 --> 00:31:10,080
does that

831
00:31:13,110 --> 00:31:11,760
and and so

832
00:31:14,630 --> 00:31:13,120
we might be waiting a year to get to

833
00:31:16,470 --> 00:31:14,640
that part of the mission

834
00:31:18,950 --> 00:31:16,480
uh however

835
00:31:20,710 --> 00:31:18,960
if you take it and and sort of the way

836
00:31:22,149 --> 00:31:20,720
that it presents itself right now most

837
00:31:24,630 --> 00:31:22,159
simply you could guess that it would be

838
00:31:26,389 --> 00:31:24,640

younger and in that case what's cool

839
00:31:28,310 --> 00:31:26,399
about mount sharp is that it takes us

840
00:31:29,830 --> 00:31:28,320
from the time in mars's history right

841
00:31:32,149 --> 00:31:29,840
down at the base of mount sharp where we

842
00:31:34,549 --> 00:31:32,159
have clays to the time when we have

843
00:31:36,310 --> 00:31:34,559
sulfates and then maybe seven eight

844
00:31:38,870 --> 00:31:36,320
hundred meters above it we cross a

845
00:31:40,950 --> 00:31:38,880
boundary and everything up there it's

846
00:31:43,269 --> 00:31:40,960
morphologic character that the physical

847
00:31:45,269 --> 00:31:43,279
stratigraphy the mineralogy suggests

848
00:31:47,909 --> 00:31:45,279
that it represents the dry period of

849
00:31:50,110 --> 00:31:47,919
mars and and i

850
00:31:52,310 --> 00:31:50,120
you know for lack of a better

851
00:31:53,990 --> 00:31:52,320
contextualizing phrase i like to refer

852
00:31:55,350 --> 00:31:54,000
to this as the great desiccation event

853
00:31:57,669 --> 00:31:55,360
of mars this is the thing that

854
00:31:59,909 --> 00:31:57,679
everybody's been wondering about how did

855
00:32:01,750 --> 00:31:59,919
mars go from being a wet planet to a dry

856
00:32:03,830 --> 00:32:01,760
planet and we hope to cross that

857
00:32:05,909 --> 00:32:03,840
boundary and get at that

858
00:32:07,350 --> 00:32:05,919
but as you know if you draw an analogy

859
00:32:09,590 --> 00:32:07,360
to the way we study the earth we have

860
00:32:12,149 --> 00:32:09,600
things like the great oxidation event it

861
00:32:14,549 --> 00:32:12,159
turns out it's initially we think it's a

862
00:32:15,990 --> 00:32:14,559
single unidirectional trend but then it

863
00:32:17,750 --> 00:32:16,000

turns out as you do more research you

864
00:32:20,149 --> 00:32:17,760
see well there's precursor events and

865
00:32:21,509 --> 00:32:20,159
there's there's events that happen after

866
00:32:23,509 --> 00:32:21,519
and i think a lot of people now think

867
00:32:26,950 --> 00:32:23,519
that there is a phase in mars history in

868
00:32:28,630 --> 00:32:26,960
amazonian time when it may have been wet

869
00:32:30,230 --> 00:32:28,640
and it just wasn't wet for a long period

870
00:32:32,310 --> 00:32:30,240
of time and maybe gale crater has just

871
00:32:34,870 --> 00:32:32,320
captured one of those those younger

872
00:32:36,470 --> 00:32:34,880
pulses and and the amazing thing about

873
00:32:38,950 --> 00:32:36,480
it is is that we make may get to

874
00:32:41,110 --> 00:32:38,960
investigate this this

875
00:32:42,389 --> 00:32:41,120
broad range of environments in mars's

876
00:32:44,789 --> 00:32:42,399
history

877
00:32:46,549 --> 00:32:44,799
but tbd on the actual stratigraphic

878
00:32:48,630 --> 00:32:46,559
relationship

879
00:32:52,630 --> 00:32:48,640
okay we have another question actually

880
00:32:56,950 --> 00:32:55,029
hi um irene klotz with reuters i have a

881
00:32:59,269 --> 00:32:56,960
couple logistics questions and a science

882
00:33:00,549 --> 00:32:59,279
question um do you and i know this might

883
00:33:01,830 --> 00:33:00,559
be for the next panel but do you know

884
00:33:04,149 --> 00:33:01,840
yet if another

885
00:33:08,630 --> 00:33:04,159
trajectory correction maneuver is going

886
00:33:12,149 --> 00:33:10,389
it may not but we should wait for the

887
00:33:16,549 --> 00:33:12,159
next panel to answer that

888
00:33:18,230 --> 00:33:16,559

okay um and uh for john um if uh if the

889
00:33:21,190 --> 00:33:18,240
checkout and everything goes as planned

890
00:33:23,029 --> 00:33:21,200
when do you expect uh science operations

891
00:33:26,389 --> 00:33:23,039
to begin

892
00:33:28,070 --> 00:33:26,399
um it's again it's sort of uh as you

893
00:33:30,950 --> 00:33:28,080
might as you're guessing already i mean

894
00:33:32,470 --> 00:33:30,960
it's kind of a fuzzy uh progression uh

895
00:33:33,590 --> 00:33:32,480
we land and we start checking things out

896
00:33:34,870 --> 00:33:33,600
but the important thing to remember is

897
00:33:36,870 --> 00:33:34,880
every time we check out a science

898
00:33:39,110 --> 00:33:36,880
instrument we're making a measurement

899
00:33:41,350 --> 00:33:39,120
and and so when we turn them on you know

900
00:33:43,430 --> 00:33:41,360
first thing we do an aliveness test and

