1
00:00:04,550 --> 00:00:02,550
well good afternoon everyone and welcome

2
00:00:06,550 --> 00:00:04,560
to the spacex 3

3
00:00:07,749 --> 00:00:06,560
science and technology cargo news

4
00:00:09,990 --> 00:00:07,759
conference

5
00:00:11,430 --> 00:00:10,000
we have a panel here today to brief you

6
00:00:12,789 --> 00:00:11,440
on lots of exciting things that will be

7
00:00:15,030 --> 00:00:12,799
going up to the international space

8
00:00:16,870 --> 00:00:15,040
station and we will start off with

9
00:00:19,109 --> 00:00:16,880
remarks and presentations from them

10
00:00:21,750 --> 00:00:19,119
before taking questions and answers i

11
00:00:23,029 --> 00:00:21,760
would like to introduce to you the panel

12
00:00:25,429 --> 00:00:23,039
to my left

13
00:00:27,269 --> 00:00:25,439

camille elaine from the nasa

14
00:00:29,349 --> 00:00:27,279
international space station program

15
00:00:30,790 --> 00:00:29,359
science office

16
00:00:32,229 --> 00:00:30,800
to her left

17
00:00:34,549 --> 00:00:32,239
michael roberts

18
00:00:36,870 --> 00:00:34,559
senior research pathway manager for the

19
00:00:39,670 --> 00:00:36,880
center for the advancement of science in

20
00:00:41,190 --> 00:00:39,680
space which you may know as cases

21
00:00:42,630 --> 00:00:41,200
and joining us by telephone from

22
00:00:45,750 --> 00:00:42,640
washington dc

23
00:00:47,430 --> 00:00:45,760
andy petro of the nasa space technology

24
00:00:49,910 --> 00:00:47,440
mission directorate

25
00:00:52,150 --> 00:00:49,920
and we'll start things off with camille

26
00:00:54,950 --> 00:00:52,160
hi good afternoon thank you so much for

27
00:00:56,869 --> 00:00:54,960
being here it's our pleasure to

28
00:00:59,670 --> 00:00:56,879
join you to share a little bit about

29
00:01:01,590 --> 00:00:59,680
what's going on on spacex tomorrow in

30
00:01:04,229 --> 00:01:01,600
terms of science

31
00:01:07,429 --> 00:01:04,239
tomorrow's spacex launch would contain

32
00:01:09,990 --> 00:01:07,439
just a little over 1100 kilograms of

33
00:01:14,070 --> 00:01:10,000
research supplies that would support

34
00:01:16,950 --> 00:01:14,080
about 150 scientific investigations both

35
00:01:20,230 --> 00:01:16,960
new and ongoing that will be conducted

36
00:01:22,630 --> 00:01:20,240
during expedition 39 40.

