Dr. Mary Cleave

Retired NASA Astronaut

STEM in 30

1
00:00:04,720 --> 00:00:07,479
THIS IS "STEM IN 30."

2
00:00:07,479 --> 00:00:10,769
WHAT'S OUR TOPIC, MARTY?

3
00:00:10,769 --> 00:00:11,960
>> THIS IS YOUR SHOW.

4
00:00:11,960 --> 00:00:14,380
I PLANNED THE LAST ONE.

5
00:00:14,380 --> 00:00:20,609
>> UM, WAIT A MINUTE, THAT
SOUNDS LIKE BLAKING NEWS FROM

6
00:00:20,609 --> 00:00:21,800
NICK PARTIDGE.

7
00:00:21,800 --> 00:00:23,969
LET'S SEE WHAT HE HAS TO SAY.

8
00:00:23,969 --> 00:00:26,210
>> LADIES AND GENTLEMEN, WE
INTERRUPT YOUR REGULARLY

9
00:00:26,210 --> 00:00:29,570
SCHEDULED "STEM IN 30" PROGRAM
TO BRING YOU THIS SPECIAL

10
00:00:29,570 --> 00:00:30,570
REPORT.

11
00:00:30,570 --> 00:00:33,360
I'M STANDING HERE LIVE IN FRONT
OF THE PHOEBE WATERMAN HAAS

12
00:00:33,360 --> 00:00:36,910

PUBLIC OBSERVATORY IN
WASHINGTON, D.C., WHERE ABOUT 20

13
00:00:36,910 --> 00:00:40,760
MINUTES AGO, ASTRONOMY EDUCATOR
SHAUNA EDSON REPORTED OBSERVING

14
00:00:40,760 --> 00:00:44,390
SEVERAL LARGE EXPLOSIONS OF
INCANDESCENT GAS ON THE SURFACE

15
00:00:44,390 --> 00:00:45,390
OF MARS.

16
00:00:45,390 --> 00:00:49,510
THE SUSPECT SCOPE INDICATES THAT
IT IS HYDROGEN AND IS HEADED

17
00:00:49,510 --> 00:00:52,200
TOWARDS EARTH AT ENORMOUS
VELOCITY.

18
00:00:52,200 --> 00:00:57,280
IT'S REPORTED THE PHENOMENON AS
"LIKE A JET OF BLUE FLAME SHOT

19
00:00:57,280 --> 00:00:59,410
FROM A GUN."

20
00:00:59,410 --> 00:01:02,240
IT IS OUR BELIEF THAT MARTIANS
HAVE LAUNCHED SHIPS TOWARDS

21
00:01:02,240 --> 00:01:04,379
EARTH TO BEGIN AN INVASION.

22
00:01:04,379 --> 00:01:07,409
ONE THING IS CERTAIN, THERE IS
NO STOPPING THEM.

23
00:01:07,409 --> 00:01:15,920
LET'S GO TO FOOTAGE NOW FROM
NASA.

24
00:01:15,920 --> 00:01:30,200
\M\M
>> STOP!

25
00:01:30,200 --> 00:01:37,350
STOP!

26
00:01:37,350 --> 00:01:38,610
THAT'S NOT MARS INVADING EARTH.

27
00:01:38,610 --> 00:01:40,190
THIS IS EARTH INVADING MARS.

28
00:01:40,190 --> 00:01:41,490
WHERE ARE BETH AND MARTY?

29
00:01:41,490 --> 00:01:43,490
WE'VE GOT TO GET THIS RIGHT.

30
00:01:43,490 --> 00:01:48,390
BETH, MARTY, THERE SEEMS TO BE A
LOT OF CONFUSION OUT THERE ABOUT

31
00:01:48,390 --> 00:01:49,390
MARS.

32
00:01:49,390 --> 00:01:50,470
I THINK WE COULD STRAIGHTEN IT
OUT.

33
00:01:50,470 --> 00:01:52,110
>> I THINK WE FOUND OUR TOPIC.

34
00:01:52,110 --> 00:01:53,270

>> DO YOU HAVE TIME?

35
00:01:53,270 --> 00:01:54,710
>> WE HAVE ABOUT 30 MINUTES.

36
00:01:54,710 --> 00:01:55,870
>> I'M NEW HERE.

37
00:01:55,870 --> 00:02:01,530
WHY 30 MINUTES?

38
00:02:01,530 --> 00:02:20,600
>> WELL, BECAUSE†--
>> THIS IS "STEM IN 30."

39
00:02:20,600 --> 00:02:34,270
\M\M
>> THIS IS "STEM IN 30."

40
00:02:34,270 --> 00:02:39,670
\M\M
>> HI.

41
00:02:39,670 --> 00:02:42,360
AND NOW WE'RE COMING TO YOU LIVE
FROM THE NATIONAL AIR AND SPACE

42
00:02:42,360 --> 00:02:45,090
MUSEUM IN THE EXPLORING THE
PLANETS GALLERY.

43
00:02:45,090 --> 00:02:47,560
>> AND THIS GALLERY REALLY DOES
SHOW THAT IF YOU SET YOUR MIND

44
00:02:47,560 --> 00:02:49,880
TO IT, YOU CAN ACCOMPLISH
ANYTHING.

45

00:02:49,880 --> 00:02:51,020
LET'S GO LOOK AROUND.

46
00:02:51,020 --> 00:02:52,990
>> LET'S TAKE A LOOK.

47
00:02:52,990 --> 00:02:55,040
>> HERE IN THE EXPLORING THE
PLANETS GALLERY, YOU CAN

48
00:02:55,040 --> 00:02:58,730
DISCOVER THE PLANETS, MOONS,
ASTEROIDS, DWARF PLANETS AND

49
00:02:58,730 --> 00:03:02,410
COMETS IN OUR SOLAR SYSTEM AND
LEARN ABOUT THE SPACECRAFT THAT

50
00:03:02,410 --> 00:03:05,500
TRAVELED GREAT DISTANCES TO
STUDY THEM.

51
00:03:05,500 --> 00:03:09,230
>> IN THIS GALLERY, YOU'LL FIND
THREE GENERATIONS OF MARS ROVERS

52
00:03:09,230 --> 00:03:12,270
AS WELL AS THE "STARDUST"
CAPSULE, WHICH WAS THE FIRST TO

53
00:03:12,270 --> 00:03:14,810
BRING BACK A SAMPLE FROM A
COMET.

54
00:03:14,810 --> 00:03:17,459
>> THERE'S ALSO THE BLINK
COMPARATOR, WHICH CLYDE TOMBAUGH

55
00:03:17,459 --> 00:03:20,269
USED TO DISCOVER PLUTO IN 1930.

56
00:03:20,269 --> 00:03:23,129
>> OF COURSE, THERE'S ALSO A
FULL-SCALE MODEL OF THE NEW

57
00:03:23,129 --> 00:03:27,470
HORIZONS SPACECRAFT, WHICH IN
2015 SHOWED US THE HEART OF

58
00:03:32,769 --> 00:03:30,620
PLUTO.

59
00:03:32,769 --> 00:03:33,769
THAT'S FOR ANOTHER SHOW.

60
00:03:33,769 --> 00:03:34,900
TODAY WE'RE TALKING ABOUT MARS.

61
00:03:34,900 --> 00:03:37,319
>> BUT BEFORE WE GET STARTED,
LET'S WELCOME OUR STUDENTS

62
00:03:37,319 --> 00:03:38,819
TODAY, WHITTIER EDUCATION
CAMPUS.

63
00:03:38,819 --> 00:03:40,459
THANK YOU SO MUCH FOR COMING IN.

64
00:03:40,459 --> 00:03:43,050
WE CAN'T WAIT TO HEAR YOUR
QUESTIONS LATER IN THE SHOW.

65
00:03:43,050 --> 00:03:46,209
>> AND WE'D LIKE TO WELCOME OUR
ONLINE VIEWERS AND VIEWERS ON

66
00:03:46,209 --> 00:03:47,540
NASA TV.

67
00:03:47,540 --> 00:03:51,060
YOU CAN SUBMIT LIVE QUESTIONS,
AND PERHAPS WE'LL ANSWER THEM

68
00:03:51,060 --> 00:03:52,060
DURING THE SHOW.

69
00:03:52,060 --> 00:03:54,280
>> WE HAVE AN EXPERT STANDING BY
TO ANSWER THEM, IF YOU SUBMIT

70
00:03:54,280 --> 00:03:55,820
THEM ONLINE AS WELL.

71
00:03:55,820 --> 00:04:01,500
>> OKAY, SO, WHAT WE HAVE FIRST
TODAY IS SOME STUDENTS WHO HAVE

72
00:04:01,500 --> 00:04:06,980
GOT A BIG QUESTION FOR US, SO
LET'S TAKE A LISTEN TO THEIR

73
00:04:06,980 --> 00:04:07,980
QUESTION.

74
00:04:07,980 --> 00:04:10,569
>> HI, I'M STEPHANIE FROM
LIBERTY, MISSOURI.

75
00:04:10,569 --> 00:04:14,670
>> AND WE ARE WANTING TO KNOW,
WHY IS THERE SUCH A FASCINATION

76
00:04:14,670 --> 00:04:15,670
WITH MARS?

77
00:04:15,670 --> 00:04:17,940
>> WELL, WE'RE GOING TO SPEND

THE NEXT 30 MINUTES TALKING

78
00:04:17,940 --> 00:04:21,090
ABOUT WHY THERE'S A FASCINATION
WITH MARS, BUT RIGHT NOW I'M

79
00:04:21,090 --> 00:04:22,190
JOINED BY DR.

80
00:04:22,190 --> 00:04:24,030
JOHN GRANT, ONE OF
THE SCIENTISTS HERE AT THE

81
00:04:24,030 --> 00:04:25,030
MUSEUM.

82
00:04:25,030 --> 00:04:26,030
THANK YOU FOR JOINING US.