901
00:33:45,509 --> 00:33:43,440
then after that we do a health and

902
00:33:47,190 --> 00:33:45,519
safety test and in the course of doing

903
00:33:49,269 --> 00:33:47,200
most of those tests we actually acquire

904
00:33:51,110 --> 00:33:49,279
data that that comes back down to earth

905
00:33:53,190 --> 00:33:51,120
that gives us some sense of what's going

906
00:33:55,269 --> 00:33:53,200
on but until

907
00:33:56,470 --> 00:33:55,279
you know we'll do that for about the

908
00:33:59,350 --> 00:33:56,480
first uh

909
00:34:01,509 --> 00:33:59,360
you know 12 14 saws roughly the first

910
00:34:03,830 --> 00:34:01,519
two weeks will be spent

911
00:34:05,350 --> 00:34:03,840
putting up the mast using of the

912
00:34:07,830 --> 00:34:05,360
instruments that are associated with the

913
00:34:09,349 --> 00:34:07,840

mass doing remote sensing and then after

914
00:34:11,190 --> 00:34:09,359
that we have a little break in the

915
00:34:12,710 --> 00:34:11,200
action we call intermission where we're

916
00:34:15,270 --> 00:34:12,720
going to be able to drive for the first

917
00:34:17,589 --> 00:34:15,280
time so if we when we do the second part

918
00:34:18,790 --> 00:34:17,599
of checkout we want to put the arm out

919
00:34:19,909 --> 00:34:18,800
for example

920
00:34:21,349 --> 00:34:19,919
we'd like to put the arm out on

921
00:34:22,950 --> 00:34:21,359
something we think is interesting so we

922
00:34:25,430 --> 00:34:22,960
might drive a couple of meters a few

923
00:34:26,230 --> 00:34:25,440
tens of meters and along the way uh

924
00:34:28,069 --> 00:34:26,240
we're going to do some more

925
00:34:29,510 --> 00:34:28,079
characterization of the cameras we're

926
00:34:30,629 --> 00:34:29,520
going to do some characterization of the

927
00:34:32,550 --> 00:34:30,639
chemcam

928
00:34:34,389 --> 00:34:32,560
uh we're going to turn sam on for the

929
00:34:35,669 --> 00:34:34,399
first time and and do a sniff of the

930
00:34:37,589 --> 00:34:35,679
atmosphere

931
00:34:39,109 --> 00:34:37,599
and and that's a that's an engineering

932
00:34:41,750 --> 00:34:39,119
checkout but it's a science measurement

933
00:34:43,430 --> 00:34:41,760
at the same time and so then after that

934
00:34:45,349 --> 00:34:43,440
we'll you know with the

935
00:34:47,750 --> 00:34:45,359
a few weeks after that we'll be doing

936
00:34:49,909 --> 00:34:47,760
the contact science instruments and

937
00:34:52,149 --> 00:34:49,919
somewhere between a month and two months

938
00:34:53,990 --> 00:34:52,159

after we've started i would guess we

939
00:34:56,069 --> 00:34:54,000
will have collected the first soil

940
00:34:57,829 --> 00:34:56,079
sample and maybe even drilled the first

941
00:35:00,069 --> 00:34:57,839
rock roughly

942
00:35:02,550 --> 00:35:00,079
so it'll be staged in sort of days weeks

943
00:35:04,950 --> 00:35:02,560
and and months until we're really ready

944
00:35:07,430 --> 00:35:04,960
to go and we get the keys to the rover

945
00:35:08,790 --> 00:35:07,440
thanks and uh i guess another um kind of

946
00:35:11,349 --> 00:35:08,800
big picture science question you

947
00:35:13,430 --> 00:35:11,359
mentioned the sam instrument um

948
00:35:15,270 --> 00:35:13,440
will the roker have anything that's

949
00:35:17,349 --> 00:35:15,280
going to be able to characterize any

950
00:35:18,950 --> 00:35:17,359
atmospheric methane and if so would

951
00:35:21,190 --> 00:35:18,960
there be any way to

952
00:35:23,030 --> 00:35:21,200
distinguish whether it's geologic or

953
00:35:24,950 --> 00:35:23,040
biologic

954
00:35:26,950 --> 00:35:24,960
that would be the the tunable laser

955
00:35:29,430 --> 00:35:26,960
spectrometer which is part of the sam

956
00:35:31,910 --> 00:35:29,440
package and it's during the intermission

957
00:35:32,710 --> 00:35:31,920
we're hopeful to be able to make

958
00:35:34,550 --> 00:35:32,720
uh

959
00:35:36,950 --> 00:35:34,560
a a measurement when we do the

960
00:35:39,510 --> 00:35:36,960
instrument checkout however again just

961
00:35:41,670 --> 00:35:39,520
to just to condition expectation

962
00:35:44,310 --> 00:35:41,680
that measurement will not be long enough

963
00:35:45,990 --> 00:35:44,320

to give a definitive answer to the yey

964
00:35:48,150 --> 00:35:46,000
or an a question about methane in the

965
00:35:50,230 --> 00:35:48,160
atmosphere we we need a longer period of

966
00:35:52,310 --> 00:35:50,240
time to do that so that will wait until

967
00:35:54,790 --> 00:35:52,320
slightly longer in the mission

968
00:35:56,870 --> 00:35:54,800
and in the event that we detect methane

969
00:35:58,710 --> 00:35:56,880
what we can do is determine the isotope

970
00:36:00,950 --> 00:35:58,720
ratio of the carbon that's present in

971
00:36:02,950 --> 00:36:00,960
that methane and even if it turns out