37
00:01:24,950 --> 00:01:22,640
these scientific investigations will be

38
00:01:26,550 --> 00:01:24,960

conducted in the areas of biology and

39
00:01:29,830 --> 00:01:26,560
biotechnology

40
00:01:32,069 --> 00:01:29,840
human research physical science earth

41
00:01:34,230 --> 00:01:32,079
and space science technology

42
00:01:36,069 --> 00:01:34,240
demonstration and development and

43
00:01:37,910 --> 00:01:36,079
education

44
00:01:39,590 --> 00:01:37,920
even though there's a lot of great

45
00:01:42,230 --> 00:01:39,600
science that will be heading to the

46
00:01:44,469 --> 00:01:42,240
space station tomorrow i'll take just

47
00:01:45,990 --> 00:01:44,479
enough time today to talk to you about a

48
00:01:47,990 --> 00:01:46,000
few

49
00:01:50,310 --> 00:01:48,000
the first investigation i'll share with

50
00:01:53,109 --> 00:01:50,320
you today is a new technology

51
00:01:55,830 --> 00:01:53,119
demonstration activity which is designed

52
00:01:59,030 --> 00:01:55,840
to lay the foundation to send data back

53
00:02:01,990 --> 00:01:59,040
to earth from the iss at much faster

54
00:02:02,950 --> 00:02:02,000
rates than that is currently being done

55
00:02:05,670 --> 00:02:02,960
today

56
00:02:08,550 --> 00:02:05,680
the opel's investigation in opal stands

57
00:02:11,110 --> 00:02:08,560
for optical payload for laser com

58
00:02:13,350 --> 00:02:11,120
science was first conceived and

59
00:02:16,949 --> 00:02:13,360
developed by nasa's jet propulsion

60
00:02:19,589 --> 00:02:16,959
laboratory and is nasa's first payload

61
00:02:24,070 --> 00:02:19,599
that will demonstrate use the use of

62
00:02:26,390 --> 00:02:24,080
optical communications for data transfer

63
00:02:29,990 --> 00:02:26,400

optical communication is an emerging

64
00:02:32,790 --> 00:02:30,000
technology that mod modulates data onto

65
00:02:36,390 --> 00:02:32,800
laser beams and these laser beams has

66
00:02:39,110 --> 00:02:36,400
detect the potential to transfer data at

67
00:02:41,509 --> 00:02:39,120
much faster rates than currently is

68
00:02:43,190 --> 00:02:41,519
achievable with radio frequency

69
00:02:45,270 --> 00:02:43,200
transmission

70
00:02:48,390 --> 00:02:45,280
this becomes really important for

71
00:02:52,229 --> 00:02:48,400
scientific instruments that increasingly

72
00:02:55,670 --> 00:02:52,239
rely on high data applications such as

73
00:02:58,710 --> 00:02:55,680
high definition video streams

74
00:03:01,430 --> 00:02:58,720
once opel is delivered it will be

75
00:03:03,990 --> 00:03:01,440
located externally on the iss

76
00:03:06,070 --> 00:03:04,000
as it orbits the earth it will make

77
00:03:09,190 --> 00:03:06,080
contact with ground-based receiving

78
00:03:11,350 --> 00:03:09,200
telescope located at table mountain near

79
00:03:14,309 --> 00:03:11,360
jet propulsion laboratory

80
00:03:17,030 --> 00:03:14,319
where a typical data transfer such as

81
00:03:19,670 --> 00:03:17,040
video will take place over a period of

82
00:03:22,550 --> 00:03:19,680
about two minutes while the receiver and

83
00:03:24,869 --> 00:03:22,560
opals are within line of sight

84
00:03:27,589 --> 00:03:24,879
what you see here are images of the

85
00:03:30,149 --> 00:03:27,599
opel's hardware taken as it was

86
00:03:32,710 --> 00:03:30,159
preparing to pack for launch

87
00:03:36,390 --> 00:03:32,720
currently many of our deep space

88
00:03:38,869 --> 00:03:36,400

missions communicate at about 200 to 400

89
00:03:41,750 --> 00:03:38,879
kilobits per second opels will

90
00:03:44,309 --> 00:03:41,760
demonstrate the capability of up to 50

91
00:03:47,430 --> 00:03:44,319
megabits per second and i was told by

92
00:03:49,750 --> 00:03:47,440
the opel's investigators team that this

93
00:03:52,949 --> 00:03:49,760
is analogous to upgrading your home

94
00:03:56,070 --> 00:03:52,959
system from dial-up to dsl

95
00:04:01,030 --> 00:03:56,080
this is jpl's first external payload on

96
00:04:03,110 --> 00:04:01,040
iss and its first launch on spacex

97
00:04:06,550 --> 00:04:03,120
we're also launching the vegetable

98
00:04:08,630 --> 00:04:06,560
production system also known as veggie

99
00:04:11,110 --> 00:04:08,640
and this is a plant growth system that

100
00:04:14,390 --> 00:04:11,120
will provide the necessary lighting and

101
00:04:17,430 --> 00:04:14,400
nutrients in which to go to grow plants

102
00:04:20,870 --> 00:04:17,440
in space this system will be used for a

103
00:04:24,070 --> 00:04:20,880
wide range of purposes from research to

104
00:04:27,110 --> 00:04:24,080
educational outreach and also eventually

105
00:04:29,189 --> 00:04:27,120
as a potential food source fresh food

106
00:04:33,270 --> 00:04:29,199
source for astronauts

107
00:04:36,230 --> 00:04:33,280
the veggie system will be the simplest

108
00:04:38,390 --> 00:04:36,240
plant growth system on iss to date and

109
00:04:40,710 --> 00:04:38,400
it will provide the greatest surface

110
00:04:43,990 --> 00:04:40,720
area yet to grow plants

111
00:04:46,390 --> 00:04:44,000
we will start by growing red romaine

112
00:04:48,870 --> 00:04:46,400
lettuce and i'm told by the investigator

113
00:04:51,909 --> 00:04:48,880

team that lettuce was chosen because of

114
00:04:54,469 --> 00:04:51,919
its excellent germination ease and speed

115
00:04:56,390 --> 00:04:54,479
of growth and its palatability

116
00:04:58,870 --> 00:04:56,400
the lettuce will be grown on board the

117
00:05:01,510 --> 00:04:58,880
space station it will be harvested and

118
00:05:04,070 --> 00:05:01,520
returned for nutrient and microbial

119
00:05:06,790 --> 00:05:04,080
analysis and evaluated for its

120
00:05:08,950 --> 00:05:06,800
suitability as a fresh food source for

121
00:05:12,310 --> 00:05:08,960
the astronauts

122
00:05:15,350 --> 00:05:12,320
we have a prototype here in the media

123
00:05:18,469 --> 00:05:15,360
room which the media is welcome to take

124
00:05:21,189 --> 00:05:18,479
a closer look after the briefing

125
00:05:25,189 --> 00:05:21,199
the system can be deployed and stored as

126
00:05:28,390 --> 00:05:25,199
needed on iss and can run on less power

127
00:05:30,950 --> 00:05:28,400
than is needed for your desktop computer

128
00:05:33,189 --> 00:05:30,960
the plants are grown in these individual

129
00:05:34,230 --> 00:05:33,199
pillows that i have a prototype on the

130
00:05:37,350 --> 00:05:34,240
desk

131
00:05:40,469 --> 00:05:37,360
and those act as pods of nutrients and

132
00:05:42,390 --> 00:05:40,479
root matting for the plants

133
00:05:44,710 --> 00:05:42,400
in addition to the plant growth for

134
00:05:46,870 --> 00:05:44,720
producing edible crops

135
00:05:49,029 --> 00:05:46,880
researchers are exploring future

136
00:05:52,230 --> 00:05:49,039
research that looks at the behavioral

137
00:05:55,029 --> 00:05:52,240
impacts of these plants in space in

138
00:05:57,350 --> 00:05:55,039

addition to educational opportunities

139
00:05:59,430 --> 00:05:57,360
for students

140
00:06:02,550 --> 00:05:59,440
the final investigation i'll mention

141
00:06:05,350 --> 00:06:02,560
today is called t-cell activation in

142
00:06:08,070 --> 00:06:05,360
aging which is currently funded by the

143
00:06:10,070 --> 00:06:08,080
national institute of aging which is a

144
00:06:12,070 --> 00:06:10,080
part of the national institutes of

145
00:06:14,950 --> 00:06:12,080
health or nih

146
00:06:18,309 --> 00:06:14,960
this study uses microgravity as a novel

147
00:06:21,189 --> 00:06:18,319
and accelerated model system for aging

148
00:06:24,309 --> 00:06:21,199
to investigate mechanisms of the immune

149
00:06:25,670 --> 00:06:24,319
suppression commonly seen in the elderly

150
00:06:28,710 --> 00:06:25,680
population

151
00:06:31,590 --> 00:06:28,720
researchers will also like to figure out

152
00:06:34,150 --> 00:06:31,600
why the immune system of astronauts are

153
00:06:36,390 --> 00:06:34,160
suppressed in space

154
00:06:39,110 --> 00:06:36,400
our immune system protects us from

155
00:06:41,029 --> 00:06:39,120
disease and the t cells are the first

156
00:06:43,990 --> 00:06:41,039
cells in the immune system to be

157
00:06:45,670 --> 00:06:44,000
mobilized when illness is introduced

158
00:06:49,189 --> 00:06:45,680
