
PAO
ISS D/L 3 LOS
NASA
SPACESTATION
LIVE

1
00:00:09,750 --> 00:00:08,150
so a lot of science done every day on

2
00:00:12,390 --> 00:00:09,760
board the international space station a

3
00:00:14,470 --> 00:00:12,400
lot done in the year 2015 when two crew

4
00:00:16,230 --> 00:00:14,480
members scott kelly mikhail kornienko

5
00:00:17,590 --> 00:00:16,240
spent an entire year on board the

6
00:00:20,230 --> 00:00:17,600
station and they're set to come home in

7
00:00:21,510 --> 00:00:20,240
about two weeks joining me today here in

8
00:00:22,870 --> 00:00:21,520
mission control one of the brilliant

9
00:00:24,470 --> 00:00:22,880
minds that helps get a lot of that

10
00:00:26,390 --> 00:00:24,480
science done on board the orbiting

11
00:00:28,470 --> 00:00:26,400
laboratory julie robinson the chief

12
00:00:30,390 --> 00:00:28,480
scientist for the international space

13
00:00:31,990 --> 00:00:30,400

station program julie first off thanks

14
00:00:33,670 --> 00:00:32,000
so much for joining me today it's always

15
00:00:35,350 --> 00:00:33,680
great to kind of dig in your head and

16
00:00:37,030 --> 00:00:35,360
see what's going on behind the scenes to

17
00:00:39,430 --> 00:00:37,040
get all this work done

18
00:00:41,430 --> 00:00:39,440
and i want to jump right in if i can so

19
00:00:43,510 --> 00:00:41,440
scott and mikhail getting ready to come

20
00:00:45,270 --> 00:00:43,520
home in just about two weeks

21
00:00:47,110 --> 00:00:45,280
give an overview of just some of the

22
00:00:48,549 --> 00:00:47,120
stuff they've been doing during this

23
00:00:50,709 --> 00:00:48,559
year in space like how many

24
00:00:53,110 --> 00:00:50,719
investigations have they been you know

25
00:00:55,430 --> 00:00:53,120
kind of hands-on with even an estimate

26
00:00:56,790 --> 00:00:55,440
just over the last year yeah well over

27
00:00:58,869 --> 00:00:56,800
the course of the last year they've

28
00:01:01,270 --> 00:00:58,879
either touched or enabled

29
00:01:03,750 --> 00:01:01,280
scott probably about 340 different

30
00:01:05,270 --> 00:01:03,760
investigations there have been about 450

31
00:01:07,270 --> 00:01:05,280
that have gone on in some way shape or

32
00:01:10,070 --> 00:01:07,280
form over that last year so it's an

33
00:01:11,590 --> 00:01:10,080
incredibly busy place if you ask scott

34
00:01:12,710 --> 00:01:11,600
to tell you all the experiments he did

35
00:01:14,630 --> 00:01:12,720
he won't be able to remember that

36
00:01:16,230 --> 00:01:14,640
there's so many going on

37
00:01:18,550 --> 00:01:16,240
it'd be a heck of a final exam for him

38
00:01:20,070 --> 00:01:18,560

to try and list all those i bet but uh

39
00:01:22,149 --> 00:01:20,080
so i mean that's just the science that's

40
00:01:24,870 --> 00:01:22,159
been taking place on board

41
00:01:26,310 --> 00:01:24,880
it's not done once they leave is it like

42
00:01:28,469 --> 00:01:26,320
once they come home there's still a lot

43
00:01:30,390 --> 00:01:28,479
of work to do yeah to some extent the

44
00:01:32,149 --> 00:01:30,400
crew members themselves are part of the

45
00:01:34,310 --> 00:01:32,159
experiment not just operators of some of

46
00:01:36,789 --> 00:01:34,320
the experiments so a number of different

47
00:01:38,710 --> 00:01:36,799
measures have been taken of their bodies

48
00:01:41,270 --> 00:01:38,720
to understand the differences that

49
00:01:43,830 --> 00:01:41,280
happen to you when you go into space and

50
00:01:45,590 --> 00:01:43,840
especially to design ways to intervene

51
00:01:48,550 --> 00:01:45,600
and keep that from happening so that in

52
00:01:50,069 --> 00:01:48,560
the future explorers to mars

53
00:01:52,230 --> 00:01:50,079
will get there healthy and be able to do

54
00:01:54,069 --> 00:01:52,240
a successful mission but the really neat

55
00:01:55,670 --> 00:01:54,079
