
Google+
NASA
MISSION MARS:
VIRTUAL FIELD TRIP
#MarsFieldTrip
FRIDAY, APRIL 25, 2014
EDT
Lyle

1
00:01:01,480 --> 00:00:58,330
go ahead Lisa hi everybody

2
00:01:03,370 --> 00:01:01,490
welcome to the NASA exhibit space here

3
00:01:06,910 --> 00:01:03,380
at the USA science and engineering

4
00:01:08,950 --> 00:01:06,920
festival today is Smith Day at the

5
00:01:11,499 --> 00:01:08,960
festival but it's really crowded and

6
00:01:14,230 --> 00:01:11,509
there's already a ton of cool exhibits

7
00:01:16,149 --> 00:01:14,240
for people to see and I'm very excited

8
00:01:18,910 --> 00:01:16,159
to be here with our partners from the US

9
00:01:21,819 --> 00:01:18,920
Department of State and Google to take

10
00:01:25,120 --> 00:01:21,829
folks on a virtual field trip to Mars

11
00:01:27,429 --> 00:01:25,130
and on an actual real-life field trip

12
00:01:30,039 --> 00:01:27,439
with us are the students and teachers of

13
00:01:33,399 --> 00:01:30,049

Cramer middle school from Washington DC

14
00:01:35,139 --> 00:01:33,409
and we have international and national

15
00:01:38,080 --> 00:01:35,149
participants brought to you through

16
00:01:40,090 --> 00:01:38,090
NASA's Digital Learning Network and our

17
00:01:43,330 --> 00:01:40,100
partners at Google who provided this

18
00:01:44,260 --> 00:01:43,340
Google hangout I am really honored to be

19
00:01:47,859 --> 00:01:44,270
here today

20
00:01:51,879 --> 00:01:47,869
yes dr. Jim Green who is a director for

21
00:01:54,639 --> 00:01:51,889
planetary science at NASA and also with

22
00:01:57,429 --> 00:01:54,649
John feels like the principal Deputy

23
00:02:00,819 --> 00:01:57,439
Assistant Secretary of State for Western

24
00:02:03,340 --> 00:02:00,829
Hemisphere affairs and with that I know

25
00:02:05,559 --> 00:02:03,350
John has some opening remarks to welcome

26
00:02:07,209 --> 00:02:05,569
us all especially our international

27
00:02:11,400 --> 00:02:07,219
students who are joining us in this

28
00:02:13,570 --> 00:02:11,410
hangout and I'll pass the mic now John

29
00:02:15,640 --> 00:02:13,580
thank you so very much

30
00:02:16,570 --> 00:02:15,650
Lisa Jim it's a real pleasure to be here

31
00:02:18,430 --> 00:02:16,580
with you

32
00:02:21,580 --> 00:02:18,440
and it's a great day to be here with

33
00:02:24,280 --> 00:02:21,590
Carver echoing miserable and you gotta

34
00:02:26,230 --> 00:02:24,290
watch them being in Buenos Aires

35
00:02:30,280 --> 00:02:26,240
saludos our souls balloon disgusting

36
00:02:32,650 --> 00:02:30,290
parade keep it in me Mika a la que toda

37
00:02:35,050 --> 00:02:32,660
la cuestión de la Sierra MODOK notice on

38
00:02:36,430 --> 00:02:35,060

particularly my CLO you know these guys

39
00:02:38,680 --> 00:02:36,440
Nicaragua they've been going through

40
00:02:40,690 --> 00:02:38,690
some pretty bad earthquakes so I think

41
00:02:42,700 --> 00:02:40,700
you're gonna actually find this trip to

42
00:02:44,350 --> 00:02:42,710
Mars maybe a little bit more relaxing

43
00:02:47,020 --> 00:02:44,360
than what they've been going through

44
00:02:48,940 --> 00:02:47,030
lately anyway I want to just thank you

45
00:02:50,770 --> 00:02:48,950
guys for the opportunity of the State

46
00:02:52,990 --> 00:02:50,780
Department to be here here this is a

47
00:02:55,630 --> 00:02:53,000
great collaboration between NASA's

48
00:02:57,580 --> 00:02:55,640
Digital Learning Network between Google

49
00:02:59,500 --> 00:02:57,590
Jenica classroom and the State

50
00:03:07,810 --> 00:02:59,510
Department's Bureau of Educational and

51
00:03:10,630 --> 00:03:07,820
Cultural Affairs is all about a

52
00:03:14,020 --> 00:03:10,640
collaboration it's all about people

53
00:03:16,120 --> 00:03:14,030
working across cultures across time and

54
00:03:19,750 --> 00:03:16,130
space through our virtual network here

55
00:03:21,730 --> 00:03:19,760
to learn and to explore Elohim ego mio

56
00:03:24,310 --> 00:03:21,740
que tenga en lara humongous I've

57
00:03:27,040 --> 00:03:24,320
addressed each o essa dijo que no es el

58
00:03:29,140 --> 00:03:27,050
destino sino el viaje but it just said

59
00:03:31,780 --> 00:03:29,150
is it's not about where you wind up

60
00:03:34,090 --> 00:03:31,790
going it's about the trip getting there

61
00:03:36,820 --> 00:03:34,100
and so what you guys are gonna do today

62
00:03:39,070 --> 00:03:36,830
is you're gonna go there in a bicultural

63
00:03:40,660 --> 00:03:39,080

in a multicultural environment and

64
00:03:43,330 --> 00:03:40,670
that's what we do at the State

65
00:03:45,070 --> 00:03:43,340
Department we try to bring people

66
00:03:47,650 --> 00:03:45,080
together from different backgrounds

67
00:03:50,199 --> 00:03:47,660
speaking different languages going to

68
00:03:52,420 --> 00:03:50,209
some incredibly cool journeys so it's

69
00:03:53,770 --> 00:03:52,430
all about that journey just like Aloha

70
00:03:55,330 --> 00:03:53,780
me go away and letting them it again you

71
00:03:57,490 --> 00:03:55,340
gotta go away no site is wrong at these

72
00:03:58,930 --> 00:03:57,500
fruits out of the idea I just want to

73
00:04:00,970 --> 00:03:58,940
thank everybody for letting me be a part

74
00:04:06,400 --> 00:04:00,980
of this and I can't wait to the journey

75
00:04:06,880 --> 00:04:06,410
to start I win oh okay yeah well a donde

76
00:04:08,500 --> 00:04:06,890
Tang

77
00:04:11,470 --> 00:04:08,510
nosotros tenemos like even a pantalla

78
00:04:14,310 --> 00:04:11,480
Chiquita Abajo dónde están mis amigos in

79
00:04:19,390 --> 00:04:14,320
Buenos Aires at Salaam on Oahu burrito

80
00:04:28,110 --> 00:04:19,400
no real o s or muy bien ok yo no puedo

81
00:04:32,830 --> 00:04:31,960
good afternoon ladies and gentlemen my

82
00:04:35,290 --> 00:04:32,840
name is Lolita

83
00:04:38,380 --> 00:04:35,300
Avila from also in school and I would

84
00:04:40,600 --> 00:04:38,390
like to tell you who we are all since

85
00:04:43,150 --> 00:04:40,610
school is a school named one Osiris it

86
00:04:47,980 --> 00:04:43,160
has Surakarta characteristics that makes

87
00:04:51,610 --> 00:04:47,990
it special and for example we have no no

88
00:04:55,120 --> 00:04:51,620

doors in the classroom and this makes us

89
00:04:59,200 --> 00:04:55,130
to adapt to work in two sided atmosphere

90
00:05:02,290 --> 00:04:59,210
in order to respect each other we don't

91
00:05:06,010 --> 00:05:02,300
have bell announcing the beginning and

92
00:05:09,430 --> 00:05:06,020
end of periods on break times and also

93
00:05:12,190 --> 00:05:09,440
the school towns with several indoor

94
00:05:16,780 --> 00:05:12,200
patios full of plants and colorful

95
00:05:19,990 --> 00:05:16,790
flowers our schoolmates special emphasis

96
00:05:22,480 --> 00:05:20,000
on STEM education and currently were

97
00:05:25,840 --> 00:05:22,490
working in several international

98
00:05:29,080 --> 00:05:25,850
programs like this one and the below

99
00:05:31,660 --> 00:05:29,090
international program and we believe

100
00:05:33,580 --> 00:05:31,670
that STEM education is very important

101
00:05:36,180 --> 00:05:33,590
because it involves with the knowledge

102
00:05:43,970 --> 00:05:36,190
used for the future of human rights

103
00:05:48,410 --> 00:05:46,470
thank you so much thank you for joining

104
00:05:51,300 --> 00:05:48,420
us all the way from Buenos Aires and

105
00:05:54,300 --> 00:05:51,310
here we have in washington d.c kramer

106
00:05:56,010 --> 00:05:54,310
middle school and i believe it's our

107
00:06:00,500 --> 00:05:56,020
india that's going to give us some words

108
00:06:06,630 --> 00:06:04,500
hi my name is Ronnie áwill and we are

109
00:06:09,900 --> 00:06:06,640
representing crown middle school in

110
00:06:11,940 --> 00:06:09,910
Washington DC we have six great and

111
00:06:15,420 --> 00:06:11,950
through eighth grade we are blending

112
00:06:18,660 --> 00:06:15,430
learning model that means we spend half

113
00:06:20,910 --> 00:06:18,670

of each class online if have and face to

114
00:06:24,360 --> 00:06:20,920
face instruction with the teacher we are

115
00:06:25,800 --> 00:06:24,370
very excited about Disney's experience

116
00:06:31,680 --> 00:06:25,810
thank you

117
00:06:34,320 --> 00:06:31,690
much our next school participating in

118
00:06:37,710 --> 00:06:34,330
the virtual field trip is in fact the

119
00:06:40,830 --> 00:06:37,720
Marie Curie school and access Managua

120
00:06:42,300 --> 00:06:40,840
and I would invite those folks to come

121
00:06:46,560 --> 00:06:42,310
up and say a few words about their

122
00:06:50,210 --> 00:06:46,570
school thank you do I have my friends

123
00:06:56,930 --> 00:06:50,220
from Managua hi wave

124
00:07:07,710 --> 00:07:04,310
I'm from Pierre Money Cody we are from a

125
00:07:10,350 --> 00:07:07,720
tropical country in Central America our

126
00:07:12,200 --> 00:07:10,360
school has worked with the NASA EC

127
00:07:14,970 --> 00:07:12,210
program before throughout this year and

128
00:07:16,740 --> 00:07:14,980
we are very excited to be sharing this

129
00:07:19,350 --> 00:07:16,750
experience knowledge and information

130
00:07:26,750 --> 00:07:19,360
with you guys and for giving us this

131
00:07:29,450 --> 00:07:26,760
privilege so thank you hello everyone

132
00:07:37,730 --> 00:07:29,460
name is hora wind L I am from Nicaragua

133
00:07:40,010 --> 00:07:37,740
okay would you listen to me I am part of

134
00:07:42,710 --> 00:07:40,020
the access program is a special

135
00:07:44,900 --> 00:07:42,720
programming crowd that is sponsored by

136
00:07:48,440 --> 00:07:44,910
the government of the United States that

137
00:07:52,190 --> 00:07:48,450
gives opportunity to poor people to

138
00:07:54,440 --> 00:07:52,200

study and learn a good English so we are

139
00:07:56,330 --> 00:07:54,450
so excited for being here because know

140
00:07:59,540 --> 00:07:56,340
every day you are gonna participate in

141
00:08:13,390 --> 00:07:59,550
an experiment with NASA so thank you

142
00:08:18,890 --> 00:08:17,120
thank you very much for joining us I am

143
00:08:20,690 --> 00:08:18,900
really excited about the opportunity to

144
00:08:22,490 --> 00:08:20,700
include all of you on this field trip

145
00:08:24,860 --> 00:08:22,500
that we're about to embark on we have

146
00:08:27,770 --> 00:08:24,870
two other schools in our connected

147
00:08:29,300 --> 00:08:27,780
classroom today and the first one that

148
00:08:31,760 --> 00:08:29,310
I'm going to do the next one I'm going

149
00:08:34,250 --> 00:08:31,770
to introduce will be the Montgomery

150
00:08:37,730 --> 00:08:34,260
middle school from upper the upper

151
00:08:39,500 --> 00:08:37,740
campus from Skillman New Jersey are we

152
00:08:45,470 --> 00:08:39,510
guys are you guys online you ready to

153
00:08:47,630 --> 00:08:45,480
roll wave hi from NASA hi from

154
00:08:57,490 --> 00:08:47,640
Washington tell us a little bit about

155
00:09:05,140 --> 00:08:57,500
Montgomery clean places I just named

156
00:09:08,240 --> 00:09:05,150
well this is it people around me and

157
00:09:10,910 --> 00:09:08,250
person right to left to your right of me

158
00:09:12,260 --> 00:09:10,920
our entire eighth graders who are

159
00:09:14,210 --> 00:09:12,270
representing the eighth grade here in

160
00:09:16,100 --> 00:09:14,220
Montgomery Montgomery upper middle

161
00:09:18,290 --> 00:09:16,110
school has seventh and eighth graders we

162
00:09:20,600 --> 00:09:18,300
have about seven eight hundred students

163
00:09:21,380 --> 00:09:20,610

here and we're really glad to be here

164
00:09:32,540 --> 00:09:21,390
with you guys

165
00:09:39,250 --> 00:09:32,550
thank you memory middle school I mean

166
00:09:45,020 --> 00:09:43,040
is Metcalf Elementary I'm Houston Texas

167
00:09:46,460 --> 00:09:45,030
Metcalf are you on the line are you

168
00:09:52,820 --> 00:09:46,470
ready to tell us a little about your

169
00:10:03,590 --> 00:09:52,830
school yeah wait a minute cough I come

170
00:10:05,660 --> 00:10:03,600
from Washington - ours Texas we are

171
00:10:13,640 --> 00:10:05,670