83
00:04:26,030 --> 00:04:27,030
>> MY PLEASURE.

84
00:04:27,030 --> 00:04:28,030
HI, GUYS!

85
00:04:28,030 --> 00:04:30,999
>> JOHN, WHAT GOT YOU INTERESTED
IN MARS?

86
00:04:30,999 --> 00:04:34,400
>> WHEN I GREW UP IN NORTHERN
NEW YORK STATE, I LOOKED OUT

87
00:04:34,400 --> 00:04:36,510
AROUND ME AND I SAW LAKES AND I
SAW RIVERS.

88
00:04:36,510 --> 00:04:40,460
AND WHEN I WAS A TEENAGER, THE

VIKING LANDERS LANDED ON MARS.

89
00:04:40,460 --> 00:04:44,050
AND LO AND BEHOLD, I SAW DRY
LAKES AND DRY RIVERS IN TERMS OF

90
00:04:44,050 --> 00:04:47,010
THE IMAGES, AND IT REALLY MADE
ME THINK ABOUT THE POSSIBILITY

91
00:04:47,010 --> 00:04:48,430
THAT THERE COULD HAVE BEEN LIFE
ON MARS.

92
00:04:48,430 --> 00:04:51,360
>> NOW, PART OF YOUR JOB IS
WORKING WITH MARS ROVERS, SO YOU

93
00:04:51,360 --> 00:04:54,380
GET TO DRIVE THESE THINGS AND GO
OUT AND DISCOVER THINGS.

94
00:04:54,380 --> 00:04:57,160
SO, DO YOU SIT IN YOUR OFFICE
WITH, YOU KNOW, LIKE A GAME

95
00:04:57,160 --> 00:05:01,680
CONSOLE WHERE YOU TURN IT AND
PUSH THE GAS, MOVE IT AROUND?

96
00:05:01,680 --> 00:05:04,610
>> I WISH, BUT IT TURNS OUT THAT
YOU CAN'T DRIVE A ROVER ON MARS

97
00:05:04,610 --> 00:05:06,380
THAT WAY FOR A COUPLE REASONS.

98
00:05:06,380 --> 00:05:08,560
ONE, YOU WANT TO MAKE SURE YOU
DON'T DRIVE INTO SOMETHING, BUT

99
00:05:08,560 --> 00:05:12,500
REALLY BECAUSE MARS IS SO FAR
AWAY THAT IT TAKES A LONG TIME

100
00:05:12,500 --> 00:05:14,919
FOR THE SIGNAL TO GET FROM EARTH
TO MARS AND BACK.

101
00:05:14,919 --> 00:05:16,379
SO, THERE'S A DELAY.

102
00:05:16,379 --> 00:05:18,840
YOU WOULDN'T REALLY BE ABLE TO
DO THINGS IN REALTIME BECAUSE

103
00:05:18,840 --> 00:05:20,960
YOU WOULDN'T BE ABLE TO SEE
WHERE YOU WENT.

104
00:05:20,960 --> 00:05:24,280
>> NOW, IF ONE OF THE ROVERS IS
DRIVING ALONG, AND LET'S SAY

105
00:05:24,280 --> 00:05:28,110
THERE'S A HOLE, DOES IT JUST
FALL INTO THE HOLE?

106
00:05:28,110 --> 00:05:29,110
>> NO.

107
00:05:29,110 --> 00:05:31,680
WHAT WE DO THROUGH THE ROVER
PLANNERS AT THE JET PROPULSION

108
00:05:31,680 --> 00:05:35,080
LAB IS PLAN WHAT WE CALL
KEEP-OUT ZONES, THINGS THAT ARE

109

00:05:35,080 --> 00:05:37,900
HAZARDS, THINGS THAT ARE OUTSIDE
THE BOUNDS OF WHERE WE WANT TO

110
00:05:37,900 --> 00:05:40,560
GO ARE CONSIDERED OFF LIMITS.

111
00:05:40,560 --> 00:05:43,980
BUT THEN THE ROVER ALSO HAS SORT
OF HAZARD AVOIDANCE THINGS.

112
00:05:43,980 --> 00:05:46,930
SO, IF THERE'S SOMETHING THAT
POPS UP UNEXPECTEDLY, WHICH HAS

113
00:05:46,930 --> 00:05:50,430
NEVER HAPPENED, IT WOULD KNOW
NOT TO DRIVE OFF A CLIFF.

114
00:05:50,430 --> 00:05:52,759
>> WELL, WE HAVE SOME FRIENDS
WHO ARE ACTUALLY TRYING TO

115
00:05:52,759 --> 00:05:56,000
PROGRAM SOME ROBOTS.

116
00:05:56,000 --> 00:05:57,819
DO YOU WANT TO SEE HOW THEY'RE
DOING?

117
00:05:57,819 --> 00:05:59,449
>> I'M CURIOUS IF THEY DO BETTER
THAN WE DO.

118
00:05:59,449 --> 00:06:00,660
>> OKAY, LET'S TAKE A LOOK.

119
00:06:00,660 --> 00:06:03,530
>> ALL RIGHT, WE'VE GOT A COUPLE
FRIENDS HERE GETTING READY TO

120
00:06:03,530 --> 00:06:05,449
DRIVE SOME STEROID ROVERS.

121
00:06:05,449 --> 00:06:08,900
THE WAY THIS WORKS IS YOU PLOT A
COURSE FOR THEM ON THE iPAD AND

122
00:06:08,900 --> 00:06:10,040
THEN GO.

123
00:06:10,040 --> 00:06:11,570
SO YOU HAVE TO PREPLOT YOUR
COURSE.

124
00:06:11,570 --> 00:06:13,260
WE HAVE A COUPLE CRATERS OVER
HERE.

125
00:06:13,260 --> 00:06:19,389
I WANT TO SEE IF YOU GUYS CAN
END UP IN ONE OF THOSE CRATERS.

126
00:06:19,389 --> 00:06:22,970
GIVE IT A TRY.

127
00:06:22,970 --> 00:06:24,770
KEEP GOING.

128
00:06:24,770 --> 00:06:30,530
SEE IF YOU CAN HIT THAT MARK
THERE.

129
00:06:30,530 --> 00:06:36,280
WELL, YOU GUYS ARE ALL†-- THAT
WAS REALLY†-- YOU DID IT!

130
00:06:36,280 --> 00:06:37,280
GREAT JOB!

131
00:06:37,280 --> 00:06:38,280
NICE WORK.

132
00:06:38,280 --> 00:06:41,050
I WILL TELL YOU GUYS, I AM
TREMENDOUSLY BAD AT THIS, SO YOU

133
00:06:41,050 --> 00:06:43,400
GUYS DID A MUCH, MUCH BETTER
JOB.

134
00:06:43,400 --> 00:06:45,180
BETH, THESE GUYS ARE ON A ROLL.

135
00:06:45,180 --> 00:06:47,599
LET'S GO BACK OVER TO YOU AND
JOHN.

136
00:06:47,599 --> 00:06:50,580
>> DO YOU THINK THEY COULD BE
YOUR NEXT MARS ROVERS DRIVERS?

137
00:06:50,580 --> 00:06:52,319
>> I KNOW I COULDN'T DO THAT.

138
00:06:52,319 --> 00:06:55,880
>> IT LOOKS A LITTLE HARDER THAN
ONE MIGHT EXPECT, THOUGH.

139
00:06:55,880 --> 00:06:56,880
>> EXACTLY, EXACTLY.

140
00:06:56,880 --> 00:06:58,409
I THINK IT'S KIND OF
COMPLICATED.

141
00:06:58,409 --> 00:06:59,409
>> YEAH.

142
00:06:59,409 --> 00:07:01,750
WELL, THEY HAVE ANOTHER ROVER
THAT THEY'RE TRYING OUT OVER

143
00:07:01,750 --> 00:07:02,750
THERE.

144
00:07:02,750 --> 00:07:03,750
THIS ONE'S GOT A LITTLE CAMERA.

145
00:07:03,750 --> 00:07:04,759
SHOULD WE GO BACK AND SEE†--
>> SURE, LET'S SEE HOW THEY DO

146
00:07:04,759 --> 00:07:05,759
THAT WITH.

147
00:07:05,759 --> 00:07:06,759
>>†-- IF THIS IS BETTER?

148
00:07:06,759 --> 00:07:09,400
>> ALL RIGHT, WE'VE GOT ANOTHER
FRIEND HERE, AND HE'S GOING TO

149
00:07:09,400 --> 00:07:10,400
DRIVE THIS ONE.

150
00:07:10,400 --> 00:07:11,740
NOW, HOLD ON, HOLD ON, HOLD ON.

151
00:07:11,740 --> 00:07:12,840
YOU'RE GETTING REAL ANXIOUS
HERE.

152
00:07:12,840 --> 00:07:15,800
NOW, WE HAVE GOT THIS ROVER AND
IT'S GOT A CAMERA ON IT, BUT

153
00:07:15,800 --> 00:07:18,600
JUST LOOKING AT THE TERRAIN
HERE, THAT'S TOO EASY AND NOT

154
00:07:18,600 --> 00:07:21,120
LIKE WHAT WE DO ON MARS, SO WHAT
WE'RE GOING TO DO IS WE'RE GOING

155
00:07:21,120 --> 00:07:22,390
TO TURN YOU AROUND.

156
00:07:22,390 --> 00:07:25,819
NOW, WE HAVE GOT KIND OF A
TARGET OUT HERE WE WANT YOU TO

157
00:07:25,819 --> 00:07:26,819
TRY TO FIND.

158
00:07:26,819 --> 00:07:29,009
SO, SEE IF YOU CAN DRIVE THAT
ROVER WITHOUT ACTUALLY LOOKING

159
00:07:29,009 --> 00:07:32,520
WHERE YOU'RE GOING, OTHER THAN
THE CAMERA ON BOARD.

160
00:07:32,520 --> 00:07:39,550
SO, WHAT'S GOING ON?