thing is that when we learn about those

56
00:01:56,870 --> 00:01:55,680
special things in the space environment

57
00:01:58,230 --> 00:01:56,880
some of that knowledge gives us

58
00:01:59,749 --> 00:01:58,240
something we wouldn't have learned here

59
00:02:01,270 --> 00:01:59,759
on earth and we bring that back home and

60
00:02:03,429 --> 00:02:01,280
that can make our lives better here as

61
00:02:05,030 --> 00:02:03,439
well all right and so they're set to

62
00:02:07,670 --> 00:02:05,040
come home in two weeks

63
00:02:09,669 --> 00:02:07,680

scott kelly mikhail kornienko so let's i

64
00:02:11,910 --> 00:02:09,679
mean let's talk specifically about scott

65
00:02:13,910 --> 00:02:11,920
kelly once he comes home

66
00:02:15,589 --> 00:02:13,920
he's still given that data for those

67
00:02:17,750 --> 00:02:15,599
experiments on his body right how long

68
00:02:19,910 --> 00:02:17,760
is that going to continue right so um

69
00:02:21,910 --> 00:02:19,920
there's a set of windows of research

70
00:02:22,869 --> 00:02:21,920
data that's collected the first data

71
00:02:24,869 --> 00:02:22,879
will actually

72
00:02:26,470 --> 00:02:24,879
be collected right there in kazakhstan

73
00:02:28,070 --> 00:02:26,480
after scott and misha land and that's

74
00:02:30,390 --> 00:02:28,080
for a joint study we have with our

75
00:02:33,030 --> 00:02:30,400
russian investigators called field test

76
00:02:34,949 --> 00:02:33,040
okay they'll be going through a variety

77
00:02:36,710 --> 00:02:34,959
of different tasks that look a lot like

78
00:02:39,190 --> 00:02:36,720
what you might have to do if you had

79
00:02:41,750 --> 00:02:39,200
just landed on the surface of mars and

80
00:02:42,949 --> 00:02:41,760
needed to connect to a habitat maybe

81
00:02:44,869 --> 00:02:42,959
they've been pre-positioned and there's

82
00:02:46,790 --> 00:02:44,879
no one there to help you they'll climb

83
00:02:49,030 --> 00:02:46,800
ladders they'll connect

84
00:02:50,869 --> 00:02:49,040
kind of valves and tubing they may do

85
00:02:52,150 --> 00:02:50,879
some programming they'll look at what

86
00:02:53,910 --> 00:02:52,160
would happen if you fell down and had to

87
00:02:55,509 --> 00:02:53,920
get back up by yourself and then

88
00:02:57,990 --> 00:02:55,519

scientists use all of those measurements

89
00:02:59,430 --> 00:02:58,000
to help determine if their balance and

90
00:03:00,949 --> 00:02:59,440
all of those different countermeasures

91
00:03:02,710 --> 00:03:00,959
that we're doing to help them recover

92
00:03:05,190 --> 00:03:02,720
from being in space would be suitable

93
00:03:07,030 --> 00:03:05,200
for the surface of mars okay but then

94
00:03:08,869 --> 00:03:07,040
after that there's a series of blood

95
00:03:09,910 --> 00:03:08,879
tests the crew members will start moving

96
00:03:12,229 --> 00:03:09,920
around they'll do their press

97
00:03:13,750 --> 00:03:12,239
conferences and we have different

98
00:03:16,390 --> 00:03:13,760
measurements that continue out they can

99
00:03:17,910 --> 00:03:16,400
go out as far as three years three years

100
00:03:20,630 --> 00:03:17,920
depending on if the crew members have

101
00:03:22,550 --> 00:03:20,640
lost bone what we found is that um it

102
00:03:24,710 --> 00:03:22,560
can take up to three years to recover

103
00:03:26,470 --> 00:03:24,720
base bone mass density also what's

104
00:03:28,229 --> 00:03:26,480
happening is the bones are remodeling so

105
00:03:29,830 --> 00:03:28,239
the structure inside the bone and

106
00:03:32,149 --> 00:03:29,840
outside the bone is different than when

107
00:03:34,710 --> 00:03:32,159
they launched it may be thicker on the

108
00:03:36,869 --> 00:03:34,720
outside more porous on the inside so to

109
00:03:38,710 --> 00:03:36,879
watch that process takes it takes about

110
00:03:40,630 --> 00:03:38,720