excited to be here and to visit other

172
00:10:21,510 --> 00:10:16,620
thank you and welcome to the trip to

173
00:10:29,790 --> 00:10:21,520
Mars taking on the item is no better

174
00:10:31,830 --> 00:10:29,800
person dr. Jim Lee the director and I'm

175
00:10:34,830 --> 00:10:31,840
gonna hand it over thank you to keep us

176
00:10:37,590 --> 00:10:34,840
off Thank You Peggy Lee cycle let's go

177
00:10:59,550 --> 00:10:37,600
let's get started begin again I'm gonna

178
00:11:04,380 --> 00:10:59,560
tell you no orbits and we didn't act on

179
00:11:08,040 --> 00:11:04,390
that on that many many years the next

180
00:11:18,450 --> 00:11:08,050
and most hardest is to get onto the

181
00:11:35,010 --> 00:11:18,460
ground it's like yeah so so what we're

182
00:11:38,910 --> 00:11:35,020
going to talk about over on our Mars

183
00:11:40,350 --> 00:11:38,920
rovers rovers well thank you Jim hi

184
00:11:42,090 --> 00:11:40,360
everyone it's great to see all of you

185
00:11:43,920 --> 00:11:42,100
students back again today and I want to

186
00:11:46,110 --> 00:11:43,930
welcome everybody who's joining us

187
00:11:47,280 --> 00:11:46,120
online and a special welcome to the

188
00:11:49,740 --> 00:11:47,290

embassies around the world who are

189
00:11:51,990 --> 00:11:49,750
watching us today I'm excited to share

190
00:11:53,550 --> 00:11:52,000
with you some of the things related to

191
00:11:55,800 --> 00:11:53,560
science and engineering that are going

192
00:11:57,840 --> 00:11:55,810
on on the red planet right now but

193
00:12:00,870 --> 00:11:57,850
before we get started with that I would

194
00:12:02,450 --> 00:12:00,880
like to ask you what you know about the

195
00:12:04,800 --> 00:12:02,460
red planet so I'm going to start with

196
00:12:07,140 --> 00:12:04,810
Buenos Aires in just a moment and I'm

197
00:12:09,380 --> 00:12:07,150
going to ask them a question about Mars

198
00:12:12,660 --> 00:12:09,390
so let's take a look right up here and

199
00:12:16,320 --> 00:12:12,670
if you see on my screen you should

200
00:12:19,470 --> 00:12:16,330
notice that there is in fact a category

201
00:12:21,750 --> 00:12:19,480
called atmosphere now Argentina your

202
00:12:23,430 --> 00:12:21,760
question is about the atmosphere of Mars

203
00:12:25,920 --> 00:12:23,440
here on earth our atmosphere is mostly

204
00:12:27,870 --> 00:12:25,930
nitrogen and oxygen and I'm wonder

205
00:12:30,690 --> 00:12:27,880
if anybody there knows what the

206
00:12:32,880 --> 00:12:30,700
atmosphere of Mars is mostly composed of

207
00:12:40,430 --> 00:12:32,890
and if you don't know and want to make a

208
00:12:46,850 --> 00:12:42,329
Argentina it looks like your microphone

209
00:12:49,380 --> 00:12:46,860
might be muted mostly carbon dioxide ah

210
00:12:50,790 --> 00:12:49,390
carbon dioxide is their guest and if

211
00:12:52,500 --> 00:12:50,800
you're playing along at home you can see

212
00:12:54,900 --> 00:12:52,510
that sure enough carbon dioxide is

213
00:12:57,449 --> 00:12:54,910

correct in fact carbon dioxide makes up

214
00:13:00,120 --> 00:12:57,459
95% of the atmosphere on Mars nicely

215
00:13:01,889 --> 00:13:00,130
done all right well kramer middle school

216
00:13:04,079 --> 00:13:01,899
you know you're next and you probably

217
00:13:05,940 --> 00:13:04,089
were looking here at satellites now here

218
00:13:07,230 --> 00:13:05,950
on earth we have one natural satellite

219
00:13:09,840 --> 00:13:07,240
and I'm going to ask you how many

220
00:13:10,949 --> 00:13:09,850
natural satellites there are around Mars

221
00:13:12,449 --> 00:13:10,959
so don't be thinking about the

222
00:13:14,519 --> 00:13:12,459
satellites that Jim was talking about

223
00:13:17,850 --> 00:13:14,529
that we have sent to Mars but what

224
00:13:19,350 --> 00:13:17,860
satellites are orbiting Mars natural

225
00:13:20,610 --> 00:13:19,360
ones how many do you think there are and

226
00:13:34,370 --> 00:13:20,620
I'll give you bonus points if you know

227
00:13:37,250 --> 00:13:35,960
all right and Kramer middle school oh

228
00:13:41,060 --> 00:13:37,260
there we go it's just gonna say I think

229
00:13:43,900 --> 00:13:41,070
you're needed can we try again please

230
00:13:47,150 --> 00:13:43,910
try again he knows there's answer here

231
00:13:49,310 --> 00:13:47,160
there are two satellites on Mars there

232
00:13:51,680 --> 00:13:49,320
are two satellites excellent

233
00:13:57,250 --> 00:13:51,690
very nicely done now for bonus points do

234
00:14:06,860 --> 00:14:05,180
fo MOS and Simba demos I'm gonna give

235
00:14:11,840 --> 00:14:06,870
you half of your bonus point there are

236
00:14:13,910 --> 00:14:11,850
two on Mars are Phobos and Deimos very

237
00:14:16,010 --> 00:14:13,920
nicely all right

238
00:14:20,390 --> 00:14:16,020

now this next one is going to Managua

239
00:14:23,420 --> 00:14:20,400
Nicaragua so surface pressure is the

240
00:14:26,450 --> 00:14:23,430
weight of the air on our bodies and on

241
00:14:28,160 --> 00:14:26,460
the earth itself at the surface and I'm

242
00:14:29,930 --> 00:14:28,170
gonna stay here on earth the surface

243
00:14:33,410 --> 00:14:29,940
pressure is measured in something called

244
00:14:35,540 --> 00:14:33,420
millibars and if you were at the ocean

245
00:14:37,880 --> 00:14:35,550
you would be feeling about a thousand

246
00:14:40,040 --> 00:14:37,890
millibars of pressure on your body so I

247
00:14:42,530 --> 00:14:40,050
am wondering how many millibars do you

248
00:14:44,300 --> 00:14:42,540
think would be pressing on our Rovers on

249
00:14:46,160 --> 00:14:44,310
Mars or on your spacesuit if you were

250
00:14:51,530 --> 00:14:46,170
walking around on the Red Planet

251
00:14:53,300 --> 00:14:51,540
so I'll pass that over to Managua you've

252
00:15:06,920 --> 00:14:53,310
got the answer or if you have a guess

253
00:15:08,900 --> 00:15:06,930
I'd love to hear it 500 millibars that

254
00:15:12,310 --> 00:15:08,910
is a pretty good guess that would mean

255
00:15:15,140 --> 00:15:12,320
we would have about half the pressure on

256
00:15:17,540 --> 00:15:15,150
Mars as we do on earth well you're in

257
00:15:19,910 --> 00:15:17,550
the right area because there is less

258
00:15:22,190 --> 00:15:19,920
pressure on the atmosphere of Mars but

259
00:15:25,070 --> 00:15:22,200
it turns out that there is a lot less

260
00:15:27,080 --> 00:15:25,080
there is just over six millibars of

261
00:15:28,930 --> 00:15:27,090
pressure in the atmosphere on Mars that

262
00:15:32,210 --> 00:15:28,940
means it's a very thin atmosphere and

263
00:15:34,820 --> 00:15:32,220

because it's such a thin atmosphere it

264
00:15:36,410 --> 00:15:34,830
makes it very tricky to land on the Red

265
00:15:39,080 --> 00:15:36,420
Planet we'll talk about how we do that

266
00:15:41,030 --> 00:15:39,090
in a few minutes all right so we're

267
00:15:42,440 --> 00:15:41,040
going to move now to Skillman New Jersey

268
00:15:44,090 --> 00:15:42,450
and you've been looking at this knowing

269
00:15:47,150 --> 00:15:44,100
that temperature was your question so

270
00:15:48,050 --> 00:15:47,160
I'm going to ask you how hot or how cold

271
00:15:51,770 --> 00:15:48,060
do you

272
00:15:54,380 --> 00:15:51,780
think the temperature on Mars okay who's

273
00:15:56,750 --> 00:15:54,390
answering it all right Araya you want to

274
00:15:59,900 --> 00:15:56,760
guess what the temperature depends where

275
00:16:04,430 --> 00:15:59,910
we are and what time of day give a guess

276
00:16:07,730 --> 00:16:04,440
during the day I will assume it's maybe

277
00:16:11,650 --> 00:16:07,740
maybe a little colder okay

278
00:16:15,890 --> 00:16:11,660
I like the older congestion it depends

279
00:16:17,720 --> 00:16:15,900
it depends absolutely right if you are

280
00:16:19,820 --> 00:16:17,730
on the equator of Mars where you're

281
00:16:22,070 --> 00:16:19,830
getting the most direct sunlight if you

282
00:16:23,810 --> 00:16:22,080
are outside it's a 4 o'clock in the

283
00:16:25,880 --> 00:16:23,820
afternoon on Mars where you're going to

284
00:16:28,640 --> 00:16:25,890
have the warmest time of day and it's

285
00:16:30,110 --> 00:16:28,650
this summer that is excuse me it's the

286
00:16:31,940 --> 00:16:30,120
summer season you might reach

287
00:16:34,430 --> 00:16:31,950
temperatures as high as 70 degrees

288
00:16:36,290 --> 00:16:34,440

Fahrenheit or 20 degrees Celsius so yeah

289
00:16:37,010 --> 00:16:36,300
very similar to what we experience here

290
00:16:40,970 --> 00:16:37,020
on earth

291
00:16:42,290 --> 00:16:40,980
however at night or near the poles or

292
00:16:45,410 --> 00:16:42,300
during the winter you might see

293
00:16:47,810 --> 00:16:45,420
temperatures drop as low as 225 degrees

294
00:16:51,140 --> 00:16:47,820
below zero Fahrenheit or 153 degrees

295
00:16:53,150 --> 00:16:51,150
below zero Celsius so very very cold now

296
00:16:55,310 --> 00:16:53,160
if you're curious as to what the weather

297
00:16:58,160 --> 00:16:55,320
is like right now on Mars we can take a

298
00:16:59,480 --> 00:16:58,170
quick look curiosity the rover we'll be

299
00:17:02,330 --> 00:16:59,490
talking about in just a few minutes

300
00:17:04,190 --> 00:17:02,340
happens to have some weather sensors on

301
00:17:05,780 --> 00:17:04,200
it and we can check what the weather was

302
00:17:08,360 --> 00:17:05,790
like and you should be seeing right now

303
00:17:10,820 --> 00:17:08,370
just a few days ago on Mars we had an

304
00:17:12,560 --> 00:17:10,830
air temperature of 21 degrees below zero

305
00:17:16,220 --> 00:17:12,570
Celsius that was our high temperature

306
00:17:18,620 --> 00:17:16,230
and 85 degrees below zero was our low

307
00:17:21,070 --> 00:17:18,630
temperature so we're at a pretty cold

308
00:17:23,810 --> 00:17:21,080
spot where the rover happens to be

309
00:17:26,150 --> 00:17:23,820
nicely done though now that leaves us

310
00:17:29,320 --> 00:17:26,160
with one last question and we're going

311
00:17:31,880 --> 00:17:29,330
to head over to Houston and Houston

312
00:17:34,970 --> 00:17:31,890
question if you were looking along there

313
00:17:39,130 --> 00:17:34,980

has to do with the size of the Red

314
00:17:44,900 --> 00:17:42,250
2106 miles

315
00:17:50,270 --> 00:17:44,910
2100 six miles that's a very specific

316
00:17:53,930 --> 00:17:50,280
yes it sounds like you know well I gave

317
00:17:56,330 --> 00:17:53,940
it two thousand 110 miles or three

318
00:17:58,910 --> 00:17:56,340
thousand three hundred 96 kilometers but

319
00:18:01,100 --> 00:17:58,920
that is so close that I think you

320
00:18:01,880 --> 00:18:01,110
definitely deserve a round of applause

321
00:18:04,430 --> 00:18:01,890
for that one night

322
00:18:06,380 --> 00:18:04,440
done all right and if you look at what

323
00:18:09,110 --> 00:18:06,390
that means compared to these two planets

324
00:18:12,530 --> 00:18:09,120
you can see that earth is about twice

325
00:18:15,350 --> 00:18:12,540
the diameter of the Red Planet so it's a

326
00:18:18,440 --> 00:18:15,360
very large planet in comparison now as

327
00:18:20,960 --> 00:18:18,450
Jim had said we have been traveling to

328
00:18:24,470 --> 00:18:20,970
the Red Planet for quite a long time in

329
00:18:26,810 --> 00:18:24,480
fact over four decades now we don't just

330
00:18:28,370 --> 00:18:26,820
go to Mars to take pretty pictures the

331
00:18:30,860 --> 00:18:28,380
pictures that we get can be very

332
00:18:32,810 --> 00:18:30,870
inspirational and I think they're very

333
00:18:34,790 --> 00:18:32,820
beautiful but that's not the only reason

334
00:18:37,280 --> 00:18:34,800
to go we actually have four science

335
00:18:39,200 --> 00:18:37,290
objectives that guide our exploration of

336
00:18:41,030 --> 00:18:39,210
the red planet and so I want to share

337
00:18:44,870 --> 00:18:41,040
with you what those science objectives

338
00:18:48,310 --> 00:18:44,880

are excuse me our first science

339
00:18:51,320 --> 00:18:48,320
objective has to do with understanding

340