161
00:07:39,550 --> 00:07:48,199
LOOKS LIKE YOU'RE UP AGAINST
SOME MOUNTAINS THERE.

162
00:07:48,199 --> 00:07:52,110
I LIKE HOW YOU'RE TAKING THE
SMALL STEPS THERE.

163
00:07:52,110 --> 00:07:56,400
NOT QUITE AS EASY AS IT LOOKS,

IS IT?

164
00:07:56,400 --> 00:07:57,430
WHAT'S HARD ABOUT IT?

165
00:07:57,430 --> 00:08:01,689
>> JUST LOOKING IN THE CAMERA
AND TURNING.

166
00:08:01,689 --> 00:08:05,340
>> ALL RIGHT, WELL, BETH, WE'RE
DRIVING.

167
00:08:05,340 --> 00:08:06,470
YOU DON'T NEED ANY ROADS.

168
00:08:06,470 --> 00:08:08,070
SO, LET'S GO BACK OVER TO YOU.

169
00:08:08,070 --> 00:08:10,540
>> YEAH, THEY DON'T NEED ANY
ROADS, BUT THEY MIGHT NEED SOME

170
00:08:10,540 --> 00:08:12,530
WORK WITH DRIVING THAT ROVER
AROUND.

171
00:08:12,530 --> 00:08:14,060
EVEN THAT'S A LITTLE MORE
DIFFICULT.

172
00:08:14,060 --> 00:08:16,590
>> I THINK THAT'S RIGHT, BUT IT
IS A LITTLE BIT LIKE THE WAY WE

173
00:08:16,590 --> 00:08:19,880
DRIVE THE ROVERS ON MARS, WHERE
WE DRIVE AWAY, TAKE SOME

174

00:08:19,880 --> 00:08:23,010
PICTURES, AND THEN CREATE,
ESSENTIALLY, A LANDSCAPE THAT WE

175
00:08:23,010 --> 00:08:24,429
DRIVE INTO THE NEXT DAY.

176
00:08:24,429 --> 00:08:26,310
>> WELL, ARE YOU READY FOR SOME
QUESTIONS?

177
00:08:26,310 --> 00:08:27,310
>> SURE.

178
00:08:27,310 --> 00:08:28,310
>> LET'S START WITH A VIDEO
QUESTION.

179
00:08:28,310 --> 00:08:29,310
>> OKAY.

180
00:08:29,310 --> 00:08:30,750
>> MY NAME IS McKAYLA, AND MY
QUESTION IS, WHEN DID THE FIRST

181
00:08:30,750 --> 00:08:32,929
ROBOT EMERGE ON MARS?

182
00:08:32,929 --> 00:08:36,339
>> WHAT WAS THE FIRST ROBOT ON
MARS?

183
00:08:36,339 --> 00:08:39,349
>> THE FIRST ROBOT THAT LANDED
ON MARS AND SUCCESSFULLY

184
00:08:39,349 --> 00:08:41,599
OPERATED WERE THE VIKING LANDERS
IN 1976.

185
00:08:41,599 --> 00:08:46,399
AS I SAID EARLIER, THAT'S WHAT
PIQUED MY INTEREST IN PLANETARY

186
00:08:46,399 --> 00:08:47,399
GEOLOGY.

187
00:08:47,399 --> 00:08:48,459
>> SO, WE'VE BEEN ON MARS FOR A
WHILE.

188
00:08:48,459 --> 00:08:50,100
>> YES, WE HAVE.

189
00:08:50,100 --> 00:08:51,589
>> LET'S TRY AN ONLINE QUESTION.

190
00:08:51,589 --> 00:08:53,269
LET'S SEE.

191
00:08:53,269 --> 00:08:57,299
ARE THERE PLACES ON MARS WHERE
THE ROVERS CAN'T GO?

192
00:08:57,299 --> 00:08:59,920
>> THERE'S TWO KINDS OF PLACES
THE ROVER CAN'T GO.

193
00:08:59,920 --> 00:09:01,319
ONE HAS TO DO WITH HAZARDS.

194
00:09:01,319 --> 00:09:05,059
IF THE HILL IS TOO STEEP, IF THE
ROCKS ARE TOO BIG, WE CAN'T GO

195
00:09:05,059 --> 00:09:06,439
TO THOSE PLACES.

196

00:09:06,439 --> 00:09:10,179
THE OTHER KIND OF PLACE WE CAN'T
GO IS WHERE THERE MIGHT BE LIFE

197
00:09:10,179 --> 00:09:11,179
ON MARS.

198
00:09:11,179 --> 00:09:14,100
WE DON'T KNOW IF THERE'S LIFE ON
MARS, BUT THERE'S PLACES WHERE,

199
00:09:14,100 --> 00:09:16,800
IF THERE IS, IT'S LIKELY TO
OCCUR, PLACES WHERE THERE MIGHT

200
00:09:16,800 --> 00:09:17,869
BE LIQUID WATER TODAY.

201
00:09:17,869 --> 00:09:20,430
SO, THOSE ARE SORT OF STEER
CLEAR PLACES AS WELL.

202
00:09:20,430 --> 00:09:23,100
>> OKAY, I THINK WE HAVE A
STUDENT WHO HAS A REALLY GREAT

203
00:09:23,100 --> 00:09:25,809
QUESTION ABOUT TAKING PICTURES?

204
00:09:25,809 --> 00:09:28,660
COME ON UP.

205
00:09:28,660 --> 00:09:39,089
>> IS THERE A SCIENTIFIC REASON
FOR THE ROVER TO TAKE SELFIES?

206
00:09:39,089 --> 00:09:41,009
>> THERE IS.

207

00:09:41,009 --> 00:09:44,350
THE ROVERS TAKE SELFIES FOR TWO
REASONS.

208
00:09:44,350 --> 00:09:47,439
ONE, BECAUSE USUALLY WE'VE JUST
DRILLED A HOLE IN THE ROCKS AND

209
00:09:47,439 --> 00:09:51,119
IT ALLOWS US TO PROVIDE CONTEXT
FOR WHERE THE DRILL HOLE IS, THE

210
00:09:51,119 --> 00:09:53,600
THINGS AROUND IT, AND WHERE THE
ROVER WAS SITTING.

211
00:09:53,600 --> 00:09:57,040
THE OTHER TIME THAT WE TAKE
SELFIES IS TO UNDERSTAND WHAT'S

212
00:09:57,040 --> 00:09:59,399
HAPPENING WITH THE ROVER, TO
LOOK DOWN, FOR EXAMPLE, ON

213
00:09:59,399 --> 00:10:02,579
OPPORTUNITY AND SEE HOW MUCH
DUST HAS ACCUMULATED ON THE

214
00:10:02,579 --> 00:10:03,579
SOLAR PANELS.

215
00:10:03,579 --> 00:10:06,089
SO, THERE IS BOTH OPERATIONAL
AND SCIENTIFIC REASONS.

216
00:10:06,089 --> 00:10:07,550
>> IT'S NOT JUST FOR THEIR
FACEBOOK PAGE.

217
00:10:07,550 --> 00:10:10,230

>> NO, NOT JUST FOR THEIR
FACEBOOK PAGE.

218
00:10:10,230 --> 00:10:12,339
>> WE HAVE ANOTHER VIDEO
QUESTION.

219
00:10:12,339 --> 00:10:13,339
>> OKAY.

220
00:10:13,339 --> 00:10:14,339
>> WATCH.

221
00:10:14,339 --> 00:10:17,350
>> HI, MY NAME'S McKAYLA, AND MY
QUESTION IS, WHY IS IT IMPORTANT

222
00:10:17,350 --> 00:10:19,069
THAT WE FOUND WATER ON MARS?

223
00:10:19,069 --> 00:10:21,749
>> WHY IS IT IMPORTANT THAT WE
FOUND WATER ON MARS?

224
00:10:21,749 --> 00:10:24,509
>> WELL, I STARTED TO SAY THIS A
LITTLE BIT EARLIER AND THEN I

225
00:10:24,509 --> 00:10:25,639
LOST MY TRAIN OF THOUGHT.

226
00:10:25,639 --> 00:10:29,850
BUT REALLY, WATER IS SOMETHING
ON THE EARTH THAT WE ASSOCIATE

227
00:10:29,850 --> 00:10:30,850
WITH LIFE.

228
00:10:30,850 --> 00:10:32,249

WHERE WE FIND WATER, WE FIND
LIFE.

229
00:10:32,249 --> 00:10:36,220
AND SO, THE IDEA IS THAT, IF ON
MARS WE'VE GOT LIQUID WATER,

230
00:10:36,220 --> 00:10:38,829
THEN POTENTIALLY THAT
RELATIONSHIP HOLDS TRUE, BECAUSE

231
00:10:38,829 --> 00:10:42,240
WATER IS THE KEY TO MANY OF THE
KINDS OF THINGS THAT LIFE NEEDS

232
00:10:42,240 --> 00:10:43,449
TO GET GOING.

233
00:10:43,449 --> 00:10:46,660
>> WELL, WE WERE ABLE TO TALK TO
SOME ASTRONAUTS, AND WE GOT

234
00:10:46,660 --> 00:10:47,740
THEIR THOUGHTS ON MARS.

235
00:10:47,740 --> 00:10:49,790
SO, DO YOU WANT TO TAKE A LOOK
AT WHAT THEY HAD TO SAY?

236
00:10:49,790 --> 00:10:51,920
>> I WOULD LOVE TO.

237
00:10:51,920 --> 00:10:55,079
>> LET'S SEE.

238
00:10:55,079 --> 00:10:59,989
>> WELL, YOU'RE LOOKING FOR THE
SIGNATURE OF LIFE, YEAH, BECAUSE

239

00:10:59,989 --> 00:11:02,879
YOU KNOW, IT'S NOT GOING TO BE
SOMEBODY STANDING UP GOING, "HI,

240
00:11:02,879 --> 00:11:03,879
WELCOME TO MARS!"