into our bodies

159
00:06:51,909 --> 00:06:49,199
in a healthy immune system t cells

160
00:06:53,909 --> 00:06:51,919
call on other critical cells which mount

161
00:06:55,749 --> 00:06:53,919
an immune defense

162
00:06:57,909 --> 00:06:55,759
against the invader

163
00:07:00,309 --> 00:06:57,919

in past research

164
00:07:02,950 --> 00:07:00,319
investigations of this type

165
00:07:06,230 --> 00:07:02,960
studies have shown that gravity affects

166
00:07:09,029 --> 00:07:06,240
gene expression and early activation of

167
00:07:12,230 --> 00:07:09,039
t cells in ways that are strikingly

168
00:07:14,790 --> 00:07:12,240
similar to the depressed immune system

169
00:07:16,629 --> 00:07:14,800
in elderly populations

170
00:07:19,990 --> 00:07:16,639
tomorrow we will launch

171
00:07:22,629 --> 00:07:20,000
human t-cells that will be activated

172
00:07:25,670 --> 00:07:22,639
once on board with simulated in

173
00:07:27,830 --> 00:07:25,680
infections they will learn they would be

174
00:07:29,189 --> 00:07:27,840
progressed over a period of time and

175
00:07:30,870 --> 00:07:29,199
returned home

176
00:07:32,790 --> 00:07:30,880
for analysis

177
00:07:35,670 --> 00:07:32,800
ultimately the findings will be

178
00:07:39,670 --> 00:07:35,680
beneficial in new treatment strategies

179
00:07:42,230 --> 00:07:39,680
for immune system dysfunction

180
00:07:44,790 --> 00:07:42,240
so again these investigations are just a

181
00:07:47,510 --> 00:07:44,800
sample of the science that will be

182
00:07:49,909 --> 00:07:47,520
enabled by tomorrow's launch and that

183
00:07:53,110 --> 00:07:49,919
will contribute to the advancement of

184
00:07:55,110 --> 00:07:53,120
human space exploration and ultimately

185
00:07:57,589 --> 00:07:55,120
to improving the quality of our lives

186
00:08:00,309 --> 00:07:57,599
here on earth for more information on

187
00:08:04,390 --> 00:08:00,319
the science please visit our website at

188
00:08:12,230 --> 00:08:05,589

iss

189
00:08:13,670 --> 00:08:12,240
underscore research thank you thank you

190
00:08:14,950 --> 00:08:13,680
camille

191
00:08:19,430 --> 00:08:14,960
mike

192
00:08:21,909 --> 00:08:19,440
an excellent introduction of

193
00:08:22,869 --> 00:08:21,919
the science that nasa is supporting we

194
00:08:28,230 --> 00:08:22,879
work

195
00:08:30,390 --> 00:08:28,240
to support very similar research aims

196
00:08:32,790 --> 00:08:30,400
cases is the center for the advancement

197
00:08:35,029 --> 00:08:32,800
of science and space we are a

198
00:08:36,630 --> 00:08:35,039
not-for-profit organization that works

199
00:08:37,750 --> 00:08:36,640
through a cooperative agreement with

200
00:08:39,990 --> 00:08:37,760
nasa

201
00:08:41,829 --> 00:08:40,000
to manage the international space

202
00:08:43,909 --> 00:08:41,839
station national lab

203
00:08:46,310 --> 00:08:43,919
the difference between the type of

204
00:08:48,470 --> 00:08:46,320
science and technology development that

205
00:08:50,949 --> 00:08:48,480
nasa continues to support

206
00:08:53,509 --> 00:08:50,959
and the mission objectives of cases

207
00:08:55,910 --> 00:08:53,519
sponsored science going to station

208
00:08:58,550 --> 00:08:55,920
are essentially focused on

209
00:09:00,470 --> 00:08:58,560
the outcome of that research the type of

210
00:09:03,030 --> 00:09:00,480
science that i'm going to describe in in

211
00:09:05,829 --> 00:09:03,040
brief here that's going up on space x3

212
00:09:07,030 --> 00:09:05,839
tomorrow is focused on science for earth

213
00:09:09,990 --> 00:09:07,040

benefit

214
00:09:12,790 --> 00:09:10,000
so we have access to 50 percent of the

215
00:09:14,389 --> 00:09:12,800
resources available to the iss operating

216
00:09:16,150 --> 00:09:14,399
segment on station

217
00:09:18,310 --> 00:09:16,160
and that enables us to reach out to

218
00:09:19,910 --> 00:09:18,320
communities that historically

219
00:09:21,750 --> 00:09:19,920
have not been able to access the

220
00:09:22,949 --> 00:09:21,760
international space station national lab

221
00:09:25,030 --> 00:09:22,959
with ease

222
00:09:27,910 --> 00:09:25,040
those communities include not only

223
00:09:29,350 --> 00:09:27,920
academic investigators but commercial

224
00:09:31,269 --> 00:09:29,360
companies who have interest in

225
00:09:33,190 --> 00:09:31,279
translational medical research or

226
00:09:34,949 --> 00:09:33,200
fundamental research

227
00:09:37,430 --> 00:09:34,959
in the life and physical sciences to go

228
00:09:38,470 --> 00:09:37,440
to station as well as continuing to

229
00:09:40,470 --> 00:09:38,480
support

230
00:09:42,790 --> 00:09:40,480
other government agencies such as the

231
00:09:45,110 --> 00:09:42,800
national institutes of health that

232
00:09:46,949 --> 00:09:45,120
camille mentioned in her introductory

233
00:09:49,590 --> 00:09:46,959
comments so if i could have the first

234
00:09:52,070 --> 00:09:49,600
slide please

235
00:09:54,470 --> 00:09:52,080
so among several investigations that

236
00:09:56,070 --> 00:09:54,480
cases is sponsoring on the spacex 3

237
00:09:58,949 --> 00:09:56,080
mission tomorrow i'm going to highlight

238
00:10:00,550 --> 00:09:58,959

a few of those and describe in very

239
00:10:03,430 --> 00:10:00,560
brief detail

240
00:10:05,350 --> 00:10:03,440
the objectives of those investigations

241
00:10:08,630 --> 00:10:05,360
each of these investigations is part of

242
00:10:10,630 --> 00:10:08,640
what kasis calls arc one so arc one is

243
00:10:11,990 --> 00:10:10,640
an acronym for advancing research

244
00:10:15,190 --> 00:10:12,000
knowledge one

245
00:10:17,030 --> 00:10:15,200
arc one is the first of several mission

246
00:10:19,509 --> 00:10:17,040
increments going to international space

247
00:10:21,190 --> 00:10:19,519
station that involve a multitude of

248
00:10:22,949 --> 00:10:21,200
investigators in different lines of

249
00:10:26,470 --> 00:10:22,959
investigation

250
00:10:27,829 --> 00:10:26,480
among those missions going up to arc one

251
00:10:30,829 --> 00:10:27,839
to the international space station

252
00:10:33,350 --> 00:10:30,839
tomorrow are five cases sponsored

253
00:10:35,110 --> 00:10:33,360
investigations centered on protein

254
00:10:36,310 --> 00:10:35,120
crystal growth in the microgravity

255
00:10:38,470 --> 00:10:36,320
environment

256
00:10:40,790 --> 00:10:38,480
i'm sure many of you are familiar with

257
00:10:42,949 --> 00:10:40,800
previous research that nasa has

258
00:10:45,269 --> 00:10:42,959
sponsored as well as commercial

259
00:10:47,430 --> 00:10:45,279
companies have sponsored in utilizing

260
00:10:49,590 --> 00:10:47,440
the unique environment on the

261
00:10:52,949 --> 00:10:49,600
international space station for

262
00:10:55,670 --> 00:10:52,959
prolonged precipitation of crystals

263
00:10:58,069 --> 00:10:55,680

in these new advancements that cases

264
00:10:58,949 --> 00:10:58,079
will be sponsoring tomorrow we have much

265
00:11:02,310 --> 00:10:58,959
better

266
00:11:04,310 --> 00:11:02,320
hardware and much longer exposure times

267
00:11:06,310 --> 00:11:04,320
for these investigations to be supported

268
00:11:08,310 --> 00:11:06,320
on the international space station

269
00:11:10,389 --> 00:11:08,320
the potential outcomes of each of these

270
00:11:12,790 --> 00:11:10,399
investigations are going to have

271
00:11:14,949 --> 00:11:12,800
significant impact we believe upon many

272
00:11:17,350 --> 00:11:14,959
areas of medical research

273
00:11:19,190 --> 00:11:17,360
i wanted to emphasize that each of these

274
00:11:20,870 --> 00:11:19,200
research investigations many of them

275
00:11:22,069 --> 00:11:20,880
came to nasa through many different

276
00:11:24,310 --> 00:11:22,079
pathways

277
00:11:27,030 --> 00:11:24,320
we are sponsoring investigations that

278
00:11:28,470 --> 00:11:27,040
are wholly sponsored by a commercial

279
00:11:29,829 --> 00:11:28,480
company in this case merck

280
00:11:31,990 --> 00:11:29,839
pharmaceutical

281
00:11:34,310 --> 00:11:32,000
merck is sponsoring its own research to

282
00:11:35,990 --> 00:11:34,320
the station in the realization that they

283
00:11:36,949 --> 00:11:36,000
are going to be able to return better