00:18:54,740 --> 00:18:51,330
whether or not life ever arose on Mars

341
00:18:58,340 --> 00:18:54,750
here on earth we know that life needs

342
00:19:00,110 --> 00:18:58,350
water and we wanted to find whether or

343
00:19:01,910 --> 00:19:00,120
not Mars could have been a habitable

344
00:19:03,950 --> 00:19:01,920
place so first we needed to find out if

345
00:19:06,080 --> 00:19:03,960
there was ever water on the surface and

346
00:19:08,630 --> 00:19:06,090
sure enough there was and then we needed

347
00:19:10,970 --> 00:19:08,640
to figure out whether or not Mars had

348
00:19:14,000 --> 00:19:10,980
the ingredients for life a chemical

349
00:19:16,450 --> 00:19:14,010
building blocks I like to think of the

350
00:19:18,230 --> 00:19:16,460
chemical building blocks of life as six

351
00:19:19,940 --> 00:19:18,240
ingredients and you don't have to

352
00:19:21,590 --> 00:19:19,950
remember the name of all of them just

353
00:19:23,860 --> 00:19:21,600
think about the fact that there are six

354
00:19:26,570 --> 00:19:23,870
carbon hydrogen nitrogen oxygen

355
00:19:30,020 --> 00:19:26,580
phosphorus and sulfur think about those

356
00:19:32,120 --> 00:19:30,030
six life as we know it needs it so

357
00:19:34,610 --> 00:19:32,130
that's what we're looking for on Mars

358
00:19:38,840 --> 00:19:34,620
now that's our first objective our next

359
00:19:41,600 --> 00:19:38,850
objective has to do with the climate of

360
00:19:43,850 --> 00:19:41,610
Mars so we want to understand the

361
00:19:46,430 --> 00:19:43,860
climate of Mars we want to know where

362
00:19:48,440 --> 00:19:46,440
it's hot where it's cold we on the

363
00:19:50,630 --> 00:19:48,450

understand weather patterns over time we

364
00:19:59,310 --> 00:19:50,640
want to know what the cloud systems are

365
00:19:59,320 --> 00:21:15,220
you

366
00:21:21,310 --> 00:21:19,029
for up to a year but the trip to Mars is

367
00:21:24,639 --> 00:21:21,320
going to be a very long trip in fact

368
00:21:27,399 --> 00:21:24,649
round trip could be as long as two years

369
00:21:29,710 --> 00:21:27,409
so we really need to understand a lot

370
00:21:31,450 --> 00:21:29,720
before we can go to Mars and the

371
00:21:34,299 --> 00:21:31,460
exploration of Mars really helps us out

372
00:21:35,500 --> 00:21:34,309
with that all right now Mars is a very

373
00:21:37,149 --> 00:21:35,510
interesting place we wouldn't be

374
00:21:39,730 --> 00:21:37,159
spending so much time exploring there if

375
00:21:41,560 --> 00:21:39,740
it was not as interesting as it is so

376
00:21:43,750 --> 00:21:41,570
let's take a close look at some of the

377
00:21:46,750 --> 00:21:43,760
features of the red planet if you look

378
00:21:48,759 --> 00:21:46,760
here you can see on Mars there is one of

379
00:21:50,649 --> 00:21:48,769
the largest valleys in the entire solar

380
00:21:52,389 --> 00:21:50,659
system Valles Marineris it would stretch

381
00:21:54,810 --> 00:21:52,399
all the way from here to Skillman New

382
00:21:57,460 --> 00:21:54,820
Jersey or Washington DC it's huge

383
00:22:00,669 --> 00:21:57,470
Mars is also home to the largest volcano

384
00:22:02,500 --> 00:22:00,679
in the solar system Olympus Mons so big

385
00:22:05,100 --> 00:22:02,510
that it would take up the entire state

386
00:22:07,210 --> 00:22:05,110
of Arizona here in the United States and

387
00:22:08,830 --> 00:22:07,220
because Mars doesn't have plate

388
00:22:11,980 --> 00:22:08,840

tectonics like Earth does that are

389
00:22:14,110 --> 00:22:11,990
causing all of those earthquakes Olympus

390
00:22:15,460 --> 00:22:14,120
Mons was able to grow very very tall I

391
00:22:17,409 --> 00:22:15,470
want you to think for a moment about the

392
00:22:18,940 --> 00:22:17,419
tallest mountain on earth I'll give you

393
00:22:20,409 --> 00:22:18,950
about 10 seconds to think about that

394
00:22:22,000 --> 00:22:20,419
maybe even less time because you

395
00:22:24,519 --> 00:22:22,010
probably know the tallest mountain on

396
00:22:27,940 --> 00:22:24,529
earth is Mount Everest well compared to

397
00:22:29,649 --> 00:22:27,950
Mount Everest Olympus Mons is huge you

398
00:22:32,379 --> 00:22:29,659
can see Olympus Mons outlined in orange

399
00:22:35,590 --> 00:22:32,389
there Mount Everest is about 40 thousand

400
00:22:38,740 --> 00:22:35,600
feet shorter than Olympus Mons which

401
00:22:42,490 --> 00:22:38,750
makes makes that a pretty interesting

402
00:22:44,740 --> 00:22:42,500
place to check out however we did not go

403
00:22:48,970 --> 00:22:44,750
to Olympus Mons with any of our Rovers

404
00:22:50,529 --> 00:22:48,980
in the past and what I did is about a

405
00:22:52,360 --> 00:22:50,539
week ago I asked all of the students

406
00:22:55,090 --> 00:22:52,370
that are connected with us to look at

407
00:22:56,680 --> 00:22:55,100
four different potential landing sites

408
00:22:58,810 --> 00:22:56,690
so if your school was going to send a

409
00:23:00,730 --> 00:22:58,820
rover to Mars where would you send it to

410
00:23:02,080 --> 00:23:00,740
and so I'm going to bring up those four

411
00:23:06,600 --> 00:23:02,090
potential landing sites so that

412
00:23:14,409 --> 00:23:11,230
there we go we have our first landing

413
00:23:16,930 --> 00:23:14,419

site and our first landing site this is

414
00:23:18,669 --> 00:23:16,940
Evers walled crater a great location to

415
00:23:20,049 --> 00:23:18,679
visit on Mars lots of scientists and

416
00:23:22,299 --> 00:23:20,059
engineers thought that would be a great

417
00:23:24,759 --> 00:23:22,309
place to visit we have Gale Crater

418
00:23:26,879 --> 00:23:24,769
another excellent location that many

419
00:23:28,530 --> 00:23:26,889
scientists and engineers wanted to go to

420
00:23:31,920 --> 00:23:28,540
we have

421
00:23:34,110 --> 00:23:31,930
golden crater again a fantastic location

422
00:23:37,260 --> 00:23:34,120
with lots of potential science to be

423
00:23:39,900 --> 00:23:37,270
studied and Martha Alice and again all

424
00:23:41,700 --> 00:23:39,910
four of these were sites that many many

425
00:23:44,550 --> 00:23:41,710
scientists and engineers wanted to go to

426
00:23:47,070 --> 00:23:44,560
but when you send a rover to Mars you

427
00:23:50,520 --> 00:23:47,080
have to pick one location so I'm going

428
00:23:53,310 --> 00:23:50,530
to ask our school at Colegio de todos

429
00:23:56,490 --> 00:23:53,320
los santos in buenos aires where they

430
00:23:58,680 --> 00:23:56,500
selected for their landing site so

431
00:24:00,270 --> 00:23:58,690
argentina if you would go ahead and

432
00:24:02,790 --> 00:24:00,280
unmute your microphone and tell us what

433
00:24:12,030 --> 00:24:02,800
you chose and briefly why you thought

434
00:24:14,370 --> 00:24:12,040
that might be a good spot to go to mark

435
00:24:16,910 --> 00:24:14,380
boley's hi Martha

436
00:24:20,400 --> 00:24:16,920
okay and why did you choose Marsalis

437
00:24:25,170 --> 00:24:20,410
mark boley's because he's on your house

438
00:24:28,440 --> 00:24:25,180

every song and also it was the Mars the

439
00:24:32,340 --> 00:24:28,450
word every science team is like it's

440
00:24:36,500 --> 00:24:32,350
it's going to send a rover to fish up if

441
00:24:40,740 --> 00:24:36,510
you sorry about that person you know so

442
00:24:45,930 --> 00:24:40,750
because they are also going to search

443
00:24:47,310 --> 00:24:45,940
box horrible - okay excellent choice it

444
00:24:49,620 --> 00:24:47,320
sounds like your school is thinking like

445
00:24:52,080 --> 00:24:49,630
scientists and engineers in your site

446
00:24:53,040 --> 00:24:52,090
selection very nice to hear that all

447
00:24:58,610 --> 00:24:53,050
right

448
00:25:00,780 --> 00:24:58,620
and I would like to see now who from

449
00:25:06,520 --> 00:25:00,790
middle school is going to share with us

450
00:25:11,590 --> 00:25:09,310
we have chosen a hotel credit the Holden

451
00:25:14,110 --> 00:25:11,600
crater because it is near the rover's

452
00:25:18,220 --> 00:25:14,120
landing site and it does not have hills

453
00:25:21,070 --> 00:25:18,230
or big mountains and it has channels

454
00:25:23,919 --> 00:25:21,080
that are evidence of water okay that

455
00:25:26,350 --> 00:25:23,929
sounds like thinking like an engineer no

456
00:25:28,840 --> 00:25:26,360
big Hills flat surface engineers love

457
00:25:30,850 --> 00:25:28,850
that because it takes away a lot of risk

458
00:25:32,140 --> 00:25:30,860
in terms of driving around on the

459
00:25:34,919 --> 00:25:32,150
surface nice choice

460
00:25:37,570 --> 00:25:34,929
alright let's head to Nicaragua and see

461
00:25:44,310 --> 00:25:37,580
what our students in Nicaragua chose as

462
00:25:47,649 --> 00:25:44,320
their landing site okay I choose the

463
00:25:50,830 --> 00:25:47,659

every small dick Rutter because this is

464
00:25:54,100 --> 00:25:50,840
one of the best there was the Gale

465
00:25:56,350 --> 00:25:54,110
Crater have a good one because half a

466
00:25:59,830 --> 00:25:56,360
mountain and half a layer by layer and

467
00:26:04,539 --> 00:25:59,840
the layer by layer the Gale Crater is is

468
00:26:11,169 --> 00:26:04,549
because I think it's the possibility the

469
00:26:13,029 --> 00:26:11,179
in the past half water there excellent

470
00:26:14,799 --> 00:26:13,039
thank you so Evers walled crater and

471
00:26:17,020 --> 00:26:14,809
your reasoning makes me think that you

472
00:26:19,180 --> 00:26:17,030
may be a future geologist talking about

473
00:26:20,980 --> 00:26:19,190
the layers that we can inspect and the

474
00:26:23,080 --> 00:26:20,990
fact that water will help us create

475
00:26:26,169 --> 00:26:23,090
those nicely done all right let's move

476
00:26:29,919 --> 00:26:26,179
on to Houston Texas for our final

477
00:26:31,930 --> 00:26:29,929
landing site where did you choose it we

478
00:26:35,740 --> 00:26:31,940
chose Mark Ballas as our landing site

479
00:26:37,330 --> 00:26:35,750
for the mission surface to Mars we chose

480
00:26:42,039 --> 00:26:37,340
it because it's rich in clay minerals

481
00:26:44,740 --> 00:26:42,049
also there are silicates which in the

482
00:26:47,919 --> 00:26:44,750
president the president wanted it has an

483
00:26:50,680 --> 00:26:47,929
ancient channel cards but kind of dealt

484
00:26:55,510 --> 00:26:50,690
with bugs it looks like a good place to

485
00:26:57,490 --> 00:26:55,520
search for life on Mars I have to say I

486
00:27:02,140 --> 00:26:57,500
am so very impressed by all of your

487
00:27:03,310 --> 00:27:02,150
responses today you can tell that you

488
00:27:04,750 --> 00:27:03,320

were doing your homework there nicely

489
00:27:06,460 --> 00:27:04,760
done I think we've got some future

490
00:27:08,470 --> 00:27:06,470
scientists and engineers ready to work

491
00:27:10,090 --> 00:27:08,480
for us as soon as they're wrapped up

492
00:27:14,200 --> 00:27:10,100
with their college career so thank you

493
00:27:15,630 --> 00:27:14,210
very much now as was mentioned we have

494
00:27:17,919 --> 00:27:15,640
been visiting Mars for quite a long time

495
00:27:19,870 --> 00:27:17,929
the Curiosity rover is not the first

496
00:27:20,280 --> 00:27:19,880
Rover we've sent in fact the first Rover

497
00:27:22,830 --> 00:27:20,290
we

498
00:27:25,200 --> 00:27:22,840
it was called Sojourner & Sojourner had

499
00:27:27,210 --> 00:27:25,210
a wheel this big the rover itself was

500
00:27:29,430 --> 00:27:27,220
about the size of a microwave oven it

501
00:27:31,170 --> 00:27:29,440
only weighed 23 pounds and we really

502
00:27:33,540 --> 00:27:31,180
were just trying to figure out whether

503
00:27:35,850 --> 00:27:33,550
or not we could in fact land and drive

504
00:27:37,470 --> 00:27:35,860
her over around on a Red Planet this

505
00:27:39,570 --> 00:27:37,480
Rover was designed to last for eight

506
00:27:41,490 --> 00:27:39,580
Martian days a day on Mars we call a

507
00:27:43,170 --> 00:27:41,500
Saul so if you hear me talking about

508
00:27:45,930 --> 00:27:43,180
Saul's I'm just talking about a day on

509
00:27:49,860 --> 00:27:45,940