241
00:11:03,879 --> 00:11:06,959
SO, YOU'RE LOOKING FOR THINGS
LIKE CARBON DIOXIDE THAT WE

242
00:11:06,959 --> 00:11:10,749
BREATHE OUT, OR IT'S AN
ANAEROBIC SYSTEM, ONE WITHOUT

243
00:11:10,749 --> 00:11:14,360
OXYGEN, YOU MIGHT GET SULFUR
DIOXIDE OR SULFUR-BASED

244
00:11:14,360 --> 00:11:15,360
COMPOUNDS.

245
00:11:15,360 --> 00:11:18,739
THERE ARE A NUMBER OF DIFFERENT
THINGS THAT YOU COULD BE LOOKING

246
00:11:18,739 --> 00:11:23,610
FOR, AND YOU HAVE TO HONE IN ON
WHAT'S THERE AND THEN REFINE IT.

247
00:11:23,610 --> 00:11:31,439
SO, IT'S AN ITERATIVE PROCESS,
LIKE MOST SCIENCES.

248
00:11:31,439 --> 00:11:35,130
>> WELL, I WAS THERE IN SPACE
FOR ABOUT 6 MONTHS, 5†1/2

249
00:11:35,130 --> 00:11:38,829
MONTHS, AND MY SKELETON, YOU

KNOW, LOST A LOT OF WEIGHT.

250
00:11:38,829 --> 00:11:40,679
MY MUSCLES CHANGED.

251
00:11:40,679 --> 00:11:42,579
MY EYES CHANGED.

252
00:11:42,579 --> 00:11:44,779
MY WAY OF SEEING THINGS CHANGED.

253
00:11:44,779 --> 00:11:49,329
AND SO, WE NEED TO UNDERSTAND
ALL THIS MECHANISM, THE IMPACT

254
00:11:49,329 --> 00:11:52,920
THAT WE HAVE ON OUR BODY, AND WE
NEED TO MAKE SURE THAT WE HAVE

255
00:11:52,920 --> 00:11:56,590
THE CAPABILITY TO PRESERVING THE
BODY, THE FUNCTIONALITY OF THE

256
00:11:56,590 --> 00:12:00,209
BODY OVER THIS LONG PERIOD OF
TIME, WHICH IS TWO TO THREE

257
00:12:00,209 --> 00:12:01,209
YEARS.

258
00:12:01,209 --> 00:12:04,179
>> WE'RE LOOKING AT WAYS TO
PROVIDE ASTRONAUTS WITH

259
00:12:04,179 --> 00:12:05,179
AUTONOMY.

260
00:12:05,179 --> 00:12:07,429
IF I CALL THE GROUND FROM THE

INTERNATIONAL SPACE STATION, I

261
00:12:07,429 --> 00:12:09,179
GET AN IMMEDIATE RESPONSE.

262
00:12:09,179 --> 00:12:12,569
BUT IF I'M TRAVELING AND I'M
NEAR THE MARTIAN SURFACE, IT'S

263
00:12:12,569 --> 00:12:14,670
GOING TO TAKE A LONG TIME TO GET
THAT RESPONSE.

264
00:12:14,670 --> 00:12:18,319
SO, ASTRONAUTS AND THE GROUND
TEAM THAT SUPPORT THEM ARE GOING

265
00:12:18,319 --> 00:12:20,420
TO NEED TO FIGURE OUT HOW TO
DEAL WITH THOSE TYPE OF

266
00:12:20,420 --> 00:12:21,659
PSYCHOLOGICAL ISSUES.

267
00:12:21,659 --> 00:12:23,779
>> TELL YOU THERE'S TWO BIG
CHALLENGES.

268
00:12:23,779 --> 00:12:26,769
ONE IS THE TRANSPORTATION TO GET
THERE, AND THEN THE SECOND HAS

269
00:12:26,769 --> 00:12:27,769
TO DO WITH HEALTH.

270
00:12:27,769 --> 00:12:31,230
WHEN YOU LOOK AT TRANSPORTATION,
NOW WE'RE GOING 30 MILLION TO

271

00:12:31,230 --> 00:12:34,439
250 MILLION MILES AWAY,
DEPENDING ON HOW THE PLANETS ARE

272
00:12:34,439 --> 00:12:35,439
ALIGNED.

273
00:12:35,439 --> 00:12:37,119
IT'S A LONG TIME TO GET THERE.

274
00:12:37,119 --> 00:12:40,160
IT'S A BIG DISTANCE, SO WE NEED
A VEHICLE THAT CAN GET US THERE.

275
00:12:40,160 --> 00:12:43,850
WHEN YOU TALK ABOUT HEALTH, HOW
ARE WE GOING TO REACT BEING IN

276
00:12:43,850 --> 00:12:46,799
SPACE FOR THAT LONG WITH THE
RADIATION PROBLEM?

277
00:12:46,799 --> 00:12:49,660
AND THEN WE HAVE FOOD, WATER,
ALL THOSE THINGS THAT WE TAKE

278
00:12:49,660 --> 00:12:53,509
FOR GRANTED HERE.

279
00:12:53,509 --> 00:13:02,069
>> WELL, WE ASTRONAUTS IN SPACE
ARE GUINEA PIGS IN A CERTAIN

280
00:13:02,069 --> 00:13:03,069
WAY.

281
00:13:03,069 --> 00:13:07,569
AND ONE OF THE WAYS THAT WE HELP
IN PLANNING THE MARS MISSION IS

282
00:13:07,569 --> 00:13:11,459
ALLOWING THE SCIENTISTS TO LOOK
AT OUR BODY AND SEE WHAT HAPPENS

283
00:13:11,459 --> 00:13:14,129
WHEN YOU STAY IN MICROGRAVITY
FOR A LONG TIME.

284
00:13:14,129 --> 00:13:16,239
>> RIGHT NOW WE HAVE SCOTT KELLY
UP THERE FOR AN ENTIRE YEAR

285
00:13:16,239 --> 00:13:18,310
BECAUSE WE NEED TO PUSH BEYOND
SIX MONTHS IF WE'RE GOING TO

286
00:13:18,310 --> 00:13:20,139
SEND SOMEONE TO MARS.

287
00:13:20,139 --> 00:13:21,920
THEN, WHAT'S GOING ON WITH OUR
MACHINERY?

288
00:13:21,920 --> 00:13:23,040
HOW'S THE RELIABILITY?

289
00:13:23,040 --> 00:13:24,560
HOW'S OUR ENVIRONMENTAL CONTROL
SYSTEM?

290
00:13:24,560 --> 00:13:25,600
IS IT KEEPING US ALIVE?

291
00:13:25,600 --> 00:13:26,639
IS IT BREAKING DOWN?

292
00:13:26,639 --> 00:13:29,019
DO WE NEED SPARE PARTS?

293
00:13:29,019 --> 00:13:31,240
NOW WE'RE LOOKING AT 3D
PRINTING, WHICH WILL HAVE A

294
00:13:31,240 --> 00:13:34,389
GREAT APPLICATION TO GO TO MARS.

295
00:13:34,389 --> 00:13:35,389
SO, EVERYTHING TOGETHER.

296
00:13:35,389 --> 00:13:37,629
IT'S THE HUMAN LIVING, IT'S THE
SCIENTIFIC RESEARCH, IT'S THE

297
00:13:37,629 --> 00:13:39,349
MACHINERY AND THE RELIABILITY.

298
00:13:39,349 --> 00:13:43,249
>> WHETHER IT BE RECYCLING THEIR
URINE INTO DRINKING WATER OR

299
00:13:43,249 --> 00:13:47,799
FINDING WAYS TO BREAK DOWN WATER
INTO HYDROGEN AND OXYGEN TO GIVE

300
00:13:47,799 --> 00:13:54,319
THEM BREATHING MATERIAL AND HOW
TO GROW PLANTS IN SPACE SO THAT,

301
00:13:54,319 --> 00:13:57,609
PERHAPS THEY CAN EAT THEIR
SALADS THAT THEY GROW IN THE

302
00:13:57,609 --> 00:13:58,609
SPACESHIP.

303
00:13:58,609 --> 00:14:01,230
SO, IT'S REALLY IMPORTANT FOR
PEOPLE TO BE FOCUSING ON THE

304
00:14:01,230 --> 00:14:06,259
FUTURE WITH RECYCLING CAPABILITY
AND WAYS TO ELIMINATE THE NEED

305
00:14:06,259 --> 00:14:10,509
TO CARRY BIG, MASSIVE THINGS
INTO SPACE.

306
00:14:10,509 --> 00:14:13,149
>> WE'RE JOINED NOW BY MATT
SHINDELL, A CURATOR AT THE

307
00:14:13,149 --> 00:14:15,470
NATIONAL AIR AND SPACE MUSEUM.

308
00:14:15,470 --> 00:14:17,759
WE'VE BEEN FASCINATED WITH MARS
FOR A LONG TIME.

309
00:14:17,759 --> 00:14:19,579
WHY SUCH A FASCINATION WITH THE
RED PLANET?

310
00:14:19,579 --> 00:14:22,319
>> WELL, I THINK THERE'S AT
LEAST TWO QUESTIONS TO THAT.

311
00:14:22,319 --> 00:14:26,029
YOU KNOW, WHY HAVE WE ALWAYS
REMAINED SO INTERESTED IN MARS?

312
00:14:26,029 --> 00:14:29,389
THE FIRST I THINK IS THAT MARS
HAS DONE A REALLY GOOD JOB OF

313
00:14:29,389 --> 00:14:31,249
HOLDING ON TO ITS SECRETS.

314

00:14:31,249 --> 00:14:34,059
AND THE OTHER IS THAT DURING THE
TIME THAT WE'VE BEEN OBSERVING

315
00:14:34,059 --> 00:14:38,540
IT, OUR IDEA OF WHAT MARS IS HAS
SHIFTED DRAMATICALLY AT LEAST

316
00:14:38,540 --> 00:14:40,480
TWICE, PROBABLY MORE THAN THAT.

