1
00:00:06,550 --> 00:00:04,870
good afternoon from nasa's kennedy space

2
00:00:08,629 --> 00:00:06,560
center in florida and welcome to today's

3
00:00:10,790 --> 00:00:08,639
news conference spacex is due to launch

4
00:00:13,030 --> 00:00:10,800
its dragon spacecraft tomorrow morning

5
00:00:14,390 --> 00:00:13,040
at 10 10 a.m eastern time there's quite

6
00:00:16,790 --> 00:00:14,400
a bit of supplies for the crew of

7
00:00:18,310 --> 00:00:16,800
expedition 34 as well as a significant

8
00:00:20,150 --> 00:00:18,320
amount of science on this mission both

9
00:00:21,590 --> 00:00:20,160
going to the space station and coming

10
00:00:23,349 --> 00:00:21,600
back home at the conclusion of the

11
00:00:25,269 --> 00:00:23,359
flight here to give us more details

12
00:00:27,189 --> 00:00:25,279
about what's ahead is julie robinson the

13
00:00:29,269 --> 00:00:27,199

international space station program

14
00:00:31,509 --> 00:00:29,279
scientist

15
00:00:32,950 --> 00:00:31,519
we're also joined by simon gilroy

16
00:00:35,350 --> 00:00:32,960
researcher and scientist from the

17
00:00:36,630 --> 00:00:35,360
university of wisconsin

18
00:00:38,630 --> 00:00:36,640
we're also joined by marshall

19
00:00:40,229 --> 00:00:38,640
porterfield the life and physical

20
00:00:41,350 --> 00:00:40,239
sciences division director up at nasa

21
00:00:43,910 --> 00:00:41,360
headquarters

22
00:00:46,549 --> 00:00:43,920
as well as mike johnson chief technology

23
00:00:49,270 --> 00:00:46,559
officer from nanoracks

24
00:00:51,110 --> 00:00:49,280
as well as mike roberts staff scientist

25
00:00:52,630 --> 00:00:51,120
for the center for the advancement of

26
00:00:54,229 --> 00:00:52,640
science in space

27
00:00:57,830 --> 00:00:54,239
or cases we're going to hear from each

28
00:01:00,229 --> 00:00:57,840
one of them we'll get started with julie

29
00:01:02,470 --> 00:01:00,239
spacex 2 is a really important mission

30
00:01:04,070 --> 00:01:02,480
for us because the cargo that goes to

31
00:01:06,149 --> 00:01:04,080
and from the space station is key to

32
00:01:09,429 --> 00:01:06,159
completing a research mission there'll

33
00:01:11,190 --> 00:01:09,439
be about 330 kilograms of supplies for

34
00:01:13,750 --> 00:01:11,200
research and experiments that go up on

35
00:01:14,789 --> 00:01:13,760
the flight and about 571 kilograms that

36
00:01:16,950 --> 00:01:14,799
come down

37
00:01:18,469 --> 00:01:16,960
and it covers all the broad disciplines

38
00:01:20,950 --> 00:01:18,479

of research that we do on the space

39
00:01:23,670 --> 00:01:20,960
station including human research biology

40
00:01:25,910 --> 00:01:23,680
and biotechnology physical sciences and

41
00:01:27,990 --> 00:01:25,920
education activities and all of these

42
00:01:29,510 --> 00:01:28,000
supplies go to support the over 200

43
00:01:31,830 --> 00:01:29,520
investigations that are active on the

44
00:01:33,190 --> 00:01:31,840
space station today

45
00:01:35,109 --> 00:01:33,200
some highlights of some of those

46
00:01:37,109 --> 00:01:35,119
experiments are

47
00:01:39,190 --> 00:01:37,119
some new cell biology hardware and some

48
00:01:41,590 --> 00:01:39,200
new hardware for doing genetic analysis

49
00:01:43,429 --> 00:01:41,600
on orbit and those really help step up

50
00:01:45,990 --> 00:01:43,439
some of our life sciences capabilities

51
00:01:47,670 --> 00:01:46,000
and later today you'll hear both from dr

52
00:01:49,350 --> 00:01:47,680
gilroy talking about his specific

53
00:01:51,429 --> 00:01:49,360
experiment and also from dr porterfield

54
00:01:53,190 --> 00:01:51,439
to talk about the overall ramp up in the

55
00:01:54,469 --> 00:01:53,200
life sciences program

56
00:01:56,310 --> 00:01:54,479
at nasa

57
00:01:57,830 --> 00:01:56,320
we also have a flow cytometer that's

58
00:01:59,910 --> 00:01:57,840
going to provide the ability to count

59
00:02:02,230 --> 00:01:59,920
cells at a very fine scale

60
00:02:03,990 --> 00:02:02,240
and in in the area of physical sciences

61
00:02:05,590 --> 00:02:04,000
we have commercial studies by

62
00:02:07,350 --> 00:02:05,600
organizations such as procter gamble

63
00:02:09,350 --> 00:02:07,360

aimed at making products improving

64
00:02:11,270 --> 00:02:09,360
products by studying colloids

65
00:02:13,190 --> 00:02:11,280
or and studies of

66
00:02:15,670 --> 00:02:13,200
spacecraft materials and other important

67
00:02:17,990 --> 00:02:15,680
areas for nasa's exploration mission

68
00:02:20,229 --> 00:02:18,000
so you'll be able to follow the

69
00:02:22,229 --> 00:02:20,239
the progress both of the launch of these

70
00:02:23,270 --> 00:02:22,239
samples and then as the samples come out

71
00:02:24,710 --> 00:02:23,280
and are used on orbit and the

72
00:02:26,949 --> 00:02:24,720
experiments are completed you can follow

73
00:02:29,830 --> 00:02:26,959
all of that through our social media

74
00:02:31,270 --> 00:02:29,840
feed which is at iss underscore research

75
00:02:32,949 --> 00:02:31,280
with that i'll uh

76
00:02:33,990 --> 00:02:32,959
let simon gilroy tell you about some of

77
00:02:37,190 --> 00:02:34,000
the experiments that he's going to be

78
00:02:39,350 --> 00:02:37,200
doing thank you julie uh so this is a

79
00:02:41,910 --> 00:02:39,360
very exciting opportunity for us uh

80
00:02:44,470 --> 00:02:41,920
we're part of a package called brick 17

81
00:02:45,670 --> 00:02:44,480
which is to put plant biology into space

82
00:02:47,830 --> 00:02:45,680
and there are a couple of different

83
00:02:49,270 --> 00:02:47,840
questions which are being tried we're

84
00:02:50,470 --> 00:02:49,280
trying to answer between a couple of

85
00:02:52,470 --> 00:02:50,480
groups working there

86
00:02:53,430 --> 00:02:52,480
we're all using

87
00:02:56,470 --> 00:02:53,440
this

88
00:02:58,949 --> 00:02:56,480

experimental material

89
00:03:01,190 --> 00:02:58,959
see that this is uh arabidopsis thaliana

90
00:03:03,430 --> 00:03:01,200
or mouseed cress we always like to say

91
00:03:04,949 --> 00:03:03,440
this is the lab rat of plant biology

92
00:03:06,630 --> 00:03:04,959
it's the plants that we understand the

93
00:03:07,589 --> 00:03:06,640
best of

94
00:03:09,350 --> 00:03:07,599
and so

95
00:03:11,509 --> 00:03:09,360
we're putting these into space to begin

96
00:03:13,910 --> 00:03:11,519
to pull apart a couple of biological

97
00:03:16,070 --> 00:03:13,920
questions using the iss as what it is

98
00:03:18,390 --> 00:03:16,080
which is a fantastic laboratory doing

99
00:03:19,350 --> 00:03:18,400
experiments that we simply can't do

100
00:03:20,470 --> 00:03:19,360
on earth

101
00:03:21,990 --> 00:03:20,480
so

102
00:03:23,430 --> 00:03:22,000
uh

103
00:03:24,789 --> 00:03:23,440
particularly for the experiment we're

104
00:03:27,830 --> 00:03:24,799
interested in

105
00:03:29,190 --> 00:03:27,840
is related to the fact that in space

106
00:03:30,949 --> 00:03:29,200
uh conditions are different from what

107
00:03:33,270 --> 00:03:30,959
they are on the earth and some of the

108
00:03:35,430 --> 00:03:33,280
the challenges that biology faces are

109
00:03:37,750 --> 00:03:35,440
very intuitive to us so for instance

110
00:03:39,509 --> 00:03:37,760
astronauts losing muscle mass and bone

111
00:03:41,190 --> 00:03:39,519
mass uh makes a lot of sense because

112
00:03:42,789 --> 00:03:41,200
that weightless environment but there

113
00:03:45,430 --> 00:03:42,799

are other challenges up there for

114
00:03:47,990 --> 00:03:45,440
biology which uh one a little bit less

115
00:03:50,630 --> 00:03:48,000
intuitive but equally important and one

116
00:03:52,390 --> 00:03:50,640
of those is that gases move differently

117
00:03:54,390 --> 00:03:52,400
in a weightless environment from the way

118
00:03:56,550 --> 00:03:54,400
they do on earth and one way to think

119
00:03:59,350 --> 00:03:56,560
about that is a hot air balloon rises

120
00:04:01,350 --> 00:03:59,360
because the hot air is ways less and so

121
00:04:02,710 --> 00:04:01,360
you have buoyancy

122
00:04:05,350 --> 00:04:02,720
driven movements

123
00:04:07,589 --> 00:04:05,360
and that doesn't occur in space so that

124
00:04:09,910 --> 00:04:07,599
movement of gases driven by convection

125
00:04:11,670 --> 00:04:09,920
does not occur in weightlessness

126
00:04:12,830 --> 00:04:11,680
and so if you think about what that

127
00:04:15,270 --> 00:04:12,840
means for

128
00:04:17,270 --> 00:04:15,280
biology uh imagine that you're a plant

129
00:04:19,749 --> 00:04:17,280
and you are breathing you're respiring

130
00:04:22,230 --> 00:04:19,759
using up oxygen that mixing of gases

131
00:04:25,110 --> 00:04:22,240
doesn't occur and eventually you will

132
00:04:26,710 --> 00:04:25,120
use up the oxygen nearby you and so you

133
00:04:28,950 --> 00:04:26,720
can suffocate a plant under those

134
00:04:30,550 --> 00:04:28,960
conditions exactly the way that a human

135
00:04:33,830 --> 00:04:30,560
being could suffocate with lack of

136
00:04:35,670 --> 00:04:33,840
oxygen so our experiment is that we've

137
00:04:37,510 --> 00:04:35,680
engineered some of these little

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

arabidopsis plants

139
00:04:41,909 --> 00:04:39,520
uh we've changed their signaling system

140
00:04:43,030 --> 00:04:41,919
that they use on earth to sense oxygen

141
00:04:45,909 --> 00:04:43,040
conditions

142
00:04:47,670 --> 00:04:45,919
and we've made that more sensitive so

143
00:04:49,510 --> 00:04:47,680
one way to think about that as well is

144
00:04:51,749 --> 00:04:49,520
that those plants on earth if they're

145
00:04:53,189 --> 00:04:51,759
challenged with low oxygen so

146
00:04:54,870 --> 00:04:53,199
when would that occur imagine you've

147
00:04:56,790 --> 00:04:54,880
flooded a field

148
00:04:59,110 --> 00:04:56,800
the root system in that flooded field

149
00:05:01,430 --> 00:04:59,120
doesn't have oxygen available to it and

150
00:05:02,950 --> 00:05:01,440
it sends out a lot of stress signals

151
00:05:05,189 --> 00:05:02,960
we've turned up the volume on those

152
00:05:07,189 --> 00:05:05,199
stress signals now in space we think

153
00:05:10,150 --> 00:05:07,199
there's a similar kind of issue going on

154
00:05:11,590 --> 00:05:10,160
with low availability of oxygen and so

155
00:05:13,909 --> 00:05:11,600
we all have engineered these plants we

156
00:05:15,830 --> 00:05:13,919
hope to be able to deal with that stress

157
00:05:17,590 --> 00:05:15,840
a lot better and so the experiment that

158
00:05:19,909 --> 00:05:17,600
we're doing is sending arabidopsis

159
00:05:22,150 --> 00:05:19,919
plants into space and then we'll bring

160
00:05:23,749 --> 00:05:22,160
them back down and ask did they perform

161
00:05:25,110 --> 00:05:23,759
better in space

162
00:05:27,189 --> 00:05:25,120
we'll look at things like how big the

163
00:05:31,350 --> 00:05:27,199

plants are what genes they switch on and

164
00:05:31,360 --> 00:05:34,629
okay

165
00:05:39,350 --> 00:05:36,230
i'm really happy to be here with simon

166
00:05:41,350 --> 00:05:39,360
today in in supporting his research i

167
00:05:43,270 --> 00:05:41,360
recently came to my post at headquarters

168
00:05:45,830 --> 00:05:43,280
from purdue university where i'm a

169
00:05:46,790 --> 00:05:45,840
faculty member so i've lived the life of

170
00:05:55,029 --> 00:05:46,800
a

171
00:05:56,870 --> 00:05:55,039
support

172
00:05:57,909 --> 00:05:56,880
world leading researchers like simon

173
00:05:59,189 --> 00:05:57,919
gilroy

174
00:06:00,950 --> 00:05:59,199
the other reason i'm happy to be here

175
00:06:03,670 --> 00:06:00,960
because simon's work that he's described

176
00:06:06,469 --> 00:06:03,680
to you was also the topic of my phd

177
00:06:11,029 --> 00:06:06,479
dissertation so i'm kind of interested

178
00:06:14,710 --> 00:06:13,510
so i guess i wanted to

179
00:06:16,950 --> 00:06:14,720
bring up

180
00:06:19,110 --> 00:06:16,960
or talk about some of the reasons why we

181