Mars it was designed to last for about a

510
00:27:52,020 --> 00:27:49,870
week on Mars it lasted for over 80 days

511
00:27:53,940 --> 00:27:52,030
on Mars and one of the things that we

512
00:27:55,980 --> 00:27:53,950
realized beyond the fact that yes we can

513
00:27:58,080 --> 00:27:55,990

drive a robot around on another planet

514
00:28:00,390 --> 00:27:58,090
is that we want to discover and learn

515
00:28:02,220 --> 00:28:00,400
more we want to explore more so our

516
00:28:04,410 --> 00:28:02,230
engineers and our scientists they built

517
00:28:07,740 --> 00:28:04,420
a rover as you can see by this wheel

518
00:28:09,690 --> 00:28:07,750
that was quite a bit bigger now it's not

519
00:28:12,120 --> 00:28:09,700
just one Rover we actually built twin

520
00:28:14,010 --> 00:28:12,130
rovers Spirit and Opportunity Spirit and

521
00:28:15,780 --> 00:28:14,020
Opportunity were designed to last for 90

522
00:28:20,540 --> 00:28:15,790
days on the Red Planet

523
00:28:23,160 --> 00:28:20,550
while spirit lasted for 2,200 8 Sol's

524
00:28:28,500 --> 00:28:23,170
opportunity over ten years later today

525
00:28:30,300 --> 00:28:28,510
marks opportunity's 3640 third Saul not

526
00:28:33,090 --> 00:28:30,310
bad for missions that were only supposed

527
00:28:34,560 --> 00:28:33,100
to last for three months well you can

528
00:28:38,430 --> 00:28:34,570
think of Spirit and Opportunity as

529
00:28:41,820 --> 00:28:38,440
mobile geologists studying the geo the

530
00:28:44,220 --> 00:28:41,830
geologic history of Mars well with our

531
00:28:48,870 --> 00:28:44,230
latest rover Curiosity our wheels are

532
00:28:50,520 --> 00:28:48,880
getting even bigger now this one is so

533
00:28:53,070 --> 00:28:50,530
big but I'm only going to hold it up for

534
00:28:55,740 --> 00:28:53,080
a short while this is the rover wheel

535
00:28:59,100 --> 00:28:55,750
for curiosity and as you can see by the

536
00:29:00,750 --> 00:28:59,110
wheel it's a much larger Rover now it's

537
00:29:04,410 --> 00:29:00,760
kind of hard to get an idea of just how

538
00:29:06,540 --> 00:29:04,420

big a rover is by looking at its wheel

539
00:29:08,430 --> 00:29:06,550
so what I did is I got all of our

540
00:29:10,500 --> 00:29:08,440
engineering models those are the Rovers

541
00:29:12,480 --> 00:29:10,510
that we test out here on earth to better

542
00:29:14,850 --> 00:29:12,490
understand how they work before we tell

543
00:29:16,860 --> 00:29:14,860
them to do things on Mars I got them

544
00:29:19,080 --> 00:29:16,870
together I put them in what we call our

545
00:29:22,140 --> 00:29:19,090
Mars yard and a Mars yard is just an

546
00:29:23,700 --> 00:29:22,150
area where we practice and test out our

547
00:29:27,360 --> 00:29:23,710
Rovers so let me bring up a picture and

548
00:29:28,980 --> 00:29:27,370
you can see just how big these Rovers

549
00:29:31,320 --> 00:29:28,990
are compared to each other not only

550
00:29:33,600 --> 00:29:31,330
compared to each other but also compared

551
00:29:34,080 --> 00:29:33,610
to me so there I am right there in the

552
00:29:36,149 --> 00:29:34,090
middle you can

553
00:29:37,470 --> 00:29:36,159
see sojourner up front you can see em ER

554
00:29:39,419 --> 00:29:37,480
on the side that spirit and

555
00:29:40,010 --> 00:29:39,429
opportunities twin and then curiosity on

556
00:29:42,180 --> 00:29:40,020
the right

557
00:29:44,850 --> 00:29:42,190
curiosity is huge at seven feet tall

558
00:29:47,070 --> 00:29:44,860
it's nine feet wide ten feet long and

559
00:29:48,960 --> 00:29:47,080
weighs 2,000 pounds or about a thousand

560
00:29:51,180 --> 00:29:48,970
kilograms it is huge

561
00:29:52,890 --> 00:29:51,190
now the reason that it's so big is

562
00:29:55,289 --> 00:29:52,900
because we had to pack a lot of

563
00:29:57,360 --> 00:29:55,299

scientific instruments into that Rover

564
00:30:00,210 --> 00:29:57,370
so let's take a quick look at some of

565
00:30:04,260 --> 00:30:00,220
those instruments we're gonna switch my

566
00:30:06,330 --> 00:30:04,270
screen here so you can see that now when

567
00:30:09,600 --> 00:30:06,340
I say a lot of instruments I'm talking

568
00:30:10,980 --> 00:30:09,610
about an entire science laboratory that

569
00:30:13,560 --> 00:30:10,990
would take up the size of the room

570
00:30:15,960 --> 00:30:13,570
you're in now packed into this Rover we

571
00:30:18,269 --> 00:30:15,970
have 17 different cameras and 11

572
00:30:20,039 --> 00:30:18,279
scientific instruments let's take a look

573
00:30:22,860 --> 00:30:20,049
at just some of these are you can see

574
00:30:24,240 --> 00:30:22,870
the rover here and when we move up to

575
00:30:25,710 --> 00:30:24,250
the front of the rover we can see the

576
00:30:27,269 --> 00:30:25,720
mast you can think of that as like the

577
00:30:29,159 --> 00:30:27,279
head with the eyes that help the rover

578
00:30:30,840 --> 00:30:29,169
get around it also has a pretty cool

579
00:30:32,940 --> 00:30:30,850
instrument called the chemcam that can

580
00:30:35,250 --> 00:30:32,950
zap rocks from up to 30 feet away with

581
00:30:36,450 --> 00:30:35,260
the laser we can move around here and we

582
00:30:39,060 --> 00:30:36,460
can see the way that it communicates

583
00:30:40,560 --> 00:30:39,070
through its antenna now if we go to the

584
00:30:42,149 --> 00:30:40,570
top of the rover there are a couple

585
00:30:46,320 --> 00:30:42,159
things that are pretty interesting Sam

586
00:30:48,360 --> 00:30:46,330
and chemin are our instruments that the

587
00:30:50,580 --> 00:30:48,370
rover can put samples inside of itself

588
00:30:52,139 --> 00:30:50,590

and analyze and measure them and over

589
00:30:53,549 --> 00:30:52,149
here this is something that I think is

590
00:30:55,980 --> 00:30:53,559
pretty interesting send your name to

591
00:30:58,289 --> 00:30:55,990
Mars there are two microchips with over

592
00:31:02,220 --> 00:30:58,299
1 million names from around the world on

593
00:31:06,750 --> 00:31:02,230
this microchip in fact there are 266

594
00:31:09,419 --> 00:31:06,760
names from Nicaragua 9000 364 names from

595
00:31:11,519 --> 00:31:09,429
Argentina and over 500 thousand names

596
00:31:13,139 --> 00:31:11,529
from the United States on this chip so

597
00:31:15,480 --> 00:31:13,149
when I talk about this being a worldwide

598
00:31:18,779 --> 00:31:15,490
effort it really is truly a worldwide

599
00:31:21,210 --> 00:31:18,789
effort now one thing that I really love

600
00:31:22,409 --> 00:31:21,220
about this Rover is the robotic arm just

601
00:31:27,060 --> 00:31:22,419
by show of hands how many of you are

602
00:31:28,380 --> 00:31:27,070
left-handed alright a few folks are

603
00:31:30,029 --> 00:31:28,390
left-handed well you've got something

604
00:31:31,950 --> 00:31:30,039
special in common with the rover the

605
00:31:34,019 --> 00:31:31,960
rover is left-handed as well and that's

606
00:31:36,120 --> 00:31:34,029
because it's arm is on its left side so

607
00:31:37,919 --> 00:31:36,130
it sort of has to be left-handed and we

608
00:31:40,560 --> 00:31:37,929
say that at the end of the robotic arm

609
00:31:43,289 --> 00:31:40,570
is its hand and that is a rotating

610
00:31:45,480 --> 00:31:43,299
turret it has multiple instruments on it

611
00:31:47,430 --> 00:31:45,490
it has a camera it has something called

612
00:31:48,000 --> 00:31:47,440
a spectrometer that helps us understand

613
00:31:50,610 --> 00:31:48,010

what rocks

614
00:31:53,340 --> 00:31:50,620
made of and one of my favorites is the

615
00:31:54,840 --> 00:31:53,350
Molly camera the Mars hand lens imager

616
00:31:58,140 --> 00:31:54,850
you can think of that it's like a

617
00:32:00,420 --> 00:31:58,150
magnifying glass to look closely so the

618
00:32:03,450 --> 00:32:00,430
rover is packed full of these very very

619
00:32:04,800 --> 00:32:03,460
interesting very very interesting

620
00:32:07,230 --> 00:32:04,810
instruments that help us better

621
00:32:10,260 --> 00:32:07,240
understand the red planet now because

622
00:32:12,570 --> 00:32:10,270
the rover is so big we had to figure out

623
00:32:14,940 --> 00:32:12,580
new ways to land it and the new ways to

624
00:32:16,800 --> 00:32:14,950
land were required because of where we

625
00:32:18,450 --> 00:32:16,810
wanted to go you told me your landing

626
00:32:20,580 --> 00:32:18,460
sites well of those four landing sites

627
00:32:23,490 --> 00:32:20,590
the science and engineering teams here

628
00:32:26,250 --> 00:32:23,500
at NASA they chose Gale Crater as their

629
00:32:28,500 --> 00:32:26,260
landing site and Gale Crater is a very

630
00:32:31,200 --> 00:32:28,510
fascinating place it's a crater that is

631
00:32:33,270 --> 00:32:31,210
about a hundred miles or 150 kilometers

632
00:32:35,580 --> 00:32:33,280
in diameter and it has a huge mountain

633
00:32:37,500 --> 00:32:35,590
in the middle and our landing techniques

634
00:32:39,960 --> 00:32:37,510
while they have gotten better over the

635
00:32:41,640 --> 00:32:39,970
years could not guarantee that we would

636
00:32:43,200 --> 00:32:41,650
not land on the side of a mountain or

637
00:32:45,150 --> 00:32:43,210
the side of the crater we don't want to

638
00:32:48,000 --> 00:32:45,160

do that with a rover and have it tumble

639
00:32:49,320 --> 00:32:48,010
down but with new technologies and

640
00:32:51,750 --> 00:32:49,330
engineering that we developed we were

641
00:32:53,670 --> 00:32:51,760
able to guarantee a very small landing

642
00:32:55,080 --> 00:32:53,680
spot right there in the center and so

643
00:32:57,030 --> 00:32:55,090
what I want to do is I want to play a

644
00:32:59,820 --> 00:32:57,040
quick video for you that will show you

645
00:33:02,730 --> 00:32:59,830
what this technology was how we got it

646
00:33:07,350 --> 00:33:02,740
and why it was so fascinating to see but

647
00:33:11,680 --> 00:33:09,610
you can see here the Mars Science

648
00:33:13,750 --> 00:33:11,690
Laboratory getting its final push from

649
00:33:16,270 --> 00:33:13,760
Earth on its way to Mars it's about

650
00:33:19,870 --> 00:33:16,280
eight and a half months trip even

651
00:33:22,360 --> 00:33:19,880
traveling at tens of thousands now when

652
00:33:29,320 --> 00:33:22,370
it gets to Mars - it's like 13,000 miles

653
00:33:57,870 --> 00:33:29,330
per hour and that's speed when it slows

654
00:34:00,340 --> 00:33:57,880
it down leaving the rover on the surface

655
00:34:06,340 --> 00:34:00,350
now we've been on the surface of Mars

656
00:34:09,909 --> 00:34:06,350
for quite a long time year and a half

657
00:34:12,340 --> 00:34:09,919
and we're excited to figure out more

658
00:34:14,380 --> 00:34:12,350
about it so what I want to do talk about

659
00:34:17,260 --> 00:34:14,390
what happened after we landed well when

660
00:34:19,210 --> 00:34:17,270
we landed on the Red Planet we looked

661
00:34:21,100 --> 00:34:19,220
south and when we looked south we saw

662
00:34:24,330 --> 00:34:21,110
some beautiful sights in fact we saw our

663
00:34:26,290 --> 00:34:24,340

ultimate destination we saw Gale Crater

664
00:34:27,220 --> 00:34:26,300
there's the mountain inside of Gale

665
00:34:28,720 --> 00:34:27,230
Crater excuse me

666
00:34:31,300 --> 00:34:28,730
we saw the mountain inside of Gale

667
00:34:31,750 --> 00:34:31,310
Crater known as Mount sharp and about 10

668
00:34:36,460 --> 00:34:31,760
miles

669
00:34:39,240 --> 00:34:36,470
we saw the base of Mount sharp and

670
00:34:43,000 --> 00:34:39,250
that's ultimately where we wanted to go

671
00:34:47,040 --> 00:34:43,010
now we did look right in that direction

672
00:34:50,980 --> 00:34:47,050
and in fact off in the distance we saw a

673
00:34:53,470 --> 00:34:50,990
rock that often the distance looked

674
00:34:55,390 --> 00:34:53,480
about the size of what curiosity would

675
00:34:57,310 --> 00:34:55,400
be when it gets out to that distance but

676
00:34:59,530 --> 00:34:57,320
instead of heading south we actually

677
00:35:01,870 --> 00:34:59,540
looked and we saw a place that was very