972
00:36:04,790 --> 00:36:02,960
that it's very light which is often

973
00:36:06,790 --> 00:36:04,800
what's associated with methane on earth

974
00:36:08,950 --> 00:36:06,800
that's of biogenic origin there are

975
00:36:11,190 --> 00:36:08,960
abiotic sources that also produce

976
00:36:13,349 --> 00:36:11,200
methane so we'll always be in this

977
00:36:15,349 --> 00:36:13,359
somewhat equivocal situation of saying

978
00:36:17,510 --> 00:36:15,359
you know it might be or it might not but

979
00:36:19,589 --> 00:36:17,520
the first thing is to just ask is there

980
00:36:21,349 --> 00:36:19,599
methane in the atmosphere or not that's

981
00:36:23,270 --> 00:36:21,359
that's that's what we're trying to do

982
00:36:25,030 --> 00:36:23,280
okay and irene your first question gave

983
00:36:26,710 --> 00:36:25,040
me a perfect opportunity to remind

984
00:36:28,470 --> 00:36:26,720
everybody that we do have this is the

985
00:36:32,470 --> 00:36:28,480
first of two news conferences this

986
00:36:34,630 --> 00:36:32,480
morning at 11 a.m pacific 2 p.m eastern

987
00:36:36,550 --> 00:36:34,640
we will have our mission overview

988
00:36:38,470 --> 00:36:36,560

engineering news conference and any

989
00:36:40,870 --> 00:36:38,480
questions about entry descent and

990
00:36:42,230 --> 00:36:40,880
landing will be addressed there but in

991
00:36:44,390 --> 00:36:42,240
the meantime i believe we have more

992
00:36:46,310 --> 00:36:44,400
questions here for our science panel uh

993
00:36:48,069 --> 00:36:46,320
let's go ahead in the first row

994
00:36:49,990 --> 00:36:48,079
yeah hi this is uh john russell with

995
00:36:51,430 --> 00:36:50,000
reuters

996
00:36:52,550 --> 00:36:51,440
you know when i when i told my wife that

997
00:36:53,829 --> 00:36:52,560
i was coming up here the first thing she

998
00:36:55,589 --> 00:36:53,839
wants to know is you know when are we

999
00:36:58,710 --> 00:36:55,599
going to put somebody on mars and so the

1000
00:37:00,790 --> 00:36:58,720
perception is how big how big a step is

1001
00:37:02,950 --> 00:37:00,800
this in that process and and then

1002
00:37:08,069 --> 00:37:02,960
secondly how excited are you guys and

1003
00:37:11,109 --> 00:37:09,030
um

1004
00:37:13,510 --> 00:37:11,119
part of the design of

1005
00:37:15,349 --> 00:37:13,520
the mars science laboratory was in fact

1006
00:37:17,349 --> 00:37:15,359
to create a capability to get a metric

1007
00:37:20,069 --> 00:37:17,359
ton to the surface of mars

1008
00:37:22,069 --> 00:37:20,079
and hopefully we've done that

1009
00:37:23,589 --> 00:37:22,079
and that is going to help us go a long

1010
00:37:25,670 --> 00:37:23,599
way of understanding how to get to the

1011
00:37:26,870 --> 00:37:25,680
surface to mars safely with with large

1012
00:37:29,910 --> 00:37:26,880
payloads

1013
00:37:31,349 --> 00:37:29,920

i think also as background and some

1014
00:37:33,670 --> 00:37:31,359
necessary steps we need to make

1015
00:37:34,790 --> 00:37:33,680
measurements at mars to understand the

1016
00:37:36,390 --> 00:37:34,800
planet

1017
00:37:38,150 --> 00:37:36,400
not only in terms of the science but

1018
00:37:40,069 --> 00:37:38,160
what it can tell us in terms of what

1019
00:37:42,470 --> 00:37:40,079
would be the safest way to get to mars

1020
00:37:45,109 --> 00:37:42,480
and have humans go there and explore and

1021
00:37:46,470 --> 00:37:45,119
rad is a great example of

1022
00:37:48,150 --> 00:37:46,480
what one of the things that we're doing

1023
00:37:50,790 --> 00:37:48,160
that's going to help the science but

1024
00:37:52,790 --> 00:37:50,800
also will greatly inform uh what we need

1025
00:37:55,589 --> 00:37:52,800
to do perfume for future human

1026
00:37:57,510 --> 00:37:55,599
exploratory explorers

1027
00:37:59,589 --> 00:37:57,520
the uh

1028
00:38:02,310 --> 00:37:59,599
to go back to the you know putting them

1029
00:38:03,670 --> 00:38:02,320
putting someone on the moon how big a

1030
00:38:05,670 --> 00:38:03,680
step is

1031
00:38:08,310 --> 00:38:05,680
you know as far as you know being able

1032
00:38:09,990 --> 00:38:08,320
to do this job from back then to doing

1033
00:38:11,910 --> 00:38:10,000
what we're doing now because there's a

1034
00:38:13,349 --> 00:38:11,920
perception when you talk to people about

1035
00:38:14,150 --> 00:38:13,359
exploration

1036
00:38:15,829 --> 00:38:14,160
that

1037
00:38:17,430 --> 00:38:15,839
you know nothing has changed since then

1038
00:38:19,190 --> 00:38:17,440

we've been stalled but and i'm just

1039
00:38:21,430 --> 00:38:19,200
wondering from you guys how how wrong

1040
00:38:23,990 --> 00:38:21,440
that perception is

1041
00:38:27,829 --> 00:38:26,069
one of one of the things to keep in mind

1042
00:38:30,870 --> 00:38:27,839
is actually sending

1043
00:38:33,589 --> 00:38:30,880