three years it sounds like no rest for

111
00:03:42,630 --> 00:03:40,640
the weary so fortunately they'll have a

112
00:03:45,030 --> 00:03:42,640
lot of time in between to do things as

113
00:03:46,789 --> 00:03:45,040

as we wait to take those final

114
00:03:48,550 --> 00:03:46,799
baseline data collection measure okay

115
00:03:51,509 --> 00:03:48,560
well to change gears a little bit so

116
00:03:53,030 --> 00:03:51,519
2015 obviously a very busy year a great

117
00:03:55,030 --> 00:03:53,040
year with the one-year crew on board but

118
00:03:56,229 --> 00:03:55,040
a lot of other stuff happening in the in

119
00:03:58,869 --> 00:03:56,239
the world of science on board the

120
00:04:01,270 --> 00:03:58,879
international space station now you

121
00:04:03,509 --> 00:04:01,280
right for an amazing science blog a lab

122
00:04:05,509 --> 00:04:03,519
a lot which if you're not following

123
00:04:09,190 --> 00:04:05,519
nasa blogs online look it up at lab

124
00:04:10,470 --> 00:04:09,200
aloft and you came up with or you came

125
00:04:12,229 --> 00:04:10,480
out with four

126
00:04:13,830 --> 00:04:12,239
really

127
00:04:16,629 --> 00:04:13,840
kind of groundbreaking or very

128
00:04:18,550 --> 00:04:16,639
interesting examples from 2015. i'd like

129
00:04:20,710 --> 00:04:18,560
to go through those real quick oh sure

130
00:04:22,390 --> 00:04:20,720
so first off was protein crystal growth

131
00:04:25,030 --> 00:04:22,400
and this is one that we've we've talked

132
00:04:27,030 --> 00:04:25,040
about quite a bit and it had some really

133
00:04:29,749 --> 00:04:27,040
exciting impacts to life right down here

134
00:04:32,070 --> 00:04:29,759
on earth right yeah the pathway from the

135
00:04:33,670 --> 00:04:32,080
research result in space to the benefit

136
00:04:35,990 --> 00:04:33,680
back here on earth it's a pretty long

137
00:04:37,510 --> 00:04:36,000
one and so this is exciting because this

138
00:04:39,510 --> 00:04:37,520

is a research that was done several

139
00:04:41,830 --> 00:04:39,520
years ago by our japanese colleagues on

140
00:04:44,310 --> 00:04:41,840
the space station and they flew a lot of

141
00:04:45,510 --> 00:04:44,320
different samples of proteins where they

142
00:04:47,110 --> 00:04:45,520
thought if we could get a slightly

143
00:04:49,430 --> 00:04:47,120
better structure we might be able to

144
00:04:51,030 --> 00:04:49,440
design a drug to help treat a disease

145
00:04:52,790 --> 00:04:51,040
and one of those proteins was in a

146
00:04:54,950 --> 00:04:52,800
protein that's important in duchenne's

147
00:04:56,870 --> 00:04:54,960
muscular dystrophy it's a genetic form

148
00:04:58,550 --> 00:04:56,880
of muscular dystrophy affects about one

149
00:05:00,629 --> 00:04:58,560
in ten thousand boys

150
00:05:02,390 --> 00:05:00,639
and they were able to get just ever so

151
00:05:04,070 --> 00:05:02,400
slightly better structure from a more

152
00:05:05,590 --> 00:05:04,080
pure crystal that they grew in space

153
00:05:06,870 --> 00:05:05,600
compared to the best structure we had

154
00:05:08,550 --> 00:05:06,880
from the ground

155
00:05:10,870 --> 00:05:08,560
with that structure they were able to

156
00:05:12,950 --> 00:05:10,880
determine why that protein in people

157
00:05:14,870 --> 00:05:12,960
with muscular dystrophy isn't shaped

158
00:05:16,790 --> 00:05:14,880
quite right and could be causing the

159
00:05:18,550 --> 00:05:16,800
problem and they invented or they

160
00:05:19,909 --> 00:05:18,560
designed a drug that might help to

161
00:05:21,749 --> 00:05:19,919
alleviate that

162
00:05:25,110 --> 00:05:21,759
and they went on to testing that

163
00:05:26,870 --> 00:05:25,120

designer drug basically in um

164
00:05:29,189 --> 00:05:26,880
first in animal models because there are

165
00:05:30,710 --> 00:05:29,199
some some some kinds of dogs that appear

166