678
00:35:04,170 --> 00:35:01,880
interesting to us a place called Glen

679
00:35:08,740 --> 00:35:04,180
elk and we found it interesting because

680
00:35:10,300 --> 00:35:08,750
these different areas all have different

681
00:35:12,730 --> 00:35:10,310
properties so when we look we see a

682
00:35:14,890 --> 00:35:12,740
light gray area we see this area covered

683
00:35:16,510 --> 00:35:14,900
in craters and then we see our landing

684
00:35:18,250 --> 00:35:16,520
area was a little bit darker and we

685
00:35:19,900 --> 00:35:18,260
thought well if we go there we can

686
00:35:20,920 --> 00:35:19,910
explore all three of these areas without

687
00:35:23,410 --> 00:35:20,930
having to do a lot of

688
00:35:24,880 --> 00:35:23,420

travellin so we traveled over there

689
00:35:26,650 --> 00:35:24,890
thinking maybe we'll spend about a month

690
00:35:28,690 --> 00:35:26,660
or two they're doing some science we'll

691
00:35:31,650 --> 00:35:28,700
it was such a fascinating place that we

692
00:35:33,609 --> 00:35:31,660
actually spent about a year there and

693
00:35:35,260 --> 00:35:33,619
these are some of the things that we

694
00:35:37,359 --> 00:35:35,270
discovered on the right you can see a

695
00:35:40,240 --> 00:35:37,369
rock from Earth called a conglomerate

696
00:35:42,309 --> 00:35:40,250
conglomerates form in water and on the

697
00:35:44,230 --> 00:35:42,319
left you can see a rock on the right now

698
00:35:45,490 --> 00:35:44,240
I'm going to guess and you can raise

699
00:35:47,290 --> 00:35:45,500
your hand to tell me if this is true or

700
00:35:49,089 --> 00:35:47,300
not your teachers will sometimes ask you

701
00:35:53,530 --> 00:35:49,099
to compare and contrast things is that

702
00:35:55,690 --> 00:35:53,540
right that's what I thought

703
00:35:56,980 --> 00:35:55,700
yeah well we have to compare and

704
00:35:59,319 --> 00:35:56,990
contrast two things that we know about

705
00:36:01,750 --> 00:35:59,329
two things that we do not know about and

706
00:36:03,160 --> 00:36:01,760
want to understand better so we looked

707
00:36:04,569 --> 00:36:03,170
at this rock on the left and we thought

708
00:36:07,059 --> 00:36:04,579
that looks a whole lot like a

709
00:36:08,500 --> 00:36:07,069
conglomerate and when we look closely at

710
00:36:10,480 --> 00:36:08,510
it we could see some of these rounded

711
00:36:12,400 --> 00:36:10,490
pebbles and the rounded pebbles that

712
00:36:14,230 --> 00:36:12,410
help make up the conglomerate tell us

713
00:36:16,510 --> 00:36:14,240

that not only was this rock formed in

714
00:36:18,339 --> 00:36:16,520
water but it was formed in water that

715
00:36:20,260 --> 00:36:18,349
was flowing because as those rocks

716
00:36:22,540 --> 00:36:20,270
tumbled they got smoothed out by the

717
00:36:24,250 --> 00:36:22,550
flowing water so we found a lot of very

718
00:36:27,789 --> 00:36:24,260
interesting things out just by looking

719
00:36:29,289 --> 00:36:27,799
at that now one thing that I think is

720
00:36:31,059 --> 00:36:29,299
very fascinating and I already mentioned

721
00:36:33,819 --> 00:36:31,069
this a little bit is that robotic arm

722
00:36:38,859 --> 00:36:33,829
that I talked about and the robotic arm

723
00:36:41,260 --> 00:36:38,869
is about seven feet long meaning if it

724
00:36:41,920 --> 00:36:41,270
were able to hold a basketball it could

725
00:36:45,010 --> 00:36:41,930
slam dunk

726
00:36:46,720 --> 00:36:45,020
and what that robotic arm was able to do

727
00:36:49,089 --> 00:36:46,730
and we'll take a quick look at some of

728
00:36:52,900 --> 00:36:49,099
the things that it is being tested with

729
00:36:56,440 --> 00:36:52,910
that robotic arm has a drill at the end

730
00:36:58,480 --> 00:36:56,450
of it and that drill allows us to see

731
00:36:59,710 --> 00:36:58,490
some pretty astute some pretty

732
00:37:03,910 --> 00:36:59,720
interesting science something we've

733
00:37:06,400 --> 00:37:03,920
never been able to do before and if you

734
00:37:08,920 --> 00:37:06,410
take a look at this image right here

735
00:37:12,609 --> 00:37:08,930
this is a rock that we named john klein

736
00:37:14,890 --> 00:37:12,619
and john klein while it's gray in this

737
00:37:16,420 --> 00:37:14,900
picture is actually this reddish color

738
00:37:18,760 --> 00:37:16,430

that we're so familiar with when we look

739
00:37:20,140 --> 00:37:18,770
at Mars and when we drilled into it we

740
00:37:22,030 --> 00:37:20,150
saw something very interesting the

741
00:37:25,270 --> 00:37:22,040
powder that we drilled out of it was

742
00:37:27,970 --> 00:37:25,280
grey and looking at that gray powder we

743
00:37:29,410 --> 00:37:27,980
scooped it up we put it inside one of

744
00:37:30,819 --> 00:37:29,420
those instruments that I mentioned on

745
00:37:33,850 --> 00:37:30,829
the top of the rover we opened the hatch

746
00:37:35,710 --> 00:37:33,860
then we closed it back up and when

747
00:37:37,780 --> 00:37:35,720
we looked at it we got a very

748
00:37:39,430 --> 00:37:37,790
interesting readout now when we get

749
00:37:41,590 --> 00:37:39,440
science readouts from Messiah from

750
00:37:42,640 --> 00:37:41,600
curiosity they don't look like the sort

751
00:37:44,730 --> 00:37:42,650
of reports that you might read a

752
00:37:49,240 --> 00:37:44,740
newspaper or in the book or a magazine

753
00:37:51,760 --> 00:37:49,250
this is what we saw and while they look

754
00:37:54,130 --> 00:37:51,770
similar on each side the picture on the

755
00:37:56,050 --> 00:37:54,140
right has something that somebody

756
00:37:58,330 --> 00:37:56,060
mentioned earlier a phyllosilicate and a

757
00:38:01,300 --> 00:37:58,340
phyllosilicate is a clay that forms in

758
00:38:04,200 --> 00:38:01,310
water and when we looked very closely at

759
00:38:08,140 --> 00:38:04,210
this what we detected were carbon

760
00:38:10,720 --> 00:38:08,150
hydrogen nitrogen oxygen phosphorus and

761
00:38:12,670 --> 00:38:10,730
sulfur those six ingredients that we

762
00:38:14,290 --> 00:38:12,680
understand are necessary for life and so

763
00:38:16,740 --> 00:38:14,300

what this did is it accomplished one of

764
00:38:18,850 --> 00:38:16,750
our main scientific objectives to

765
00:38:21,400 --> 00:38:18,860
understand whether or not Mars was ever

766
00:38:24,070 --> 00:38:21,410
able to support life and sure enough it

767
00:38:27,220 --> 00:38:24,080
was now that doesn't mean Mars has life

768
00:38:30,520 --> 00:38:27,230
or even had life but it had the ability

769
00:38:31,690 --> 00:38:30,530
to support it now because we spent so

770
00:38:33,790 --> 00:38:31,700
much time on the Red Planet

771
00:38:35,980 --> 00:38:33,800
all right see me ha ha at that one

772
00:38:38,470 --> 00:38:35,990
location that I mentioned we still

773
00:38:40,900 --> 00:38:38,480
needed to get down to where we were

774
00:38:44,680 --> 00:38:40,910
originally wanting to go and so what we

775
00:38:47,230 --> 00:38:44,690
did is we quickly let's see if we can

776
00:38:55,120 --> 00:38:47,240
switch over there alright we quickly

777
00:38:56,830 --> 00:38:55,130
made our way south work on the rover

778
00:38:58,480 --> 00:38:56,840
we're now at a place that we are calling

779
00:38:59,860 --> 00:38:58,490
the Kimberley you can see down here and

780
00:39:02,080 --> 00:38:59,870
this is one of our very interesting

781
00:39:04,030 --> 00:39:02,090
science stops that we're excited about

782
00:39:05,440 --> 00:39:04,040
what we might find there now on the way

783
00:39:06,700 --> 00:39:05,450
there we've been doing some science as

784
00:39:08,610 --> 00:39:06,710
well but most of what we've been doing

785
00:39:13,690 --> 00:39:08,620
is driving to get to our main location

786
00:39:16,000 --> 00:39:13,700
one of the tools I mentioned was the cam

787
00:39:17,950 --> 00:39:16,010
cam that was the laser at the top of the

788
00:39:20,620 --> 00:39:17,960

rover that allows us to zap rocks from a

789
00:39:24,700 --> 00:39:20,630
good distance away when we look at

790
00:39:27,430 --> 00:39:24,710
chemcam the results again are a little

791
00:39:27,850 --> 00:39:27,440
bit different and we get something

792
00:39:29,140 --> 00:39:27,860
called

793
00:39:32,410 --> 00:39:29,150
a spectra now how many of your teachers

794
00:39:33,940 --> 00:39:32,420
have you work on graphs in school just

795
00:39:35,530 --> 00:39:33,950
by quick show of hands all right well

796
00:39:37,810 --> 00:39:35,540
being able to read a graph is very

797
00:39:39,970 --> 00:39:37,820
helpful if you're going to look at

798
00:39:42,280 --> 00:39:39,980
different spectra and wouldn't use a box

799
00:39:44,020 --> 00:39:42,290
we get some things that look like this

800
00:39:45,490 --> 00:39:44,030
and the different peaks and the

801
00:39:47,650 --> 00:39:45,500
different troughs where it goes up and

802
00:39:49,450 --> 00:39:47,660
where it goes down tell us what types of

803
00:39:51,130 --> 00:39:49,460
these are so what we're going to do

804
00:39:53,470 --> 00:39:51,140
we're going to very quickly take a look

805
00:39:56,049 --> 00:39:53,480
at some worksheets that you happen to

806
00:39:57,609 --> 00:39:56,059
have with you so if you have those

807
00:39:59,049 --> 00:39:57,619
spectral worksheets we're actually going

808
00:40:01,569 --> 00:39:59,059
to just look at the first spectral

809
00:40:02,980 --> 00:40:01,579
worksheet that looks like this and we're

810
00:40:04,210 --> 00:40:02,990
going to look at the third one so if you

811
00:40:07,630 --> 00:40:04,220
have that second one you'll actually be

812
00:40:09,190 --> 00:40:07,640
able to save that one for later so what

813
00:40:11,319 --> 00:40:09,200

I want you to do is I want you to look

814
00:40:13,539 --> 00:40:11,329
very carefully at this you see four

815
00:40:18,160 --> 00:40:13,549
different spectra of Martian rocks one

816
00:40:21,069 --> 00:40:18,170
we named a LH 77051 named Nakhla and one

817
00:40:24,660 --> 00:40:21,079
named zaga me excuse me and a fourth one

818
00:40:27,940 --> 00:40:24,670
named eet seven nine zero zero one and

819
00:40:30,549 --> 00:40:27,950
these four rock samples represent three

820
00:40:34,150 --> 00:40:30,559
different types of rocks meaning two of

821
00:40:35,859 --> 00:40:34,160
them are going to be very similar so

822
00:40:37,390 --> 00:40:35,869
what I want you to do is look closely at

823
00:40:39,910 --> 00:40:37,400
these and of course you know the order

824
00:40:43,630 --> 00:40:39,920
we're going into I am going to ask our

825
00:40:45,609 --> 00:40:43,640
first school and buena sera excuse me in

826
00:41:01,930 --> 00:40:45,619
Buenos Aires to tell me one rock that

827
00:41:06,100 --> 00:41:04,160
- areas go ahead and unmute your

828
00:41:08,510 --> 00:41:06,110
microphone

829
00:41:15,620 --> 00:41:08,520
we believe that the two matching rocks

830
00:41:18,820 --> 00:41:15,630
are the Sagami and the eet 7 9 0 0 1 all

831
00:41:20,960 --> 00:41:18,830
right excellent thinking let's take a a

832
00:41:27,940 --> 00:41:20,970
response from Kramer middle school

833
00:41:32,750 --> 00:41:30,550
all right Kramer

834
00:41:40,400 --> 00:41:32,760
agree or disagree which ones do you

835
00:41:53,960 --> 00:41:40,410
think we agree agree so Jack enjoy all

836
00:41:58,130 --> 00:41:53,970
right so we're going to jump forward now

837
00:42:00,650 --> 00:41:58,140
and we are going to go to our next

838
00:42:02,720 --> 00:42:00,660

grouping you should see zaga me again

839
00:42:05,000 --> 00:42:02,730
there at the clock and when you're

840
00:42:10,310 --> 00:42:05,010
looking at this one I would like you to

841
00:42:12,380 --> 00:42:10,320
see that there are not exact matches

842
00:42:14,960 --> 00:42:12,390
because some of these are composed of

843
00:42:17,120 --> 00:42:14,970
different types of rock they might have

844
00:42:18,920 --> 00:42:17,130
a little bit of quartz in them they

845
00:42:20,450 --> 00:42:18,930
might have some labradorite some objects

846
00:42:24,230 --> 00:42:20,460
and a mobile or some force all right