a robot to go and basically make your

1044
00:38:35,430 --> 00:38:33,599
measurements is a difficult thing to do

1045
00:38:39,510 --> 00:38:35,440
we have a hard time doing that here on

1046
00:38:40,710 --> 00:38:39,520
this planet much less sending it to mars

1047
00:38:44,550 --> 00:38:40,720
and we have

1048
00:38:46,470 --> 00:38:44,560
another major issue with sending humans

1049
00:38:48,710 --> 00:38:46,480
comparing it sending them to

1050
00:38:50,470 --> 00:38:48,720
the moon compared to sending to mars we

1051
00:38:53,270 --> 00:38:50,480
have a very different radiation

1052
00:38:55,349 --> 00:38:53,280
environment and we have a travel time

1053
00:38:57,430 --> 00:38:55,359
that's a big issue i mean

1054
00:38:59,589 --> 00:38:57,440
um our science laboratory is taking

1055
00:39:01,990 --> 00:38:59,599
eight and a half months to get to mars

1056
00:39:03,510 --> 00:39:02,000
to the moon it's a three-day trip

1057
00:39:05,510 --> 00:39:03,520
and that makes a huge difference in

1058
00:39:07,910 --> 00:39:05,520
terms of oh something went wrong let's

1059
00:39:09,910 --> 00:39:07,920
go home versus

1060
00:39:10,790 --> 00:39:09,920
sorry guys

1061
00:39:12,829 --> 00:39:10,800
so

1062
00:39:15,829 --> 00:39:12,839
there's a lot that goes into it

1063
00:39:18,069 --> 00:39:15,839

and and then you fold in because of

1064
00:39:20,230 --> 00:39:18,079
transit time how much more stuff you

1065
00:39:23,190 --> 00:39:20,240
have to take with you you have to

1066
00:39:24,630 --> 00:39:23,200
and you know have to get back so

1067
00:39:26,630 --> 00:39:24,640
we're not stalled at all and i think

1068
00:39:28,630 --> 00:39:26,640
we've made tremendous progress in

1069
00:39:31,670 --> 00:39:28,640
certainly getting

1070
00:39:33,910 --> 00:39:31,680
uh robotic effectors to do our job so we

1071
00:39:35,670 --> 00:39:33,920
don't have to send humans right away

1072
00:39:36,950 --> 00:39:35,680
and we can learn a lot of background

1073
00:39:39,349 --> 00:39:36,960
information and find out if there are

1074
00:39:41,510 --> 00:39:39,359
ways we can go to mars and actually use

1075
00:39:45,030 --> 00:39:41,520
the resources there to make the whole

1076
00:39:46,790 --> 00:39:45,040
trip a little more cost effective

1077
00:39:48,950 --> 00:39:46,800
okay i think we have a few more

1078
00:39:51,109 --> 00:39:48,960
questions let's get a mic over here to

1079
00:39:52,950 --> 00:39:51,119
the yeah go ahead

1080
00:39:57,270 --> 00:39:52,960
john

1081
00:40:00,150 --> 00:39:57,280
speaking of the uh habitability issue

1082
00:40:01,829 --> 00:40:00,160
on on the trip to mars the the what

1083
00:40:04,309 --> 00:40:01,839
would that big spike have done to a

1084
00:40:06,550 --> 00:40:04,319
human crew

1085
00:40:09,589 --> 00:40:06,560
well so john

1086
00:40:11,190 --> 00:40:09,599
the the spike inside the rover uh was

1087
00:40:12,710 --> 00:40:11,200
observed by rad would be sort of the

1088
00:40:14,309 --> 00:40:12,720

environment that an astronaut would

1089
00:40:16,790 --> 00:40:14,319
experience and

1090
00:40:17,750 --> 00:40:16,800
i think the spike in and of itself isn't

1091
00:40:18,710 --> 00:40:17,760
uh

1092
00:40:20,470 --> 00:40:18,720
you know

1093
00:40:21,910 --> 00:40:20,480
isn't isn't lethal not that size of a

1094
00:40:24,790 --> 00:40:21,920
spike it would have to be a much larger

1095
00:40:26,870 --> 00:40:24,800
spike to to have

1096
00:40:29,030 --> 00:40:26,880
a short-term risk from that one

1097
00:40:30,710 --> 00:40:29,040
particular event but

1098
00:40:31,589 --> 00:40:30,720
when you consider a long-term mission to

1099
00:40:33,109 --> 00:40:31,599
mars

1100
00:40:34,150 --> 00:40:33,119
we're talking two to three years

1101
00:40:36,150 --> 00:40:34,160
round-trip

1102
00:40:37,750 --> 00:40:36,160
it's all cumulative so it's the

1103
00:40:39,829 --> 00:40:37,760
background galactic radiation

1104
00:40:41,829 --> 00:40:39,839
environment as well as the numbers of

1105
00:40:43,829 --> 00:40:41,839
those spikes as they add up over time

1106
00:40:45,270 --> 00:40:43,839
and the size of them and and then what

1107
00:40:46,550 --> 00:40:45,280
sort of shielding you can provide on the

1108
00:40:47,589 --> 00:40:46,560
surface as well

1109
00:40:49,750 --> 00:40:47,599
well

1110
00:40:51,910 --> 00:40:49,760
given that then have you what have you

1111
00:40:53,829 --> 00:40:51,920
learned about the potential for a human

1112
00:40:55,109 --> 00:40:53,839
crew to survive on the trip well so far

1113
00:40:56,630 --> 00:40:55,119

there's three parts there's the there's

1114
00:40:58,550 --> 00:40:56,640
the crews out there's the one way out

1115
00:41:00,390 --> 00:40:58,560
there's the surface time on mars and

1116
00:41:01,750 --> 00:41:00,400
then there's the cruise back cruise back