317
00:14:40,480 --> 00:14:43,870
I MEAN, KEEP IN MIND THAT THE
EARLIEST OBSERVATIONS OF MARS

318
00:14:43,870 --> 00:14:46,759
WERE DONE JUST WITH THE NAKED
EYE, AND THEY WERE ALSO DONE

319
00:14:46,759 --> 00:14:50,429
DURING A TIME WHEN WE DIDN'T
EVEN REALLY HAVE A CONCEPT THAT

320
00:14:50,429 --> 00:14:52,480
EARTH AND MARS ORBITED THE SUN.

321
00:14:52,480 --> 00:14:56,709
SO, THE MOTIONS OF MARS IN THE
NIGHT SKY, THIS SORT OF STAR

322
00:14:56,709 --> 00:14:59,850
THAT SEEMED TO MOVE, WERE
MYSTERIOUS TO THE EARLY

323
00:14:59,850 --> 00:15:00,850
OBSERVERS.

324
00:15:00,850 --> 00:15:03,449
NOW, IN THE AGE OF THE
TELESCOPE, THAT STARTED TO

325
00:15:03,449 --> 00:15:04,449
CHANGE.

326
00:15:04,449 --> 00:15:08,019
GALILEO LOOKED AT MARS THROUGH
HIS TELESCOPE IN 1610, AND FROM

327
00:15:08,019 --> 00:15:11,560
THEN UP UNTIL THE MID-19th
CENTURY, ASTRONOMERS KEPT

328
00:15:11,560 --> 00:15:16,059
LOOKING THROUGH BIGGER AND
BETTER TELESCOPES AND EVEN BEGAN

329
00:15:16,059 --> 00:15:18,029
MAPPING THE SURFACE OF MARS.

330
00:15:18,029 --> 00:15:20,420
THERE WAS ONE MAIN PROBLEM,
THOUGH, DURING THAT TIME, WHICH

331
00:15:20,420 --> 00:15:23,560
WAS THAT, YOU KNOW, WHEN YOU'RE
LOOKING AT MARS FROM THE EARTH,

332
00:15:23,560 --> 00:15:26,001
YOU HAVE TO LOOK THROUGH THE
EARTH'S ATMOSPHERE, AND THAT

333
00:15:26,001 --> 00:15:29,369
MAKES MARS LOOK BLURRY, PRETTY
MUCH NO MATTER HOW GOOD YOUR

334
00:15:29,369 --> 00:15:30,369
TELESCOPE IS.

335
00:15:30,369 --> 00:15:34,470

NOW, WE'RE IN THE 19th CENTURY,
SO THE BIGGEST SORT OF PROMOTER

336
00:15:34,470 --> 00:15:37,649
OF THE IDEA THAT MARS WAS AN
INTERESTING PLACE, THAT IT MIGHT

337
00:15:37,649 --> 00:15:41,839
BE THE ABODE OF LIFE, WAS AN
ASTRONOMERED IN PERCIVAL LOWELL

338
00:15:41,839 --> 00:15:45,479
WHO CAME FROM A PROMINENT
BOSKONAN FAMILY.

339
00:15:45,479 --> 00:15:48,019
AND LOWELL DECIDED HE WOULD
BUILD AN OBSERVATORY IN

340
00:15:48,019 --> 00:15:51,139
FLAGSTAFF, ARIZONA, WHERE HE
THOUGHT THE ALTITUDE WAS HIGH

341
00:15:51,139 --> 00:15:54,240
ENOUGH AND THE ATMOSPHERE THIN
ENOUGH THAT HE WOULD FINALLY GET

342
00:15:54,240 --> 00:15:57,239
A CLEAR LOOK AT WHAT THE SURFACE
OF MARS LOOKED LIKE.

343
00:15:57,239 --> 00:16:02,149
AND WHAT WE HAVE HERE IS A GLOBE
THAT LOWELL HAD MADE IN 1905,

344
00:16:02,149 --> 00:16:06,009
SHOWING WHAT HE SAW OR THOUGHT
HE SAW THROUGH THE TELESCOPE

345
00:16:06,009 --> 00:16:07,009

WHILE LOOKING AT MARS.

346
00:16:07,009 --> 00:16:09,800
AND YOU CAN SEE IT'S A SYSTEM OF
CANALS.

347
00:16:09,800 --> 00:16:12,629
AND WHAT LOWELL THOUGHT HE WAS
SEEING HERE WAS EVIDENCE OF

348
00:16:12,629 --> 00:16:17,139
EXTRATERRESTRIAL INTELLIGENT
LIFE, BASICALLY, A CIVILIZATION

349
00:16:17,139 --> 00:16:20,629
THAT WAS DEALING WITH AN
ECOLOGICAL CRISIS AND TRYING TO

350
00:16:20,629 --> 00:16:23,859
KEEP THEIR PLANET ALIVE THROUGH,
YOU KNOW, HUGE FEATS OF

351
00:16:23,859 --> 00:16:25,759
ENGINEERING.

352
00:16:25,759 --> 00:16:30,249
SO, LOWELL'S VISION OF MARS
SPARKED, YOU KNOW, A LOT OF

353
00:16:30,249 --> 00:16:32,259
INTEREST IN THE HUMAN
IMAGINATION.

354
00:16:32,259 --> 00:16:35,720
BUT UNFORTUNATELY, HE WASN'T
REALLY SEEING THIS.

355
00:16:35,720 --> 00:16:38,809
AND WE HAVE AN IMAGE FROM
MARINER 4.

356
00:16:38,809 --> 00:16:44,319
IN 1965, NASA SENT MARINER 4 TO
FLY BY MARS, AND WHAT IT SENT

357
00:16:44,319 --> 00:16:48,189
BACK WERE THESE PICTURES OF A
VERY DESOLATE LOOKING MARS,

358
00:16:48,189 --> 00:16:51,089
HEAVILY CRATERED, LIKE OUR
EARTH, AND REALLY LOOKING LIKE

359
00:16:51,089 --> 00:16:55,109
IT MIGHT NOT EACH BE THAT
SCIENTIFICALLY INTERESTING.

360
00:16:55,109 --> 00:16:58,930
BUT THEN WE SENT MARINER 9 IN
1971, AND MARINER 9 WENT INTO

361
00:16:58,930 --> 00:17:00,609
ORBIT AROUND MARS.

362
00:17:00,609 --> 00:17:04,520
IT MAPPED THE SURFACE OF MARS
PHOTOGRAPHICALLY AND SENT BACK

363
00:17:04,520 --> 00:17:06,510
PICTURES OF MUCH MORE
INTERESTING MARS.

364
00:17:06,510 --> 00:17:10,110
IN FACT, WHEN MARINER 9 FIRST
ARRIVED AT MARS, THE WHOLE PLAN

365
00:17:10,110 --> 00:17:13,929
YET WAS COVERED IN A PLANETWIDE
DUST STORM AND THEY COULDN'T SEE

366
00:17:13,929 --> 00:17:17,419
ANYTHING, BUT AS THE DUST STORM
SLOWLY SUBSIDED, IT REVEALED

367
00:17:17,419 --> 00:17:21,069
HUGE VOLCANOS, THE LARGEST
VOLCANO IN THE SOLAR SYSTEM,

368
00:17:21,069 --> 00:17:26,679
OLYMPUS MONS, AND A CANYON
SYSTEM THAT IS ABOUT AS WIDE AS

369
00:17:26,679 --> 00:17:31,080
THE ENTIRE UNITED STATES OF
AMERICA, VALLES MARINERIS, SO IT

370
00:17:31,080 --> 00:17:35,970
WAS A DYNAMIC PLANET BUT VERY
DIFFERENT FROM LOWELL'S VERSION

371
00:17:35,970 --> 00:17:37,559
OF MARS, RIGHT?

372
00:17:37,559 --> 00:17:40,730
IT WAS NO LONGER AS MYSTERIOUS,
BUT IT WAS NOW SORT OF A PUZZLE

373
00:17:40,730 --> 00:17:43,659
WITH ITS OWN GEOLOGIC HISTORY,
AND WE'VE BEEN TRYING TO UNLOCK

374
00:17:43,659 --> 00:17:44,659
THAT EVER SINCE.

375
00:17:44,659 --> 00:17:45,659
>> AWESOME.

376
00:17:45,659 --> 00:17:46,659
WELL, ARE YOU READY FOR A COUPLE

QUESTIONS?

377
00:17:46,659 --> 00:17:47,659
>> SURE.

378
00:17:47,659 --> 00:17:49,720
>> WE HAVE A FRIEND AT SOUTH
VALLEY MIDDLE SCHOOL WITH A

379
00:17:49,720 --> 00:17:50,820
QUESTION.

380
00:17:50,820 --> 00:17:53,730
>> MY NAME IS JULIA, AND MY
QUESTION IS, WHY ARE SO MANY OF

381
00:17:53,730 --> 00:17:56,749
THE SCIENCE FICTION BOOKS BASED
OFF OF MARS?

382
00:17:56,749 --> 00:18:00,150
>> WELL, I THINK THE ANSWER
REALLY LIES, AT LEAST IN PART,

383
00:18:00,150 --> 00:18:04,000
WITH LOWELL AND THAT STORY I WAS
JUST TELLING YOU, THAT THE HUMAN

384
00:18:04,000 --> 00:18:07,400
IMAGINATION WAS REALLY SPARKED
BY THE IDEA THAT THERE COULD BE

385
00:18:07,400 --> 00:18:09,769
LIFE ON MARS, THAT THERE COULD
BE ANOTHER INTELLIGENT

386
00:18:09,769 --> 00:18:14,860
CIVILIZATION NEARBY AND THAT WE
COULD, SOMEHOW, SOME DAY

387
00:18:14,860 --> 00:18:16,259
INTERACT WITH THAT CIVILIZATION.