847
00:42:27,710 --> 00:42:24,240
what I want to know from you is which of

848
00:42:31,190 --> 00:42:27,720
these do you think is closest to zaga me

849
00:42:32,720 --> 00:42:31,200
so we have 5 different options there and

850
00:42:33,890 --> 00:42:32,730
three of them are very similar so I'm

851
00:42:36,070 --> 00:42:33,900
going to ask each of our remaining

852
00:42:40,730 --> 00:42:36,080
schools to choose one that they think

853
00:42:44,510 --> 00:42:40,740
matches closely with zaga me so we'll

854
00:43:05,120 --> 00:42:44,520
start with Managua what do you think is

855
00:43:11,240 --> 00:43:09,059
people could you respond a little bit

856
00:43:16,740 --> 00:43:11,250
louder please

857
00:43:18,180 --> 00:43:16,750
I'm feeble I'm feeble okay alright so

858
00:43:19,829 --> 00:43:18,190
that's one choice we think might be

859
00:43:20,819 --> 00:43:19,839
correct let's check in with film in New

860
00:43:41,510 --> 00:43:20,829
Jersey what do you think might be

861
00:43:50,190 --> 00:43:47,390
okay could you hear us yeah it's like

862
00:43:51,599 --> 00:43:50,200
and that is exactly what we do we look

863
00:43:53,849 --> 00:43:51,609

at the different patterns to see if they

864
00:43:55,500 --> 00:43:53,859
are similar to things that we know all

865
00:43:57,089 --> 00:43:55,510
right so let's check in now with our

866
00:44:01,490 --> 00:43:57,099
school in Houston Texas what do you

867
00:44:05,039 --> 00:44:01,500
think could be a match so I can meet and

868
00:44:07,079 --> 00:44:05,049
not drive all right so you've got Zach a

869
00:44:08,940 --> 00:44:07,089
meme labradorite matchstick well let's

870
00:44:11,940 --> 00:44:08,950
take a look at which three match up with

871
00:44:15,839 --> 00:44:11,950
Zach I mean we have a giant and the bull

872
00:44:17,970 --> 00:44:15,849
and four straight so this can be a very

873
00:44:19,680 --> 00:44:17,980
challenging thing for us to have to

874
00:44:22,289 --> 00:44:19,690
figure out and understand what these

875
00:44:24,299 --> 00:44:22,299
different rocks are made of but nicely

876
00:44:26,190 --> 00:44:24,309
done you all did an excellent job now

877
00:44:28,020 --> 00:44:26,200
what I would like to do is I would like

878
00:44:30,539 --> 00:44:28,030
to introduce to you a very special guest

879
00:44:31,230 --> 00:44:30,549
and let's bring us up on the screen here

880
00:44:34,250 --> 00:44:31,240
all right

881
00:44:36,390 --> 00:44:34,260
hi everyone I want you to meet our

882
00:44:39,390 --> 00:44:36,400
deputy project scientist for the Mars

883
00:44:41,930 --> 00:44:39,400
Science Laboratory Ashwin Vasavada - how

884
00:44:44,819 --> 00:44:41,940
are you today great thank you everybody

885
00:44:46,140 --> 00:44:44,829
excellent thank you so much for being

886
00:44:48,230 --> 00:44:46,150
here today I really appreciate you

887
00:44:51,089 --> 00:44:48,240
taking time out of your day to do this

888
00:44:54,359 --> 00:44:51,099

we were wondering what is your role on

889
00:44:58,170 --> 00:44:54,369
the Mars Science Laboratory sure so I'm

890
00:45:00,870 --> 00:44:58,180
a scientist I studied science in in

891
00:45:03,089 --> 00:45:00,880
University and then spend a lot of time

892
00:45:05,280 --> 00:45:03,099
learning how to do research in planetary

893
00:45:07,319 --> 00:45:05,290
science and make discoveries came here

894
00:45:09,510 --> 00:45:07,329
about 10 years ago to work on the Mars

895
00:45:13,020 --> 00:45:09,520
Science Laboratory with the rover

896
00:45:14,640 --> 00:45:13,030
Curiosity and in the last 10 years

897
00:45:16,650 --> 00:45:14,650
that's the only job I've had here I've

898
00:45:18,660 --> 00:45:16,660
been working on curiosity since the very

899
00:45:21,720 --> 00:45:18,670
since we were just drawing little

900
00:45:23,880 --> 00:45:21,730
designs on on paper and now it's been

901
00:45:26,280 --> 00:45:23,890
exploring Mars for almost two years my

902
00:45:28,770 --> 00:45:26,290
job as a scientist has been to help

903
00:45:31,670 --> 00:45:28,780
design what experiments that we do with

904
00:45:34,770 --> 00:45:31,680
curiosity what cameras and other

905
00:45:36,600 --> 00:45:34,780
instruments we put on the rover and then

906
00:45:38,130 --> 00:45:36,610
now that we're on Mars surface to

907
00:45:40,560 --> 00:45:38,140
actually study the data and help plan

908
00:45:43,260 --> 00:45:40,570
what we do every day and just now came

909
00:45:45,630 --> 00:45:43,270
back from helping design what the rover

910
00:45:47,880 --> 00:45:45,640
is gonna do on Mars tomorrow so you knew

911
00:45:49,410 --> 00:45:47,890
not only planning on on how to build the

912
00:45:50,940 --> 00:45:49,420
rover but what the rover is doing on a

913
00:45:53,040 --> 00:45:50,950

day to day basis that's right yeah that

914
00:45:55,640 --> 00:45:53,050
sounds like a fascinating job it's fun

915
00:45:57,300 --> 00:45:55,650
now do you have a favorite instrument

916
00:45:59,640 --> 00:45:57,310
that's a tough one

917
00:46:01,710 --> 00:45:59,650
you know the reason the rover is so big

918
00:46:03,030 --> 00:46:01,720
is because we send laboratories to Mars

919
00:46:05,040 --> 00:46:03,040
the reason is called the Mars Science

920
00:46:06,840 --> 00:46:05,050
Laboratory is we took the kind of

921
00:46:08,370 --> 00:46:06,850
experiments that you do in a big

922
00:46:10,650 --> 00:46:08,380
laboratory that might fill a room this

923
00:46:12,840 --> 00:46:10,660
size we shrunk those laboratory

924
00:46:14,400 --> 00:46:12,850
experiments down to about something

925
00:46:16,830 --> 00:46:14,410
about this big and then put them on a

926
00:46:18,390 --> 00:46:16,840
big Rover that can carry him around so I

927
00:46:21,810 --> 00:46:18,400
love those laboratories but they're

928
00:46:23,940 --> 00:46:21,820
really complex and and also produce some

929
00:46:25,230 --> 00:46:23,950
of our best scientific results but if I

930
00:46:26,910 --> 00:46:25,240
had to choose a favorite I'd probably

931
00:46:28,650 --> 00:46:26,920
choose some of the cameras because the

932
00:46:30,300 --> 00:46:28,660
cameras you know we all love pictures

933
00:46:32,400 --> 00:46:30,310
and it really makes me feel everyday

934
00:46:35,300 --> 00:46:32,410
that I'm working on Mars even though

935
00:46:37,680 --> 00:46:35,310
it's a robot 150 million miles away

936
00:46:39,120 --> 00:46:37,690
excellent well I can understand why you

937
00:46:41,100 --> 00:46:39,130
would like the cameras I love the

938
00:46:42,480 --> 00:46:41,110

pictures as well all right well thank

939
00:46:44,190 --> 00:46:42,490
you Ashwin for joining us what I would

940
00:46:46,560 --> 00:46:44,200
like to do is I would like to open up an

941
00:46:48,420 --> 00:46:46,570
opportunity for not only our schools who

942
00:46:50,790 --> 00:46:48,430
are joining us today but also those of

943
00:46:52,650 --> 00:46:50,800
you who are watching online to ask some

944
00:46:54,960 --> 00:46:52,660
questions of you and Jim green back at

945
00:46:56,550 --> 00:46:54,970
headquarters great excuse me he's at the

946
00:47:00,420 --> 00:46:56,560
USA science and engineering festival

947
00:47:01,800 --> 00:47:00,430
today so if you are online and want to

948
00:47:05,190 --> 00:47:01,810
submit some questions you can use the

949
00:47:06,840 --> 00:47:05,200
hashtag Mars field trip and I'll be

950
00:47:09,270 --> 00:47:06,850
monitoring those in just a few minutes

951
00:47:12,120 --> 00:47:09,280
to check those out but what we're going

952
00:47:14,130 --> 00:47:12,130
to do is we're going to start and head

953
00:47:15,810 --> 00:47:14,140
to Argentina with your questions so

954
00:47:23,360 --> 00:47:15,820
please if you would speak nice and loud

955
00:47:29,650 --> 00:47:26,070
well you find science of the month in

956
00:47:31,240 --> 00:47:29,660
Mars what would we do what is your plan

957
00:47:34,180 --> 00:47:31,250
would you tell the world immediately

958
00:47:36,999 --> 00:47:34,190
about it or you would keep it as a

959
00:47:38,829 --> 00:47:37,009
secret all right so if we found signs of

960
00:47:41,109 --> 00:47:38,839
life on Mars what would we do

961
00:47:43,089 --> 00:47:41,119
is there even a plan would you tell the

962
00:47:45,180 --> 00:47:43,099
world or would repel this islet I love

963
00:47:51,009 --> 00:47:45,190

that Jim and osh will handle this okay

964
00:47:55,720 --> 00:47:51,019
Jim would you like to go I mean life is

965
00:47:58,690 --> 00:47:55,730
such an unbelievable step in our

966
00:48:00,970 --> 00:47:58,700
understanding of how life might exist

967
00:48:02,620 --> 00:48:00,980
throughout the universe we'll have to

968
00:48:05,650 --> 00:48:02,630
have proof

969
00:48:08,289 --> 00:48:05,660
it's an extraordinary claim it requires

970
00:48:12,490 --> 00:48:08,299
extraordinary proof so we will have to

971
00:48:21,309 --> 00:48:12,500
least bring back samples and interrogate

972
00:48:23,470 --> 00:48:21,319
them here on earth Ashwin yeah this

973
00:48:25,450 --> 00:48:23,480
would be such an important discovery for

974
00:48:27,099 --> 00:48:25,460
all of us who study Mars and all of us

975
00:48:29,980 --> 00:48:27,109
as humans to know that life exists

976
00:48:33,880 --> 00:48:29,990
somewhere else in our solar system that

977
00:48:36,400 --> 00:48:33,890
we would have to not only on Mars we do

978
00:48:38,859 --> 00:48:36,410
a lot of follow-up experiments and then

979
00:48:41,589 --> 00:48:38,869
as Jim said we'd bring the samples back

980
00:48:43,150 --> 00:48:41,599
to earth with future missions so we

981
00:48:45,009 --> 00:48:43,160
would you know we would bring the public

982
00:48:46,420 --> 00:48:45,019
along we would tell all of you all those

983
00:48:48,789 --> 00:48:46,430
steps that we're doing because we don't

984
00:48:50,650 --> 00:48:48,799
hide anything from anybody but there's a

985
00:48:52,839 --> 00:48:50,660
difference between hiding it and just

986
00:48:54,970 --> 00:48:52,849
not running out and shouting the result

987
00:48:56,859 --> 00:48:54,980
right away before we are sure ourselves

988
00:48:58,749 --> 00:48:56,869

that we really believe it so a lot of

989
00:49:00,279 --> 00:48:58,759
what science is is just asking a whole

990
00:49:02,589 --> 00:49:00,289
series of questions - they really are

991
00:49:03,630 --> 00:49:02,599
sure that you've addressed the question

992
00:49:05,650 --> 00:49:03,640
that you're asking

993
00:49:08,259 --> 00:49:05,660
excellent question and thank you for the

994
00:49:12,880 --> 00:49:08,269
great responses let's move on to Cramer

995
00:49:16,720 --> 00:49:12,890
middle school do you how do Sciences

996
00:49:21,059 --> 00:49:16,730
named the places they go all Mars that's

997
00:49:23,920 --> 00:49:21,069
a great question I think it's different

998
00:49:26,170 --> 00:49:23,930
that goes to Mars because the missions

999
00:49:28,329 --> 00:49:26,180
are made up of different people for

1000
00:49:31,480 --> 00:49:28,339
curiosity what we decided was to name

1001
00:49:33,039 --> 00:49:31,490
the features after really important

1002
00:49:35,440 --> 00:49:33,049
sites where things were discovered on

1003
00:49:37,420 --> 00:49:35,450
earth so when we first got to the

1004
00:49:39,160 --> 00:49:37,430
landing site where curiosity is we

1005
00:49:42,759 --> 00:49:39,170
mapped it we created a whole series of

1006
00:49:43,930 --> 00:49:42,769
maps and then we chose individual sites

1007
00:49:47,620 --> 00:49:43,940
that

1008
00:49:49,660 --> 00:49:47,630
important things were discovered on

1009
00:49:52,210 --> 00:49:49,670
earth like where the oldest rocks were

1010
00:49:54,400 --> 00:49:52,220
ever discovered on earth in the North

1011
00:49:57,040 --> 00:49:54,410
American comment is the place that we

1012
00:49:59,020 --> 00:49:57,050
named after Yellowknife Bay and then now

1013
00:50:01,000 --> 00:49:59,030

we're in a part of Mars without we're

1014
00:50:02,710 --> 00:50:01,010
exploring called the Kimberley which is

1015
00:50:07,450 --> 00:50:02,720