284
00:11:38,310 --> 00:11:36,959
data

285
00:11:40,790 --> 00:11:38,320
from the unique environment of

286
00:11:42,470 --> 00:11:40,800
microgravity available on station than

287
00:11:43,829 --> 00:11:42,480
they were able to determine from

288
00:11:45,430 --> 00:11:43,839

christine

289
00:11:47,509 --> 00:11:45,440
protein structures

290
00:11:49,910 --> 00:11:47,519
precipitated here on earth

291
00:11:52,230 --> 00:11:49,920
we also have five investigations three

292
00:11:54,069 --> 00:11:52,240
of which are going up on on four excuse

293
00:11:56,470 --> 00:11:54,079
me that are going up on the arc one

294
00:11:58,310 --> 00:11:56,480
flight on spacex x3 tomorrow

295
00:11:59,910 --> 00:11:58,320
that came to cases through a

296
00:12:02,389 --> 00:11:59,920
solicitation

297
00:12:04,230 --> 00:12:02,399
so cases has funding to provide to

298
00:12:06,230 --> 00:12:04,240
investigators who can

299
00:12:09,110 --> 00:12:06,240
access these funds through formal

300
00:12:11,030 --> 00:12:09,120
solicitations requests for proposals

301
00:12:13,509 --> 00:12:11,040
we have another investigation which is

302
00:12:15,350 --> 00:12:13,519
coming to us that camille mentioned the

303
00:12:17,509 --> 00:12:15,360
t cells in space

304
00:12:20,470 --> 00:12:17,519
that is coming to us essentially through

305
00:12:22,710 --> 00:12:20,480
the pathway that nasa used previously

306
00:12:24,710 --> 00:12:22,720
a nasa research announcement in this

307
00:12:26,230 --> 00:12:24,720
case that was actually funded by the

308
00:12:27,350 --> 00:12:26,240
other governmental agency that was

309
00:12:30,389 --> 00:12:27,360
interested in funding their

310
00:12:32,230 --> 00:12:30,399
investigators to use the national lab

311
00:12:33,750 --> 00:12:32,240
in addition to these protein crystal

312
00:12:36,389 --> 00:12:33,760
growth experiments

313
00:12:39,750 --> 00:12:36,399

nasa is also sponsoring an unsolicited

314
00:12:41,990 --> 00:12:39,760
proposal related to plant research

315
00:12:44,629 --> 00:12:42,000
similar to the research that camille

316
00:12:46,790 --> 00:12:44,639
described utilizing the veggie hardware

317
00:12:49,269 --> 00:12:46,800
in this particular example university of

318
00:12:51,670 --> 00:12:49,279
florida investigators anna-lysa paul and

319
00:12:54,310 --> 00:12:51,680
rob ferrell are interested in following

320
00:12:56,629 --> 00:12:54,320
up some investigations performed earlier

321
00:12:58,870 --> 00:12:56,639
to look at the responses of plants at a

322
00:13:01,590 --> 00:12:58,880
molecular level to life in a

323
00:13:03,509 --> 00:13:01,600
microgravity environment

324
00:13:05,030 --> 00:13:03,519
this the unique environment of the

325
00:13:06,870 --> 00:13:05,040
international space station offers

326
00:13:09,750 --> 00:13:06,880
significant advantages for fundamental

327
00:13:12,310 --> 00:13:09,760
biological studies such as these because

328
00:13:15,269 --> 00:13:12,320
all of life as we understand it evolved

329
00:13:17,590 --> 00:13:15,279
in a constant environment of 1g there's

330
00:13:19,829 --> 00:13:17,600
always as far as we know

331
00:13:21,509 --> 00:13:19,839
been a constant one gravitational

332
00:13:23,269 --> 00:13:21,519
environment on earth

333
00:13:25,910 --> 00:13:23,279
when you study the responses of

334
00:13:29,350 --> 00:13:25,920
biological organisms in the microgravity

335
00:13:31,990 --> 00:13:29,360
environment where you have altered the

336
00:13:34,389 --> 00:13:32,000
form of this one steady

337
00:13:36,629 --> 00:13:34,399
environment you can actually uncover

338
00:13:38,710 --> 00:13:36,639

some significant changes in the

339
00:13:41,030 --> 00:13:38,720
responses of those organisms to many

340
00:13:42,790 --> 00:13:41,040
different environmental stimuli

341
00:13:44,949 --> 00:13:42,800
doctors paul and ferl are going to use

342
00:13:46,470 --> 00:13:44,959
that environment to look at changes at

343
00:13:48,509 --> 00:13:46,480
the genetic level

344
00:13:50,790 --> 00:13:48,519
in gene expression of a

345
00:13:53,350 --> 00:13:50,800
well-characterized plant arabidopsis

346
00:13:55,430 --> 00:13:53,360
thaliana in the microgravity environment

347
00:13:58,230 --> 00:13:55,440
and as i mentioned this proposal came to

348
00:14:00,069 --> 00:13:58,240
cases through the unsolicited portal

349
00:14:03,110 --> 00:14:00,079
so in addition to formal grant

350
00:14:06,069 --> 00:14:03,120
solicitations that kasis offers where we

351
00:14:07,509 --> 00:14:06,079
identify an area of research that we are

352
00:14:09,910 --> 00:14:07,519
interested in supporting or which we

353
00:14:11,269 --> 00:14:09,920
believe has significant potential for

354
00:14:14,150 --> 00:14:11,279
earth benefit

355
00:14:16,949 --> 00:14:14,160
investigators can propose their own

356
00:14:19,110 --> 00:14:16,959
targeted areas of research to cases and

357
00:14:22,150 --> 00:14:19,120
this particular unsolicited pathway is

358
00:14:25,670 --> 00:14:22,160
available to investigators anytime

359
00:14:28,629 --> 00:14:25,680
if i could have the slide back up please

360
00:14:31,350 --> 00:14:28,639
last is the t cell activation and aging

361
00:14:33,990 --> 00:14:31,360
proposal that camille mentioned

362
00:14:36,230 --> 00:14:34,000
this proposal this research opportunity

363
00:14:37,990 --> 00:14:36,240

began its life as a collaboration a

364
00:14:40,150 --> 00:14:38,000
collaborative effort between nasa and

365
00:14:42,230 --> 00:14:40,160
the national institutes of health

366
00:14:43,670 --> 00:14:42,240
to enable access to the international

367
00:14:45,430 --> 00:14:43,680
space station

368
00:14:47,030 --> 00:14:45,440
to investigators who work at other

369
00:14:49,189 --> 00:14:47,040
government agencies

370
00:14:50,710 --> 00:14:49,199
this partnership between nasa and the

371
00:14:52,470 --> 00:14:50,720
other government agencies has been very

372
00:14:54,389 --> 00:14:52,480
successful and has been utilized not

373
00:14:56,470 --> 00:14:54,399
only by investigators from the national

374
00:14:59,670 --> 00:14:56,480
institutes of health but also by the

375
00:15:01,829 --> 00:14:59,680
usda and departments of defense

376
00:15:04,150 --> 00:15:01,839
in continuing to to establish this

377
00:15:06,069 --> 00:15:04,160
relationship cases is now going to take

378
00:15:08,870 --> 00:15:06,079
over the role and responsibilities that

379
00:15:10,629 --> 00:15:08,880
cases that nasa formerly had in reaching

380
00:15:12,550 --> 00:15:10,639
out to other government agencies and

381
00:15:14,230 --> 00:15:12,560
introducing the unique opportunities

382
00:15:16,310 --> 00:15:14,240
available on the international space

383
00:15:19,509 --> 00:15:16,320
station to these investigators if i

384
00:15:21,590 --> 00:15:19,519
could have the next slide please

385
00:15:23,110 --> 00:15:21,600
i just wanted to briefly touch on a few

386
00:15:25,110 --> 00:15:23,120
of the protein crystal growth

387
00:15:27,430 --> 00:15:25,120
investigators and

388
00:15:29,269 --> 00:15:27,440

the targets of their research that are

389
00:15:30,310 --> 00:15:29,279
going up on the spacex 3 vehicle

390
00:15:31,910 --> 00:15:30,320
tomorrow

391
00:15:33,509 --> 00:15:31,920
dr joseph ing

392
00:15:35,990 --> 00:15:33,519
who has a faculty appointment at the

393
00:15:38,870 --> 00:15:36,000
university of alabama huntsville and is

394
00:15:40,710 --> 00:15:38,880
also the ceo of i express genes

395
00:15:43,670 --> 00:15:40,720
is interested in

396
00:15:45,189 --> 00:15:43,680
forming crystals for his study on earth

397
00:15:47,189 --> 00:15:45,199
that are much larger and much more

398
00:15:48,629 --> 00:15:47,199
homogeneous than he is capable of

399
00:15:50,710 --> 00:15:48,639
forming on earth

400
00:15:52,870 --> 00:15:50,720
his target in this area is to form a

401
00:15:55,829 --> 00:15:52,880
protein crystal that he is able to then

402
00:15:58,389 --> 00:15:55,839
subject to neutron diffraction studies

403
00:16:00,310 --> 00:15:58,399
so unlike the typical x-ray diffraction

404
00:16:01,829 --> 00:16:00,320
studies that are used to study protein

405
00:16:04,230 --> 00:16:01,839
structure on earth

406