00:06:20,790 --> 00:06:19,120
do work with plants

182
00:06:22,390 --> 00:06:20,800
in space why we do research with plants

183
00:06:23,510 --> 00:06:22,400
in space one is that

184
00:06:25,830 --> 00:06:23,520
the

185
00:06:28,230 --> 00:06:25,840
stress responses that simon is talking

186
00:06:29,749 --> 00:06:28,240
about also occur on the ground it is an

187
00:06:31,670 --> 00:06:29,759
important agricultural problem so the

188
00:06:33,909 --> 00:06:31,680

more that we learn about that

189
00:06:35,830 --> 00:06:33,919
we potentially can take that knowledge

190
00:06:37,430 --> 00:06:35,840
and serve

191
00:06:39,510 --> 00:06:37,440
the agricultural community and solve

192
00:06:41,749 --> 00:06:39,520
problems that are real agricultural

193
00:06:43,110 --> 00:06:41,759
problems here on the earth the other is

194
00:06:45,749 --> 00:06:43,120
that um

195
00:06:49,110 --> 00:06:45,759
plants also act as sentinels to some

196
00:06:52,070 --> 00:06:49,120
extent many of the mechanisms for how

197
00:06:55,110 --> 00:06:52,080
plant cells grow divide

198
00:06:56,390 --> 00:06:55,120
respond to stress are conserved across

199
00:06:58,870 --> 00:06:56,400
all

200
00:07:01,350 --> 00:06:58,880
living organisms so we may be learning

201
00:07:04,390 --> 00:07:01,360
things about plants that apply to human

202
00:07:06,629 --> 00:07:04,400
research for example

203
00:07:09,990 --> 00:07:06,639
the other is that

204
00:07:12,070 --> 00:07:10,000
this work really does support

205
00:07:14,309 --> 00:07:12,080
the development of

206
00:07:16,150 --> 00:07:14,319
long-duration human exploration systems

207
00:07:19,029 --> 00:07:16,160
in the future

208
00:07:20,469 --> 00:07:19,039
in that possibly one day we may be

209
00:07:21,909 --> 00:07:20,479
developing

210
00:07:24,469 --> 00:07:21,919
space missions that rely on

211
00:07:26,629 --> 00:07:24,479
bioregenerative capabilities so plants

212
00:07:28,150 --> 00:07:26,639
and such a system like that would not

213
00:07:31,189 --> 00:07:28,160

only

214
00:07:33,189 --> 00:07:31,199
provide food for astronauts for crew

215
00:07:35,110 --> 00:07:33,199
over long periods of time but also

216
00:07:38,150 --> 00:07:35,120
potentially could be involved with

217
00:07:40,469 --> 00:07:38,160
recycling the atmosphere and

218
00:07:43,110 --> 00:07:40,479
water purification processes

219
00:07:44,790 --> 00:07:43,120
so this is an example of

220
00:07:48,230 --> 00:07:44,800
the type of research that we are doing

221
00:07:50,150 --> 00:07:48,240
today on the iss that has impact in the

222
00:07:52,710 --> 00:07:50,160
future in terms of

223
00:07:54,550 --> 00:07:52,720
exploration so we do see

224
00:07:59,350 --> 00:07:54,560
the opportunity right now with the space

225
00:08:01,749 --> 00:07:59,360
station as being very important to do

226
00:08:04,230 --> 00:08:01,759
the relevant research in biological

227
00:08:06,309 --> 00:08:04,240
systems and in human research that solve

228
00:08:08,629 --> 00:08:06,319
some of the problems that simon

229
00:08:11,270 --> 00:08:08,639
mentioned earlier bone muscle wasting

230
00:08:13,670 --> 00:08:11,280
also immune responses

231
00:08:15,670 --> 00:08:13,680
that are that are critical to understand

232
00:08:18,070 --> 00:08:15,680
to protect astronaut health

233
00:08:21,430 --> 00:08:18,080
over long periods of times over large

234
00:08:22,390 --> 00:08:21,440
long missions and deep space exploration

235
00:08:23,909 --> 00:08:22,400
so

236
00:08:25,350 --> 00:08:23,919
one of the things we're starting to do

237
00:08:27,110 --> 00:08:25,360
right now and

238
00:08:28,710 --> 00:08:27,120

we're going to be rolling this out over

239
00:08:30,550 --> 00:08:28,720
the next few months or so and i'm

240
00:08:33,269 --> 00:08:30,560
working closely with julie robinson and

241
00:08:37,269 --> 00:08:33,279
the iss program office develop new

242
00:08:39,670 --> 00:08:37,279
platforms to enable more research

243
00:08:41,670 --> 00:08:39,680
by researchers like simon and allow more

244
00:08:43,990 --> 00:08:41,680
people have access to iss research

245
00:08:46,870 --> 00:08:44,000
capabilities so we're developing more

246
00:08:49,110 --> 00:08:46,880
open source innovation approaches for

247
00:08:51,430 --> 00:08:49,120
doing science we actually refer to as

248
00:08:54,470 --> 00:08:51,440
open source science where we'll be doing

249
00:08:56,870 --> 00:08:54,480
large scale experiments using

250
00:08:58,310 --> 00:08:56,880
the most advanced analytical tools that

251
00:08:59,350 --> 00:08:58,320
are available

252
00:09:00,230 --> 00:08:59,360
today

253
00:09:01,190 --> 00:09:00,240
to

254
00:09:04,230 --> 00:09:01,200
create

255
00:09:06,790 --> 00:09:04,240
bioinformatics database based

256
00:09:08,389 --> 00:09:06,800
research opportunities for researchers

257
00:09:10,790 --> 00:09:08,399
on the ground to be able to study the

258
00:09:12,550 --> 00:09:10,800
responses that are measured in space and

259
00:09:15,590 --> 00:09:12,560
these open source

260
00:09:17,350 --> 00:09:15,600
approaches can be will be funded by nasa

261
00:09:20,949 --> 00:09:17,360
but at the same time it'll be open for

262
00:09:22,630 --> 00:09:20,959
anyone even i i envision

263
00:09:24,790 --> 00:09:22,640

high school kids doing their science

264
00:09:25,910 --> 00:09:24,800
fair projects based on results that

265
00:09:28,230 --> 00:09:25,920
they've mined

266
00:09:30,790 --> 00:09:28,240
using bio informatics tools from these

267
00:09:34,230 --> 00:09:30,800
databases

268
00:09:39,750 --> 00:09:37,030
okay i'm mike johnson from nanoracks and

269
00:09:41,269 --> 00:09:39,760
um we are extremely excited about the

270
00:09:44,470 --> 00:09:41,279
spacex ii

271
00:09:46,790 --> 00:09:44,480
mission um we have uh two sets of

272
00:09:49,990 --> 00:09:46,800
payloads uh actually four

273
00:09:51,590 --> 00:09:50,000
uh four modules about this size here on

274
00:09:52,630 --> 00:09:51,600
the vehicle

275
00:09:55,269 --> 00:09:52,640
and the

276
00:09:57,030 --> 00:09:55,279
the first module that we're flying is a

277
00:09:58,150 --> 00:09:57,040
commercial protein crystal growth

278
00:09:59,670 --> 00:09:58,160
experiment

279
00:10:00,870 --> 00:09:59,680
we're very excited about this we've been

280
00:10:03,110 --> 00:10:00,880
working in conjunction with thermal

281
00:10:05,190 --> 00:10:03,120
biosystems and cases

282
00:10:08,550 --> 00:10:05,200
and

283
00:10:11,829 --> 00:10:08,560
this experiment takes advantage of

284
00:10:13,509 --> 00:10:11,839
modern advances in microfluidics

285
00:10:16,069 --> 00:10:13,519
and on this one flight we're going to

286
00:10:18,630 --> 00:10:16,079
have about we have about 25

287
00:10:21,750 --> 00:10:18,640
proteins that we're flying

288
00:10:23,829 --> 00:10:21,760

each protein has 400 different sample

289
00:10:25,990 --> 00:10:23,839
conditions so a total of 10 000

290
00:10:27,509 --> 00:10:26,000
different sample conditions it all fits

291
00:10:30,150 --> 00:10:27,519
into about

292
00:10:31,990 --> 00:10:30,160
four cubes about this size here

293
00:10:33,910 --> 00:10:32,000
now

294
00:10:36,710 --> 00:10:33,920
what does that mean to

295
00:10:38,790 --> 00:10:36,720
say commercial protein crystallography

296
00:10:40,870 --> 00:10:38,800
well for the first time

297
00:10:44,870 --> 00:10:40,880
in the history of the

298
00:10:46,949 --> 00:10:44,880
it's rather long protein crystal growth

299
00:10:49,269 --> 00:10:46,959
program that has occurred over the years

300
00:10:51,750 --> 00:10:49,279
at nasa we're going to get long-term

301
00:10:53,750 --> 00:10:51,760
exposure on the space station in

302
00:10:54,949 --> 00:10:53,760
addition we're going to be able to

303
00:10:57,269 --> 00:10:54,959
perform

304
00:11:00,550 --> 00:10:57,279
matrix uh

305
00:11:03,829 --> 00:11:00,560
basically you could say edisonian using

306
00:11:05,990 --> 00:11:03,839
edisonian methods of trying every single

307
00:11:07,910 --> 00:11:06,000
possible combination

308
00:11:10,069 --> 00:11:07,920
of protein

309
00:11:12,230 --> 00:11:10,079
concentration to figure out

310
00:11:14,630 --> 00:11:12,240
how these protein crystals will grow in

311
00:11:16,790 --> 00:11:14,640
microgravity we're very excited about

312
00:11:18,310 --> 00:11:16,800
this because in the past uh with this

313
00:11:21,590 --> 00:11:18,320

new state-of-the-art hardware in fact

314
00:11:23,430 --> 00:11:21,600
this hardware uh it's it's uh

315
00:11:25,430 --> 00:11:23,440
it was developed and is commercially

316
00:11:29,430 --> 00:11:25,440
sold by emerald biosystems

317
00:11:32,550 --> 00:11:29,440
in the boston seattle area

318
00:11:34,550 --> 00:11:32,560
has become basically a de facto method

319
00:11:36,389 --> 00:11:34,560
of growing protein crystals

320
00:11:38,150 --> 00:11:36,399
terrestrially and for the first time

321
00:11:40,069 --> 00:11:38,160
we're going to get the opportunity to

322
00:11:41,829 --> 00:11:40,079
fly this in microgravity and try it in

323
00:11:43,269 --> 00:11:41,839
space

324
00:11:45,030 --> 00:11:43,279
we have a lot of researchers very

325
00:11:47,110 --> 00:11:45,040
excited about this because we're able to

326
00:11:48,550 --> 00:11:47,120
remove one variable and that variable is

327
00:11:49,590 --> 00:11:48,560
gravity

328
00:11:53,670 --> 00:11:49,600
and

329
00:11:56,150 --> 00:11:53,680
have a fantastic situation i might also

330
00:11:57,670 --> 00:11:56,160
add that um

331
00:11:59,269 --> 00:11:57,680
on the spacex

332
00:12:01,190 --> 00:11:59,279
ii launch vehicle

333
00:12:02,790 --> 00:12:01,200
the dragon capsule

334
00:12:04,550 --> 00:12:02,800
we're using the

335
00:12:07,670 --> 00:12:04,560
glacier freezer

336
00:12:10,069 --> 00:12:07,680
the glacier freesia is is fantastic for

337
00:12:12,470 --> 00:12:10,079
us from a commercial standpoint it's

338
00:12:14,790 --> 00:12:12,480

solving a lot of problems we we load our

339
00:12:16,470 --> 00:12:14,800
little crystal plates each of the plates

340
00:12:17,509 --> 00:12:16,480
we have 25 plates

341
00:12:19,110 --> 00:12:17,519
in our

342
00:12:20,790 --> 00:12:19,120
sample set they're about the size of a

343
00:12:22,710 --> 00:12:20,800
microscope slide

344
00:12:24,389 --> 00:12:22,720
and

345
00:12:27,110 --> 00:12:24,399
each one of these plates holds as i said

346
00:12:28,629 --> 00:12:27,120
about 400 different sample conditions

347
00:12:31,030 --> 00:12:28,639
and what we do is we load these on the

348
00:12:33,030 --> 00:12:31,040
ground freeze them and then fly them up

349
00:12:35,030 --> 00:12:33,040
frozen in the glacier

350
00:12:36,629 --> 00:12:35,040
freezer once they get on orbit they'll

351
00:12:39,110 --> 00:12:36,639
thaw out and the crystals will start to

352
00:12:41,910 --> 00:12:39,120
grow and we'll examine these crystals on

353
00:12:44,230 --> 00:12:41,920
orbit with a small microscope that

354
00:12:46,389 --> 00:12:44,240
nanoracks has in this facility

355
00:12:48,069 --> 00:12:46,399
so

356
00:12:49,990 --> 00:12:48,079
we're very excited about this particular

357
00:12:53,110 --> 00:12:50,000
project and the second set of

358
00:12:56,389 --> 00:12:53,120
experiments that we're flying is a set

359
00:12:58,550 --> 00:12:56,399
of experiments developed by

360
00:13:00,790 --> 00:12:58,560
a series of high school students in

361
00:13:02,150 --> 00:13:00,800
particular valley christian high school

362
00:13:04,629 --> 00:13:02,160
in the

363
00:13:07,590 --> 00:13:04,639

silicon valley area it's a fantastic

364
00:13:10,230 --> 00:13:07,600
organization they've developed

365
00:13:14,069 --> 00:13:10,240
a set of experiments that fit into

366
00:13:19,670 --> 00:13:15,910
basically four

367
00:13:21,110 --> 00:13:19,680
experiments fit into each one of these

368
00:13:23,110 --> 00:13:21,120
main modules

369
00:13:24,949 --> 00:13:23,120
and the module itself

370
00:13:26,389 --> 00:13:24,959
connects with

371