a really important part of northern

1016
00:50:08,830 --> 00:50:07,460
northwestern Australia alright thank you

1017
00:50:11,710 --> 00:50:08,840
for the great question let's go ahead

1018
00:50:15,090 --> 00:50:11,720
and check in with Managua Nicaragua to

1019
00:50:19,600 --> 00:50:15,100
see if they have any questions for us

1020
00:50:23,830 --> 00:50:19,610
well I did see some remarks if it has is

1021
00:50:25,060 --> 00:50:23,840
different on each site did you repeat

1022
00:50:25,990 --> 00:50:25,070
the question once more I had a little

1023
00:50:32,410 --> 00:50:26,000
hard time hearing you

1024
00:50:35,770 --> 00:50:32,420
I did see some remarks it's different on

1025
00:50:38,140 --> 00:50:35,780
each site so are there seasons on Mars

1026
00:50:40,240 --> 00:50:38,150
right yeah that that's a really

1027
00:50:42,250 --> 00:50:40,250
interesting one because Mars and Earth

1028
00:50:45,310 --> 00:50:42,260
are actually amazingly similar in that

1029
00:50:47,650 --> 00:50:45,320
respect so Mars and Earth both have a 24

1030
00:50:50,590 --> 00:50:47,660
hour day roughly Mars is just 37 minutes

1031
00:50:52,780 --> 00:50:50,600
longer and then Mars and Earth also tilt

1032
00:50:55,900 --> 00:50:52,790
on their axis as they go around the Sun

1033
00:50:57,970 --> 00:50:55,910
in a very similar angle so just like on

1034
00:50:59,650 --> 00:50:57,980
earth there's winter and summer in the

1035
00:51:01,200 --> 00:50:59,660
northern part of Mars and there's winter

1036
00:51:05,050 --> 00:51:01,210
and summer on the southern part of Mars

1037
00:51:07,030 --> 00:51:05,060
and the only difference really that we

1038
00:51:09,940 --> 00:51:07,040

notice is that because Mars is further

1039
00:51:12,220 --> 00:51:09,950
out from the Sun its year is much longer

1040
00:51:14,200 --> 00:51:12,230
it takes longer to go around the Sun but

1041
00:51:16,150 --> 00:51:14,210
curiosity landed near the equator and

1042
00:51:18,580 --> 00:51:16,160
just like near the equator on earth

1043
00:51:21,040 --> 00:51:18,590
where some of you are that the seasons

1044
00:51:23,530 --> 00:51:21,050
are as extreme but when we land up near

1045
00:51:26,280 --> 00:51:23,540
the poles of Mars we see a really cold

1046
00:51:27,910 --> 00:51:26,290
winter and a really warm summer

1047
00:51:31,210 --> 00:51:27,920
excellent question

1048
00:51:38,400 --> 00:51:31,220
all right let's check in to Metcalf

1049
00:51:38,410 --> 00:51:45,660
how long did it take to build Robert

1050
00:51:54,910 --> 00:51:51,520
well we started you know the initial

1051
00:51:57,310 --> 00:51:54,920
idea is what really was we needed a big

1052
00:51:58,990 --> 00:51:57,320
one if advertised tomorrow

1053
00:52:01,750 --> 00:51:59,000
whole sophisticated scientific

1054
00:52:05,650 --> 00:52:01,760
experiments on Mars with rocks and soils

1055
00:52:07,270 --> 00:52:05,660
all started around 2001 or 2002 and it

1056
00:52:09,010 --> 00:52:07,280
built along the discoveries of

1057
00:52:14,290 --> 00:52:09,020
everything that we bought on Mars before

1058
00:52:15,760 --> 00:52:14,300
though by about 2004 we had an idea the

1059
00:52:18,100 --> 00:52:15,770
entire war don't help them should be

1060
00:52:21,520 --> 00:52:18,110
ideas and even instruments to fly to

1061
00:52:26,710 --> 00:52:21,530
Mars then we built it from about 2004

1062
00:52:29,320 --> 00:52:26,720
until about 2011 and launched it in 2011

1063
00:52:32,020 --> 00:52:29,330

arrived in 2012 and then hopefully we'll

1064
00:52:34,720 --> 00:52:32,030
operate it for another I don't know five

1065
00:52:37,630 --> 00:52:34,730
ten years if we're lucky so all in all

1066
00:52:39,040 --> 00:52:37,640
it could be more than 20 years that's

1067
00:52:40,360 --> 00:52:39,050
quite a long time to be working on a

1068
00:52:42,610 --> 00:52:40,370
project do you hope to be there for the

1069
00:52:44,440 --> 00:52:42,620
whole 20 years if it extends that lie I

1070
00:52:47,680 --> 00:52:44,450
hope to be here and I'll certainly

1071
00:52:49,240 --> 00:52:47,690
follow it no matter what well we've got

1072
00:52:51,670 --> 00:52:49,250
a question that came in from Twitter

1073
00:52:54,310 --> 00:52:51,680
using the ask excuse me the Mars field

1074
00:53:01,600 --> 00:52:54,320
trip hashtag and Jim maybe you can help

1075
00:53:03,880 --> 00:53:01,610
us to answer this question Lyle you'll

1076
00:53:06,190 --> 00:53:03,890
have to ask that again please certainly

1077
00:53:09,700 --> 00:53:06,200
the question big question will there be

1078
00:53:13,150 --> 00:53:09,710
another Mars rover good question

1079
00:53:14,490 --> 00:53:13,160
actually my answer to that is absolutely

1080
00:53:17,740 --> 00:53:14,500
yes

1081
00:53:20,080 --> 00:53:17,750
you know we're continuing on that

1082
00:53:21,940 --> 00:53:20,090
wonderful tradition of getting down on

1083
00:53:24,520 --> 00:53:21,950
the ground and exploring there's many

1084
00:53:27,010 --> 00:53:24,530
more sites that we need to go to and so

1085
00:53:29,650 --> 00:53:27,020
right now we have on the drawing board

1086
00:53:31,720 --> 00:53:29,660
at that early phase that Ashwin

1087
00:53:35,830 --> 00:53:31,730
mentioned that curiosity was in the

1088
00:53:39,640 --> 00:53:35,840

early 2000s a Mars mission a rover that

1089
00:53:42,190 --> 00:53:39,650
we call right now Mars 2020 only because

1090
00:53:46,030 --> 00:53:42,200
our plan is to launch it in in the year

1091
00:53:49,060 --> 00:53:46,040
2020 it's a great Rover it's got all

1092
00:53:53,110 --> 00:53:49,070
kinds of wonderful experiments on it and

1093
00:53:55,870 --> 00:53:53,120
it looks very similar to what Curiosity

1094
00:53:58,300 --> 00:53:55,880
looks like now we curiosity is is a

1095
00:54:00,780 --> 00:53:58,310
one-ton Rover that we were able to put

1096
00:54:02,950 --> 00:54:00,790
down on the ground so it has a wonderful

1097
00:54:04,870 --> 00:54:02,960
infrastructure to be able to deliver a

1098
00:54:08,230 --> 00:54:04,880
whole series of different instruments

1099
00:54:13,630 --> 00:54:08,240
and so that's our next approach is to

1100
00:54:17,990 --> 00:54:15,980
excellent thank you so much Jim all

1101
00:54:31,130 --> 00:54:18,000
right let's head back to Argentina for

1102
00:54:36,769 --> 00:54:33,890
hello my name is Austin Ram I am

1103
00:54:41,210 --> 00:54:36,779
mysterion nursing schools at home

1104
00:54:44,299 --> 00:54:41,220
mission how much does it cost how much

1105
00:54:49,339 --> 00:54:44,309
does the whole mission cost Jim do you

1106
00:54:53,380 --> 00:54:49,349
want to take that one well let's see it

1107
00:54:57,009 --> 00:54:53,390
it is not it is not an inexpensive

1108
00:55:00,950 --> 00:54:57,019
activity to go to Mars and in fact

1109
00:55:05,089 --> 00:55:00,960
curiosity cost approximately 2.5 billion

1110
00:55:09,319 --> 00:55:05,099
dollars but that actually is spent here

1111
00:55:14,479 --> 00:55:09,329
on earth it helps our scientists it

1112
00:55:18,499 --> 00:55:14,489
funds our engineers it really makes the

1113
00:55:21,049 --> 00:55:18,509

exciting part of exploration happen and

1114
00:55:22,579 --> 00:55:21,059
it allows us to tell the world what

1115
00:55:25,430 --> 00:55:22,589
we've been doing and what we've been

1116
00:55:29,479 --> 00:55:25,440
discovering so it's a real bargain in my

1117
00:55:31,729 --> 00:55:29,489
mind I would agree I I heard someone

1118
00:55:33,769 --> 00:55:31,739
describe it as if everybody in America

1119
00:55:36,440 --> 00:55:33,779
bought a movie ticket and and I think

1120
00:55:39,559 --> 00:55:36,450
that's a pretty worthwhile investment to

1121
00:55:41,779 --> 00:55:39,569
to do so excellent question and thank

1122
00:55:43,519 --> 00:55:41,789
you for that answer Jim let's go on now

1123
00:55:45,440 --> 00:55:43,529
to Cramer middle school since we're

1124
00:55:53,630 --> 00:55:45,450
since we're right there on camera do you

1125
00:55:59,210 --> 00:55:53,640
have another question for us are we

1126
00:56:09,249 --> 00:55:59,220
gonna go to the Mars movie are we going

1127
00:56:11,839 --> 00:56:09,259
to Mars Mars one thing we're doing that

1128
00:56:13,400 --> 00:56:11,849
we don't get a lot of time to tell

1129
00:56:15,470 --> 00:56:13,410
everybody about it is that we actually

1130
00:56:16,069 --> 00:56:15,480
do some astronomy right from the surface

1131
00:56:18,499 --> 00:56:16,079
of Mars

1132
00:56:21,349 --> 00:56:18,509
so with curiosity and with opportunity

1133
00:56:23,239 --> 00:56:21,359
and spirit before us we look up and take

1134
00:56:25,099 --> 00:56:23,249
pictures of Mars moons just like we can

1135
00:56:26,989 --> 00:56:25,109
see the moon from Earth we can see

1136
00:56:29,479 --> 00:56:26,999
Phobos and Deimos in the night sky on

1137
00:56:35,359 --> 00:56:29,489
Mars but how about Jim are we ever going

1138
00:56:38,569 --> 00:56:35,369

to go there my bet is one day absolutely

1139
00:56:42,380 --> 00:56:38,579
Phobos and Deimos or the space station

1140
00:56:44,150 --> 00:56:42,390
of Mars that we really don't know a lot

1141
00:56:44,810 --> 00:56:44,160
about them they could be captured

1142
00:56:47,870 --> 00:56:44,820
asteroid

1143
00:56:51,620 --> 00:56:47,880
they could be left over from how Mars

1144
00:56:54,620 --> 00:56:51,630
accreted and was created but we do know

1145
00:56:57,590 --> 00:56:54,630
that there's Mars material all over

1146
00:56:59,180 --> 00:56:57,600
those two bodies because cratering that

1147
00:57:02,360 --> 00:56:59,190
happens on Mars

1148
00:57:05,390 --> 00:57:02,370
blows material up in the sky and Phobos

1149
00:57:07,850 --> 00:57:05,400
and Deimos has been collecting those so

1150
00:57:10,370 --> 00:57:07,860
there are a wonderful opportunity for us

1151
00:57:12,020 --> 00:57:10,380
to do some fabulous science it's a

1152
00:57:13,880 --> 00:57:12,030
wonderful opportunity for us to

1153
00:57:16,640 --> 00:57:13,890
understand their structure and know what

1154
00:57:19,190 --> 00:57:16,650
they are and to really understand a

1155
00:57:22,580 --> 00:57:19,200
little bit more about how Mars is being

1156
00:57:25,190 --> 00:57:22,590
put together so let's see if we can do

1157
00:57:27,350 --> 00:57:25,200
that in the future excellent I love your

1158
00:57:30,950 --> 00:57:27,360
positivity about that absolutely one day

1159
00:57:33,920 --> 00:57:30,960
I'm excited for that day let's now move

1160
00:57:48,140 --> 00:57:33,930
on to Managua Nicaragua for our next

1161
00:57:49,970 --> 00:57:48,150
question could you say that again really

1162
00:57:55,400 --> 00:57:49,980
really loud almost like you're shouting

1163
00:58:00,680 --> 00:57:57,680

so if humans go to Mars what will they

1164
00:58:03,470 --> 00:58:00,690
do first that's really interesting thing

1165
00:58:06,230 --> 00:58:03,480
to think about I think one thing they'll

1166
00:58:09,700 --> 00:58:06,240
do is you know they'll be very early

1167
00:58:12,020 --> 00:58:09,710
explorers just like easily explored

1168
00:58:14,210 --> 00:58:12,030
going in ships around the world for the

1169
00:58:16,100 --> 00:58:14,220
first time and discovering new lands

1170
00:58:17,660 --> 00:58:16,110
it's a lot of what we'll have to do when

1171
00:58:20,180 --> 00:58:17,670
we first bring humans to Mars is just

1172
00:58:22,610 --> 00:58:20,190
learn how to live to practice just

1173
00:58:25,010 --> 00:58:22,620
generating the the food and water that

1174
00:58:27,770 --> 00:58:25,020
we need in the shelter and then of

1175
00:58:29,840 --> 00:58:27,780
course getting there and coming back but

1176
00:58:32,210 --> 00:58:29,850
hopefully one day we'll go for good and

1177
00:58:34,730 --> 00:58:32,220
we'll establish permanent colonies on

1178
00:58:36,080 --> 00:58:34,740
Mars just like people set up colonies

1179
00:58:38,660 --> 00:58:36,090
around different places on earth and

1180
00:58:39,850 --> 00:58:38,670
maybe like to turn it over to Jim again

1181
00:58:43,820 --> 00:58:39,860
to you for an answer

1182
00:58:47,210 --> 00:58:43,830