00:16:06,710 --> 00:16:04,240
neutron studies are able to locate at a

407
00:16:08,389 --> 00:16:06,720
much higher level of resolution and

408
00:16:10,230 --> 00:16:08,399
actually tell you the position of

409
00:16:13,509 --> 00:16:10,240
hydrogen atoms inside each of these

410
00:16:15,110 --> 00:16:13,519
protein structures so in essence dr ing

411
00:16:16,870 --> 00:16:15,120
is interested in utilizing the unique

412
00:16:19,430 --> 00:16:16,880
environment of microgravity to get

413
00:16:21,749 --> 00:16:19,440

larger more homogeneous crystals so that

414
00:16:23,670 --> 00:16:21,759
he can get higher resolution detail of

415
00:16:25,910 --> 00:16:23,680
the physical structure of a protein of

416
00:16:28,389 --> 00:16:25,920
interest to his research

417
00:16:30,710 --> 00:16:28,399
in addition to dr ing we are also

418
00:16:33,350 --> 00:16:30,720
sponsoring investigations from dr sergey

419
00:16:34,790 --> 00:16:33,360
korolev and dr pamela burkman

420
00:16:36,629 --> 00:16:34,800
each of these investigators are

421
00:16:38,870 --> 00:16:36,639
interested in determining protein

422
00:16:40,949 --> 00:16:38,880
structure of proteins that are relevant

423
00:16:43,189 --> 00:16:40,959
to diseases of humans

424
00:16:45,350 --> 00:16:43,199
so their studies will result in

425
00:16:47,910 --> 00:16:45,360
advancement of

426
00:16:49,350 --> 00:16:47,920
fields of research that are important to

427
00:16:51,110 --> 00:16:49,360
human health

428
00:16:52,949 --> 00:16:51,120
so this again points out some of the

429
00:16:54,949 --> 00:16:52,959
differences between the type of research

430
00:16:56,790 --> 00:16:54,959
that nasa has sponsored in the past and

431
00:16:58,949 --> 00:16:56,800
continues to sponsor and what cases

432
00:17:01,189 --> 00:16:58,959
sponsors and that we are primarily

433
00:17:04,549 --> 00:17:01,199
interested in sponsoring research that

434
00:17:05,990 --> 00:17:04,559
has direct earth benefit for humans and

435
00:17:09,029 --> 00:17:06,000
other

436
00:17:10,949 --> 00:17:09,039
translational medical fields where the

437
00:17:13,029 --> 00:17:10,959
use of the international space station

438
00:17:15,189 --> 00:17:13,039

affords a unique opportunity for these

439
00:17:18,870 --> 00:17:15,199
investigators if i could have my final

440
00:17:23,510 --> 00:17:20,949
we are also sponsoring investigations by

441
00:17:26,069 --> 00:17:23,520
dr aller and dr edward snell

442
00:17:28,630 --> 00:17:26,079
who are looking at responses of multiple

443
00:17:31,029 --> 00:17:28,640
diseases and therapeutic targets into

444
00:17:33,590 --> 00:17:31,039
the design of therapeutic targets to aid

445
00:17:36,310 --> 00:17:33,600
in the development of treatments and

446
00:17:37,990 --> 00:17:36,320
therapies for these particular diseases

447
00:17:39,590 --> 00:17:38,000
and last but not certainly least i'd

448
00:17:40,870 --> 00:17:39,600
like to call out the research of paul

449
00:17:43,430 --> 00:17:40,880
reichert from merck research

450
00:17:45,830 --> 00:17:43,440
laboratories who is our commercial

451
00:17:47,830 --> 00:17:45,840
investigator who is continuing on some

452
00:17:50,549 --> 00:17:47,840
preliminary research that he followed up

453
00:17:52,150 --> 00:17:50,559
on in during the shuttle program

454
00:17:53,909 --> 00:17:52,160
to look at the capabilities of the

455
00:17:56,390 --> 00:17:53,919
microgravity environment for forming

456
00:17:58,710 --> 00:17:56,400
better crystals in his particular case

457
00:18:01,510 --> 00:17:58,720
dr dr mr reichert is going to be looking

458
00:18:04,390 --> 00:18:01,520
at monoclonal antibodies to a specific

459
00:18:06,070 --> 00:18:04,400
protein formation in orbit this will aid

460
00:18:07,990 --> 00:18:06,080
merck in the development and completion

461
00:18:09,669 --> 00:18:08,000
of clinical trials for these particular

462
00:18:11,990 --> 00:18:09,679
therapeutic agents

463
00:18:14,789 --> 00:18:12,000

thank you mike okay mike thank you and

464
00:18:16,789 --> 00:18:14,799
now joining us by phone is andy petrov

465
00:18:18,070 --> 00:18:16,799
from nasa headquarters in washington

466
00:18:19,990 --> 00:18:18,080
andy

467
00:18:22,310 --> 00:18:20,000
uh hi mike um i appreciate the

468
00:18:24,470 --> 00:18:22,320
opportunity to join you all today i'm

469
00:18:26,870 --> 00:18:24,480
going to be talking about uh two of the

470
00:18:29,750 --> 00:18:26,880
space technology payloads on this launch

471
00:18:33,270 --> 00:18:29,760
the robonaut legs and the phone set

472
00:18:36,630 --> 00:18:33,280
if we can put up the the title chart

473
00:18:38,950 --> 00:18:36,640
to be to be uh begin the presentation

474
00:18:41,510 --> 00:18:38,960
the robonaut is an example of how we can

475
00:18:43,669 --> 00:18:41,520
use robots for repetitive and dangerous

476
00:18:45,990 --> 00:18:43,679
tasks in space and how they can extend

477
00:18:47,510 --> 00:18:46,000
human presence beyond our own physical

478
00:18:49,830 --> 00:18:47,520
limitations

479
00:18:51,590 --> 00:18:49,840
and the phonesat small spacecraft shows

480
00:18:53,990 --> 00:18:51,600
how we can use these very small

481
00:18:56,070 --> 00:18:54,000
spacecraft

482
00:18:58,710 --> 00:18:56,080
and how they might eventually serve as a

483
00:19:01,029 --> 00:18:58,720
multitude of eyes and ears for observing

484
00:19:03,430 --> 00:19:01,039
the earth and the universe beyond

485
00:19:05,990 --> 00:19:03,440
so we can go to the next chart

486
00:19:08,230 --> 00:19:06,000
with the space technology portfolio

487
00:19:10,789 --> 00:19:08,240
i wanted to provide just a context for

488
00:19:14,310 --> 00:19:10,799

how these two payloads fit into the

489
00:19:16,630 --> 00:19:14,320
overall nasa space technology efforts

490
00:19:19,110 --> 00:19:16,640
on this chart you see the nine programs

491
00:19:20,710 --> 00:19:19,120
that compose the space technology

492
00:19:23,350 --> 00:19:20,720
mission directorate each of these

493
00:19:25,270 --> 00:19:23,360
programs has many projects on the left

494
00:19:28,549 --> 00:19:25,280
you see the small spacecraft technology

495
00:19:31,110 --> 00:19:28,559
project a program that's the one that

496
00:19:32,789 --> 00:19:31,120
sponsoring the phonesat and as well as a

497
00:19:34,870 --> 00:19:32,799
number of other

498
00:19:37,110 --> 00:19:34,880
small spacecraft projects and then the

499
00:19:39,669 --> 00:19:37,120
game changing development program that

500
00:19:42,549 --> 00:19:39,679
is sponsoring the robonaut

501
00:19:43,990 --> 00:19:42,559
including the robonaut lakes

502
00:19:49,350 --> 00:19:44,000
the other

503
00:19:52,710 --> 00:19:50,870
through these programs we work with

504
00:19:54,789 --> 00:19:52,720
private companies of all sizes with

505
00:19:56,630 --> 00:19:54,799
universities with nasa researchers and

506
00:19:58,390 --> 00:19:56,640
independent inventors in in our

507
00:20:00,230 --> 00:19:58,400
technology efforts

508
00:20:03,590 --> 00:20:00,240
we can go to the next chart the

509
00:20:05,029 --> 00:20:03,600
technologies for deep space exploration

510
00:20:08,149 --> 00:20:05,039
i just wanted to

511
00:20:10,310 --> 00:20:08,159
mention the broad range of

512
00:20:12,070 --> 00:20:10,320
nasa technology development and

513
00:20:14,390 --> 00:20:12,080

highlight for example

514
00:20:16,310 --> 00:20:14,400
high power solar electric propulsion

515
00:20:18,070 --> 00:20:16,320
laser communications

516
00:20:19,510 --> 00:20:18,080
advanced robotics and lightweight

517
00:20:21,510 --> 00:20:19,520
structures

518
00:20:22,789 --> 00:20:21,520
these and all of the other efforts we're

519
00:20:24,390 --> 00:20:22,799
involved with

520
00:20:27,029 --> 00:20:24,400
will enable the exploration of the solar

521
00:20:31,110 --> 00:20:27,039
system and improvement of life on earth

522
00:20:33,430 --> 00:20:31,120
and we can now go to the next chart

523
00:20:35,510 --> 00:20:33,440
about the robonaut

524
00:20:37,190 --> 00:20:35,520
the robonaut 2

525
00:20:39,430 --> 00:20:37,200
is the um

526
00:20:43,270 --> 00:20:39,440
the human-like robot that's currently on

527
00:20:45,510 --> 00:20:43,280
the iss it's been there since 2011.