00:13:29,509 --> 00:13:26,399
nanorack's

372
00:13:31,670 --> 00:13:29,519
nanorx frame on orbit through a usb port

373
00:13:33,509 --> 00:13:31,680
as marshall was talking about earlier

374
00:13:35,670 --> 00:13:33,519
at nanoracks we

375
00:13:37,829 --> 00:13:35,680
we've concentrated highly on using

376
00:13:38,949 --> 00:13:37,839
standardized interfaces such as usb

377
00:13:40,870 --> 00:13:38,959
connectors

378
00:13:43,430 --> 00:13:40,880
as you may know there are something on

379
00:13:45,750 --> 00:13:43,440
the order of six billion usb devices in

380
00:13:47,269 --> 00:13:45,760
the world i think that's about one usb

381
00:13:48,949 --> 00:13:47,279
device per person

382
00:13:51,110 --> 00:13:48,959
and in fact i see a whole bunch in this

383
00:13:53,189 --> 00:13:51,120
room right now

384
00:13:56,230 --> 00:13:53,199
but

385
00:13:58,230 --> 00:13:56,240
so the folks at valley christian in

386
00:14:00,470 --> 00:13:58,240
conjunction with nine other

387
00:14:02,389 --> 00:14:00,480
high schools and organizations

388
00:14:04,790 --> 00:14:02,399

have put together a series of 12

389
00:14:07,430 --> 00:14:04,800
different experiments

390
00:14:09,509 --> 00:14:07,440
in particular i like to call out

391
00:14:11,509 --> 00:14:09,519
the uh

392
00:14:13,670 --> 00:14:11,519
they're they're bringing in schools and

393
00:14:16,710 --> 00:14:13,680
institutions from all over the country

394
00:14:18,629 --> 00:14:16,720
the hawaiian girl scouts are flying a

395
00:14:21,350 --> 00:14:18,639
lettuce growing experiment

396
00:14:24,310 --> 00:14:21,360
that'll be very interesting

397
00:14:26,949 --> 00:14:24,320
we also have some folks from minnesota

398
00:14:29,670 --> 00:14:26,959
minnehaha christian high school or i'm

399
00:14:31,350 --> 00:14:29,680
sorry minnehaha christian academy

400
00:14:33,990 --> 00:14:31,360
they're working on an experiment to see

401
00:14:35,590 --> 00:14:34,000
how paint adheres in orbit and how it

402
00:14:37,750 --> 00:14:35,600
dries in orbit

403
00:14:39,910 --> 00:14:37,760
that's something we haven't really done

404
00:14:41,509 --> 00:14:39,920
before there's also an electroplating

405
00:14:43,990 --> 00:14:41,519
experiment

406
00:14:45,030 --> 00:14:44,000
out of the valley christian high school

407
00:14:46,870 --> 00:14:45,040
team

408
00:14:48,389 --> 00:14:46,880
that

409
00:14:50,629 --> 00:14:48,399
i think this is this i believe the

410
00:14:53,350 --> 00:14:50,639
second time this has flown but

411
00:14:55,509 --> 00:14:53,360
this is pioneering area so i don't think

412
00:14:57,590 --> 00:14:55,519
anyone on this team is over 18 years old

413
00:14:58,949 --> 00:14:57,600

except for the mentors

414
00:15:00,790 --> 00:14:58,959
and

415
00:15:05,350 --> 00:15:00,800
all these kids have done a fantastic job

416
00:15:09,829 --> 00:15:06,949
implement

417
00:15:11,590 --> 00:15:09,839
high school projects on orbit

418
00:15:13,829 --> 00:15:11,600
to me it's it's fascinating i've been in

419
00:15:14,870 --> 00:15:13,839
this business for about 22 years

420
00:15:16,790 --> 00:15:14,880
and

421
00:15:18,550 --> 00:15:16,800
the unprecedented access that the

422
00:15:20,629 --> 00:15:18,560
international space station is providing

423
00:15:21,750 --> 00:15:20,639
and also the transportation systems in

424
00:15:24,230 --> 00:15:21,760
particular

425
00:15:27,269 --> 00:15:24,240
spacex dragon

426
00:15:29,990 --> 00:15:27,279
that they're providing to the uh

427
00:15:31,590 --> 00:15:30,000
to the research community is phenomenal

428
00:15:32,470 --> 00:15:31,600
it's a good time to be in space right

429
00:15:33,590 --> 00:15:32,480
now

430
00:15:35,590 --> 00:15:33,600
and um

431
00:15:37,749 --> 00:15:35,600
uh

432
00:15:39,670 --> 00:15:37,759
yes with that i'd just like to

433
00:15:42,710 --> 00:15:39,680
thank uh all the help we're getting from

434
00:15:46,790 --> 00:15:42,720
the nasa folks to make this commercial

435
00:15:51,910 --> 00:15:48,310
as i said it's just a great time to be

436
00:15:55,749 --> 00:15:54,069
my presence here today is to

437
00:15:57,509 --> 00:15:55,759
reintroduce you or introduce you for the

438
00:15:59,189 --> 00:15:57,519

first time if you haven't heard of cases

439
00:16:01,430 --> 00:15:59,199
cases is the center for the advancement

440
00:16:03,990 --> 00:16:01,440
of science and space we are a

441
00:16:06,550 --> 00:16:04,000
non-profit non-governmental organization

442
00:16:08,550 --> 00:16:06,560
that was created with the intent of

443
00:16:10,150 --> 00:16:08,560
defining new research pathways to

444
00:16:11,590 --> 00:16:10,160
utilize station

445
00:16:13,910 --> 00:16:11,600
so our

446
00:16:16,470 --> 00:16:13,920
service to nasa is to

447
00:16:17,910 --> 00:16:16,480
increase the ability of scientists to

448
00:16:19,749 --> 00:16:17,920
get their science and technology

449
00:16:22,069 --> 00:16:19,759
development up to station

450
00:16:24,389 --> 00:16:22,079
as a non-governmental not-for-profit

451
00:16:26,389 --> 00:16:24,399
organization cases has the opportunity

452
00:16:28,310 --> 00:16:26,399
to engage in the marketplace in ways

453
00:16:29,189 --> 00:16:28,320
that government organizations and nasa

454
00:16:30,870 --> 00:16:29,199
couldn't

455
00:16:32,389 --> 00:16:30,880
one of those is that we interact very

456
00:16:34,949 --> 00:16:32,399
closely and work very closely with

457
00:16:37,670 --> 00:16:34,959
implementation partners like nanoracks

458
00:16:39,990 --> 00:16:37,680
to enable them to find funding for their

459
00:16:42,550 --> 00:16:40,000
hardware and to identify scientists who

460
00:16:43,350 --> 00:16:42,560
have questions with earth benefits

461
00:16:45,590 --> 00:16:43,360
that

462
00:16:47,350 --> 00:16:45,600
can benefit from the unique environment

463
00:16:49,269 --> 00:16:47,360

of the space station

464
00:16:51,110 --> 00:16:49,279
we're very excited about the spacex ii

465
00:16:52,550 --> 00:16:51,120
launch because it represents a pivot

466
00:16:55,030 --> 00:16:52,560
point in

467
00:16:57,430 --> 00:16:55,040
cases relationship with nasa and that as

468
00:16:59,990 --> 00:16:57,440
we move forward from this point on

469
00:17:02,150 --> 00:17:00,000
more of the science that is going to go

470
00:17:04,949 --> 00:17:02,160
to iss national lab that has direct

471
00:17:06,949 --> 00:17:04,959
earth benefits is going to be managed by

472
00:17:09,590 --> 00:17:06,959
cases in its organization so we view

473
00:17:10,549 --> 00:17:09,600
this as a as a door opening a new window

474
00:17:12,710 --> 00:17:10,559
opening

475
00:17:14,390 --> 00:17:12,720
and it is truly an exciting time for

476
00:17:16,230 --> 00:17:14,400
scientists in space

477
00:17:18,230 --> 00:17:16,240
because we truly are going to be able to

478
00:17:20,309 --> 00:17:18,240
do a lot more science on station from

479
00:17:23,189 --> 00:17:20,319
this point forward because of the

480
00:17:24,390 --> 00:17:23,199
ability to engage commercial academic

481
00:17:26,309 --> 00:17:24,400
and

482
00:17:29,110 --> 00:17:26,319
other institutions who previously didn't

483
00:17:31,590 --> 00:17:29,120
consider iss national lab as a viable

484
00:17:34,310 --> 00:17:31,600
platform for their science

485
00:17:36,070 --> 00:17:34,320
to give a bit of a plug we have

486
00:17:37,909 --> 00:17:36,080
some of the first

487
00:17:39,909 --> 00:17:37,919
science that will be going up to station

488
00:17:41,830 --> 00:17:39,919

that is going to be managed from cradle

489
00:17:43,590 --> 00:17:41,840
to cradle by cases will be going up

490
00:17:46,710 --> 00:17:43,600
later this year

491
00:17:49,830 --> 00:17:46,720
for increments 37 and 38. we're very

492
00:17:51,669 --> 00:17:49,840
excited to announce that that

493
00:17:52,950 --> 00:17:51,679
mission for cases is going to be known

494
00:17:57,110 --> 00:17:52,960
as the

495
00:18:00,470 --> 00:17:57,120
advancing research knowledge or arc one

496
00:18:02,630 --> 00:18:00,480
it symbolizes again this transition to

497
00:18:05,510 --> 00:18:02,640
iss national lab

498
00:18:06,950 --> 00:18:05,520
as a national lab entity where a number

499
00:18:08,390 --> 00:18:06,960
of investigators can have the

500
00:18:09,669 --> 00:18:08,400
opportunity to get their science up

501
00:18:11,830 --> 00:18:09,679
there whether they're coming from

502
00:18:14,470 --> 00:18:11,840
academic institutions or from commercial

503
00:18:15,510 --> 00:18:14,480
interests

504
00:18:16,789 --> 00:18:15,520
okay

505
00:18:18,390 --> 00:18:16,799
we're going to take some questions now

506
00:18:19,590 --> 00:18:18,400
from here and we have uh quite a number

507
00:18:20,870 --> 00:18:19,600
of the social media people that are here

508
00:18:22,630 --> 00:18:20,880
as part of the nasa social we'll start

509
00:18:25,669 --> 00:18:22,640
with uh jay over here on the right hand

510
00:18:29,590 --> 00:18:27,270
oh we'll start with ken okay jay's

511
00:18:30,549 --> 00:18:29,600
behind me um i know um

512
00:18:32,150 --> 00:18:30,559
that's what i thought you were pointing

513
00:18:34,870 --> 00:18:32,160

to i'm sorry ken kramer for space flight

514
00:18:36,630 --> 00:18:34,880
magazine universe today uh for simon i

515
00:18:38,150 --> 00:18:36,640
have some questions for you if you could

516
00:18:39,990 --> 00:18:38,160
describe your

517
00:18:41,990 --> 00:18:40,000
experiment a little bit more detail what

518
00:18:43,669 --> 00:18:42,000
what did you change in these plants is

519
00:18:44,950 --> 00:18:43,679
this the first time these plants have

520
00:18:46,549 --> 00:18:44,960
been altered

521
00:18:48,630 --> 00:18:46,559
and what would be the if what's the

522
00:18:51,270 --> 00:18:48,640
effect on earth so what's the control do

523
00:18:52,870 --> 00:18:51,280
they do these changes have on

524
00:18:54,549 --> 00:18:52,880
their their survival on earth thanks

525
00:18:55,430 --> 00:18:54,559
excellent questions

526
00:18:57,669 --> 00:18:55,440
so

527
00:18:59,270 --> 00:18:57,679
as part of a

528
00:19:01,110 --> 00:18:59,280
bigger research program we've been

529
00:19:03,830 --> 00:19:01,120
trying to understand what happens when

530
00:19:05,750 --> 00:19:03,840
plants get flooded as

531
00:19:07,669 --> 00:19:05,760
an element of an agricultural problem

532
00:19:10,150 --> 00:19:07,679
but also it's a very fundamental problem

533
00:19:11,590 --> 00:19:10,160
about thinking about how biology like a

534
00:19:14,230 --> 00:19:11,600
plant can

535
00:19:15,590 --> 00:19:14,240
i can tell what the oxygen levels around

536
00:19:18,070 --> 00:19:15,600
it are and then

537
00:19:20,150 --> 00:19:18,080
deal with that so there are cellular

538
00:19:22,549 --> 00:19:20,160

signals which are generated almost

539
00:19:25,750 --> 00:19:22,559
instantaneously when the oxygen levels

540
00:19:27,270 --> 00:19:25,760
in the environment drop and we we are at

541
00:19:28,950 --> 00:19:27,280
the forefront of science here so we

542
00:19:30,710 --> 00:19:28,960
don't know how that sensor works but we

543
00:19:32,549 --> 00:19:30,720
know what the signals are

544
00:19:34,950 --> 00:19:32,559
and so one of the things that changes is

545
00:19:37,110 --> 00:19:34,960
is the a signature of of calcium ions

546
00:19:40,230 --> 00:19:37,120
within the cytoplasm that's a classic

547
00:19:42,070 --> 00:19:40,240
cellular regulator so we know a lot

548
00:19:43,830 --> 00:19:42,080
about the dynamics of that and we also

549
00:19:47,029 --> 00:19:43,840
know a lot about the genes which are

550
00:19:48,470 --> 00:19:47,039
involved in making that signal work

551
00:19:50,549 --> 00:19:48,480
so

552
00:19:52,710 --> 00:19:50,559
taking that information which is

553
00:19:54,230 --> 00:19:52,720
withdrawn from a lot of other people's

554
00:19:55,990 --> 00:19:54,240
research and our own research and

555
00:19:58,310 --> 00:19:56,000
pulling all of that together we were

556
00:20:01,909 --> 00:19:58,320