so I believe the first people on Mars

1183
00:58:49,910 --> 00:58:47,220
those men and women will be scientists

1184
00:58:52,850 --> 00:58:49,920
they'll be planetary scientists they'll

1185
00:58:55,250 --> 00:58:52,860
be looking at the geology in addition to

1186
00:58:57,170 --> 00:58:55,260
trying to survive exactly right as our

1187
00:58:58,500 --> 00:58:57,180
early pioneers did they had to find a

1188
00:59:01,380 --> 00:58:58,510

way to be able to live

1189
00:59:04,560 --> 00:59:01,390
live off the land so as scientists today

1190
00:59:07,590 --> 00:59:04,570
we're uncovering reservoirs of water

1191
00:59:10,800 --> 00:59:07,600
we're uncovering resources from our

1192
00:59:14,490 --> 00:59:10,810
satellites and our Rovers for potential

1193
00:59:16,950 --> 00:59:14,500
use by humans when they are on Mars so

1194
00:59:20,780 --> 00:59:16,960
those resources will be important and we

1195
00:59:23,160 --> 00:59:20,790
want them to do more of our science

1196
00:59:25,320 --> 00:59:23,170
excellent and you know it's great you

1197
00:59:26,070 --> 00:59:25,330
know hang on one second I'm not a

1198
00:59:29,580 --> 00:59:26,080
scientist

1199
00:59:32,160 --> 00:59:29,590
but I watch human behavior and so my bet

1200
00:59:33,600 --> 00:59:32,170
is that the first thing that those men

1201
00:59:36,540 --> 00:59:33,610
and women and I hope it's one of the

1202
00:59:41,190 --> 00:59:36,550
kids here does when they land on Mars is

1203
00:59:44,280 --> 00:59:41,200
take a selfie and send it back lots of

1204
00:59:46,070 --> 00:59:44,290
pictures lots and lots of pictures I can

1205
00:59:49,500 --> 00:59:46,080
I can certainly imagine that happening

1206
00:59:51,960 --> 00:59:49,510
all right let's move on to Skillman New

1207
00:59:54,210 --> 00:59:51,970
Jersey Montgomery upper middle school it

1208
00:59:56,430 --> 00:59:54,220
looks like we had some students step out

1209
00:59:58,140 --> 00:59:56,440
is that correct all right so what we're

1210
01:00:01,500 --> 00:59:58,150
going to do is we're going to then jump

1211
01:00:04,920 --> 01:00:01,510
right into our school Metcalf Elementary

1212
01:00:06,510 --> 01:00:04,930
in Houston for our last question here on

1213
01:00:08,270 --> 01:00:06,520

this round and will be panel Twitter

1214
01:00:11,550 --> 01:00:08,280
question and then you've got things off

1215
01:00:15,630 --> 01:00:11,560
will Rover ever be able to rock samples

1216
01:00:17,280 --> 01:00:15,640
from Mars will vote will the will a

1217
01:00:18,720 --> 01:00:17,290
rover ever be able to bring back rock

1218
01:00:20,040 --> 01:00:18,730
samples that is a great question because

1219
01:00:22,350 --> 01:00:20,050
it sure would be nice to have some

1220
01:00:24,090 --> 01:00:22,360
Martian rocks here on earth early you

1221
01:00:26,310 --> 01:00:24,100
know and we're right at the cusp of

1222
01:00:28,260 --> 01:00:26,320
doing that what's so great about where

1223
01:00:30,990 --> 01:00:28,270
we are in the Mars program now is we're

1224
01:00:33,720 --> 01:00:31,000
just about to transition from sending

1225
01:00:35,190 --> 01:00:33,730
more and more complex robots to Mars to

1226
01:00:38,430 --> 01:00:35,200
do all the science in place and just

1227
01:00:40,410 --> 01:00:38,440
beam back the data defending robots that

1228
01:00:42,600 --> 01:00:40,420
go to Mars and bring back those samples

1229
01:00:45,000 --> 01:00:42,610
to our best Laboratories on earth so

1230
01:00:46,590 --> 01:00:45,010
curiosity the one I work on is kind of

1231
01:00:48,510 --> 01:00:46,600
probably probably the last time we'll

1232
01:00:50,730 --> 01:00:48,520
send something with such sophisticated

1233
01:00:52,980 --> 01:00:50,740
instruments that that doesn't bring

1234
01:00:58,530 --> 01:00:52,990
anything back and I'll let Jim talk

1235
01:01:00,840 --> 01:00:58,540
about what we're doing next the indeed

1236
01:01:03,450 --> 01:01:00,850
the Mars 2020 Rover

1237
01:01:06,570 --> 01:01:03,460
is that first step in bringing back

1238
01:01:09,900 --> 01:01:06,580

samples it has the experiments and the

1239
01:01:12,420 --> 01:01:09,910
capability to be able to go to regions

1240
01:01:16,410 --> 01:01:12,430
where perhaps life existed in it

1241
01:01:18,599 --> 01:01:16,420
past create cores drill into rocks and

1242
01:01:21,960 --> 01:01:18,609
those are the pieces that we want back

1243
01:01:25,920 --> 01:01:21,970
we want pieces of Mars history back in

1244
01:01:28,440 --> 01:01:25,930
our hands to understand how Mars changed

1245
01:01:32,069 --> 01:01:28,450
from a planet that looked much like

1246
01:01:35,490 --> 01:01:32,079
Earth today to what it is today a very

1247
01:01:38,069 --> 01:01:35,500
dry and arid location so it went through

1248
01:01:41,039 --> 01:01:38,079
climate change perhaps had life on it

1249
01:01:43,380 --> 01:01:41,049
early on and those rocks are going to be

1250
01:01:46,349 --> 01:01:43,390
the goal for our scientists to be able

1251
01:01:55,359 --> 01:01:46,359
to uncover those secrets that Mars has

1252
01:01:59,599 --> 01:01:58,010
thank you Jim and what we're going to do

1253
01:02:02,450 --> 01:01:59,609
now is take our final question from

1254
01:02:04,069 --> 01:02:02,460
online and I apologize we weren't able

1255
01:02:07,130 --> 01:02:04,079
to get to the hundreds of you that have

1256
01:02:09,799 --> 01:02:07,140
tweeted into our Mars field trip hashtag

1257
01:02:11,359 --> 01:02:09,809
with questions but this final question I

1258
01:02:13,069 --> 01:02:11,369
think is pretty important because if

1259
01:02:17,380 --> 01:02:13,079
we're going to go to Mars we will need

1260
01:02:21,620 --> 01:02:17,390
to survive could you drink water on Mars

1261
01:02:23,359 --> 01:02:21,630
it's a good one it reminds me this is a

1262
01:02:25,039 --> 01:02:23,369
little bit of a tangent but it reminds

1263
01:02:27,230 --> 01:02:25,049

me of a discovery that curiosity made

1264
01:02:29,480 --> 01:02:27,240
earlier last year where we discovered an

1265
01:02:32,089 --> 01:02:29,490
ancient lake bed on Mars it's dry now

1266
01:02:34,760 --> 01:02:32,099
but just by studying the rocks that

1267
01:02:37,039 --> 01:02:34,770
formed as silt and dirt in the water

1268
01:02:38,660 --> 01:02:37,049
settled down and formed these rocks we

1269
01:02:40,940 --> 01:02:38,670
were able to determine that Mars once

1270
01:02:42,890 --> 01:02:40,950
had lakes with fresh enough water that

1271
01:02:44,750 --> 01:02:42,900
you could drink now there's still a lot

1272
01:02:46,130 --> 01:02:44,760
of water on Mars and the polar ice caps

1273
01:02:48,410 --> 01:02:46,140
and it tied a little bit in the

1274
01:02:50,720 --> 01:02:48,420
atmosphere and even some just in

1275
01:02:52,819 --> 01:02:50,730
minerals in the ground and what a lot of

1276
01:02:54,470 --> 01:02:52,829
future astronauts will have to do is

1277
01:02:55,970 --> 01:02:54,480
figure out how to extract that water

1278
01:02:59,120 --> 01:02:55,980
from all these different places on Mars

1279
01:03:04,160 --> 01:02:59,130
and then be able to drink it anything to

1280
01:03:05,990 --> 01:03:04,170
add Jim actually this is Lisa I am your

1281
01:03:07,880 --> 01:03:06,000
host and in fact I want to talk to you

1282
01:03:10,430 --> 01:03:07,890
just a second we've got a mission on the

1283
01:03:12,890 --> 01:03:10,440
way to Mars right now gonna get there in

1284
01:03:15,650 --> 01:03:12,900
September and what it's gonna do is look

1285
01:03:17,690 --> 01:03:15,660
at Mars atmosphere Mars lost most of its

1286
01:03:21,319 --> 01:03:17,700
atmosphere it has less than 1% of the

1287
01:03:24,620 --> 01:03:21,329
air of Earth and what we know is there

1288
01:03:26,809 --> 01:03:24,630

was water on Mars as Ashwin said where

1289
01:03:28,549 --> 01:03:26,819
did it go some of it as you mentioned

1290
01:03:29,990 --> 01:03:28,559
went in the rocks some of it's still in

1291
01:03:32,029 --> 01:03:30,000
the atmosphere but where did it all go

1292
01:03:34,670 --> 01:03:32,039
so by learning about where that

1293
01:03:36,710 --> 01:03:34,680
atmosphere went mavens also gonna tell

1294
01:03:38,210 --> 01:03:36,720
us about where the water went and we're

1295
01:03:39,589 --> 01:03:38,220
gonna look at where it's going now and

1296
01:03:41,779 --> 01:03:39,599
what's stripping the atmosphere often

1297
01:03:44,089 --> 01:03:41,789
look back in time to see what Mars

1298
01:03:45,559 --> 01:03:44,099
atmospheric history is so that one's

1299
01:03:48,380 --> 01:03:45,569
going to be getting to Mars and going

1300
01:03:50,630 --> 01:03:48,390
into orbit September 21st little late at

1301
01:03:52,130 --> 01:03:50,640
night here on the East Coast 10 p.m. but

1302
01:03:52,789 --> 01:03:52,140
it's gonna be well worth paying

1303
01:03:55,549 --> 01:03:52,799
attention to

1304
01:03:56,900 --> 01:03:55,559
and and Lyle I'm gonna I'm gonna do

1305
01:03:59,089 --> 01:03:56,910
something on the fly here I'm gonna call

1306
01:04:01,640 --> 01:03:59,099
an audible I feel bad for all those

1307
01:04:03,200 --> 01:04:01,650
folks who who sent in through Twitter

1308
01:04:04,460 --> 01:04:03,210
through the hashtag Mars field script

1309
01:04:06,650 --> 01:04:04,470
that didn't get their questions answered

1310
01:04:09,090 --> 01:04:06,660
so I'm gonna make an offer on my

1311
01:04:12,990 --> 01:04:09,100
personal Twitter feed

1312
01:04:16,020 --> 01:04:13,000
the first 25 questions I find online

1313
01:04:18,030 --> 01:04:16,030

with Mars field trip hashtag I'll make

1314
01:04:23,400 --> 01:04:18,040
sure I tweet out an answer later today

1315
01:04:27,120 --> 01:04:23,410
I'm at LD May and we will send that out

1316
01:04:29,550 --> 01:04:27,130
tonight with answers on Twitter well

1317
01:04:31,950 --> 01:04:29,560
thank you very much that's very kind of

1318
01:04:34,290 --> 01:04:31,960
you so you heard it if you do have a

1319
01:04:36,630 --> 01:04:34,300
question she will take the 25 first

1320
01:04:39,330 --> 01:04:36,640
questions that she gets and answer them

1321
01:04:40,740 --> 01:04:39,340
a little later so thank you for that and

1322
01:04:42,720 --> 01:04:40,750
I want to thank a Schwinn for joining us

1323
01:04:44,490 --> 01:04:42,730
today I want to thank all of our schools

1324
01:04:51,180 --> 01:04:44,500
who joined us and I'm going to now pass

1325
01:04:53,130 --> 01:04:51,190
it back to Lisa again who's got just a

1326
01:04:55,560 --> 01:04:53,140
couple of closing remarks first of all I

1327
01:04:57,870 --> 01:04:55,570
want to assure everyone while this is

1328
01:05:00,180 --> 01:04:57,880
the end of this session this class this

1329
01:05:01,860 --> 01:05:00,190
connected classroom that this is

1330
01:05:04,530 --> 01:05:01,870
certainly not your last opportunity to

1331
01:05:06,720 --> 01:05:04,540
continue exploring and that NASA's

1332
01:05:08,310 --> 01:05:06,730
Digital Learning Network you can go

1333
01:05:12,500 --> 01:05:08,320
there yourself you can look at this you

1334
01:05:16,170 --> 01:05:12,510
can engage in future events at DLN

1335
01:05:19,020 --> 01:05:16,180
nasa.gov and i would like to thank very

1336
01:05:21,720 --> 01:05:19,030
much our guests here in Washington John

1337
01:05:24,510 --> 01:05:21,730
feely and Jim Greene I appreciate your

1338
01:05:26,970 --> 01:05:24,520

time and your enthusiasm for and your

1339
01:05:28,700 --> 01:05:26,980
responses to the questions I'd also like

1340
01:05:31,320 --> 01:05:28,710
to thank Google for making this

1341
01:05:33,630 --> 01:05:31,330
technology available to us to make these

1342
01:05:35,640 --> 01:05:33,640
connections around the world and explore

1343
01:05:38,280 --> 01:05:35,650
Mars together on our virtual field trip

1344
01:05:40,020 --> 01:05:38,290
and finally I'd like to echo Lyle's

1345
01:05:42,690 --> 01:05:40,030
thanks to the students and to the

1346
01:05:45,360 --> 01:05:42,700
teachers for your curiosity about our

1347
01:05:49,620 --> 01:05:45,370
curiosity and your participation today