1117
00:41:03,990 --> 00:41:01,760
we would hope would be similar to the

1118
00:41:06,390 --> 00:41:04,000
cruise out although you never really can

1119
00:41:07,990 --> 00:41:06,400
you can't really predict those the the

1120
00:41:10,230 --> 00:41:08,000
solar storms or the solar particle

1121
00:41:11,910 --> 00:41:10,240
events but what we've learned is that uh

1122
00:41:13,990 --> 00:41:11,920
the contribution to

1123
00:41:15,349 --> 00:41:14,000
uh an astronaut's total

1124
00:41:18,710 --> 00:41:15,359
um

1125
00:41:21,030 --> 00:41:18,720
lifetime dose limit which nasa

1126
00:41:22,790 --> 00:41:21,040
uh has established you know it's a it's

1127
00:41:24,550 --> 00:41:22,800
a non-trivial fraction of it it's uh

1128
00:41:26,150 --> 00:41:24,560
it's a significant fraction we're we're

1129
00:41:27,910 --> 00:41:26,160
still analyzing those and reducing those

1130
00:41:30,150 --> 00:41:27,920
data um

1131
00:41:32,230 --> 00:41:30,160
you know to get the exact numbers but

1132
00:41:34,069 --> 00:41:32,240
you know it's a it's a significant

1133
00:41:36,069 --> 00:41:34,079
contribution to an astronaut's career

1134
00:41:37,750 --> 00:41:36,079
limit for radiation

1135
00:41:40,630 --> 00:41:37,760
okay we have time for a couple more

1136
00:41:43,990 --> 00:41:40,640
questions let's go to the second row

1137
00:41:49,349 --> 00:41:46,550
all right just that's fine go ahead

1138
00:41:52,230 --> 00:41:49,359

we'll get to you too we'll just go

1139
00:41:54,710 --> 00:41:52,240
in the order the mic appears

1140
00:41:54,720 --> 00:41:57,589
okay go ahead

1141
00:42:00,550 --> 00:41:59,510
here you want me to go yes sorry about

1142
00:42:03,270 --> 00:42:00,560
that

1143
00:42:04,550 --> 00:42:03,280
okay now one question each for the two

1144
00:42:06,710 --> 00:42:04,560
mikes

1145
00:42:08,230 --> 00:42:06,720
mike malen

1146
00:42:10,550 --> 00:42:08,240
describe the

1147
00:42:13,829 --> 00:42:10,560
advancement in data storage image

1148
00:42:17,270 --> 00:42:13,839
storage that you've got with

1149
00:42:19,109 --> 00:42:17,280
msl compared with spirit and opportunity

1150
00:42:21,430 --> 00:42:19,119
okay the

1151
00:42:23,510 --> 00:42:21,440
the these cameras are significantly more

1152
00:42:25,589 --> 00:42:23,520
advanced than the

1153
00:42:28,630 --> 00:42:25,599
spirit and opportunity cameras

1154
00:42:31,829 --> 00:42:28,640
though they are probably not as advanced

1155
00:42:33,030 --> 00:42:31,839
as something you have in your pocket

1156
00:42:37,589 --> 00:42:33,040
the

1157
00:42:38,550 --> 00:42:37,599
and

1158
00:42:43,910 --> 00:42:38,560
the

1159
00:42:45,109 --> 00:42:43,920
of an eight gig card gigabyte card in

1160
00:42:50,309 --> 00:42:45,119
the camera

1161
00:42:52,630 --> 00:42:50,319
having to rely on the rover to store it

1162
00:42:54,550 --> 00:42:52,640
in its memory each camera has an eight

1163
00:42:57,750 --> 00:42:54,560

gigabyte memory

1164
00:43:00,710 --> 00:42:57,760
and so each the total cameras have 32

1165
00:43:02,630 --> 00:43:00,720
gigabytes which is a a fairly large

1166
00:43:04,950 --> 00:43:02,640
amount i'm not sure if it's the largest

1167
00:43:06,309 --> 00:43:04,960
amount that's ever flown in a nasa

1168
00:43:09,030 --> 00:43:06,319
spacecraft but it's probably pretty

1169
00:43:11,829 --> 00:43:10,710
all right i think we had a question i'm

1170
00:43:13,270 --> 00:43:11,839
sorry craig did you have a follow-up

1171
00:43:14,790 --> 00:43:13,280
yeah i had a follow-up

1172
00:43:17,190 --> 00:43:14,800
a more broad ques

1173
00:43:18,230 --> 00:43:17,200
a broader question for mike meyer

1174
00:43:20,550 --> 00:43:18,240
would be in

1175
00:43:22,710 --> 00:43:20,560
in the context of

1176
00:43:26,630 --> 00:43:22,720
the 21st century

1177
00:43:28,069 --> 00:43:26,640
uh in terms of laying a true

1178
00:43:29,349 --> 00:43:28,079
highly detailed

1179
00:43:30,950 --> 00:43:29,359
database

1180
00:43:32,790 --> 00:43:30,960
on mars

1181
00:43:35,510 --> 00:43:32,800
kind of whacks eloquently if you would

1182
00:43:36,470 --> 00:43:35,520
there on just how significant msl will

1183
00:43:38,230 --> 00:43:36,480
be

1184
00:43:41,270 --> 00:43:38,240
no matter what future missions are

1185
00:43:43,030 --> 00:43:41,280
selected when

1186
00:43:44,230 --> 00:43:43,040
the mars science laboratory was

1187
00:43:47,670 --> 00:43:44,240
conceived

1188
00:43:48,550 --> 00:43:47,680

more than eight years ago and

1189
00:43:49,910 --> 00:43:48,560
it was

1190
00:43:52,069 --> 00:43:49,920
recognized we actually went through

1191
00:43:53,109 --> 00:43:52,079
several committees looking at what was

1192
00:43:55,430 --> 00:43:53,119
needed to be done to have an

1193
00:43:56,790 --> 00:43:55,440
astrobiology go to to mars

1194
00:43:58,950 --> 00:43:56,800
and essentially