able to target a couple of genes which

557
00:20:05,750 --> 00:20:01,919
we are fairly confident of key no points

558
00:20:07,029 --> 00:20:05,760
key pivot points in that uh signaling

559
00:20:08,630 --> 00:20:07,039
cassette

560
00:20:10,390 --> 00:20:08,640
and

561
00:20:14,710 --> 00:20:10,400
because of the because of this little

562
00:20:18,549 --> 00:20:16,230
the plant biologists have a

563
00:20:20,950 --> 00:20:18,559

fantastically powerful set of tools to

564
00:20:23,590 --> 00:20:20,960
be able to go in pick a gene and

565
00:20:26,630 --> 00:20:23,600
manipulate that gene and so what we did

566
00:20:28,630 --> 00:20:26,640
was we took the the identity of those

567
00:20:30,710 --> 00:20:28,640
key gene signaling genes

568
00:20:32,950 --> 00:20:30,720
and we went in and we knocked them out

569
00:20:35,990 --> 00:20:32,960
and it turns out that those genes are

570
00:20:38,230 --> 00:20:36,000
the off switch for the signal and so we

571
00:20:41,029 --> 00:20:38,240
take the off switch away and so when

572
00:20:43,270 --> 00:20:41,039
oxygen levels drop this calcium signal

573
00:20:44,470 --> 00:20:43,280
is generated and it's much much bigger

574
00:20:46,950 --> 00:20:44,480
than it would be

575
00:20:48,710 --> 00:20:46,960
normally on earth and that triggers a

576
00:20:50,549 --> 00:20:48,720
much larger kind of what you might think

577
00:20:52,149 --> 00:20:50,559
of as an oxygen defense response in the

578
00:20:53,909 --> 00:20:52,159
plants and that's why

579
00:20:56,310 --> 00:20:53,919
on earth we know that these these plants

580
00:20:58,070 --> 00:20:56,320
are resistant to low oxygen stress

581
00:21:00,789 --> 00:20:58,080
uh so

582
00:21:02,070 --> 00:21:00,799
in space where we are our hypothesis is

583
00:21:04,149 --> 00:21:02,080
that the same kind of thing is going to

584
00:21:06,070 --> 00:21:04,159
happen and so the low oxygen stress that

585
00:21:07,909 --> 00:21:06,080
the plants see in space

586
00:21:10,470 --> 00:21:07,919
these plants should just behave a little

587
00:21:11,750 --> 00:21:10,480
bit better under those circumstances on

588
00:21:13,270 --> 00:21:11,760

earth

589
00:21:15,510 --> 00:21:13,280
the original reason for beginning to

590
00:21:17,830 --> 00:21:15,520
think about this it's one of those happy

591
00:21:20,070 --> 00:21:17,840
coincidences or

592
00:21:21,909 --> 00:21:20,080
coalescence of of research programs

593
00:21:24,549 --> 00:21:21,919
where there's a problem which is a space

594
00:21:27,909 --> 00:21:24,559
problem but that space problem isn't is

595
00:21:29,590 --> 00:21:27,919
an earth problem as well and so

596
00:21:31,430 --> 00:21:29,600
plants having to deal with flooded

597
00:21:33,110 --> 00:21:31,440
fields

598
00:21:35,110 --> 00:21:33,120
plants encased in ice you know it

599
00:21:37,190 --> 00:21:35,120
doesn't happen in florida very often but

600
00:21:39,110 --> 00:21:37,200
we're from wisconsin at the moment it is

601
00:21:41,190 --> 00:21:39,120
cold up there and there was actually

602
00:21:43,270 --> 00:21:41,200
this white stuff on the ground and and

603
00:21:45,669 --> 00:21:43,280
so uh plants which are encased in ice

604
00:21:47,590 --> 00:21:45,679
are locked away from from a supply of

605
00:21:50,070 --> 00:21:47,600
oxygen so there's a there are many

606
00:21:51,830 --> 00:21:50,080
naturally occurring environments where

607
00:21:53,350 --> 00:21:51,840
that stress occurs

608
00:21:55,990 --> 00:21:53,360
which is why plants can deal with it in

609
00:21:57,909 --> 00:21:56,000
the first place and what we're doing is

610
00:22:00,549 --> 00:21:57,919
tinkering with that system and it just

611
00:22:02,950 --> 00:22:00,559
turns out that the space station is the

612
00:22:05,510 --> 00:22:02,960
perfect place for us to do an experiment

613
00:22:07,590 --> 00:22:05,520

where we can set up

614
00:22:09,669 --> 00:22:07,600
this low oxygen environment in a way

615
00:22:11,350 --> 00:22:09,679
that is simply impossible to do on earth

616
00:22:13,350 --> 00:22:11,360
so it's it's it's taking that

617
00:22:15,029 --> 00:22:13,360
ground-based research

618
00:22:16,310 --> 00:22:15,039
using that information in space but the

619
00:22:18,390 --> 00:22:16,320
information we're going to get back from

620
00:22:20,710 --> 00:22:18,400
space is going to plow straight back

621
00:22:22,230 --> 00:22:20,720
into that research program which which

622
00:22:23,270 --> 00:22:22,240
the one of the goals of it is to

623
00:22:24,549 --> 00:22:23,280
understand

624
00:22:26,549 --> 00:22:24,559
you know when a farmer's field is

625
00:22:28,310 --> 00:22:26,559
flooded what's going on and the

626
00:22:29,909 --> 00:22:28,320
long-term goal there would be to be able

627
00:22:31,750 --> 00:22:29,919
to do some breeding or something to make

628
00:22:33,909 --> 00:22:31,760
crops more resistant so it's that nice

629
00:22:34,950 --> 00:22:33,919
circle of research

630
00:22:36,789 --> 00:22:34,960
okay over here on the left then we'll

631
00:22:39,270 --> 00:22:36,799
come irene next go ahead

632
00:22:42,549 --> 00:22:39,280
hi i'm miriam kramer with space.com and

633
00:22:44,870 --> 00:22:42,559
i have a couple questions uh one is have

634
00:22:47,669 --> 00:22:44,880
you heard of anything fun being sent up

635
00:22:50,149 --> 00:22:47,679
in the capsule either for

636
00:22:51,110 --> 00:22:50,159
the crew members um

637
00:22:52,149 --> 00:22:51,120
or

638
00:22:54,390 --> 00:22:52,159

have

639
00:22:56,390 --> 00:22:54,400
are there any other experiments that

640
00:22:59,590 --> 00:22:56,400
you'd like to highlight um

641
00:23:02,390 --> 00:23:01,110
well we could you know it's it's

642
00:23:04,630 --> 00:23:02,400
difficult in this amount of time to

643
00:23:05,909 --> 00:23:04,640
highlight there are roughly 43

644
00:23:07,750 --> 00:23:05,919
investigations with something either

645
00:23:09,590 --> 00:23:07,760
coming up or coming down on this flight

646
00:23:12,070 --> 00:23:09,600
so it's it's definitely hard to pick a

647
00:23:14,470 --> 00:23:12,080
favorite um i think one that's

648
00:23:15,830 --> 00:23:14,480
particularly interesting is the

649
00:23:17,590 --> 00:23:15,840
combustion study that we'll be doing

650
00:23:19,750 --> 00:23:17,600
where we're burning actual space flight

651
00:23:21,430 --> 00:23:19,760
materials and and through the course of

652
00:23:23,350 --> 00:23:21,440
earlier research on the space station

653
00:23:25,270 --> 00:23:23,360
we've learned that spacecraft materials

654
00:23:26,789 --> 00:23:25,280
burn a lot differently in space than we

655
00:23:29,029 --> 00:23:26,799
thought so we we set up a whole

656
00:23:30,950 --> 00:23:29,039
spacecraft fire safety program based on

657
00:23:33,270 --> 00:23:30,960
how things burn on the ground now we're

658
00:23:34,710 --> 00:23:33,280
finding that the soots are much larger

659
00:23:37,029 --> 00:23:34,720
that things burn differently and that's

660
00:23:37,750 --> 00:23:37,039
really transforming the way that we plan

661
00:23:40,870 --> 00:23:37,760
for

662
00:23:42,070 --> 00:23:40,880
future and so that's an example

663
00:23:44,230 --> 00:23:42,080

something very different than anything

664
00:23:46,070 --> 00:23:44,240
we've talked about up here

665
00:23:48,070 --> 00:23:46,080
okay irene then we'll come up here

666
00:23:50,470 --> 00:23:48,080
thanks um irene clauds with reuters hi

667
00:23:52,149 --> 00:23:50,480
julie um you mentioned procter gamble in

668
00:23:53,909 --> 00:23:52,159
your opening comments could you

669
00:23:55,110 --> 00:23:53,919
elaborate a little bit on what their

670
00:23:56,789 --> 00:23:55,120
involvement

671
00:23:58,470 --> 00:23:56,799
is and if there's any other large

672
00:24:00,310 --> 00:23:58,480
companies that are

673
00:24:01,830 --> 00:24:00,320
backing any research

674
00:24:05,029 --> 00:24:01,840
yeah so um

675
00:24:06,789 --> 00:24:05,039
procter gamble's been a collaborator of

676
00:24:09,269 --> 00:24:06,799
academic researchers at harvard

677
00:24:10,549 --> 00:24:09,279
university and cornell and several other

678
00:24:11,990 --> 00:24:10,559
universities that have done colloids

679
00:24:13,750 --> 00:24:12,000
research on the space station for quite

680
00:24:16,149 --> 00:24:13,760
some time

681
00:24:18,549 --> 00:24:16,159
and in this particular case in the study

682
00:24:20,230 --> 00:24:18,559
we call ace m1

683
00:24:22,149 --> 00:24:20,240
those samples have been particularly

684
00:24:25,029 --> 00:24:22,159
tuned to some fundamental questions

685
00:24:27,830 --> 00:24:25,039
about how colloids behave that you can

686
00:24:29,430 --> 00:24:27,840
only study in space so remember colloid

687
00:24:32,710 --> 00:24:29,440
is something like a paint it's a mixture

688
00:24:33,830 --> 00:24:32,720

of a liquid and a solid and colloids are

689
00:24:35,669 --> 00:24:33,840
paints

690
00:24:37,510 --> 00:24:35,679
laundry detergent all kinds of consumer

691
00:24:39,750 --> 00:24:37,520
products fabric softener all of those

692
00:24:41,110 --> 00:24:39,760
things are colloids and optimizing the

693
00:24:43,110 --> 00:24:41,120
processes

694
00:24:45,430 --> 00:24:43,120
of separation and the process of mixing

695
00:24:46,630 --> 00:24:45,440
for those is an important industrial

696
00:24:48,549 --> 00:24:46,640
research area

697
00:24:50,230 --> 00:24:48,559
so the fundamental research about

698
00:24:51,669 --> 00:24:50,240
colloids that's helping us understand

699
00:24:53,990 --> 00:24:51,679
things like the critical point that's

700
00:24:56,149 --> 00:24:54,000
being done at harvard has fed into this

701
00:24:58,470 --> 00:24:56,159
procter gamble collaboration and so what

702
00:24:59,990 --> 00:24:58,480
they'll be doing is is using samples

703
00:25:02,310 --> 00:25:00,000
that are tuned to answer some of their

704
00:25:03,669 --> 00:25:02,320
specific questions about the physics of

705
00:25:04,710 --> 00:25:03,679
the systems that they have in their

706
00:25:06,070 --> 00:25:04,720
products

707
00:25:08,549 --> 00:25:06,080
and they'll be using the light

708
00:25:10,710 --> 00:25:08,559
microscopy module on iss

709
00:25:12,870 --> 00:25:10,720
and actually looking at the separation

710
00:25:14,870 --> 00:25:12,880
and the mixing and the processes at the

711
00:25:15,750 --> 00:25:14,880
molecular level or at the particle level

712
00:25:16,870 --> 00:25:15,760
at least

713
00:25:22,149 --> 00:25:16,880

in these

714
00:25:25,190 --> 00:25:23,510
there are a number of other companies

715
00:25:26,470 --> 00:25:25,200
and um why don't you go ahead and take

716
00:25:28,710 --> 00:25:26,480
that one mike

717
00:25:32,070 --> 00:25:28,720
um yeah uh one of the experiments in our

718
00:25:34,870 --> 00:25:32,080
uh in the valley christian set uh is

719
00:25:37,190 --> 00:25:34,880
sponsored by valspar paint

720
00:25:39,350 --> 00:25:37,200
and we're also looking at uh colloids

721
00:25:40,710 --> 00:25:39,360
and microgravity situation how paints

722
00:25:41,909 --> 00:25:40,720
would be used

723
00:25:45,110 --> 00:25:41,919
in

724
00:25:46,470 --> 00:25:45,120
hasn't been done they haven't had to

725
00:25:49,350 --> 00:25:46,480
paint the space station yet i don't

726
00:25:53,430 --> 00:25:50,630
okay jay

727
00:25:55,350 --> 00:25:53,440
jay barbary with nbc julie a two-part

728
00:25:58,390 --> 00:25:55,360
question you're talking about the

729
00:26:00,390 --> 00:25:58,400
science going up on crs2 the science

730
00:26:01,990 --> 00:26:00,400
you're bringing back will that be all

731
00:26:03,909 --> 00:26:02,000
science that has been

732
00:26:06,789 --> 00:26:03,919
on the station and returning to earth

733
00:26:09,029 --> 00:26:06,799
are you mixing apples going up and back

734
00:26:10,789 --> 00:26:09,039
and part two

735
00:26:11,669 --> 00:26:10,799
when we were building the space station

736
00:26:14,549 --> 00:26:11,679
we were

737
00:26:16,549 --> 00:26:14,559