388
00:18:16,259 --> 00:18:17,710
SO, H.G.

389
00:18:17,710 --> 00:18:20,910
WELLS IN HIS "WAR OF
THE WORLDS," RAY BRADBURY IN HIS

390
00:18:20,910 --> 00:18:24,890
"MARTIAN CHRONICLES," BOTH
AUTHORS IN THEIR WORKS USED THIS

391
00:18:24,890 --> 00:18:29,590
IDEA OF AN ANCIENT MARTIAN
CIVILIZATION THAT WE MIGHT ONE

392
00:18:29,590 --> 00:18:31,389
DAY HAVE TO DEAL WITH IN SOME
WAY.

393
00:18:31,389 --> 00:18:32,389
>> COOL, ALL RIGHT.

394
00:18:32,389 --> 00:18:34,059
WE'VE GOT AN ONLINE QUESTION
NEXT.

395
00:18:34,059 --> 00:18:37,640
DO YOU THINK MARS WILL EVER BE
COLONIZED?

396
00:18:37,640 --> 00:18:40,910
>> THAT'S A VERY DIFFICULT
QUESTION TO ANSWER, AND THE

397
00:18:40,910 --> 00:18:45,310
TRUTH IS THAT MARS IS AN

INCREDIBLY INHOSPITABLE, AND IT

398
00:18:45,310 --> 00:18:49,290
WOULD TAKE A GREAT DEAL OF
RESOURCES TO MAKE IT HOSPITABLE.

399
00:18:49,290 --> 00:18:53,350
SO, IF WE EVER DO COLONIZE IT,
IT WOULD BE IN A VERY LIMITED

400
00:18:53,350 --> 00:18:55,520
WAY, PROBABLY IN SOME KIND OF
SELF-CONTAINED ENVIRONMENT.

401
00:18:55,520 --> 00:18:56,520
>> OKAY.

402
00:18:56,520 --> 00:18:58,780
WE'VE GOT AN AUDIENCE QUESTION
NEXT.

403
00:18:58,780 --> 00:19:02,039
>> WHAT IS YOUR FAVORITE MARS
SCI-FI?

404
00:19:02,039 --> 00:19:04,529
>> I THINK FOR THIS TIME OF
YEAR, BECAUSE IT'S OCTOBER AND

405
00:19:04,529 --> 00:19:07,120
HALLOWEEN IS COMING UP, RAY
BRADBURY'S "THE MARTIAN

406
00:19:07,120 --> 00:19:10,010
CHRONICLES" IS PROBABLY MY
FAVORITE PIECE OF MARTIAN

407
00:19:10,010 --> 00:19:11,010
SCI-FI.

408
00:19:11,010 --> 00:19:15,440
IT EVEN INCLUDES A SORT OF
RETELLING OF EDGAR ALLAN POE'S

409
00:19:15,440 --> 00:19:18,990
"FALL OF THE HOUSE OF USHER"
USING ROBOTS AND A MECHANICAL

410
00:19:18,990 --> 00:19:20,159
HAUNTED HOUSE.

411
00:19:20,159 --> 00:19:23,159
SO, FOR THIS SEASON, THAT WOULD
DEFINITELY BE MY CHOICE.

412
00:19:23,159 --> 00:19:24,159
>> AWESOME.

413
00:19:24,159 --> 00:19:26,130
THANK YOU SO MUCH FOR TALKING
WITH US ABOUT OUR FASCINATION

414
00:19:26,130 --> 00:19:28,549
WITH MARS THROUGHOUT HISTORY,
BUT LET'S GO BACK OVER TO BETH

415
00:19:28,549 --> 00:19:30,620
AND JOHN AND LEARN MORE ABOUT
MARS TODAY.

416
00:19:30,620 --> 00:19:31,620
>> GREAT.

417
00:19:31,620 --> 00:19:36,130
>> SO, JOHN, WHERE ARE ALL OF
THESE ROBOTS THAT WE'VE PUT ON

418
00:19:36,130 --> 00:19:37,130
MARS?

419
00:19:37,130 --> 00:19:39,380
>> WELL, THE ONES THAT HAVE
LANDED ON MARS ARE IN DIFFERENT

420
00:19:39,380 --> 00:19:42,360
LOCATIONS, DEPENDING ON WHAT THE
GOAL OF THE MISSION WAS.

421
00:19:42,360 --> 00:19:45,889
THE MAP THAT YOU SEE HERE SHOWS,
FOR EXAMPLE, WHERE OUR ROVERS

422
00:19:45,889 --> 00:19:48,789
ARE, OPPORTUNITY AND SPIRIT, THE
MARS EXPLORATION ROVERS.

423
00:19:48,789 --> 00:19:51,600
THEY WERE REALLY GOING AFTER
UNDERSTANDING THE ROLE OF WATER

424
00:19:51,600 --> 00:19:54,110
IN SHAPING THE SURFACE OF MARS.

425
00:19:54,110 --> 00:19:56,929
CURIOSITY'S KIND OF BETWEEN THE
TWO, AND IT'S THE SORT OF BIG

426
00:19:56,929 --> 00:19:59,120
SISTER, IF YOU WILL, THAT'S
REALLY GOING AFTER THE QUESTION

427
00:19:59,120 --> 00:20:00,989
OF WHETHER MARS MIGHT HAVE BEEN
HABITABLE.

428
00:20:00,989 --> 00:20:03,720
>> NOW, WHAT DID SPIRIT AND
OPPORTUNITY FIND THAT WAS

429
00:20:03,720 --> 00:20:05,250
PARTICULARLY INTERESTING?

430
00:20:05,250 --> 00:20:07,929
>> WELL, STARTING WITH SPIRIT,
WE LANDED IN A PLACE CALLED

431
00:20:07,929 --> 00:20:09,289
GUSEV CRATER.

432
00:20:09,289 --> 00:20:12,490
AND AFTER DRIVING FOR A WHILE,
DISCOVERED THESE LAYERED ROCKS

433
00:20:12,490 --> 00:20:15,759
THAT ALSO SHOW THROUGH THEIR
CHEMISTRY AND THEIR FORM THAT

434
00:20:15,759 --> 00:20:18,590
THEY WERE ACTUALLY IN PLACE
DURING A VOLCANIC ERUPTION

435
00:20:18,590 --> 00:20:22,590
THROUGH SEDIMENTS THAT WERE AT
LEAST FOR SOME TIME WET.

436
00:20:22,590 --> 00:20:25,839
>> AND HOW LONG HAVE THESE BEEN
RUNNING?

437
00:20:25,839 --> 00:20:26,879
>> THEY'VE BEEN RUNNING A LONG
TIME.

438
00:20:26,879 --> 00:20:30,110
FOR EXAMPLE, SPIRIT WAS GOING
FOR A LONG TIME, SUCH THAT ONE

439
00:20:30,110 --> 00:20:32,920

OF THE SIX WHEELS STOPPED
WORKING AND WE WERE DRAGGING IT,

440
00:20:32,920 --> 00:20:35,799
AND THAT TURNED OUT TO BE SORT
OF A LEMONADE OUT OF LEMONS

441
00:20:35,799 --> 00:20:38,500
SITUATION, WHERE AS YOU CAN SEE
FROM THIS BRIGHT WHITE STREAK

442
00:20:38,500 --> 00:20:42,080
HERE, AS THE WHEEL WAS SCRAPING
ACROSS THE SURFACE, GETTING THE

443
00:20:42,080 --> 00:20:45,120
DUST OUT OF THE WAY, WE FOUND
THIS MATERIAL CALLED SILICA, AND

444
00:20:45,120 --> 00:20:49,250
THAT SILICA WAS IN PLACE IN A
STEAM VENT OR MAYBE EVEN SOME

445
00:20:49,250 --> 00:20:52,029
SORT OF FUMEROL AROUND A
VOLCANIC CENTER, LIKE I SHOWED

446
00:20:52,029 --> 00:20:55,170
YOU BEFORE, AND SHOWED THIS
PLACE MIGHT HAVE BEEN ONCE LIKE

447
00:20:55,170 --> 00:21:00,120
A MINIATURE SORT OF YELLOWSTONE,
HOT AND WET AND, PERHAPS, MAYBE

448
00:21:00,120 --> 00:21:01,120
HABITABLE.

449
00:21:01,120 --> 00:21:02,820
>> AND IS OPPORTUNITY STILL

RUNNING?

450
00:21:02,820 --> 00:21:05,330
>> OPPORTUNITY, AFTER
11†1/2-PLUS YEARS, IS STILL

451
00:21:05,330 --> 00:21:06,679
CRANKING ALONG.

452
00:21:06,679 --> 00:21:07,920
HERE'S A VIEW LOOKING BACK.

453
00:21:07,920 --> 00:21:10,140
YOU CAN SEE OUR TRACKS FADING IN
THE DISTANCE.

454
00:21:10,140 --> 00:21:13,100
AS WE'VE BEEN DRIVING ALONG, THE
RIM OF A VERY LARGE CRATER

455
00:21:13,100 --> 00:21:15,940
CALLED ENDEAVOR CRATER, TRYING
TO UNDERSTAND THE ANCIENT

456
00:21:15,940 --> 00:21:17,729
GEOLOGY OF MARS.

457
00:21:17,729 --> 00:21:20,330
>> NOW, HOW LONG WERE THEY
SUPPOSED TO RUN?

458
00:21:20,330 --> 00:21:23,120
>> THEY WERE SUPPOSED TO LAST
ABOUT THREE MONTHS, 90 SOLS,

459
00:21:23,120 --> 00:21:26,070
WHICH IS JUST A LITTLE BIT
LONGER THAN 90 EARTH DAYS.

460

00:21:26,070 --> 00:21:29,570
BUT AS YOU CAN SEE, WE'VE BEEN
TRAVERSING VERY INCREDIBLE

461
00:21:29,570 --> 00:21:30,570
TERRAIN.