1195
00:44:02,550 --> 00:43:58,960
for the first couple of tries the answer

1196
00:44:04,390 --> 00:44:02,560
back was uh we really can't do that

1197
00:44:06,069 --> 00:44:04,400
we don't have the resources that's a

1198
00:44:08,230 --> 00:44:06,079
little too advanced

1199
00:44:10,390 --> 00:44:08,240
and we finally came to msl and the

1200
00:44:12,230 --> 00:44:10,400
opportunity to select the instruments

1201
00:44:14,790 --> 00:44:12,240
and these are fantastic this is the

1202
00:44:16,550 --> 00:44:14,800
first roving analytical laboratory we've

1203
00:44:17,670 --> 00:44:16,560
sent to any planet

1204
00:44:20,630 --> 00:44:17,680
and

1205
00:44:22,870 --> 00:44:20,640
it is a laboratory it's amazing that

1206
00:44:24,150 --> 00:44:22,880
we can do chemistry and we can do

1207
00:44:27,750 --> 00:44:24,160
mineralogy

1208
00:44:29,510 --> 00:44:27,760
there on the surface and in many ways

1209
00:44:30,790 --> 00:44:29,520
any geologist would die to have

1210
00:44:33,190 --> 00:44:30,800
something like this with them when

1211
00:44:36,390 --> 00:44:33,200
they're out in the field so

1212
00:44:38,630 --> 00:44:36,400
it is a it's a tremendous asset and the

1213
00:44:40,790 --> 00:44:38,640

degree of engineering that goes into

1214
00:44:42,950 --> 00:44:40,800
making this rover to last the whole mars

1215
00:44:45,829 --> 00:44:42,960
layer year

1216
00:44:48,150 --> 00:44:45,839
and to have these instruments

1217
00:44:49,750 --> 00:44:48,160
fit inside the rover and or on the

1218
00:44:51,910 --> 00:44:49,760
outside of the rover

1219
00:44:53,670 --> 00:44:51,920
and have them integrated it's a

1220
00:44:55,510 --> 00:44:53,680
tremendous challenge that i think that

1221
00:44:58,790 --> 00:44:55,520
nasa and the science team has really

1222
00:45:01,589 --> 00:44:59,829
okay

1223
00:45:03,430 --> 00:45:01,599
we have time for a couple more questions

1224
00:45:05,349 --> 00:45:03,440
so let's get the mic over to there you

1225
00:45:06,230 --> 00:45:05,359
go

1226
00:45:08,150 --> 00:45:06,240
hi

1227
00:45:10,309 --> 00:45:08,160
nadia drake with science news and i'm

1228
00:45:12,309 --> 00:45:10,319
wondering if we know how mount sharp

1229
00:45:15,349 --> 00:45:12,319
formed and if there are any analogs on

1230
00:45:18,230 --> 00:45:16,309
um

1231
00:45:20,950 --> 00:45:18,240
that's it's uh it's a great question and

1232
00:45:23,430 --> 00:45:20,960
the science team is uh the question was

1233
00:45:25,910 --> 00:45:23,440
how we if we know how mount sharp formed

1234
00:45:28,710 --> 00:45:25,920
uh the the short answer is no

1235
00:45:30,630 --> 00:45:28,720
uh we we'd like to address that there's

1236
00:45:32,710 --> 00:45:30,640
a number of hypotheses

1237
00:45:35,030 --> 00:45:32,720
uh part of

1238
00:45:36,950 --> 00:45:35,040

answering how how it formed

1239
00:45:39,829 --> 00:45:36,960
and i presume by that you mean the shape

1240
00:45:41,910 --> 00:45:39,839
that it has today yeah uh is

1241
00:45:44,150 --> 00:45:41,920
understanding how how the layering

1242
00:45:46,230 --> 00:45:44,160
formed in it what materials the the

1243
00:45:47,109 --> 00:45:46,240
mound is made out of and and what

1244
00:45:48,790 --> 00:45:47,119
they're

1245
00:45:50,150 --> 00:45:48,800
uh what they represent in terms of the

1246
00:45:53,109 --> 00:45:50,160
mechanisms

1247
00:45:54,390 --> 00:45:53,119
uh i i think that uh

1248
00:45:56,470 --> 00:45:54,400
you know this is a feature that was

1249
00:45:58,390 --> 00:45:56,480
recognized by mike malen and and ken

1250
00:46:01,349 --> 00:45:58,400
edgett going way back to probably the

1251
00:46:02,150 --> 00:46:01,359
early days of of mock observations and

1252
00:46:03,670 --> 00:46:02,160
uh

1253
00:46:06,069 --> 00:46:03,680
and they made an incredibly important

1254
00:46:09,109 --> 00:46:06,079
observation and that was is that gail is

1255
00:46:10,950 --> 00:46:09,119
not alone there's a family of craters

1256
00:46:12,790 --> 00:46:10,960
and that they they sort of drew an

1257
00:46:14,470 --> 00:46:12,800
evolutionary tree

1258
00:46:16,870 --> 00:46:14,480
and pointing out that these big

1259
00:46:19,910 --> 00:46:16,880
milwaukee and craters that are 100 150

1260
00:46:22,550 --> 00:46:19,920
kilometers in diameter are filled up

1261
00:46:24,230 --> 00:46:22,560
and then you can go and and and you know

1262
00:46:26,790 --> 00:46:24,240
go a couple hundred kilometers away and

1263
00:46:29,030 --> 00:46:26,800

see one that's partially eroded back and

1264
00:46:31,829 --> 00:46:29,040
it begins to get a little bit of a moat

1265
00:46:33,430 --> 00:46:31,839
and then you go in another direction 100

1266
00:46:35,990 --> 00:46:33,440
a couple hundred kilometers and you see

1267
00:46:37,670 --> 00:46:36,000
one that's more eroded back and gale