constantly criticized that all the work

738
00:26:18,789 --> 00:26:16,559

going on up there was construction

739
00:26:21,669 --> 00:26:18,799
engineering development and nothing was

740
00:26:23,750 --> 00:26:21,679
going to science now that iss is

741
00:26:26,470 --> 00:26:23,760
completed what percentage of the

742
00:26:28,390 --> 00:26:26,480
workload for the crew would you estimate

743
00:26:30,789 --> 00:26:28,400
that goes for science each day and how

744
00:26:33,750 --> 00:26:30,799
much science are we really doing on the

745
00:26:35,350 --> 00:26:33,760
international space station sure

746
00:26:37,110 --> 00:26:35,360
first of all we have some some

747
00:26:38,390 --> 00:26:37,120
experiments that around tripping when if

748
00:26:40,789 --> 00:26:38,400
they're short enough duration we can

749
00:26:41,909 --> 00:26:40,799
take them up on dragon

750
00:26:43,190 --> 00:26:41,919
put them on the space station do a

751
00:26:44,950 --> 00:26:43,200
little bit of operations and then bring

752
00:26:46,230 --> 00:26:44,960
them right back home and and some of

753
00:26:47,990 --> 00:26:46,240
those are

754
00:26:49,990 --> 00:26:48,000
a demonstration of the new cell biology

755
00:26:52,470 --> 00:26:50,000
hardware that we're flying

756
00:26:53,830 --> 00:26:52,480
the brick 17 so simon's work is in that

757
00:26:54,710 --> 00:26:53,840
category

758
00:26:56,470 --> 00:26:54,720
also

759
00:26:58,870 --> 00:26:56,480
a stem cells investigation that's being

760
00:27:01,350 --> 00:26:58,880
flown by our japanese colleagues and

761
00:27:02,470 --> 00:27:01,360
an experiment on materials coarsening

762
00:27:04,310 --> 00:27:02,480
so when you take an alloy and you

763
00:27:05,590 --> 00:27:04,320

solidify it it coarsens over time and

764
00:27:07,510 --> 00:27:05,600
experiment on that those are some of the

765
00:27:09,350 --> 00:27:07,520
ones that are round tripping then we

766
00:27:11,830 --> 00:27:09,360
have a number of samples that are coming

767
00:27:14,070 --> 00:27:11,840
home that have been built up over time

768
00:27:16,230 --> 00:27:14,080
on the iss and and some examples of

769
00:27:17,269 --> 00:27:16,240
those are all of the human research

770
00:27:23,029 --> 00:27:17,279
samples

771
00:27:25,110 --> 00:27:23,039
other kinds of of things that accompany

772
00:27:26,710 --> 00:27:25,120
our human research program we also have

773
00:27:28,470 --> 00:27:26,720
hardware that we've finished using on

774
00:27:29,909 --> 00:27:28,480
orbit that will refurb on the ground and

775
00:27:31,830 --> 00:27:29,919
then provide the opportunity for the

776
00:27:33,190 --> 00:27:31,840
researchers to launch again

777
00:27:35,269 --> 00:27:33,200
some of those things are in the physical

778
00:27:37,350 --> 00:27:35,279
sciences as well so that's just some

779
00:27:39,909 --> 00:27:37,360
examples and then to answer your second

780
00:27:41,909 --> 00:27:39,919
question you know the the boundary

781
00:27:43,669 --> 00:27:41,919
between the assembly period

782
00:27:45,750 --> 00:27:43,679
and the post-assembly period where

783
00:27:47,269 --> 00:27:45,760
research is the primary mission is just

784
00:27:48,549 --> 00:27:47,279
it's an extraordinary thing to have

785
00:27:51,269 --> 00:27:48,559
experienced

786
00:27:55,029 --> 00:27:51,279
because you know i was program scientist

787
00:27:56,549 --> 00:27:55,039
by starting in 2006 2007 and so i

788
00:27:58,710 --> 00:27:56,559

worked through that entire transition

789
00:28:02,070 --> 00:27:58,720
phase and when i first started we would

790
00:28:03,990 --> 00:28:02,080
have seven eight experiments max

791
00:28:06,549 --> 00:28:04,000
sometimes or maybe only five or six

792
00:28:08,950 --> 00:28:06,559
hours a week our strategic goal after

793
00:28:10,630 --> 00:28:08,960
assembly was done was to get to 70 hours

794
00:28:11,909 --> 00:28:10,640
a week total across the whole space

795
00:28:14,470 --> 00:28:11,919
station

796
00:28:16,549 --> 00:28:14,480
35 in the u.s operating segment and 35

797
00:28:18,549 --> 00:28:16,559
in the russian segment but what we're

798
00:28:20,230 --> 00:28:18,559
seeing happen now is we're pushing that

799
00:28:22,470 --> 00:28:20,240
boundary as we get more efficient with

800
00:28:24,870 --> 00:28:22,480
our operations and so

801
00:28:27,590 --> 00:28:24,880
just a few weeks ago we had the

802
00:28:29,669 --> 00:28:27,600
record-setting number of hours that went

803
00:28:32,389 --> 00:28:29,679
to u.s research it was 71 hours in a

804
00:28:34,630 --> 00:28:32,399
single week went to u.s research and so

805
00:28:36,389 --> 00:28:34,640
what that translates into is we see the

806
00:28:38,789 --> 00:28:36,399
throughput going up we see scientists

807
00:28:40,950 --> 00:28:38,799
having repeat access we've got spacex

808
00:28:42,630 --> 00:28:40,960
flying now and all of a sudden the

809
00:28:44,950 --> 00:28:42,640
laboratory is really achieving that

810
00:28:46,389 --> 00:28:44,960
original potential it just you know it

811
00:28:49,430 --> 00:28:46,399
took a while to build it but now that

812
00:28:52,149 --> 00:28:49,440
it's built it's an amazing platform

813
00:28:54,149 --> 00:28:52,159

okay marcia washington associated press

814
00:28:55,750 --> 00:28:54,159
i'm just wondering is it just the one

815
00:28:57,909 --> 00:28:55,760
type of plants that are going up are

816
00:28:59,830 --> 00:28:57,919
there more different kinds

817
00:29:01,750 --> 00:28:59,840
and perhaps what quantity of plants and

818
00:29:04,230 --> 00:29:01,760
i see the medaka fisher coming back or

819
00:29:07,190 --> 00:29:04,240
any creatures going up as small as they

820
00:29:10,870 --> 00:29:08,789
i think we can see for

821
00:29:13,350 --> 00:29:10,880
for brick 17 there are two sets of

822
00:29:16,630 --> 00:29:13,360
experiments which are going up uh

823
00:29:18,710 --> 00:29:16,640
there's ours which is uh seedlings of of

824
00:29:20,230 --> 00:29:18,720
mouse eared crests and there's a group

825
00:29:22,950 --> 00:29:20,240
from the university of florida who's

826
00:29:25,190 --> 00:29:22,960
putting up cell cultures so that's

827
00:29:26,630 --> 00:29:25,200
taking uh parts of plants and then

828
00:29:29,510 --> 00:29:26,640
turning them into individual dividing

829
00:29:31,430 --> 00:29:29,520
cells and though to um to ask what the

830
00:29:34,389 --> 00:29:31,440
difference is between how they respond

831
00:29:35,909 --> 00:29:34,399
and how an intact plant responds uh

832
00:29:37,110 --> 00:29:35,919
i i think we'd have to ask julie about

833
00:29:39,029 --> 00:29:37,120
the other plant material we have some

834
00:29:40,789 --> 00:29:39,039
other plants coming home plants from the

835
00:29:42,070 --> 00:29:40,799
plant signaling study which was a

836
00:29:44,149 --> 00:29:42,080
different study that was in our

837
00:29:46,310 --> 00:29:44,159
centrifuge our emcs centrifuge that was

838
00:29:48,230 --> 00:29:46,320

looking at how plants know which way to

839
00:29:49,430 --> 00:29:48,240
grow down and which way to grow up those

840
00:29:51,029 --> 00:29:49,440
are also

841
00:29:53,029 --> 00:29:51,039
you know model plant material but it's a

842
00:29:55,190 --> 00:29:53,039
different investigation coming home we

843
00:29:57,909 --> 00:29:55,200
do have the samples from the madoka

844
00:30:00,470 --> 00:29:57,919
osteoclast study that's the study where

845
00:30:02,389 --> 00:30:00,480
japanese researchers are looking at the

846
00:30:04,789 --> 00:30:02,399
cells that form fish scales which are

847
00:30:06,070 --> 00:30:04,799
osteoclasts just like the cells in our

848
00:30:07,510 --> 00:30:06,080
body

849
00:30:08,549 --> 00:30:07,520
you know the cells that form fish scales

850
00:30:10,310 --> 00:30:08,559
are very much like the cells that

851
00:30:11,909 --> 00:30:10,320
remodel bone in our own bodies and so

852
00:30:13,269 --> 00:30:11,919
it's a model system for looking at the

853
00:30:15,590 --> 00:30:13,279
way those cells function and their

854
00:30:18,310 --> 00:30:15,600
samples which are um you know preserved

855
00:30:20,950 --> 00:30:18,320
samples are coming home on this flight

856
00:30:23,269 --> 00:30:20,960
on the nanoracks payloads we have

857
00:30:25,350 --> 00:30:23,279
actually four different plants that are

858
00:30:27,350 --> 00:30:25,360
flying i should say at this in the seed

859
00:30:28,470 --> 00:30:27,360
state they're going to grow on orbit

860
00:30:32,149 --> 00:30:28,480
um

861
00:30:34,389 --> 00:30:32,159
and we have uh at least uh two different

862
00:30:37,830 --> 00:30:34,399
bacteria experiments so

863
00:30:38,870 --> 00:30:37,840

little little critters

864
00:30:40,789 --> 00:30:38,880
okay over here on the left then we'll

865
00:30:44,230 --> 00:30:40,799
come over here hi i'm anna micah with

866
00:30:47,909 --> 00:30:44,240
social media and um my question is for

867
00:30:50,470 --> 00:30:47,919
dr gilroy i also graduated from uw so i

868
00:30:51,909 --> 00:30:50,480
understand the cold weather

869
00:30:53,909 --> 00:30:51,919
but it has to do with the plants that

870
00:30:55,269 --> 00:30:53,919
you're studying are they the same plants

871
00:30:57,750 --> 00:30:55,279
that they studied

872
00:30:58,950 --> 00:30:57,760
not too long ago on the iss that they

873
00:31:00,470 --> 00:30:58,960
did the

874
00:31:02,950 --> 00:31:00,480
challenge for kids where they could grow

875
00:31:04,149 --> 00:31:02,960
the plant seeds in the classrooms

876
00:31:05,509 --> 00:31:04,159
i don't know if you're familiar with

877
00:31:07,110 --> 00:31:05,519
that is that something that you're

878
00:31:09,029 --> 00:31:07,120
looking at perhaps doing i'm also a

879
00:31:10,710 --> 00:31:09,039
teacher so are you going to bring those

880
00:31:12,950 --> 00:31:10,720
seeds back so kids can grow them in the

881
00:31:14,310 --> 00:31:12,960
classrooms um

882
00:31:15,909 --> 00:31:14,320
so that they can have that connection we

883
00:31:17,430 --> 00:31:15,919
don't know about that yeah we've grown a

884
00:31:18,789 --> 00:31:17,440
couple of different kinds of seeds in

885
00:31:21,029 --> 00:31:18,799
different educational activities we have

886
00:31:23,509 --> 00:31:21,039
grown arabidopsis we've also grown basil

887
00:31:25,430 --> 00:31:23,519
seeds we've also flown basil seeds that

888
00:31:26,149 --> 00:31:25,440

were brought home and then we've

889
00:31:27,669 --> 00:31:26,159
had

890
00:31:30,149 --> 00:31:27,679
investigations for students that also

891
00:31:31,669 --> 00:31:30,159
use tomato seeds so they're a variety of

892
00:31:34,630 --> 00:31:31,679
seeds and plants that have been grown by

893
00:31:37,509 --> 00:31:34,640
students or for students

894
00:31:38,470 --> 00:31:37,519
okay let's go here is there another one

895
00:31:40,389 --> 00:31:38,480
um

896
00:31:42,950 --> 00:31:40,399
my name is kevin guerrero social media

897
00:31:45,750 --> 00:31:42,960
and i'm also a freshman studying

898
00:31:47,669 --> 00:31:45,760
aerospace engineering now i know not

899
00:31:49,590 --> 00:31:47,679
everyone that studies engineering can uh

900
00:31:51,669 --> 00:31:49,600
work with nasa but

901
00:31:53,909 --> 00:31:51,679
a lot of people work with spacex so what

902
00:31:55,269 --> 00:31:53,919
does the future have for spacex and nasa

903
00:31:57,590 --> 00:31:55,279
working together

904
00:31:59,590 --> 00:31:57,600
like on missions one i think great

905
00:32:01,590 --> 00:31:59,600
example that you'll find interesting is

906
00:32:04,389 --> 00:32:01,600
that we've been working to do

907
00:32:06,470 --> 00:32:04,399
microsat deployments both from spacex

908
00:32:08,470 --> 00:32:06,480
directly as well as from a new

909
00:32:09,750 --> 00:32:08,480
capability that's being added on iss and

910
00:32:11,110 --> 00:32:09,760
so there are university students

911
00:32:14,310 --> 00:32:11,120
engineering students that are building

912
00:32:15,750 --> 00:32:14,320