00:05:32,070 --> 00:05:30,720
to have something that is also a genetic

167
00:05:33,830 --> 00:05:32,080
defect looks a lot like muscular

168
00:05:35,909 --> 00:05:33,840
dystrophy so they tried treating that it

169
00:05:38,469 --> 00:05:35,919
was pretty successful but just because

170
00:05:39,670 --> 00:05:38,479
it works in in a different organism for

171
00:05:41,590 --> 00:05:39,680
a slightly different disease doesn't

172
00:05:43,270 --> 00:05:41,600
mean it's ready for people and so what's

173
00:05:45,350 --> 00:05:43,280
really exciting is they have a set of

174
00:05:47,430 --> 00:05:45,360
clinical trials started now with a

175
00:05:49,909 --> 00:05:47,440
pharmaceutical company that is

176
00:05:51,350 --> 00:05:49,919
interested in developing and marketing

177
00:05:53,110 --> 00:05:51,360
the drug further and those those trials

178
00:05:55,590 --> 00:05:53,120
have started this year so that's a huge

179
00:05:57,510 --> 00:05:55,600
milestone at this point

180
00:05:59,749 --> 00:05:57,520
the science will tell up until the

181
00:06:01,189 --> 00:05:59,759
clinical trials start there's politics

182
00:06:02,870 --> 00:06:01,199
there's marketing there's business

183
00:06:04,230 --> 00:06:02,880
considerations and sometimes really good

184
00:06:07,270 --> 00:06:04,240
science just doesn't make it to the

185
00:06:08,870 --> 00:06:07,280
patient but now if if this is a good

186
00:06:10,390 --> 00:06:08,880
treatment it will make it i think all

187
00:06:12,309 --> 00:06:10,400
the way through and if it isn't then

188
00:06:13,670 --> 00:06:12,319

we'll know the facts and scientists can

189
00:06:15,430 --> 00:06:13,680
go on and look for another and that's i

190
00:06:17,350 --> 00:06:15,440
mean that's a really exciting step and

191
00:06:18,629 --> 00:06:17,360
that's benefiting people right down here

192
00:06:19,990 --> 00:06:18,639
on the ground

193
00:06:21,830 --> 00:06:20,000
one of the other things you highlighted

194
00:06:24,790 --> 00:06:21,840
though was something that we're still

195
00:06:27,189 --> 00:06:24,800
trying to solve in space now the vision

196
00:06:29,029 --> 00:06:27,199
problem is still one of those kind of

197
00:06:31,029 --> 00:06:29,039
long poles in the tent for us going to

198
00:06:34,070 --> 00:06:31,039
mars astronauts have fished but not all

199
00:06:35,590 --> 00:06:34,080
of them have vision changes and a paper

200
00:06:37,350 --> 00:06:35,600
was just published can you talk about

201
00:06:38,790 --> 00:06:37,360
that a little bit right so we it's

202
00:06:40,710 --> 00:06:38,800
really just been three or four years

203
00:06:42,469 --> 00:06:40,720
since we discovered that some astronauts

204
00:06:44,230 --> 00:06:42,479
were having vision changes and we found

205
00:06:46,230 --> 00:06:44,240
some a very select group of astronauts

206
00:06:48,070 --> 00:06:46,240
were actually having permanent serious

207
00:06:50,309 --> 00:06:48,080
vision changes that were not recovering

208
00:06:51,909 --> 00:06:50,319
when they returned to earth and it took

209
00:06:53,189 --> 00:06:51,919
time over the space station because not

210
00:06:55,110 --> 00:06:53,199
everybody has it

211
00:06:57,270 --> 00:06:55,120
well one really interesting thing our

212
00:06:58,629 --> 00:06:57,280
nutrition researchers scott smith and

213
00:07:00,870 --> 00:06:58,639

sarah zwart

214
00:07:04,469 --> 00:07:00,880
noticed a correlation in their nutrition

215
00:07:06,550 --> 00:07:04,479
data that the crew members that had

216
00:07:08,790 --> 00:07:06,560
vision losses also appeared to have low

217
00:07:11,029 --> 00:07:08,800
folate and they knew that low folate was

218
00:07:13,350 --> 00:07:11,039
associated with a specific mutation or

219
00:07:15,110 --> 00:07:13,360
specific polymorphism in people now

220
00:07:17,189 --> 00:07:15,120