462
00:21:30,570 --> 00:21:32,409
THIS IS STILL ON THE RIM OF
ENDEAVOR CRATER.

463
00:21:32,409 --> 00:21:34,620
THIS IS A PLACE CALLED MARATHON
VALLEY.

464
00:21:34,620 --> 00:21:37,240
AND IF YOU LOOK CAREFULLY, YOU
CAN SEE COLOR VARIATIONS WITHIN

465
00:21:37,240 --> 00:21:41,259
THE VALLEY THAT WE THINK ARE
SOMEHOW RELATED TO OCCURRENCE OF

466
00:21:41,259 --> 00:21:44,710
CLAY THAT WE SEE FROM ORBIT THAT
TELLS US THAT WATER WAS HERE FOR

467
00:21:44,710 --> 00:21:48,630
AN EXTENDED PERIOD AND THAT THAT
WATER EXISTED IN A FORM THAT

468
00:21:48,630 --> 00:21:52,070
WASN'T TOO ACIDIC, WASN'T TOO
BASIC, BUT MAYBE JUST RIGHT AND

469
00:21:52,070 --> 00:21:55,370
MIGHT BE, AGAIN, REPRESENTING
THE SORT OF HABITABLE CONDITIONS

470
00:21:55,370 --> 00:21:56,919

EARLY IN MARS' HISTORY.

471
00:21:56,919 --> 00:22:00,029
>> AND CURIOSITY'S DOING
SOMETHING DIFFERENT.

472
00:22:00,029 --> 00:22:02,680
>> CURIOSITY'S BUILDING ON THE
RESULTS OF THE MARS EXPLORATION

473
00:22:02,680 --> 00:22:05,440
ROVERS AND REALLY GOING AFTER
HABITABILITY.

474
00:22:05,440 --> 00:22:07,720
FOR EXAMPLE, WHAT YOU SEE HERE
IN THIS SLIDE ARE A BUNCH OF

475
00:22:07,720 --> 00:22:10,679
LAYERED ROCKS THAT ARE
SEDIMENTARY ROCKS THAT IN THIS

476
00:22:10,679 --> 00:22:14,559
CASE WE KNOW NOW FROM
EXPLORATION WERE DEPOSITED AS

477
00:22:14,559 --> 00:22:19,110
WATER DRAINED DOWN THE WALL OF
THE LARGE CRATER THAT WE WERE IN

478
00:22:19,110 --> 00:22:22,700
AND DEPOSITED THEM AS SEDIMENTS
FLOWING INTO A LAKE, AND THE

479
00:22:22,700 --> 00:22:26,009
LAYERED ROCKS THAT YOU SEE HERE
NOW WE'RE CURRENTLY EXPLORING

480
00:22:26,009 --> 00:22:29,090
AND TRYING TO UNDERSTAND WHAT

THEY REPRESENT ABOUT A CHANGE IN

481
00:22:29,090 --> 00:22:32,850
ENVIRONMENT FROM THAT EARLY LAKE
ENVIRONMENT WITHIN GALE CRATER.

482
00:22:32,850 --> 00:22:34,059
>> SHOULD WE TAKE SOME
QUESTIONS?

483
00:22:34,059 --> 00:22:35,059
>> LET'S DO.

484
00:22:35,059 --> 00:22:36,480
>> LET'S TAKE SOME QUESTIONS.

485
00:22:36,480 --> 00:22:39,850
>> MY NAME'S RILEY, AND MY
QUESTION IS, WHY IS MARS RED?

486
00:22:39,850 --> 00:22:41,760
>> WHY IS MARS RED?

487
00:22:41,760 --> 00:22:43,480
>> MARS IS RED BECAUSE IT'S
RUSTIC.

488
00:22:43,480 --> 00:22:45,090
I GREW UP IN NORTHERN NEW YORK.

489
00:22:45,090 --> 00:22:48,120
IT SHOWED A LOT AND THEY USED TO
PUT SALT ON THE ROADS AND MY CAR

490
00:22:48,120 --> 00:22:49,279
WOULD RUST.

491
00:22:49,279 --> 00:22:52,100
AND THE SAME THING IS HAPPENING

TO THE IRON MINERALS IN THE

492
00:22:52,100 --> 00:22:53,100
ROCKS ON MARS.

493
00:22:53,100 --> 00:22:54,100
THEY'RE RUSTING.

494
00:22:54,100 --> 00:22:55,370
AND THAT'S WHAT GIVES IT ITS
REDDISH COLOR.

495
00:22:55,370 --> 00:22:58,529
>> AND WE HAVE AN ONLINE
QUESTION.

496
00:22:58,529 --> 00:23:02,220
HOW LONG DOES IT TAKE TO TRAVEL
TO MARS?

497
00:23:02,220 --> 00:23:03,639
>> IT TAKES MONTHS.

498
00:23:03,639 --> 00:23:07,950
AND EVEN WHEN MARS IS AS CLOSE
TO THE EARTH AS IT CAN BE, AS WE

499
00:23:07,950 --> 00:23:11,299
HEARD FROM OUR ASTRONAUTS
EARLIER, THIS IS NOT A TRIP THAT

500
00:23:11,299 --> 00:23:14,330
IS FOR THE FAINT OF HEART OR FOR
THE IMPATIENT.

501
00:23:14,330 --> 00:23:17,820
IT'S A LONG, LONG WAYS AWAY,
TENS OF MILLIONS OF MILES, AND

502

00:23:17,820 --> 00:23:21,380
IT TAKES ANYWHERE FROM, YOU
KNOW, SIX TO PERHAPS NINE OR TEN

503
00:23:21,380 --> 00:23:22,380
MONTHS.

504
00:23:22,380 --> 00:23:25,690
>> AND WE HAVE ONE OF OUR
AUDIENCE MEMBERS HAS A QUESTION

505
00:23:25,690 --> 00:23:26,690
FOR YOU.

506
00:23:26,690 --> 00:23:34,629
>> MY NAME IS ROSHONDA, AND MY
QUESTION IS, HOW DO YOU KNOW

507
00:23:34,629 --> 00:23:37,150
WHAT ROCKS ON MARS ARE MADE OF?

508
00:23:37,150 --> 00:23:41,179
>> HOW DO YOU KNOW WHAT ROCKS ON
MARS ARE MADE OF?

509
00:23:41,179 --> 00:23:42,600
>> WE DO A COUPLE OF DIFFERENT
THINGS.

510
00:23:42,600 --> 00:23:45,759
WE ACTUALLY ANALYZE THE ROCKS
DIRECTLY TO UNDERSTAND WHAT'S

511
00:23:45,759 --> 00:23:46,759
WITHIN THEM.

512
00:23:46,759 --> 00:23:49,279
WE TAKE SAMPLES WITH CURIOSITY
AND DO THAT.

513
00:23:49,279 --> 00:23:51,799
BUT WE ALSO DO IT THROUGH
SOMETHING CALLED REMOTE SENSING,

514
00:23:51,799 --> 00:23:54,879
WHERE WE USE CAMERAS AND OTHER
INSTRUMENTS THAT LOOK AT

515
00:23:54,879 --> 00:23:58,440
DIFFERENT WAVE LENGTHS OF LIGHT
AND CAN TELL HOW THE DIFFERENT

516
00:23:58,440 --> 00:24:01,700
COMPOSITIONS REFLECT LIGHT
DIFFERENTLY, JUST LIKE MY HAND

517
00:24:01,700 --> 00:24:03,370
IS A DIFFERENT COLOR THAN THIS
WOOD.

518
00:24:03,370 --> 00:24:06,330
THERE'S INFORMATION THERE ABOUT
WHAT THOSE DIFFERENT THINGS ARE

519
00:24:06,330 --> 00:24:07,330
MADE OF.

520
00:24:07,330 --> 00:24:09,899
>> LET'S TAKE ANOTHER VIDEO
QUESTION.

521
00:24:09,899 --> 00:24:12,200
>> MY NAME'S DESTINY AND MY
QUESTION IS, HOW LONG IS A DAY

522
00:24:15,359 --> 00:24:14,000
ON MARS?

523
00:24:15,359 --> 00:24:18,370

>> WELL, AT FIRST GLANCE, IT'S
ABOUT THE SAME AS AN EARTH DAY,

524
00:24:18,370 --> 00:24:20,870
BUT IT'S ACTUALLY ABOUT 40
MINUTES LONGER, AND THAT REALLY

525
00:24:20,870 --> 00:24:23,459
MESSES WITH YOU WHEN YOU'RE
TRYING TO WORK ON MARS TIME.

526
00:24:23,459 --> 00:24:25,039
>> DO YOU WORK ON MARS TIME?

527
00:24:25,039 --> 00:24:26,100
>> USED TO WORK ON MARS TIME.

528
00:24:26,100 --> 00:24:28,539
WHEN THESE MISSIONS FIRST
STARTED OPERATING ON THE SURFACE

529
00:24:28,539 --> 00:24:30,590
FOR THREE OR FOUR MONTHS, WE
DID.

530
00:24:30,590 --> 00:24:33,879
BUT THE PROBLEM IS, EVERY TWO
WEEKS, YOU GO THROUGH A WHOLE

531
00:24:33,879 --> 00:24:35,510
CYCLE OF AN EARTH DAY.

532
00:24:35,510 --> 00:24:39,889
YOU MIGHT START ON THE FIRST DAY
AT 8:00 A.M., BUT A WEEK LATER,

533
00:24:39,889 --> 00:24:41,370
YOU'RE AT 8:00 P.M.

534

00:24:41,370 --> 00:24:42,370
AT NIGHT.

535
00:24:42,370 --> 00:24:43,370
>> THAT DOESN'T SOUND LIKE A LOT
OF FUN.

536
00:24:43,370 --> 00:24:45,230
>> IT'S NOT A LOT OF FUN,
BECAUSE IT'S NOT LIKE GETTING ON

537
00:24:45,230 --> 00:24:47,429
A PLANE AND GETTING OFF SIX
HOURS LATER AND BEING

538
00:24:47,429 --> 00:24:48,429
JET-LAGGED.