1268
00:46:39,750 --> 00:46:37,680
seems to be the one that's at the

1269
00:46:41,430 --> 00:46:39,760
evolutionary end of the spectrum that's

1270
00:46:43,829 --> 00:46:41,440
the most eroded back

1271
00:46:46,550 --> 00:46:43,839
it's too high to be the central peak

1272
00:46:49,109 --> 00:46:46,560
associated with the impact itself

1273
00:46:51,349 --> 00:46:49,119
we can see the the layering from orbit

1274
00:46:54,790 --> 00:46:51,359
that tells us that the material is not

1275
00:46:58,230 --> 00:46:54,800
massive it's not impact ejecta

1276
00:47:00,230 --> 00:46:58,240
it's hard to get around the the case

1277
00:47:02,710 --> 00:47:00,240
uh that it was once filled up that that

1278
00:47:04,390 --> 00:47:02,720
crater was once filled up

1279
00:47:05,750 --> 00:47:04,400
these are always difficult stories to

1280
00:47:07,750 --> 00:47:05,760
come to grips with scientifically

1281
00:47:09,510 --> 00:47:07,760
because it becomes a story of ships that

1282
00:47:12,230 --> 00:47:09,520
pass in the night everything's been

1283
00:47:14,470 --> 00:47:12,240
eroded nobody was there to see it how do

1284
00:47:15,910 --> 00:47:14,480
you go about testing this hypothesis and

1285
00:47:18,630 --> 00:47:15,920
it's not going to be easy but we're

1286
00:47:22,829 --> 00:47:20,470
okay i think we had a question in the

1287
00:47:26,390 --> 00:47:22,839
row right in front

1288
00:47:28,230 --> 00:47:26,400

um the orange red coral

1289
00:47:29,750 --> 00:47:28,240
maybe not does anybody have any

1290
00:47:33,510 --> 00:47:29,760
additional questions

1291
00:47:34,710 --> 00:47:33,520
okay let's hop across the aisle to

1292
00:47:36,950 --> 00:47:34,720
yeah this is going to be the last

1293
00:47:41,030 --> 00:47:36,960
question right there

1294
00:47:45,349 --> 00:47:43,670
conan nbc los angeles dr meyer you

1295
00:47:47,270 --> 00:47:45,359
touched on this a moment ago just very

1296
00:47:48,870 --> 00:47:47,280
briefly though the public does remember

1297
00:47:51,829 --> 00:47:48,880
spirit and opportunity we remember

1298
00:47:53,750 --> 00:47:51,839
pathfinder uh it's a much larger uh

1299
00:47:55,990 --> 00:47:53,760
rover this time

1300
00:47:57,190 --> 00:47:56,000
the sense is that uh incrementally

1301
00:47:59,109 --> 00:47:57,200
there's been advancement of our

1302
00:48:02,309 --> 00:47:59,119
understanding of this planet

1303
00:48:04,230 --> 00:48:02,319
is is it your opinion that this could be

1304
00:48:05,990 --> 00:48:04,240
more than just that that the kind of

1305
00:48:08,710 --> 00:48:06,000
instrumentation you have here not just

1306
00:48:09,670 --> 00:48:08,720
the imagery is such that could uh could

1307
00:48:11,510 --> 00:48:09,680
lead to

1308
00:48:13,349 --> 00:48:11,520
discoveries that far outweigh anything

1309
00:48:15,670 --> 00:48:13,359
we've seen before on any of the rover

1310
00:48:18,150 --> 00:48:15,680
missions prior to this one

1311
00:48:20,309 --> 00:48:18,160
well there are two aspects one is

1312
00:48:22,630 --> 00:48:20,319
by having this instrumentation we can

1313
00:48:24,950 --> 00:48:22,640

confirm mineralogy that we think we see

1314
00:48:27,190 --> 00:48:24,960
from space so i

1315
00:48:29,510 --> 00:48:27,200
and so that can be huge in terms of just

1316
00:48:31,190 --> 00:48:29,520
globally looking at mars and going oh

1317
00:48:33,270 --> 00:48:31,200
it's a different mineral than we thought

1318
00:48:34,390 --> 00:48:33,280
this this means that the history is

1319
00:48:36,150 --> 00:48:34,400
slightly different

1320
00:48:37,510 --> 00:48:36,160
the other thing part of the reason why i

1321
00:48:40,230 --> 00:48:37,520
like to view this as the first

1322
00:48:41,990 --> 00:48:40,240
astrobiology mission since viking is

1323
00:48:44,390 --> 00:48:42,000
that we are going to measure organics on

1324
00:48:46,309 --> 00:48:44,400
this roving laboratory and one of the

1325
00:48:48,950 --> 00:48:46,319
big pieces that we're missing for

1326
00:48:50,630 --> 00:48:48,960
understanding habitability is

1327
00:48:52,309 --> 00:48:50,640
we have the water we think we have the

1328
00:48:54,230 --> 00:48:52,319
water we're going to confirm it with

1329
00:48:56,150 --> 00:48:54,240
with curiosity

1330
00:48:57,589 --> 00:48:56,160
i think we have the energy sources we

1331
00:48:58,870 --> 00:48:57,599
have to find some discontinuities that

1332
00:49:01,109 --> 00:48:58,880
sort of thing but i think we're

1333
00:49:03,510 --> 00:49:01,119
relatively constant confident that there

1334
00:49:05,190 --> 00:49:03,520
are any energy resources on mars but

1335
00:49:06,710 --> 00:49:05,200
what's missing is we haven't seen the

1336
00:49:09,510 --> 00:49:06,720
organics

1337
00:49:11,829 --> 00:49:09,520
and so one of the big measurements that

1338
00:49:14,309 --> 00:49:11,839