polymorphism is a fancy word for a

221
00:07:19,990 --> 00:07:17,199
different version of a gene blue eyes is

222
00:07:22,790 --> 00:07:20,000
one polymorphism brown eyes is another

223
00:07:24,950 --> 00:07:22,800
in this case there are polymorphisms in

224
00:07:27,350 --> 00:07:24,960
the one carbon pathway which is the

225
00:07:28,629 --> 00:07:27,360
pathway by which your body makes energy

226
00:07:31,029 --> 00:07:28,639
oh out of its very pretty important

227
00:07:33,029 --> 00:07:31,039
pretty important pathway and

228
00:07:35,029 --> 00:07:33,039
some people with a specific version of

229
00:07:36,230 --> 00:07:35,039
that gene have

230
00:07:37,990 --> 00:07:36,240
problems with

231
00:07:40,390 --> 00:07:38,000
cardiovascular problems

232
00:07:42,950 --> 00:07:40,400
and they also have folate deficiencies

233
00:07:44,869 --> 00:07:42,960
so scott proposed a study to look at

234
00:07:47,270 --> 00:07:44,879
past astronauts that have flown

235
00:07:49,270 --> 00:07:47,280
and actually determine their gene for

236
00:07:51,909 --> 00:07:49,280
that polymorphism and then see if they

237
00:07:54,469 --> 00:07:51,919
had the vision loss and those uh that

238
00:07:56,710 --> 00:07:54,479

paper just came out in january it had

239
00:07:58,710 --> 00:07:56,720
really substantial results they're still

240
00:07:59,990 --> 00:07:58,720
correlational but they say hey it may be

241
00:08:01,189 --> 00:08:00,000
that there are these certain genes that

242
00:08:02,869 --> 00:08:01,199
are really associated with the

243
00:08:05,110 --> 00:08:02,879
astronauts that have the vision loss

244
00:08:06,629 --> 00:08:05,120
it's the first time we've ever done a

245
00:08:08,390 --> 00:08:06,639
genetic study of that type with

246
00:08:10,869 --> 00:08:08,400
astronauts that's a big step it's a big

247
00:08:12,309 --> 00:08:10,879
step and uh you know people talk about

248
00:08:14,070 --> 00:08:12,319
the twin study going on in the one year

249
00:08:16,550 --> 00:08:14,080
expedition that is the next set of

250
00:08:18,790 --> 00:08:16,560
studies that are really looking at uh

251
00:08:20,629 --> 00:08:18,800
genetic impacts on space flight what we

252
00:08:23,189 --> 00:08:20,639
do with the information is also pretty

253
00:08:25,350 --> 00:08:23,199
compelling because it's not ethical to

254
00:08:26,950 --> 00:08:25,360
take that information and tell someone

255
00:08:29,029 --> 00:08:26,960
they can't have their astronaut job

256
00:08:30,230 --> 00:08:29,039
anymore so you can't do that but it does

257
00:08:32,070 --> 00:08:30,240
give us all kinds of important

258
00:08:34,389 --> 00:08:32,080
scientific information and it lets crew

259
00:08:36,230 --> 00:08:34,399
members know their own personal risk of

260
00:08:38,469 --> 00:08:36,240
having a vision impact if they go into

261
00:08:39,509 --> 00:08:38,479
space and again just everything just

262
00:08:41,589 --> 00:08:39,519
trying to make the space flight

263
00:08:43,829 --> 00:08:41,599

environment safer you know for those men

264
00:08:45,750 --> 00:08:43,839
and women going up now let's just run

265
00:08:47,910 --> 00:08:45,760
through the next two real quick so

266
00:08:50,150 --> 00:08:47,920
rapid scat one of our external payloads

267
00:08:51,829 --> 00:08:50,160
has been making a couple of big splashes

268
00:08:53,350 --> 00:08:51,839
and there was one with heat pipes which

269
00:08:55,750 --> 00:08:53,360
you're going to have to re-enlighten me

270
00:08:57,350 --> 00:08:55,760
on okay well so rapid scat is one of our

271
00:08:58,949 --> 00:08:57,360
external instruments it's mounted

272
00:09:01,509 --> 00:08:58,959
outside the iss it's looking down at the

273
00:09:03,190 --> 00:09:01,519
earth it replaces an instrument on the

274
00:09:03,990 --> 00:09:03,200
quick scat satellite

275
00:09:06,470 --> 00:09:04,000