539
00:24:48,429 --> 00:24:51,140
IT CHANGES EVERY SINGLE DAY.

540
00:24:51,140 --> 00:24:55,399
>> WELL, WE ARE DOING RESEARCH
TO GET US TO MARS, AND WE

541
00:24:55,399 --> 00:24:59,139
VISITED NASA HEADQUARTERS, WHERE
THEY HAVE SOMETHING REALLY COOL

542
00:24:59,139 --> 00:25:00,139
THAT WE SHOULD TAKE A LOOK AT.

543
00:25:00,139 --> 00:25:01,330
>> LET'S DO.

544
00:25:01,330 --> 00:25:04,110
>> I'M HERE AT NASA HEADQUARTERS
AND I'M JOINED BY MARSHALL

545

00:25:04,110 --> 00:25:05,110
PORTERFIELD.

546
00:25:05,110 --> 00:25:07,639
NOW, WE'RE STANDING IN FRONT OF
VEGGIE, THE VEGETABLE PRODUCTION

547
00:25:07,639 --> 00:25:08,639
SYSTEM.

548
00:25:08,639 --> 00:25:09,799
CAN YOU TELL ME ABOUT THIS?

549
00:25:09,799 --> 00:25:13,249
>> THIS IS A DEMONSTRATION UNIT,
A MOCK-UP OF THE EXACT HARDWARE

550
00:25:13,249 --> 00:25:15,730
SYSTEM THAT'S OPERATIONAL RIGHT
NOW ON THE INTERNATIONAL SPACE

551
00:25:15,730 --> 00:25:16,730
STATION.

552
00:25:16,730 --> 00:25:18,510
WE'RE USING IT RIGHT NOW TO
DEMONSTRATE OUR ABILITY TO GROW

553
00:25:18,510 --> 00:25:21,830
PLANTS IN SPACE AND ALSO PRODUCE
VEGETABLE CROPS, WHICH CAN BE

554
00:25:21,830 --> 00:25:23,080
USED TO FEED THE CREW.

555
00:25:23,080 --> 00:25:25,610
>> NOW, THE LIGHT IN HERE IS
VERY WEIRD LOOKING.

556

00:25:25,610 --> 00:25:26,610
WHY IS THAT?

557
00:25:26,610 --> 00:25:31,110
>> WELL, THIS IS AN EXAMPLE OF
EFFICIENCY FOR SPACE FLIGHT

558
00:25:31,110 --> 00:25:32,290
HARDWARE.

559
00:25:32,290 --> 00:25:36,860
SO, WE'RE USING RED AND BLUE
LIGHT TO FEED PHOTOSYNTHETIC

560
00:25:36,860 --> 00:25:38,210
LIGHT TO THE PLANTS.

561
00:25:38,210 --> 00:25:41,120
AND IT'S DESIGNED VERY PRECISELY
TO FEED THE WAVE LENGTH OF THE

562
00:25:41,120 --> 00:25:44,820
LIGHT THAT THE PLANTS REQUIRE
FOR PHOTOSYNTHESIS ONLY AS

563
00:25:44,820 --> 00:25:47,910
OPPOSED TO WHITE LIGHT, WHICH
WOULD INCLUDE GREEN WAVE

564
00:25:47,910 --> 00:25:50,769
LENGTHS, WHICH WOULD SIMPLY
BOUNCE OFF, BE REFLECTED BACK

565
00:25:50,769 --> 00:25:52,070
OFF THE PLANT.

566
00:25:52,070 --> 00:25:55,840
SO, IT'S AN EXAMPLE OF
ELECTRICAL EFFICIENCY AND

567
00:25:55,840 --> 00:25:56,840
PHOTOSYNTHESIS.

568
00:25:56,840 --> 00:25:58,890
>> SO, THAT'S WHY THE PLANTS IN
THERE LOOK KIND OF DULL, RATHER

569
00:25:58,890 --> 00:26:01,769
THAN THE BRIGHT GREEN WE'RE USED
TO WHEN WE SEE PLANTS.

570
00:26:01,769 --> 00:26:03,230
>> THAT'S WHY.

571
00:26:03,230 --> 00:26:05,390
THERE'S NO GREEN PHOTONS BEING
WASTED.

572
00:26:05,390 --> 00:26:06,390
>> AWESOME.

573
00:26:06,390 --> 00:26:09,059
NOW, HOW IS THIS A STEP TOWARDS
A FUTURE TRIP TO MARS?

574
00:26:09,059 --> 00:26:11,370
>> WELL, WE REALLY WANTED TO
DEMONSTRATE OUR ABILITY TO GROW

575
00:26:11,370 --> 00:26:12,370
VEGETABLE CROP.

576
00:26:12,370 --> 00:26:16,450
WE WANTED TO ALSO DEMONSTRATE
THAT THE PLANTS THAT WE DO

577
00:26:16,450 --> 00:26:20,950
PRODUCE ARE HEALTHY AND ARE FREE
OF PATHOGENS IN A SPACE FLIGHT

578
00:26:20,950 --> 00:26:22,120
ENVIRONMENT.

579
00:26:22,120 --> 00:26:24,940
THIS DEMONSTRATES OUR ABILITY TO
BE ABLE TO GROW THOSE TYPES OF

580
00:26:24,940 --> 00:26:28,120
CROP, WHICH ARE GOING TO BE
IMPORTANT IN LONG-DURATION HUMAN

581
00:26:28,120 --> 00:26:31,750
MISSIONS, NOT ONLY FOR THE
PLANTS TO PRODUCE NUTRITIOUS

582
00:26:31,750 --> 00:26:36,610
FOOD, RECYCLE THE ATMOSPHERE,
PRODUCE CO2 AND OXYGEN, BUT ALSO

583
00:26:36,610 --> 00:26:40,710
FOR THE PSYCHOLOGICAL COMFORT OF
HAVING A PIECE OF HOME.

584
00:26:40,710 --> 00:26:43,460
WE RECENTLY GREW A CROP OF
LETTUCE ON THE INTERNATIONAL

585
00:26:43,460 --> 00:26:46,090
SPACE STATION AND WE PROVIDED
THE CREW WITH A LITTLE BIT OF

586
00:26:46,090 --> 00:26:50,030
VINAIGRETTE SALAD DRESSING, AND
THEY SAY THAT THEY ENJOYED THAT

587
00:26:50,030 --> 00:26:51,070
EXPERIENCE QUITE A BIT.

588

00:26:51,070 --> 00:26:52,070
>> AWESOME.

589
00:26:52,070 --> 00:26:53,190
WELL, THANK YOU SO MUCH FOR
TALKING WITH US.

590
00:26:53,190 --> 00:26:54,379
>> NO PROBLEM.

591
00:26:54,379 --> 00:26:58,700
>> WELL, IT LOOKS LIKE WE STILL
HAVE A LOT OF WORK BEFORE WE GET

592
00:26:58,700 --> 00:27:00,280
TO MARS.

593
00:27:00,280 --> 00:27:01,840
>> BUT WE ARE HEADED IN THE
RIGHT DIRECTION.

594
00:27:01,840 --> 00:27:02,840
>> MAYBE THEY'LL MAKE IT.

595
00:27:02,840 --> 00:27:04,649
MAYBE WE'LL SEE SOME OF OUR
FRIENDS UP THERE.

596
00:27:04,649 --> 00:27:05,649
>> MAYBE THEY'LL MAKE IT.

597
00:27:05,649 --> 00:27:09,249
>> THANK YOU SO MUCH FOR TELLING
US ABOUT YOUR WORK ON

598
00:27:09,249 --> 00:27:10,249
RESEARCHING MARS.

599
00:27:10,249 --> 00:27:11,389

>> THANK YOU, BETH, FOR HAVING
ME.

600
00:27:11,389 --> 00:27:15,039
>> NOW, NEXT MONTH, ON NOVEMBER
18th, WE WILL BE LOOKING AT 15

601
00:27:15,039 --> 00:27:17,179
YEARS ON THE INTERNATIONAL SPACE
STATION.

602
00:27:17,179 --> 00:27:18,519
CHECK THIS OUT.

603
00:27:18,519 --> 00:27:23,200
>> CHECK THIS OUT!

604
00:27:23,200 --> 00:27:24,710
THAT'S BUZZ LIGHTYEAR!

605
00:27:24,710 --> 00:27:26,480
BUT NOT ANY BUZZ LIGHTYEAR.

606
00:27:26,480 --> 00:27:30,590
THIS GUY SPENT 15 MONTHS ABOARD
THE INTERNATIONAL SPACE STATION

607
00:27:30,590 --> 00:27:34,740
250 MILES UP, AND HE DIDN'T JUST
GO ALONG FOR THE RIDE.

608
00:27:34,740 --> 00:27:37,710
HE WAS UP THERE HELPING WITH
MICROGRAVITY EXPERIENCE.

609
00:27:37,710 --> 00:27:40,320
THIS GUY'S ON DISPLAY AT THE
"MOVING BEYOND EARTH" GALLERY AT

610

00:27:40,320 --> 00:27:43,330
THE NATIONAL AIR AND SPACE
MUSEUM IN WASHINGTON, D.C.

611
00:27:43,330 --> 00:27:45,750
AND IF YOU THINK THIS IS
INTERESTING, BE SURE TO CHECK

612
00:27:45,750 --> 00:27:49,900
OUT "STEM IN 30."

613
00:27:49,900 --> 00:27:53,020
>> WELL, WE WANT TO THANK
EVERYBODY FOR WATCHING TODAY,

614
00:27:53,020 --> 00:27:55,809
AND WE WANT TO THANK NASA FOR
SPONSORING US, AND WE WANT TO

615
00:27:55,809 --> 00:27:56,809
THANK OUR FRIENDS HERE.