528
00:20:48,710 --> 00:20:45,520
and uh what's there right now is just

529
00:20:50,070 --> 00:20:48,720
the the upper body and the head

530
00:20:51,750 --> 00:20:50,080
and that's

531
00:20:54,710 --> 00:20:51,760
been designed the whole robonaut has

532
00:20:57,190 --> 00:20:54,720
been designed to function within the

533
00:20:58,630 --> 00:20:57,200
same environment as the astronauts do so

534
00:21:00,310 --> 00:20:58,640
it's able to

535
00:21:02,390 --> 00:21:00,320
function inside the space station it's

536
00:21:05,029 --> 00:21:02,400
able to use switches and handles and

537
00:21:07,909 --> 00:21:05,039
tools just like a human astronaut can

538
00:21:09,669 --> 00:21:07,919

which allows him to

539
00:21:11,990 --> 00:21:09,679
somewhat easily

540
00:21:13,270 --> 00:21:12,000
fit into the work that needs to be done

541
00:21:15,510 --> 00:21:13,280
in space

542
00:21:16,950 --> 00:21:15,520
and the the applications for this type

543
00:21:18,310 --> 00:21:16,960
of robot

544
00:21:20,470 --> 00:21:18,320
uh are

545
00:21:23,110 --> 00:21:20,480
you know inside both inside and outside

546
00:21:25,510 --> 00:21:23,120
of the station and eventually they could

547
00:21:27,270 --> 00:21:25,520
be used for satellite servicing uh

548
00:21:30,070 --> 00:21:27,280
sampling asteroids and other types of

549
00:21:31,669 --> 00:21:30,080
exploration work uh along with the human

550
00:21:34,070 --> 00:21:31,679
explorers and you can see in the

551
00:21:37,350 --> 00:21:34,080
photograph the lower photograph

552
00:21:39,669 --> 00:21:37,360
the robonaut 2 on the space station

553
00:21:41,430 --> 00:21:39,679
and it's currently mounted in a fixed

554
00:21:43,350 --> 00:21:41,440
position and they've been running

555
00:21:45,990 --> 00:21:43,360
through a series of tests and

556
00:21:48,310 --> 00:21:46,000
demonstrations uh to show its capability

557
00:21:50,950 --> 00:21:48,320
to do a variety of functions

558
00:21:52,870 --> 00:21:50,960
uh we can go to the next chart

559
00:21:55,350 --> 00:21:52,880
which highlights the payload we're

560
00:21:56,830 --> 00:21:55,360
talking about which is the zero g legs

561
00:21:59,990 --> 00:21:56,840
that will be

562
00:22:02,470 --> 00:22:00,000
launched tomorrow and uh eventually

563
00:22:04,789 --> 00:22:02,480

unpacked and and connected to

564
00:22:06,230 --> 00:22:04,799
the upper part of the robot

565
00:22:07,669 --> 00:22:06,240
and um

566
00:22:09,750 --> 00:22:07,679
these we call them legs of course

567
00:22:12,390 --> 00:22:09,760
they're they're not really for walking

568
00:22:14,549 --> 00:22:12,400
in zero gravity environment they're used

569
00:22:17,430 --> 00:22:14,559
for for climbing around

570
00:22:19,990 --> 00:22:17,440
and the legs have seven joints and at

571
00:22:23,270 --> 00:22:20,000
the end instead of feet they have

572
00:22:24,470 --> 00:22:23,280
clamping devices that allow them to

573
00:22:26,470 --> 00:22:24,480
connect

574
00:22:28,870 --> 00:22:26,480
to hand handrails and other

575
00:22:30,310 --> 00:22:28,880
objects on the station and allows it to

576
00:22:32,549 --> 00:22:30,320
move around

577
00:22:35,430 --> 00:22:32,559
and also then freeing the hands to be

578
00:22:37,750 --> 00:22:35,440
used for various tasks

579
00:22:39,029 --> 00:22:37,760
and in the sense there this has been

580
00:22:40,470 --> 00:22:39,039
designed

581
00:22:42,070 --> 00:22:40,480
for a function

582
00:22:43,510 --> 00:22:42,080
in zero gravity that the humans

583
00:22:44,390 --> 00:22:43,520
themselves have not really been designed

584
00:22:46,549 --> 00:22:44,400
to do

585
00:22:49,510 --> 00:22:46,559
being able to use the the uh

586
00:22:52,870 --> 00:22:49,520
the feet as hand holds and

587
00:22:54,549 --> 00:22:52,880
keeping the hands free for other work

588
00:22:56,149 --> 00:22:54,559

the um

589
00:22:58,630 --> 00:22:56,159
i think we can go to

590
00:22:59,510 --> 00:22:58,640
the next chart just talks a little bit

591
00:23:01,830 --> 00:22:59,520
about

592
00:23:04,230 --> 00:23:01,840
what it'll be doing um

593
00:23:06,070 --> 00:23:04,240
once it's uh unpacked and it'll be

594
00:23:08,390 --> 00:23:06,080
connected to the

595
00:23:10,870 --> 00:23:08,400
upper part of the robot as i was saying

596
00:23:12,950 --> 00:23:10,880
and they'll begin testing its function

597
00:23:14,710 --> 00:23:12,960
of in space

598
00:23:15,909 --> 00:23:14,720
initially with an extension cord then a

599
00:23:17,590 --> 00:23:15,919
little later on

600
00:23:19,270 --> 00:23:17,600
by september it should have a new

601
00:23:21,590 --> 00:23:19,280
backpack

602
00:23:22,549 --> 00:23:21,600
for power that'll allow it to move

603
00:23:24,950 --> 00:23:22,559
around

604
00:23:26,950 --> 00:23:24,960
independently inside the station

605
00:23:29,190 --> 00:23:26,960
ultimately

606
00:23:31,750 --> 00:23:29,200
this is intended to be used even outside

607
00:23:33,510 --> 00:23:31,760
the station where it might be

608
00:23:35,830 --> 00:23:33,520
even more useful because it can be doing

609
00:23:37,510 --> 00:23:35,840
work outside without having the

610
00:23:40,390 --> 00:23:37,520
astronauts

611
00:23:42,870 --> 00:23:40,400
needing to go through the difficult um

612
00:23:45,110 --> 00:23:42,880
eva activities that that they normally

613
00:23:46,390 --> 00:23:45,120

do so um

614
00:23:48,549 --> 00:23:46,400
it's you know it's a step in that

615
00:23:50,149 --> 00:23:48,559
direction of a

616
00:23:51,830 --> 00:23:50,159
robot that can operate inside the

617
00:23:53,110 --> 00:23:51,840
station outside the station and

618
00:23:55,590 --> 00:23:53,120
ultimately

619
00:23:57,590 --> 00:23:55,600
do many many other kinds of things as we

620
00:24:00,549 --> 00:23:57,600
explore space

621
00:24:04,710 --> 00:24:02,950
so we can go to the next chart which is

622
00:24:07,990 --> 00:24:04,720
moving on to the other

623
00:24:09,750 --> 00:24:08,000
payload which is a phonesat 2.5

624
00:24:12,470 --> 00:24:09,760
and this

625
00:24:14,310 --> 00:24:12,480
this is a standard cubesat it's a one

626
00:24:15,830 --> 00:24:14,320
unit cubesat which means it's a four

627
00:24:18,870 --> 00:24:15,840
inch cube

628
00:24:20,549 --> 00:24:18,880
weighs about two pounds and

629
00:24:22,470 --> 00:24:20,559
this particular

630
00:24:24,149 --> 00:24:22,480
satellite is called phonesat because

631
00:24:26,870 --> 00:24:24,159
it's built around

632
00:24:28,390 --> 00:24:26,880
a smartphone as the the computer and

633
00:24:31,909 --> 00:24:28,400
control system

634
00:24:33,430 --> 00:24:31,919
for the satellite so it it's a nexus s

635
00:24:36,549 --> 00:24:33,440
smartphone

636
00:24:38,870 --> 00:24:36,559
uh off the shelf inside along with

637
00:24:40,549 --> 00:24:38,880
various other components

638
00:24:41,350 --> 00:24:40,559

including two radios

639
00:24:44,789 --> 00:24:41,360
the

640
00:24:46,549 --> 00:24:44,799
side

641
00:24:47,909 --> 00:24:46,559
looks like a tape measure because it

642
00:24:49,029 --> 00:24:47,919
actually is a piece of tape measure

643
00:24:50,950 --> 00:24:49,039
material

644
00:24:53,510 --> 00:24:50,960
that's used as the

645
00:24:56,710 --> 00:24:53,520
uhf radio antenna

646
00:24:58,549 --> 00:24:56,720
for launch it's wrapped around

647
00:25:01,110 --> 00:24:58,559
as this is put into its cubesat

648
00:25:02,950 --> 00:25:01,120
deploying container and then just pops

649
00:25:03,909 --> 00:25:02,960
out automatically once it's free in

650
00:25:06,070 --> 00:25:03,919
space

651
00:25:08,789 --> 00:25:06,080
the little uh square you see on the top

652
00:25:09,909 --> 00:25:08,799
of the cubesat is the s-band radio

653
00:25:11,190 --> 00:25:09,919
antenna

654
00:25:13,029 --> 00:25:11,200
so

655
00:25:15,269 --> 00:25:13,039
this is the fifth

656
00:25:16,149 --> 00:25:15,279
of the phonesat series that have been

657
00:25:18,149 --> 00:25:16,159
launched

658
00:25:19,029 --> 00:25:18,159
just within the past year

659
00:25:22,310 --> 00:25:19,039
and

660
00:25:24,070 --> 00:25:22,320
capability this one will be

661
00:25:26,149 --> 00:25:24,080
demonstrating the use of

662
00:25:27,510 --> 00:25:26,159
two-way communication with that s-band

663
00:25:30,310 --> 00:25:27,520

radio

664
00:25:32,870 --> 00:25:30,320
it also has the ability to

665
00:25:34,549 --> 00:25:32,880
orient itself in space

666
00:25:37,350 --> 00:25:34,559
and it uses

667
00:25:39,750 --> 00:25:37,360
i think pretty innovative design using

668
00:25:41,430 --> 00:25:39,760
just three little electric motors

669
00:25:43,750 --> 00:25:41,440
they're off the shelf motors that are

670
00:25:45,350 --> 00:25:43,760
positioned inside and by

671
00:25:47,590 --> 00:25:45,360
turning them on and off you can create a

672
00:25:49,510 --> 00:25:47,600
gyroscopic effect that causes the

673
00:25:51,590 --> 00:25:49,520
satellite to rotate to the position that

674
00:25:54,149 --> 00:25:51,600
you want so it has

675
00:25:57,110 --> 00:25:54,159
a three-dimensional pointing capability

676
00:25:59,909 --> 00:25:57,120
with this cubesat and in addition it

677
00:26:02,149 --> 00:25:59,919
also has the smartphone camera on board

678
00:26:05,190 --> 00:26:02,159
and it will be using that to take

679
00:26:07,110 --> 00:26:05,200
pictures of the earth and we expect to

680
00:26:08,230 --> 00:26:07,120
get those back on earth

681
00:26:10,390 --> 00:26:08,240
as well

682
00:26:11,590 --> 00:26:10,400
through the radio system

683
00:26:13,430 --> 00:26:11,600
so we can go

684
00:26:15,029 --> 00:26:13,440
you can of course see the size of if i

685
00:26:16,950 --> 00:26:15,039
was there i would be holding an example

686
00:26:18,470 --> 00:26:16,960
of it in my hand as well but you can see

687
00:26:19,990 --> 00:26:18,480
it in the photograph

688
00:26:21,909 --> 00:26:20,000

we can go to the next chart which just

689
00:26:23,510 --> 00:26:21,919
shows the phonesat team

690
00:26:25,669 --> 00:26:23,520
we're really proud of what this team has

691
00:26:28,789 --> 00:26:25,679
done it is as you can see a bunch of

692
00:26:30,070 --> 00:26:28,799
young guys with just a few mentors

693
00:26:32,149 --> 00:26:30,080
and

694
00:26:34,390 --> 00:26:32,159
they really originated this phone set

695
00:26:37,590 --> 00:26:34,400
concept a couple years ago

696
00:26:39,510 --> 00:26:37,600
and in the past year they have launched

697
00:26:42,070 --> 00:26:39,520
four and this will be the fifth

698
00:26:43,190 --> 00:26:42,080
first one was launched last april

699
00:26:44,310 --> 00:26:43,200
so we're really

700
00:26:46,310 --> 00:26:44,320
proud of what they've been able to

701
00:26:49,350 --> 00:26:46,320
accomplish and look forward to great

702
00:26:51,190 --> 00:26:49,360
things from them in the future

703
00:26:52,549 --> 00:26:51,200
and we can go to the next chart

704
00:26:54,470 --> 00:26:52,559
because i just want to

705
00:26:57,350 --> 00:26:54,480
tie this into

706
00:26:59,430 --> 00:26:57,360
where this is heading where we can take

707
00:27:01,750 --> 00:26:59,440
this very simple low-cost

708
00:27:02,470 --> 00:27:01,760
satellite technology what you see here

709
00:27:07,110 --> 00:27:02,480
is

710
00:27:10,070 --> 00:27:07,120
networks that's our next

711
00:27:11,830 --> 00:27:10,080
mission which will be launching

712
00:27:13,669 --> 00:27:11,840
in october

713
00:27:16,710 --> 00:27:13,679

and

714
00:27:18,830 --> 00:27:16,720
this is using the phonesat heritage the

715
00:27:22,070 --> 00:27:18,840
uses the same phonesat control system

716
00:27:25,029 --> 00:27:22,080
inside the same wheels for the motors

717
00:27:27,430 --> 00:27:25,039
for orientation it also has a science

718
00:27:29,350 --> 00:27:27,440
instrument each one has and we're going

719
00:27:32,310 --> 00:27:29,360
to launch eight of these at once

720
00:27:34,389 --> 00:27:32,320
and they will be taking measurements

721
00:27:36,149 --> 00:27:34,399
independent measurements and then uh

722
00:27:38,070 --> 00:27:36,159
sending them to each other and one of

723
00:27:39,029 --> 00:27:38,080
the the eight can be the relay to the

724
00:27:41,350 --> 00:27:39,039
ground

725
00:27:43,430 --> 00:27:41,360
and in the demonstration we'll show that

726
00:27:45,590 --> 00:27:43,440
they can each take turns doing that and

727
00:27:47,350 --> 00:27:45,600
that's a precursor for where

728
00:27:48,950 --> 00:27:47,360
for fleets of small satellites that

729
00:27:50,310 --> 00:27:48,960
might be used for science missions and

730
00:27:52,389 --> 00:27:50,320
other purposes

731
00:27:54,149 --> 00:27:52,399
in the years to come

732
00:27:56,149 --> 00:27:54,159
i just wanted to mention too that in our

733
00:27:57,990 --> 00:27:56,159
program we have some other

734
00:27:58,950 --> 00:27:58,000
even more sophisticated demonstrations

735
00:28:01,669 --> 00:27:58,960
coming

736
00:28:03,669 --> 00:28:01,679
we have a demonstration of laser

737
00:28:05,430 --> 00:28:03,679
communication

738
00:28:08,310 --> 00:28:05,440

which will be the first time that's done

739
00:28:12,870 --> 00:28:10,630
and then also a rendezvous and docking

740
00:28:15,350 --> 00:28:12,880
demonstration with two

741
00:28:18,950 --> 00:28:15,360
small cubesats which will also be a

742
00:28:21,909 --> 00:28:18,960
first for that type of capability

743
00:28:24,230 --> 00:28:21,919
and we can go to the next chart

744
00:28:27,110 --> 00:28:24,240
which just shows

745
00:28:29,029 --> 00:28:27,120
really how this whole area of small

746
00:28:31,510 --> 00:28:29,039
spacecraft brings

747
00:28:32,950 --> 00:28:31,520
spacecraft development on to a human

748
00:28:34,549 --> 00:28:32,960
scale you can see

749
00:28:36,630 --> 00:28:34,559
one of the phonesat team members

750
00:28:39,110 --> 00:28:36,640
assembling the the

751
00:28:41,110 --> 00:28:39,120
edison satellite he's got the entire

752
00:28:43,029 --> 00:28:41,120
satellite in his hands essentially we

753
00:28:46,149 --> 00:28:43,039
don't need huge buildings overhead

754
00:28:47,830 --> 00:28:46,159
cranes and giant chambers to test them

755
00:28:50,950 --> 00:28:47,840
this is all worked it can be done more

756
00:28:53,350 --> 00:28:50,960
or less on a desktop so

757
00:28:55,830 --> 00:28:53,360
it's a whole different scale of

758
00:28:57,269 --> 00:28:55,840
development but it's something we think

759
00:28:59,430 --> 00:28:57,279
is affordable

760
00:29:01,750 --> 00:28:59,440
and rapid and

761
00:29:06,310 --> 00:29:01,760
transformative and it's in its way

762
00:29:09,590 --> 00:29:07,430
and

763
00:29:10,630 --> 00:29:09,600

this is one of my favorite pictures

764
00:29:13,669 --> 00:29:10,640
the

765
00:29:16,470 --> 00:29:13,679
you can see three phone set uh threes

766
00:29:19,269 --> 00:29:16,480
cubesats um these are not ours but

767
00:29:21,110 --> 00:29:19,279
others that are floating past the

768
00:29:22,630 --> 00:29:21,120
international space station

769
00:29:25,350 --> 00:29:22,640
our phone set of course is going to be

770
00:29:27,990 --> 00:29:25,360
launched on the falcon 9.