that

276
00:09:09,509 --> 00:09:06,480
failed and what this instrument does is

277
00:09:11,990 --> 00:09:09,519
it looks at the speed of winds right at

278
00:09:15,350 --> 00:09:12,000
the surface of the ocean and scientists

279
00:09:16,790 --> 00:09:15,360
at noaa use that data to model hurricane

280
00:09:18,630 --> 00:09:16,800
eyewall recycling so when there's a

281
00:09:19,750 --> 00:09:18,640
hurricane coming ashore

282
00:09:20,949 --> 00:09:19,760
there are two things you want to know

283
00:09:22,389 --> 00:09:20,959
right where is it going to come ashore

284
00:09:24,310 --> 00:09:22,399
and how strong is it going to be and how

285
00:09:25,430 --> 00:09:24,320
do i get out of here

286
00:09:28,470 --> 00:09:25,440
okay three things you want to know in

287
00:09:31,269 --> 00:09:28,480
houston but uh so the the big global

288
00:09:32,630 --> 00:09:31,279

models of the big winds and the big high

289
00:09:34,070 --> 00:09:32,640
and low pressure system that tells you

290
00:09:36,150 --> 00:09:34,080
kind of where it's going to go ashore

291
00:09:37,590 --> 00:09:36,160
but the eye wall recycling is what tells

292
00:09:38,949 --> 00:09:37,600
you how strong it's going to be because

293
00:09:40,710 --> 00:09:38,959
if it hits at the right time in the

294
00:09:42,310 --> 00:09:40,720
eyewall cycle it's maybe a category

295
00:09:44,949 --> 00:09:42,320
three if it hits at the worst time it

296
00:09:47,110 --> 00:09:44,959
could be a category five and and these

297
00:09:48,630 --> 00:09:47,120
uh data from the rapid scan instrument

298
00:09:50,389 --> 00:09:48,640
feed into that process and they're

299
00:09:52,550 --> 00:09:50,399
helping us do better modeling of all the

300
00:09:54,310 --> 00:09:52,560
hurricanes and so all last year every

301
00:09:56,150 --> 00:09:54,320
hurricane we had more information due to

302
00:09:57,910 --> 00:09:56,160
that rapids get instructed

303
00:10:00,470 --> 00:09:57,920
okay well i mean just to just to wrap it

304
00:10:03,269 --> 00:10:00,480
up just to close we've had 15 years now

305
00:10:04,949 --> 00:10:03,279
over 15 years of people on station signs

306
00:10:06,550 --> 00:10:04,959
taking place on station what's kind of

307
00:10:07,750 --> 00:10:06,560
your peak over the horizon of what's

308
00:10:08,949 --> 00:10:07,760
coming up

309
00:10:10,470 --> 00:10:08,959
well to me

310
00:10:12,630 --> 00:10:10,480
i think one of the most important things

311
00:10:14,550 --> 00:10:12,640
we're seeing is the growth of iss as a

312
00:10:16,630 --> 00:10:14,560
national lab so we have a number of

313
00:10:18,389 --> 00:10:16,640

different pharmaceutical companies that

314
00:10:19,350 --> 00:10:18,399
are planning on doing experiments eli

315
00:10:21,190 --> 00:10:19,360
lilly

316
00:10:23,190 --> 00:10:21,200
you talked about bass m which is

317
00:10:24,470 --> 00:10:23,200
millikin a number of companies coming

318
00:10:27,030 --> 00:10:24,480
forward and using that unique

319
00:10:28,630 --> 00:10:27,040
environment to innovate and to develop

320
00:10:30,710 --> 00:10:28,640
better ways to solve problems back here

321
00:10:34,310 --> 00:10:30,720
on earth and i think seeing that growth

322
00:10:36,310 --> 00:10:34,320
as as in parallel as we go along with

323
00:10:38,150 --> 00:10:36,320
understanding space flight better makes

324
00:10:39,829 --> 00:10:38,160
the space station just really unique all

325
00:10:41,430 --> 00:10:39,839
right well again julie robinson the

326
00:10:43,750 --> 00:10:41,440
chief scientist for the international

327
00:10:45,590 --> 00:10:43,760
space station program giving us a look

328
00:10:47,190 --> 00:10:45,600
at some of the big highlights from 2015

329
00:10:48,870 --> 00:10:47,200
and what's ahead thank you so much for

330
00:10:50,310 --> 00:10:48,880
joining me julie it's always informative