some of these microsats um as university

913
00:32:17,750 --> 00:32:15,760

projects and they are able to use that

914
00:32:19,750 --> 00:32:17,760
little bit of extra capacity either on

915
00:32:21,590 --> 00:32:19,760
the spacex flight or from the iss to

916
00:32:23,830 --> 00:32:21,600
launch those microsats and do studies

917
00:32:26,230 --> 00:32:23,840
with them

918
00:32:28,870 --> 00:32:26,240
okay let's come here uh todd halperson

919
00:32:32,549 --> 00:32:28,880
florida today for julie um just to

920
00:32:35,669 --> 00:32:32,559
clarify uh the 71 hours in a single week

921
00:32:37,350 --> 00:32:35,679
was u.s only that was u.s only u.s site

922
00:32:39,509 --> 00:32:37,360
only so the russian research time was on

923
00:32:41,350 --> 00:32:39,519
top of that okay and do you know how

924
00:32:42,389 --> 00:32:41,360
much russian research time there was

925
00:32:44,710 --> 00:32:42,399
that week

926
00:32:46,789 --> 00:32:44,720
in that particular week i don't have the

927
00:32:48,950 --> 00:32:46,799
um the sum for that week but they

928
00:32:50,310 --> 00:32:48,960
average about 30 to 35 hours a week as

929
00:32:52,950 --> 00:32:50,320
well on their side

930
00:32:54,310 --> 00:32:52,960
do you know what the previous u.s record

931
00:32:55,909 --> 00:32:54,320
was

932
00:32:59,110 --> 00:32:55,919
you know we've been bumping that record

933
00:33:02,389 --> 00:32:59,120
up gradually so i think when before we

934
00:33:05,029 --> 00:33:02,399
hit 71 it was 68 and before we hit 68 it

935
00:33:06,789 --> 00:33:05,039
was 63. so we've been basically as we've

936
00:33:08,950 --> 00:33:06,799
ramped up research we've had these surge

937
00:33:10,470 --> 00:33:08,960
days over the last year

938
00:33:12,389 --> 00:33:10,480

so what's happened is we've achieved

939
00:33:14,549 --> 00:33:12,399
that overall strategic average that was

940
00:33:16,710 --> 00:33:14,559
the goal of the iss when it was designed

941
00:33:18,950 --> 00:33:16,720
and we see that in some of these amazing

942
00:33:20,630 --> 00:33:18,960
days where you know they kind of balance

943
00:33:22,149 --> 00:33:20,640
out there's a few days when right after

944
00:33:24,389 --> 00:33:22,159
spacex docks for example we'll be

945
00:33:26,549 --> 00:33:24,399
unloading cargo as fast as we can

946
00:33:28,230 --> 00:33:26,559
and so some of these days with these big

947
00:33:29,110 --> 00:33:28,240
surges make up for that and average it

948
00:33:31,430 --> 00:33:29,120
out

949
00:33:34,269 --> 00:33:31,440
and just one more for me

950
00:33:37,509 --> 00:33:34,279
i'm curious as to whether there is any

951
00:33:40,630 --> 00:33:37,519
competitiveness between exploration our

952
00:33:43,350 --> 00:33:40,640
expedition crews in terms of how much

953
00:33:45,350 --> 00:33:43,360
science they can accomplish during their

954
00:33:47,750 --> 00:33:45,360
tenure on board

955
00:33:49,909 --> 00:33:47,760
i would say it's cooperative

956
00:33:51,269 --> 00:33:49,919
and collaborative so crew members help

957
00:33:53,590 --> 00:33:51,279
each other

958
00:33:55,350 --> 00:33:53,600
they embrace the research mission a lot

959
00:33:57,029 --> 00:33:55,360
of our experiments need two people maybe

960
00:33:59,190 --> 00:33:57,039
one is an operator sometimes one is a

961
00:34:01,029 --> 00:33:59,200
subject or they need four sets of hands

962
00:34:02,310 --> 00:34:01,039
to be successful at doing harvesting or

963
00:34:04,389 --> 00:34:02,320

something like that

964
00:34:06,230 --> 00:34:04,399
and so they really help each other out

965
00:34:08,069 --> 00:34:06,240
and it's just to get all the research

966
00:34:09,030 --> 00:34:08,079
done they can

967
00:34:10,710 --> 00:34:09,040
okay

968
00:34:12,629 --> 00:34:10,720
over here on the left

969
00:34:14,470 --> 00:34:12,639
amy gravel with the nasa social group

970
00:34:16,230 --> 00:34:14,480
can you elaborate on the process

971
00:34:18,389 --> 00:34:16,240
involved with going from having a

972
00:34:23,190 --> 00:34:18,399
scientific question to getting an

973
00:34:27,270 --> 00:34:25,589
let me start let me start by splitting

974
00:34:28,869 --> 00:34:27,280
i'll start by splitting your question

975
00:34:30,230 --> 00:34:28,879
because one of the really neat things

976
00:34:31,589 --> 00:34:30,240
about the space station is there are two

977
00:34:33,829 --> 00:34:31,599
pathways today and you see that

978
00:34:35,909 --> 00:34:33,839
represented on the on the dice here so

979
00:34:37,510 --> 00:34:35,919
there's one pathway which is to get your

980
00:34:39,430 --> 00:34:37,520
research funded through nasa through a

981
00:34:42,310 --> 00:34:39,440
competitive peer review cycle that way

982
00:34:43,669 --> 00:34:42,320
competing for nasa mission driven goals

983
00:34:45,349 --> 00:34:43,679
and those are in research announcements

984
00:34:47,349 --> 00:34:45,359
and that's how dr gilroy and that's

985
00:34:49,750 --> 00:34:47,359
basically the program that that

986
00:34:52,710 --> 00:34:49,760
dr porterfield's managing then the other

987
00:34:54,710 --> 00:34:52,720
way is to come through iss is a national

988
00:34:56,869 --> 00:34:54,720

laboratory in that case you bring in

989
00:34:58,310 --> 00:34:56,879
your own funding you raise your funding

990
00:35:00,069 --> 00:34:58,320
and then you can enter and do

991
00:35:02,230 --> 00:35:00,079
experiments on iss and so that's how

992
00:35:04,150 --> 00:35:02,240
pharmaceutical companies

993
00:35:06,470 --> 00:35:04,160
educational institutions and so forth

994
00:35:08,710 --> 00:35:06,480
can come through without getting in line

995
00:35:10,710 --> 00:35:08,720
for the nasa funding and having both of

996
00:35:12,870 --> 00:35:10,720
those routes to iss is a real strength

997
00:35:14,630 --> 00:35:12,880
of the laboratory it's how research

998
00:35:16,230 --> 00:35:14,640
competes in the real world on the ground

999
00:35:18,550 --> 00:35:16,240
right you don't have to go through only

1000
00:35:19,910 --> 00:35:18,560
one agency only nsf to get research

1001
00:35:21,030 --> 00:35:19,920
funded here on earth there are a number

1002
00:35:22,790 --> 00:35:21,040
of different ways you can get your

1003
00:35:25,829 --> 00:35:22,800
research funded and that really spurs

1004
00:35:27,589 --> 00:35:25,839
scientific creativity

1005
00:35:29,589 --> 00:35:27,599
you guys want to add to that sure i

1006
00:35:31,190 --> 00:35:29,599
would say that in a lot of cases too we

1007
00:35:32,790 --> 00:35:31,200
have

1008
00:35:34,390 --> 00:35:32,800
you can be an entrepreneur on the space

1009
00:35:36,470 --> 00:35:34,400
station these days too

1010
00:35:39,190 --> 00:35:36,480
so if you have the money if you have the

1011
00:35:40,790 --> 00:35:39,200
funding uh and the support to develop

1012
00:35:44,470 --> 00:35:40,800
your own science there are very short

1013
00:35:46,950 --> 00:35:44,480

paths through banorax cases

1014
00:35:50,550 --> 00:35:46,960
through the national laboratory

1015
00:35:53,670 --> 00:35:50,560
to get on the space station very quickly

1016
00:35:55,670 --> 00:35:53,680
in some cases typically we

1017
00:35:58,470 --> 00:35:55,680
get researchers on board in about nine

1018
00:36:00,390 --> 00:35:58,480
months from the signing of a contract to

1019
00:36:02,069 --> 00:36:00,400
actual flight

1020
00:36:03,910 --> 00:36:02,079
some cases we've

1021
00:36:07,270 --> 00:36:03,920
done as fast as two months

1022
00:36:09,349 --> 00:36:07,280
i don't like to do it that fast but uh

1023
00:36:11,990 --> 00:36:09,359
nine months is a typical cycle nine to

1024
00:36:14,150 --> 00:36:12,000
six months and

1025
00:36:16,150 --> 00:36:14,160
the beauty of the

1026
00:36:17,190 --> 00:36:16,160
utilization of the u.s national lab too

1027
00:36:19,589 --> 00:36:17,200
is that

1028
00:36:20,470 --> 00:36:19,599
where as time goes by

1029
00:36:23,349 --> 00:36:20,480
the

1030
00:36:24,470 --> 00:36:23,359
amount of infrastructure that's on board

1031
00:36:26,470 --> 00:36:24,480
to cover

1032
00:36:27,829 --> 00:36:26,480
science experimentation

1033
00:36:29,910 --> 00:36:27,839
increases

1034
00:36:31,190 --> 00:36:29,920
it's it's a fantastic place nowadays

1035
00:36:32,150 --> 00:36:31,200
it's getting better

1036
00:36:33,270 --> 00:36:32,160
as

1037
00:36:35,750 --> 00:36:33,280
i think julie said earlier they're

1038
00:36:38,310 --> 00:36:35,760

flying a flow cytometer this is a very

1039
00:36:40,630 --> 00:36:38,320
important piece of research equipment

1040
00:36:42,870 --> 00:36:40,640
that will help a lot of the biological

1041
00:36:45,030 --> 00:36:42,880
side of the of the world but really in

1042
00:36:47,670 --> 00:36:45,040
all all aspects of

1043
00:36:49,349 --> 00:36:47,680
uh microgravity and and space

1044
00:36:50,150 --> 00:36:49,359
environment research

1045
00:36:53,670 --> 00:36:50,160
are

1046
00:36:56,069 --> 00:36:53,680
continuing to build up that

1047
00:36:57,430 --> 00:36:56,079
infrastructure so

1048
00:36:58,710 --> 00:36:57,440
you know in the past when you would fly

1049
00:37:00,710 --> 00:36:58,720
things on the shuttle you'd have to

1050
00:37:02,470 --> 00:37:00,720
basically build your own

1051
00:37:04,470 --> 00:37:02,480
research hardware that would support

1052
00:37:06,950 --> 00:37:04,480
your research experiment and now it's

1053
00:37:09,030 --> 00:37:06,960
possible in cases even like like brick

1054
00:37:11,990 --> 00:37:09,040
for instance

1055
00:37:13,829 --> 00:37:12,000
a researcher can use

1056
00:37:15,589 --> 00:37:13,839
equipment that they're familiar with on

1057
00:37:17,510 --> 00:37:15,599
the ground commercially available

1058
00:37:19,829 --> 00:37:17,520
equipment that's used in standardized

1059
00:37:21,109 --> 00:37:19,839
equipment it's used in laboratories

1060
00:37:23,190 --> 00:37:21,119
in the case of the protein crystal

1061
00:37:25,190 --> 00:37:23,200
growth work we're doing

1062
00:37:27,190 --> 00:37:25,200
these systems are are

1063
00:37:29,510 --> 00:37:27,200

almost robotic in nature or

1064
00:37:31,510 --> 00:37:29,520
semi-automated in nature so we can

1065
00:37:33,910 --> 00:37:31,520
increase the throughput increase the

1066
00:37:35,270 --> 00:37:33,920
number of samples we fly i like to say

1067
00:37:36,870 --> 00:37:35,280
it's uh

1068
00:37:39,190 --> 00:37:36,880
you're increasing n

1069
00:37:40,870 --> 00:37:39,200
your number of samples

1070
00:37:42,630 --> 00:37:40,880
and this is something that

1071
00:37:43,990 --> 00:37:42,640
it's it's exploding it's exploding on

1072
00:37:46,390 --> 00:37:44,000
the ground and we're able to take that

1073
00:37:48,790 --> 00:37:46,400
hardware and use it in the microgravity

1074
00:37:50,950 --> 00:37:48,800
environment on the national lab and

1075
00:37:52,630 --> 00:37:50,960
conduct some fantastic experiments so i

1076
00:37:54,150 --> 00:37:52,640
think in the next two to three years

1077
00:37:55,670 --> 00:37:54,160
you're going to see some really

1078
00:37:57,430 --> 00:37:55,680
interesting developments coming out of

1079
00:37:59,589 --> 00:37:57,440
the national lab side of the space

1080
00:38:00,950 --> 00:37:59,599
station simon you also flew on an

1081
00:38:02,950 --> 00:38:00,960
expedited schedule you want to talk

1082
00:38:05,670 --> 00:38:02,960
about about you know your timing to

1083
00:38:06,630 --> 00:38:05,680
flight yeah um we

1084
00:38:10,069 --> 00:38:06,640
uh

1085
00:38:12,950 --> 00:38:10,079
so

1086
00:38:15,190 --> 00:38:12,960
uh the classic peer review system

1087
00:38:17,589 --> 00:38:15,200
tends to just have a lag built into it

1088
00:38:19,589 --> 00:38:17,599

because it takes time to send out your

1089
00:38:21,990 --> 00:38:19,599
proposal to other scientists get them to

1090
00:38:24,230 --> 00:38:22,000
get feedback and and then of course it's

1091
00:38:25,910 --> 00:38:24,240
nasa so then there's paperwork that gets

1092
00:38:27,430 --> 00:38:25,920
involved after that

1093