771
00:29:30,710 --> 00:29:28,000
uh it'll be deployed on the way up

772
00:29:33,110 --> 00:29:30,720
in in orbit before the spacecraft

773
00:29:34,149 --> 00:29:33,120
reaches the space station along with

774
00:29:37,590 --> 00:29:34,159
four other

775
00:29:39,590 --> 00:29:37,600
small stats that are also being launched

776
00:29:41,190 --> 00:29:39,600
and this is through the cubesat launch

777
00:29:43,669 --> 00:29:41,200
initiative which is a nasa program

778
00:29:44,470 --> 00:29:43,679
providing flight opportunities for

779
00:29:47,430 --> 00:29:44,480
for

780
00:29:48,950 --> 00:29:47,440
university and government uh payloads

781
00:29:51,029 --> 00:29:48,960
but

782
00:29:53,350 --> 00:29:51,039
some some small sets are also taken as

783
00:29:54,789 --> 00:29:53,360
cargo to the station and then later

784
00:29:57,430 --> 00:29:54,799
deployed from the station and that's

785
00:29:59,350 --> 00:29:57,440
what's shown in this picture and uh

786
00:30:01,190 --> 00:29:59,360
what's impressive to me in this picture

787
00:30:01,990 --> 00:30:01,200
is that you know you see just a portion

788
00:30:07,029 --> 00:30:02,000

of

789
00:30:09,269 --> 00:30:07,039
largest satellite in in orbit

790
00:30:11,669 --> 00:30:09,279
and it's it's a satellite big enough for

791
00:30:14,389 --> 00:30:11,679
humans to live inside and at the same

792
00:30:16,230 --> 00:30:14,399
time you're seeing some small satellites

793
00:30:17,669 --> 00:30:16,240
that are small enough to hold in the

794
00:30:20,470 --> 00:30:17,679
palm of your hand

795
00:30:22,630 --> 00:30:20,480
so it's a pretty dramatic contrast

796
00:30:24,630 --> 00:30:22,640
and i just want to finish with the idea

797
00:30:27,110 --> 00:30:24,640
that you know everyone is always of

798
00:30:28,630 --> 00:30:27,120
course interested in the next big thing

799
00:30:31,029 --> 00:30:28,640
in in our program you know we're

800
00:30:33,510 --> 00:30:31,039
interested in the next small thing

801
00:30:35,269 --> 00:30:33,520
so uh with that i'll wrap it up and i'll

802
00:30:37,909 --> 00:30:35,279
be on the line for any questions later

803
00:30:40,389 --> 00:30:37,919
on so i'll turn it back to mike

804
00:30:42,549 --> 00:30:40,399
okay andy thank you very much and we're

805
00:30:44,470 --> 00:30:42,559
here ready to take your questions here

806
00:30:47,430 --> 00:30:44,480
at kennedy space center we have members

807
00:30:49,669 --> 00:30:47,440
of the nasa social in addition to

808
00:30:50,789 --> 00:30:49,679
members of the news media so we would

809
00:30:52,389 --> 00:30:50,799
ask for you to please wait for the

810
00:30:53,990 --> 00:30:52,399
microphone

811
00:30:56,470 --> 00:30:54,000
state your name and affiliation and to

812
00:30:58,470 --> 00:30:56,480
whom you are addressing your question

813
00:31:00,230 --> 00:30:58,480

and why don't we start right here in the

814
00:31:02,149 --> 00:31:00,240
front row

815
00:31:04,110 --> 00:31:02,159
hi i'm ian clough with the nasa social

816
00:31:06,149 --> 00:31:04,120
group and also blogging for

817
00:31:08,549 --> 00:31:06,159
airlinereporter.com now these uh

818
00:31:10,070 --> 00:31:08,559
cubesats that are up there this is uh

819
00:31:11,750 --> 00:31:10,080
i've heard that they're uh i mean this

820
00:31:13,909 --> 00:31:11,760
is not just the only cubesat there's

821
00:31:15,190 --> 00:31:13,919
lots of them out there how many uh how

822
00:31:17,029 --> 00:31:15,200
many of them are out there and how many

823
00:31:20,789 --> 00:31:17,039
do you expect to make with uh with this

824
00:31:24,870 --> 00:31:22,230
okay um

825
00:31:27,909 --> 00:31:24,880
if you can hear me um i i don't really

826
00:31:29,590 --> 00:31:27,919
know the exact number uh we're

827
00:31:31,830 --> 00:31:29,600
probably launching

828
00:31:34,070 --> 00:31:31,840
dozens of them uh

829
00:31:35,830 --> 00:31:34,080
the the whole community

830
00:31:38,310 --> 00:31:35,840
each year

831
00:31:40,710 --> 00:31:38,320
we expect to be launching

832
00:31:43,750 --> 00:31:40,720
in addition to this one

833
00:31:45,350 --> 00:31:43,760
10 more this year and

834
00:31:47,509 --> 00:31:45,360
several

835
00:31:49,509 --> 00:31:47,519
in the following year and of course more

836
00:31:51,990 --> 00:31:49,519
to come beyond that if something has

837
00:31:54,389 --> 00:31:52,000
really taken off um

838
00:31:56,549 --> 00:31:54,399

both among the from the technology point

839
00:31:58,789 --> 00:31:56,559
of view as well as uh for science

840
00:32:02,470 --> 00:31:58,799
missions and other purposes so

841
00:32:05,590 --> 00:32:02,480
um it's it's a very rapidly growing

842
00:32:09,830 --> 00:32:07,590
margaret mason with the nasa social

843
00:32:12,149 --> 00:32:09,840
group and this is for ellen

844
00:32:14,470 --> 00:32:12,159
you mentioned that after the lettuce is

845
00:32:17,830 --> 00:32:14,480
grown it's going to be returned to earth

846
00:32:18,950 --> 00:32:17,840
for analysis of its nutrient value and

847
00:32:21,750 --> 00:32:18,960
everything

848
00:32:23,590 --> 00:32:21,760
how will the lettuce be preserved from

849
00:32:26,149 --> 00:32:23,600
the time it's harvested and what's the

850
00:32:29,029 --> 00:32:26,159
timeline for sending it back because we

851
00:32:31,350 --> 00:32:29,039
all know for the food that we keep here

852
00:32:33,669 --> 00:32:31,360
on earth and our refrigerators it's not

853
00:32:36,310 --> 00:32:33,679
long before things have lost a

854
00:32:38,389 --> 00:32:36,320
significant portion of their value

855
00:32:41,990 --> 00:32:38,399
i was told by the investigative team

856
00:32:44,710 --> 00:32:42,000
that it will take about 28 days to grow

857
00:32:45,990 --> 00:32:44,720
the lettuce on orbit and then it will be

858
00:32:56,870 --> 00:32:46,000
returned

859
00:32:58,870 --> 00:32:56,880
returns yes okay thank you

860
00:33:01,029 --> 00:32:58,880
okay scanning the room does anyone else

861
00:33:02,230 --> 00:33:01,039
have any questions

862
00:33:07,029 --> 00:33:02,240
in the back

863
00:33:11,509 --> 00:33:08,830

chris haver with

864
00:33:13,430 --> 00:33:11,519
rocketstem.org and my question is for

865
00:33:15,190 --> 00:33:13,440
everybody

866
00:33:16,310 --> 00:33:15,200
whoever feels it's applicable to

867
00:33:18,549 --> 00:33:16,320
yourself

868
00:33:21,190 --> 00:33:18,559
can you talk a little bit about

869
00:33:23,909 --> 00:33:21,200
the future of the technology that you're

870
00:33:25,669 --> 00:33:23,919
flying today once it's proven how you

871
00:33:27,990 --> 00:33:25,679
want to develop down the line in future

872
00:33:33,110 --> 00:33:28,000
missions as well as

873
00:33:38,549 --> 00:33:35,029
andy do you want to uh do you want to

874
00:33:40,149 --> 00:33:38,559
try to answer that first yeah okay um

875
00:33:41,909 --> 00:33:40,159
and i guess i tried to allude to it a

876
00:33:44,549 --> 00:33:41,919
little bit uh in terms of the robot of

877
00:33:45,750 --> 00:33:44,559
course the idea is that robots like this

878
00:33:48,710 --> 00:33:45,760
can become

879
00:33:51,909 --> 00:33:48,720
uh our partners uh with human explorers

880
00:33:54,230 --> 00:33:51,919
as we we go out into the solar system uh

881
00:33:55,990 --> 00:33:54,240
because they can do the repetitive tests

882
00:33:57,830 --> 00:33:56,000
they can do tests in more hazardous

883
00:33:58,950 --> 00:33:57,840
situations than we might want to put

884
00:34:00,870 --> 00:33:58,960
people

885
00:34:03,190 --> 00:34:00,880
and um

886
00:34:05,669 --> 00:34:03,200
really the the potential seems unlimited

887
00:34:09,510 --> 00:34:05,679
as to where they might be helpful there

888
00:34:11,750 --> 00:34:09,520

and of course there's there's a huge

889
00:34:13,589 --> 00:34:11,760
potential for you know applications on

890
00:34:16,389 --> 00:34:13,599
earth as well

891
00:34:18,470 --> 00:34:16,399
doing work in hazardous

892
00:34:21,190 --> 00:34:18,480
conditions on earth

893
00:34:23,190 --> 00:34:21,200
helping uh disabled people all kinds of

894
00:34:24,869 --> 00:34:23,200
things like that i think

895
00:34:26,790 --> 00:34:24,879
you know we i think we see a lot of

896
00:34:29,430 --> 00:34:26,800
examples of that and in terms of the

897
00:34:31,109 --> 00:34:29,440
small spacecraft uh we also see a huge

898
00:34:33,270 --> 00:34:31,119
potential because

899
00:34:36,069 --> 00:34:33,280