curiosity is going to make is finding

1339
00:49:16,950 --> 00:49:14,319
hopefully or not

1340
00:49:17,750 --> 00:49:16,960
finding organics this is a big question

1341
00:49:19,829 --> 00:49:17,760
we

1342
00:49:21,030 --> 00:49:19,839
have good theory that suggests that

1343
00:49:23,270 --> 00:49:21,040
there should be

1344
00:49:25,829 --> 00:49:23,280
very refractory organics still there on

1345
00:49:27,109 --> 00:49:25,839
mars available in many of the not many

1346
00:49:29,510 --> 00:49:27,119
but you know some of the places that we

1347
00:49:30,950 --> 00:49:29,520
look but we don't know we don't know the

1348
00:49:33,349 --> 00:49:30,960
problem we have this radiation

1349
00:49:35,750 --> 00:49:33,359
environment on mars that can destroy

1350
00:49:37,829 --> 00:49:35,760
organic so even if it was there it may

1351
00:49:40,230 --> 00:49:37,839
be hard to find a place where it's been

1352
00:49:42,069 --> 00:49:40,240
preserved but i think that measurement

1353
00:49:44,549 --> 00:49:42,079
is going to be one of the key ones that

1354
00:49:47,030 --> 00:49:44,559
will encourage us or discourage us in

1355
00:49:49,510 --> 00:49:47,040
terms of what mars is like early in its

1356
00:49:51,030 --> 00:49:49,520
history or even today can i add to that

1357
00:49:53,190 --> 00:49:51,040
yeah please let me just add to that a

1358
00:49:54,549 --> 00:49:53,200
little bit uh i think one of the things

1359
00:49:56,549 --> 00:49:54,559
that will really distinguish this

1360
00:49:58,710 --> 00:49:56,559
mission is in addition to the larger

1361
00:50:00,710 --> 00:49:58,720
size rover and the payload which in one

1362
00:50:03,510 --> 00:50:00,720
sense may seem incremental

1363
00:50:05,270 --> 00:50:03,520

uh the fact that it's really the science

1364
00:50:07,910 --> 00:50:05,280
problem that we're addressing that is

1365
00:50:10,790 --> 00:50:07,920
presented by the field area this this

1366
00:50:12,710 --> 00:50:10,800
this mount sharp that sticks up gives us

1367
00:50:14,309 --> 00:50:12,720
this time dimension that has never been

1368
00:50:15,430 --> 00:50:14,319
explored before we did it a little bit

1369
00:50:17,349 --> 00:50:15,440
with mer

1370
00:50:19,349 --> 00:50:17,359
all of us that worked on the opportunity

1371
00:50:22,390 --> 00:50:19,359
rover got really excited with a few

1372
00:50:24,790 --> 00:50:22,400
meters of stratigraphy a little tiny

1373
00:50:27,030 --> 00:50:24,800
snapshot amongst billions of years of

1374
00:50:28,710 --> 00:50:27,040
the history of mars when we went to home

1375
00:50:31,109 --> 00:50:28,720
plate with the spirit rover we got

1376
00:50:33,430 --> 00:50:31,119
another few meters this time around we

1377
00:50:35,349 --> 00:50:33,440
have hundreds and thousands of meters

1378
00:50:37,349 --> 00:50:35,359
every significant problem that has to do

1379
00:50:38,950 --> 00:50:37,359
with the early evolution of the earth

1380
00:50:41,109 --> 00:50:38,960
the interaction between life and

1381
00:50:42,390 --> 00:50:41,119
environments that that causes the tempo

1382
00:50:44,230 --> 00:50:42,400
of evolution

1383
00:50:46,230 --> 00:50:44,240
that is exactly the way that we approach

1384
00:50:48,470 --> 00:50:46,240
these problems by taking hundreds and

1385
00:50:50,549 --> 00:50:48,480
thousands of meters of stratigraphy as

1386
00:50:52,470 --> 00:50:50,559
sort of a tape recorder of the way that

1387
00:50:54,150 --> 00:50:52,480
the planet changes to understand what

1388
00:50:55,510 --> 00:50:54,160

happened that's what's really new about

1389
00:50:56,710 --> 00:50:55,520
this mission

1390
00:50:58,630 --> 00:50:56,720
okay

1391
00:51:00,390 --> 00:50:58,640
thank you and we are unfortunately out

1392
00:51:02,390 --> 00:51:00,400
of time for questions if any reporters

1393
00:51:04,230 --> 00:51:02,400
here still have questions please uh

1394
00:51:06,950 --> 00:51:04,240
check in with the newsroom and we'll try

1395
00:51:08,390 --> 00:51:06,960
to help you set up

1396
00:51:10,390 --> 00:51:08,400
an interview or an opportunity to get

1397
00:51:12,309 --> 00:51:10,400
your question answered okay just a

1398
00:51:15,109 --> 00:51:12,319
reminder that in less than 10 minutes we

1399
00:51:17,910 --> 00:51:15,119
will be starting our mission overview

1400
00:51:19,670 --> 00:51:17,920
engineering news briefing 11 a.m pacific

1401
00:51:22,309 --> 00:51:19,680
time 2 p.m

1402
00:51:24,549 --> 00:51:22,319
eastern time and in the meantime please

1403
00:51:26,630 --> 00:51:24,559
stay tuned we will be replaying all the

1404
00:51:27,670 --> 00:51:26,640
visuals that you saw in the science news

1405
00:51:29,670 --> 00:51:27,680
conference

1406
00:51:32,309 --> 00:51:29,680
and again a reminder that lots of

1407
00:51:38,230 --> 00:51:32,319
information is online on the mission the