00:38:29,190 --> 00:38:27,440
and that paperwork

1094
00:38:31,109 --> 00:38:29,200
for all agencies

1095
00:38:33,589 --> 00:38:31,119
going from the decision to be funded to

1096
00:38:35,910 --> 00:38:33,599
actually the you know like money

1097
00:38:37,750 --> 00:38:35,920
to hire someone to begin to do that work

1098
00:38:39,510 --> 00:38:37,760
tends to be a very protracted process

1099
00:38:43,030 --> 00:38:39,520
and it's just inherent in how the system

1100
00:38:46,630 --> 00:38:43,040
works uh for for uh this for our

1101
00:38:48,550 --> 00:38:46,640
experiment on brick 17 we went from

1102
00:38:49,349 --> 00:38:48,560
writing a proposal

1103
00:38:51,750 --> 00:38:49,359
to

1104
00:38:55,910 --> 00:38:51,760
having the money appear within the

1105
00:38:57,510 --> 00:38:55,920
university of wisconsin system in maybe

1106
00:39:00,230 --> 00:38:57,520
four months three months something like

1107
00:39:02,550 --> 00:39:00,240
that which is a remarkably quick process

1108
00:39:04,550 --> 00:39:02,560
for us uh and it and to some degree that

1109
00:39:06,630 --> 00:39:04,560
kind of changes the game about how you

1110
00:39:07,589 --> 00:39:06,640
think about doing that kind of research

1111
00:39:10,470 --> 00:39:07,599
because

1112
00:39:12,790 --> 00:39:10,480
you know we write the proposal and then

1113
00:39:15,990 --> 00:39:12,800

very soon afterwards we're in a position

1114
00:39:18,150 --> 00:39:16,000
to to get into that ramp up period where

1115
00:39:20,630 --> 00:39:18,160
you know the flight is coming there's a

1116
00:39:22,790 --> 00:39:20,640
deadline and you can start running for

1117
00:39:23,750 --> 00:39:22,800
that deadline very very quickly so it

1118
00:39:28,310 --> 00:39:23,760
was a

1119
00:39:30,470 --> 00:39:28,320
much more painless process than normal

1120
00:39:32,310 --> 00:39:30,480
and if i could i would add so a lot of

1121
00:39:34,069 --> 00:39:32,320
what you heard is the model for cases

1122
00:39:36,630 --> 00:39:34,079
we're trying to

1123
00:39:38,790 --> 00:39:36,640
expedite the time from funding

1124
00:39:40,390 --> 00:39:38,800
a call goes out to an investigator to

1125
00:39:42,310 --> 00:39:40,400
the time that you're actually

1126
00:39:44,630 --> 00:39:42,320
funded to start preparing your payload

1127
00:39:46,550 --> 00:39:44,640
to actually get your science up in

1128
00:39:48,550 --> 00:39:46,560
addition to that increased capability in

1129
00:39:50,870 --> 00:39:48,560
that shortened time frame

1130
00:39:53,270 --> 00:39:50,880
cases is also accepting unsolicited

1131
00:39:55,430 --> 00:39:53,280
proposals so you don't have to wait for

1132
00:39:56,870 --> 00:39:55,440
an agency to tell you we're interested

1133
00:39:58,390 --> 00:39:56,880
in looking at this particular area of

1134
00:40:00,470 --> 00:39:58,400
investigation and we have funding

1135
00:40:01,270 --> 00:40:00,480
available write your proposal we review

1136
00:40:05,829 --> 00:40:01,280
it

1137
00:40:08,150 --> 00:40:05,839
24 7. so

1138
00:40:10,390 --> 00:40:08,160

the process is rather relatively

1139
00:40:12,470 --> 00:40:10,400
painless for a proposal and if you have

1140
00:40:14,870 --> 00:40:12,480
your own funding

1141
00:40:16,390 --> 00:40:14,880
if you have identified a person a

1142
00:40:18,470 --> 00:40:16,400
company that can help you get your

1143
00:40:20,470 --> 00:40:18,480
science up to station that better

1144
00:40:21,910 --> 00:40:20,480
enables you to put a proposal together

1145
00:40:24,309 --> 00:40:21,920
and get it in but if you're coming in

1146
00:40:25,829 --> 00:40:24,319
off the street you haven't flown before

1147
00:40:27,349 --> 00:40:25,839
cases will help you identify an

1148
00:40:29,589 --> 00:40:27,359
implementation partner that can help

1149
00:40:31,510 --> 00:40:29,599
your science be done on station

1150
00:40:33,510 --> 00:40:31,520
so the goal again is to

1151
00:40:35,910 --> 00:40:33,520
enable the utilization of the national

1152
00:40:37,829 --> 00:40:35,920
lab to its full capability by engaging a

1153
00:40:39,109 --> 00:40:37,839
broader spectrum of investigators out

1154
00:40:41,510 --> 00:40:39,119
there whether they're

1155
00:40:44,069 --> 00:40:41,520
from universities or companies

1156
00:40:46,470 --> 00:40:44,079
pharmaceutical companies or high schools

1157
00:40:48,790 --> 00:40:46,480
and middle schools

1158
00:40:51,109 --> 00:40:48,800
okay let's go back here today hi david

1159
00:40:53,030 --> 00:40:51,119
ruck with astronautmovie.com

1160
00:40:56,550 --> 00:40:53,040
can you talk a little bit about where

1161
00:40:59,670 --> 00:40:56,560
these commercially sponsored uh research

1162
00:41:01,829 --> 00:40:59,680
projects sort of fit on a on a timeline

1163
00:41:03,510 --> 00:41:01,839

um is is this sort of at the beginning

1164
00:41:05,109 --> 00:41:03,520
of that are we

1165
00:41:07,349 --> 00:41:05,119
um has this been going on for a long

1166
00:41:08,710 --> 00:41:07,359
time and in more general terms how do

1167
00:41:11,510 --> 00:41:08,720
you see

1168
00:41:13,589 --> 00:41:11,520
um the evolution of commercially

1169
00:41:16,870 --> 00:41:13,599
sponsored research

1170
00:41:18,150 --> 00:41:16,880
sort of taking place uh down the road

1171
00:41:19,910 --> 00:41:18,160
so there have been commercially

1172
00:41:21,270 --> 00:41:19,920
sponsored activities on the space

1173
00:41:23,430 --> 00:41:21,280
station from the very earliest

1174
00:41:24,950 --> 00:41:23,440
utilization some of the the very first

1175
00:41:26,390 --> 00:41:24,960
experiment on the international space

1176
00:41:29,589 --> 00:41:26,400
station was a protein crystal growth

1177
00:41:32,630 --> 00:41:29,599
investigation that had uh commercial

1178
00:41:35,270 --> 00:41:32,640
collaboration in it but what we saw in

1179
00:41:37,109 --> 00:41:35,280
2005 when congress designated iss as a

1180
00:41:39,270 --> 00:41:37,119
national laboratory

1181
00:41:41,349 --> 00:41:39,280
that really opened up the potential and

1182
00:41:44,309 --> 00:41:41,359
then once assembly was complete that's

1183
00:41:46,630 --> 00:41:44,319
allowed cases to to really start

1184
00:41:47,829 --> 00:41:46,640
bringing those commercial and

1185
00:41:49,430 --> 00:41:47,839
you know other government agency

1186
00:41:51,270 --> 00:41:49,440
opportunities to the fore because we

1187
00:41:53,349 --> 00:41:51,280
really have as you've heard

1188
00:41:55,430 --> 00:41:53,359

great capacity on the iss to meet the

1189
00:41:57,750 --> 00:41:55,440
needs of a large number of users

1190
00:41:59,910 --> 00:41:57,760
and so it's really great to see both the

1191
00:42:01,109 --> 00:41:59,920
more traditional research if you will

1192
00:42:02,870 --> 00:42:01,119
that that marshall's program is

1193
00:42:04,470 --> 00:42:02,880
selecting and then the way that they're

1194
00:42:06,390 --> 00:42:04,480
innovative in terms of open source

1195
00:42:09,430 --> 00:42:06,400
science at the same time you've got

1196
00:42:10,870 --> 00:42:09,440
commercial r d having equal access and

1197
00:42:12,150 --> 00:42:10,880
it just provides the opportunity for

1198
00:42:14,150 --> 00:42:12,160
real innovation and for things to

1199
00:42:16,150 --> 00:42:14,160
advance quite quickly

1200
00:42:18,390 --> 00:42:16,160
and to give you an idea of how fast this

1201
00:42:21,349 --> 00:42:18,400
is occurring uh nanorex

1202
00:42:23,670 --> 00:42:21,359
really started the latter part of 2009

1203
00:42:26,069 --> 00:42:23,680
and as of today we've flown something

1204
00:42:28,390 --> 00:42:26,079
over 70 experiments to the international

1205
00:42:31,190 --> 00:42:28,400
space station so it's happening very

1206
00:42:40,390 --> 00:42:32,069
i've

1207
00:42:42,069 --> 00:42:40,400
before it's it's very exciting time

1208
00:42:43,910 --> 00:42:42,079
okay down here

1209
00:42:45,910 --> 00:42:43,920
hi it's uh pete coons with nasa social

1210
00:42:47,750 --> 00:42:45,920
this is a question for simon regarding

1211
00:42:50,470 --> 00:42:47,760
the mousier plants um

1212
00:42:52,390 --> 00:42:50,480
they need to come back and if so when

1213
00:42:54,150 --> 00:42:52,400

and if they don't need to come back uh

1214
00:42:56,150 --> 00:42:54,160
who will be taking care of them on the

1215
00:42:59,030 --> 00:42:56,160
station um so you know one of the

1216
00:43:00,630 --> 00:42:59,040
challenges is for science on the station

1217
00:43:03,430 --> 00:43:00,640
is if you can't do your analysis on the

1218
00:43:06,550 --> 00:43:03,440
station stuff has to come back and you

1219
00:43:09,270 --> 00:43:06,560
know spacex makes that possible now

1220
00:43:11,190 --> 00:43:09,280
uh so our our experiment and the the

1221
00:43:13,270 --> 00:43:11,200
co-experiments which going up with us

1222
00:43:15,270 --> 00:43:13,280
will go up on spacex too and they'll

1223
00:43:16,630 --> 00:43:15,280
come back down hopefully on this same

1224
00:43:17,589 --> 00:43:16,640
dragon

1225
00:43:19,829 --> 00:43:17,599
and then

1226
00:43:21,990 --> 00:43:19,839
all of our analysis is going to be done

1227
00:43:23,670 --> 00:43:22,000
with the mach there's a freezer on the

1228
00:43:25,750 --> 00:43:23,680
split station so

1229
00:43:28,550 --> 00:43:25,760
we will germinate plants in space and

1230
00:43:29,829 --> 00:43:28,560
then after about 10 days they'll they

1231
00:43:32,630 --> 00:43:29,839
get thrown in the freezer and they

1232
00:43:33,589 --> 00:43:32,640
they'll come back down frozen

1233
00:43:34,470 --> 00:43:33,599
okay we'll go over here and then we'll

1234
00:43:35,349 --> 00:43:34,480
go over here and we'll probably have to

1235
00:43:36,950 --> 00:43:35,359
wrap up

1236
00:43:38,950 --> 00:43:36,960
okay hi the cory foy with the social

1237
00:43:40,470 --> 00:43:38,960
media group one of the questions i had

1238
00:43:41,510 --> 00:43:40,480

mr johnson mentioned

1239
00:43:44,950 --> 00:43:41,520
the

1240
00:43:46,390 --> 00:43:44,960
commercially made and

1241
00:43:49,190 --> 00:43:46,400
reusable components that are

1242
00:43:51,510 --> 00:43:49,200
standardized and with the availability

1243
00:43:54,069 --> 00:43:51,520
of those and programs like cases is

1244
00:43:55,750 --> 00:43:54,079
there a cue building up where

1245
00:43:58,950 --> 00:43:55,760
prioritization's going to need to happen

1246
00:44:01,190 --> 00:43:58,960
of the mix between commercialized and

1247
00:44:02,950 --> 00:44:01,200
research projects where we're gonna have

1248
00:44:04,550 --> 00:44:02,960
to figure out well not all of them can

1249
00:44:06,069 --> 00:44:04,560
go up at once is that a challenge that

1250
00:44:07,030 --> 00:44:06,079
you're running into and if so how is

1251
00:44:09,109 --> 00:44:07,040
that going to be addressed from a

1252
00:44:10,950 --> 00:44:09,119
prioritization perspective

1253
00:44:12,230 --> 00:44:10,960
well my hope is to never turn anyone

1254
00:44:13,190 --> 00:44:12,240
away right

1255
00:44:16,069 --> 00:44:13,200
but

1256
00:44:21,190 --> 00:44:18,790
prioritization is is an important aspect

1257
00:44:23,750 --> 00:44:21,200
of this and there will come a time when

1258
00:44:25,109 --> 00:44:23,760
when the capacity is is exceeded we're

1259
00:44:27,589 --> 00:44:25,119
not there yet

1260
00:44:30,230 --> 00:44:27,599
and i'll say too there's kind of two two

1261
00:44:31,829 --> 00:44:30,240
dynamics happening here one is

1262
00:44:33,670 --> 00:44:31,839
where

1263
00:44:35,750 --> 00:44:33,680

we're shrinking i think the the whole

1264
00:44:38,230 --> 00:44:35,760
community is shrinking the amount of

1265
00:44:40,870 --> 00:44:38,240
volume amount of mass that's required

1266
00:44:42,550 --> 00:44:40,880
to do this science in

1267
00:44:44,630 --> 00:44:42,560
and at the same time the demand is

1268
00:44:46,630 --> 00:44:44,640
increasing so they seem to be keeping

1269
00:44:49,349 --> 00:44:46,640
like kind of a flat level

1270
00:44:51,349 --> 00:44:49,359
where we can actually accommodate the

1271
00:44:52,470 --> 00:44:51,359
the payloads that are coming in

1272
00:44:54,069 --> 00:44:52,480
for instance

1273
00:44:56,829 --> 00:44:54,079
i didn't finish my sentence earlier we

1274
00:44:59,270 --> 00:44:56,839
have we've flown 70 but we have about

1275
00:45:00,230 --> 00:44:59,280
150 other payloads in the queue right

1276
00:45:01,030 --> 00:45:00,240
now

1277
00:45:01,910 --> 00:45:01,040
and

1278
00:45:03,109 --> 00:45:01,920
it's

1279
00:45:05,030 --> 00:45:03,119
really the

1280
00:45:06,390 --> 00:45:05,040
the timing issue with it is just how

1281
00:45:08,390 --> 00:45:06,400
fast can

1282
00:45:09,510 --> 00:45:08,400
the experimenters get their experiments

1283
00:45:10,790 --> 00:45:09,520
in order

1284
00:45:12,870 --> 00:45:10,800
ready to go

1285
00:45:14,630 --> 00:45:12,880
um a lot of times i think the system is

1286
00:45:17,670 --> 00:45:14,640
actually faster than what the

1287
00:45:19,510 --> 00:45:17,680
researchers are which is a an odd case

1288
00:45:21,430 --> 00:45:19,520

for me to see uh

1289
00:45:22,790 --> 00:45:21,440
uh after all these years but it's it's

1290
00:45:23,910 --> 00:45:22,800
it's refreshing

1291
00:45:25,829 --> 00:45:23,920
and um

1292
00:45:27,589 --> 00:45:25,839
yeah there's and there's a lot of demand

1293
00:45:29,030 --> 00:45:27,599
so this is a good time but people sort

1294
00:45:31,670 --> 00:45:29,040
of go in with an assumption that the

1295
00:45:33,349 --> 00:45:31,680
space station is a fixed finite capacity

1296
00:45:35,349 --> 00:45:33,359
and as we fill it up they'll start being

1297
00:45:37,910 --> 00:45:35,359
a lot of competition but actually as a

1298
00:45:40,069 --> 00:45:37,920
program we have amazing flexibility to

1299
00:45:43,670 --> 00:45:40,079
change out parts to add more research

1300
00:45:46,230 --> 00:45:43,680
facilities to expand those capacities so

1301
00:45:48,390 --> 00:45:46,240
every time we see a resource getting

1302
00:45:50,870 --> 00:45:48,400
starting to limit our users our goal is

1303
00:45:53,270 --> 00:45:50,880
to get the maximum research return for

1304
00:45:54,710 --> 00:45:53,280
all our users and so we find ways to

1305
00:45:57,430 --> 00:45:54,720
expand

1306
00:45:59,829 --> 00:45:57,440
of a four bedroom house and so it's

1307
00:46:01,670 --> 00:45:59,839
really easy to cram in a little extra

1308
00:46:03,430 --> 00:46:01,680
facility in the corner to meet another

1309
00:46:04,950 --> 00:46:03,440
user's need and so that's our goal is to

1310
00:46:06,950 --> 00:46:04,960
keep stretching that so that we actually

1311
00:46:09,270 --> 00:46:06,960
don't ever hit that point where we're

1312
00:46:11,349 --> 00:46:09,280
turning away outstanding research and

1313
00:46:13,430 --> 00:46:11,359

there's two two factors really here that

1314
00:46:14,870 --> 00:46:13,440
limit the amount of research one is the

1315
00:46:18,710 --> 00:46:14,880
up mass for the launch and the other is

1316
00:46:20,550 --> 00:46:18,720
crew time and it's um

1317
00:46:22,150 --> 00:46:20,560
with setting the new record

1318
00:46:24,230 --> 00:46:22,160
that's very impressive but i'm sitting

1319
00:46:25,750 --> 00:46:24,240
next to simon i know he's thinking 70

1320
00:46:28,309 --> 00:46:25,760
hours that's one graduate student for

1321
00:46:31,270 --> 00:46:28,319
one week

1322
00:46:33,829 --> 00:46:31,280
but what's really impressive is that 70

1323
00:46:35,750 --> 00:46:33,839
or so hours is equivalent to 460 hours

1324
00:46:37,910 --> 00:46:35,760
worth of research on the ground because

1325
00:46:40,069 --> 00:46:37,920
so many of these systems are automated

1326
00:46:41,910 --> 00:46:40,079
and they're operated on the ground by

1327
00:46:43,829 --> 00:46:41,920
operators

1328
00:46:45,670 --> 00:46:43,839
so that really increases productivity

1329
00:46:47,589 --> 00:46:45,680
station and you'll see more developments

1330
00:46:49,270 --> 00:46:47,599
in that in that respect in the future

1331
00:46:50,630 --> 00:46:49,280
too

1332
00:46:53,109 --> 00:46:50,640
okay irene

1333
00:46:55,270 --> 00:46:53,119
irene klotz with reuters um the cargo

1334
00:46:57,750 --> 00:46:55,280
manifest lists a

1335
00:46:59,349 --> 00:46:57,760
couple of japanese experiments i i don't

1336
00:47:00,950 --> 00:46:59,359
know how well you are familiar with all

1337
00:47:03,109 --> 00:47:00,960
those julie but if you have any

1338
00:47:05,670 --> 00:47:03,119

information all about the stem cells

1339
00:47:06,470 --> 00:47:05,680
what kind of stem cells from what sort

1340
00:47:09,670 --> 00:47:06,480
of

1341
00:47:11,589 --> 00:47:09,680
experiment

1342
00:47:13,670 --> 00:47:11,599
yeah so you know as you know probably uh

1343
00:47:16,470 --> 00:47:13,680
stem cells are cells that have not

1344
00:47:18,630 --> 00:47:16,480
differentiated yet um and they can occur

1345
00:47:19,670 --> 00:47:18,640
you know in any living organism they

1346
00:47:21,349 --> 00:47:19,680
haven't figured out what they're going

1347
00:47:22,790 --> 00:47:21,359
to become as a tissue when they grow up

1348
00:47:25,270 --> 00:47:22,800
if you will

1349
00:47:27,270 --> 00:47:25,280
in the japanese stem cells investigation

1350
00:47:29,910 --> 00:47:27,280
they're focused on the effect of

1351
00:47:31,910 --> 00:47:29,920
radiation on some mouse stem cells and

1352
00:47:33,349 --> 00:47:31,920
so they're going to fly the cells to

1353
00:47:34,710 --> 00:47:33,359
orbit they'll be exposed to the

1354
00:47:36,069 --> 00:47:34,720
radiation and the microgravity

1355
00:47:37,589 --> 00:47:36,079
environment for a period of time then

1356
00:47:38,710 --> 00:47:37,599
they'll be brought home

1357
00:47:41,270 --> 00:47:38,720
and they'll

1358
00:47:44,150 --> 00:47:41,280
add those stem cells to an eight cell

1359
00:47:45,510 --> 00:47:44,160
mouse embryo so it's all a mouse based

1360
00:47:47,589 --> 00:47:45,520
study but the mice will all be on the

1361
00:47:49,030 --> 00:47:47,599
ground

1362
00:47:51,349 --> 00:47:49,040
okay one more back at the back and we'll

1363
00:47:53,109 --> 00:47:51,359

ramp up hi i'm christina russo with

1364
00:47:55,510 --> 00:47:53,119
social media and public library of

1365
00:47:57,190 --> 00:47:55,520
science and my question is from michael

1366
00:47:59,270 --> 00:47:57,200
johnson about the protein

1367
00:48:00,790 --> 00:47:59,280
crystallography project

1368
00:48:02,790 --> 00:48:00,800
you mentioned there's 25 different

1369
00:48:04,710 --> 00:48:02,800
protein crystals or different proteins

1370
00:48:06,950 --> 00:48:04,720
going in and

1371
00:48:09,270 --> 00:48:06,960
i wonder what drives the decision for

1372
00:48:12,230 --> 00:48:09,280
which crystal for which proteins do

1373
00:48:14,230 --> 00:48:12,240
to go and what do you expect for them to

1374
00:48:15,510 --> 00:48:14,240
happen in microgravity

1375
00:48:16,630 --> 00:48:15,520
excellent question

1376
00:48:18,710 --> 00:48:16,640
um

1377
00:48:20,549 --> 00:48:18,720
well actually the

1378
00:48:23,109 --> 00:48:20,559
the first set that this is our our

1379
00:48:25,270 --> 00:48:23,119
maiden flight of this experiment and the

1380
00:48:28,069 --> 00:48:25,280
first set that we're flying are uh

1381
00:48:30,150 --> 00:48:28,079
standards that have flown in the past uh

1382
00:48:31,030 --> 00:48:30,160
lysozyme i think is one that comes to

1383
00:48:32,630 --> 00:48:31,040
mind

1384
00:48:34,710 --> 00:48:32,640
um

1385
00:48:36,309 --> 00:48:34,720
but what's different in this situation

1386
00:48:37,990 --> 00:48:36,319
is we're able to

1387
00:48:40,630 --> 00:48:38,000
gradually change

1388
00:48:42,710 --> 00:48:40,640

and have multiple samples of

1389
00:48:44,470 --> 00:48:42,720
concentration gradients change the

1390
00:48:47,430 --> 00:48:44,480
concentration across

1391
00:48:49,190 --> 00:48:47,440
this very long capillary

1392
00:48:50,470 --> 00:48:49,200
system that we're using micro capillary

1393
00:48:52,230 --> 00:48:50,480
systems so

1394
00:48:54,470 --> 00:48:52,240
for instance with the one lysozyme

1395
00:48:58,230 --> 00:48:54,480
crystal or protein

1396
00:49:00,390 --> 00:48:58,240
we'll be able to have 400 different

1397
00:49:01,750 --> 00:49:00,400
conditions and we're expecting to see

1398
00:49:03,750 --> 00:49:01,760
improved

1399
00:49:06,470 --> 00:49:03,760
crystal growth in the microgravity

1400
00:49:07,829 --> 00:49:06,480
situation what this means is

1401
00:49:11,030 --> 00:49:07,839
for other

1402
00:49:14,549 --> 00:49:12,230
for instance

1403
00:49:17,349 --> 00:49:14,559
my favorite that i want to go after in

1404
00:49:18,470 --> 00:49:17,359
the next few flights will be membrane

1405
00:49:26,470 --> 00:49:18,480
proteins

1406
00:49:30,549 --> 00:49:26,480
in a cell and they control every aspect

1407
00:49:32,710 --> 00:49:30,559
of the cell's metabolism and function

1408
00:49:34,950 --> 00:49:32,720
the problem is terrestrially these

1409
00:49:37,270 --> 00:49:34,960
protein crystals are very hard to grow

1410
00:49:38,790 --> 00:49:37,280
and most don't grow in fact

1411
00:49:40,630 --> 00:49:38,800
so without being able to grow that

1412
00:49:43,349 --> 00:49:40,640
crystal you can't characterize what this

1413
00:49:45,109 --> 00:49:43,359

protein is and so the membrane proteins

1414
00:49:47,190 --> 00:49:45,119
have been quite a mystery

1415
00:49:48,710 --> 00:49:47,200
for some time now what we're hoping to

1416
00:49:49,829 --> 00:49:48,720
see in the future we don't have any

1417
00:49:51,349 --> 00:49:49,839
membranes

1418
00:49:52,630 --> 00:49:51,359
membrane proteins flying in this

1419
00:49:53,589 --> 00:49:52,640
particular

1420
00:49:55,750 --> 00:49:53,599
set

1421
00:49:57,349 --> 00:49:55,760
but we want to fly these soon and see

1422
00:49:58,870 --> 00:49:57,359
what's happening and we're going to see

1423
00:50:00,470 --> 00:49:58,880
all sorts of crazy things come out of

1424
00:50:03,030 --> 00:50:00,480
this

1425
00:50:04,870 --> 00:50:03,040
in particular with the drug research a

1426
00:50:06,549 --> 00:50:04,880
lot of times what experimenters will do

1427
00:50:08,150 --> 00:50:06,559
is combine drugs with the proteins to

1428
00:50:11,430 --> 00:50:08,160
see how they interact

1429
00:50:13,510 --> 00:50:11,440
and you'll get some very specific

1430
00:50:15,750 --> 00:50:13,520
say medications and pharmaceuticals that

1431
00:50:16,870 --> 00:50:15,760
would come out of this so that's our

1432
00:50:19,750 --> 00:50:16,880
that's our

1433
00:50:23,190 --> 00:50:21,670
okay that's going to wrap it up for us

1434
00:50:24,790 --> 00:50:23,200
we want to thank all you guys for coming

1435
00:50:26,630 --> 00:50:24,800
coming up next on nasa television it's

1436
00:50:27,829 --> 00:50:26,640
going to be a heliophysics briefing on

1437
00:50:29,589 --> 00:50:27,839
the ven allen

1438
00:50:31,670 --> 00:50:29,599

probes that will begin at 2 pm eastern

1439
00:50:33,190 --> 00:50:31,680
time here on nasa television we'll be

1440
00:50:35,190 --> 00:50:33,200
back here at the kennedy space center at

1441
00:50:37,589 --> 00:50:35,200
3 pm eastern time for the pre-launch

1442
00:50:39,109 --> 00:50:37,599
briefing about tomorrow morning's spacex

1443
00:50:41,349 --> 00:50:39,119
dragon launch from here at the kennedy

1444
00:50:42,950 --> 00:50:41,359
space center and of course as always you

1445
00:50:44,630 --> 00:50:42,960
can log on to the nasa website to find

1446
00:50:46,630 --> 00:50:44,640
out more about this mission or what's

1447
00:50:50,150 --> 00:50:46,640
ahead for expedition 34 that address is

1448
00:50:52,790 --> 00:50:51,589
station and as julie mentioned at the

1449
00:50:54,230 --> 00:50:52,800
beginning if you'd like to follow along

1450
00:50:56,950 --> 00:50:54,240
with the space station science and

1451
00:50:59,109 --> 00:50:56,960
research their twitter handle is iss

1452
00:51:00,230 --> 00:50:59,119
underscore research so once again thanks