you know we we can produce some faster

900
00:34:38,550 --> 00:34:36,079
and less expensively and

901
00:34:40,230 --> 00:34:38,560
in some cases they have even unique

902
00:34:41,349 --> 00:34:40,240
applications for example if you could

903
00:34:42,310 --> 00:34:41,359
put up

904
00:34:44,069 --> 00:34:42,320
you know

905
00:34:45,829 --> 00:34:44,079
large numbers of them

906
00:34:47,829 --> 00:34:45,839
for short term missions in low earth

907
00:34:50,230 --> 00:34:47,839
orbit observing the earth we could get

908
00:34:51,829 --> 00:34:50,240
measurements um around the earth

909
00:34:53,990 --> 00:34:51,839
simultaneously in a way that you could

910
00:34:56,310 --> 00:34:54,000
never get with one one big

911
00:34:57,750 --> 00:34:56,320
spacecraft so um

912
00:35:00,550 --> 00:34:57,760
and you know we also see applications

913
00:35:02,630 --> 00:35:00,560

for them uh being part of deep space

914
00:35:04,630 --> 00:35:02,640
missions where they would fly you know

915
00:35:06,150 --> 00:35:04,640
be carried along with the larger

916
00:35:08,470 --> 00:35:06,160
spacecraft and then deployed when you

917
00:35:10,870 --> 00:35:08,480
get to the destination to do particular

918
00:35:13,430 --> 00:35:10,880
types of missions there so i think

919
00:35:15,430 --> 00:35:13,440
that's how i answer

920
00:35:16,390 --> 00:35:15,440
okay andy do you

921
00:35:18,550 --> 00:35:16,400
well

922
00:35:20,950 --> 00:35:18,560
with respect to the the payloads that

923
00:35:22,470 --> 00:35:20,960
are being sponsored by cases there's

924
00:35:25,670 --> 00:35:22,480
direct benefit

925
00:35:27,430 --> 00:35:25,680
to the investigators into

926
00:35:29,030 --> 00:35:27,440
humanity on earth from the

927
00:35:30,790 --> 00:35:29,040
investigations focused on protein

928
00:35:33,589 --> 00:35:30,800
crystal growth for example

929
00:35:35,829 --> 00:35:33,599
so merck is actually looking to form

930
00:35:36,950 --> 00:35:35,839
better crystals of a therapeutic agent a

931
00:35:39,030 --> 00:35:36,960
drug

932
00:35:41,430 --> 00:35:39,040
and from this investigation in flight

933
00:35:43,430 --> 00:35:41,440
they'll be able to understand better the

934
00:35:45,190 --> 00:35:43,440
physical structure of their monoclonal

935
00:35:46,230 --> 00:35:45,200
antibody that's already in clinical

936
00:35:49,190 --> 00:35:46,240
studies

937
00:35:50,550 --> 00:35:49,200
so this will translate in a very short

938
00:35:52,870 --> 00:35:50,560

amount of time

939
00:35:55,670 --> 00:35:52,880
to potentially significant findings that

940
00:35:56,550 --> 00:35:55,680
can benefit the use of this therapeutic

941
00:35:58,630 --> 00:35:56,560
agent

942
00:36:00,310 --> 00:35:58,640
to treat human disease

943
00:36:02,790 --> 00:36:00,320
in the cases of the other protein

944
00:36:05,190 --> 00:36:02,800
crystal growth experiments that kasis is

945
00:36:08,950 --> 00:36:05,200
sponsoring they're actually looking at

946
00:36:10,710 --> 00:36:08,960
targets of potential human disease

947
00:36:13,910 --> 00:36:10,720
in the case of the study that's being

948
00:36:16,230 --> 00:36:13,920
performed by pamela borkman at caltech

949
00:36:18,630 --> 00:36:16,240
and her graduate student gwen owen

950
00:36:20,390 --> 00:36:18,640
they're looking at the structure of

951
00:36:22,870 --> 00:36:20,400
huntington's protein

952
00:36:24,710 --> 00:36:22,880
hunting's disease is a very serious

953
00:36:26,790 --> 00:36:24,720
autosomal dominant

954
00:36:28,390 --> 00:36:26,800
disease that afflicts many of the united

955
00:36:30,870 --> 00:36:28,400
states and the world

956
00:36:33,190 --> 00:36:30,880
and that particular protein that is

957
00:36:34,470 --> 00:36:33,200
believed to be at the root of this

958
00:36:36,790 --> 00:36:34,480
disease

959
00:36:39,910 --> 00:36:36,800
cannot be precipitated on earth because

960
00:36:42,470 --> 00:36:39,920
of its size and its ability to aggregate

961
00:36:44,470 --> 00:36:42,480
so the actual action that

962
00:36:46,470 --> 00:36:44,480
causes human disease

963
00:36:49,030 --> 00:36:46,480

prevents it structure from being

964
00:36:50,390 --> 00:36:49,040
elucidated on earth so it's believed

965
00:36:52,630 --> 00:36:50,400
that the unique environment of

966
00:36:54,230 --> 00:36:52,640
microgravity will enable the formation

967
00:36:56,550 --> 00:36:54,240
of better crystals on earth that will

968
00:36:58,710 --> 00:36:56,560
then translate to better structures

969
00:37:00,550 --> 00:36:58,720
so those are just a couple of examples

970
00:37:01,910 --> 00:37:00,560
from the protein crystal growth types of

971
00:37:04,069 --> 00:37:01,920
experiments

972
00:37:06,710 --> 00:37:04,079
where the unique environment of space is

973
00:37:08,790 --> 00:37:06,720
going to translate very rapidly

974
00:37:10,470 --> 00:37:08,800
into potential technologies and

975
00:37:12,230 --> 00:37:10,480
therapeutic agents that have direct

976
00:37:14,069 --> 00:37:12,240
benefit from earth

977
00:37:17,430 --> 00:37:14,079
the research that i described on the

978
00:37:19,750 --> 00:37:17,440
plant science side of anna-lysa paul and

979
00:37:22,390 --> 00:37:19,760
rob ferrell university of florida is

980
00:37:24,390 --> 00:37:22,400
looking at what is on first glance a

981
00:37:26,390 --> 00:37:24,400
very basic fundamental question how do

982
00:37:27,430 --> 00:37:26,400
plants respond to the microgravity

983
00:37:29,270 --> 00:37:27,440
environment

984
00:37:31,109 --> 00:37:29,280
but there's potential earth benefit from

985
00:37:33,349 --> 00:37:31,119
that as well because

986
00:37:35,430 --> 00:37:33,359
we need to understand how plants and all

987
00:37:37,589 --> 00:37:35,440
organisms respond to the microgravity

988
00:37:39,990 --> 00:37:37,599

environment because with the removal of

989
00:37:42,550 --> 00:37:40,000
gravity as a constant we get better

990
00:37:44,550 --> 00:37:42,560
insight into how the genes respond to

991
00:37:47,030 --> 00:37:44,560
different stresses that are placed on

992
00:37:49,030 --> 00:37:47,040
them and that goes beyond plant science

993
00:37:52,150 --> 00:37:49,040
and basic understanding of how cells

994
00:37:54,150 --> 00:37:52,160
respond to that microgravity environment

995
00:37:56,310 --> 00:37:54,160
and just to piggyback on what michael

996
00:37:58,950 --> 00:37:56,320
was saying about protein crystal growth

997
00:38:00,630 --> 00:37:58,960
and the use of microgravity as a

998
00:38:01,510 --> 00:38:00,640
unique environment

999
00:38:03,430 --> 00:38:01,520
to

1000
00:38:06,150 --> 00:38:03,440
study these structures there's a

1001
00:38:07,829 --> 00:38:06,160
phenomenal phenomenon

1002
00:38:10,790 --> 00:38:07,839
that's gravity-induced called

1003
00:38:13,190 --> 00:38:10,800
sedimentation where heavy particles fall

1004
00:38:16,470 --> 00:38:13,200
to the bottom they fall towards earth

1005
00:38:19,670 --> 00:38:16,480
and so on earth when proteins are grown

1006
00:38:21,910 --> 00:38:19,680
they have the distortion of gravity and

1007
00:38:23,990 --> 00:38:21,920
of those particles settling in

1008
00:38:26,390 --> 00:38:24,000
microgravity you don't have that

1009
00:38:29,109 --> 00:38:26,400
gravitational element and so your

1010
00:38:31,990 --> 00:38:29,119
proteins tend to grow much bigger and

1011
00:38:34,230 --> 00:38:32,000
much clearer and you're able to study

1012
00:38:37,030 --> 00:38:34,240
the three-dimensional structures of

1013
00:38:39,349 --> 00:38:37,040

protein in a much more effective way

1014
00:38:42,310 --> 00:38:39,359
than you would on underground so that's

1015
00:38:46,230 --> 00:38:42,320
why microgravity becomes really

1016
00:38:47,910 --> 00:38:46,240
important for protein crystal growth

1017
00:38:51,510 --> 00:38:47,920
okay

1018
00:38:55,670 --> 00:38:52,950
have you

1019
00:38:58,069 --> 00:38:55,680
on the protein side of it have

1020
00:38:59,750 --> 00:38:58,079
have you worked with the stanford

1021
00:39:03,430 --> 00:38:59,760
folding at home

1022
00:39:08,069 --> 00:39:05,510
distributed computing

1023
00:39:10,150 --> 00:39:08,079
research on protein folding

1024
00:39:12,390 --> 00:39:10,160
we haven't worked directly with them as

1025
00:39:14,310 --> 00:39:12,400
i'm sure you're aware there are

1026
00:39:16,710 --> 00:39:14,320
computational based approaches to

1027
00:39:19,829 --> 00:39:16,720
looking at protein folding and they

1028
00:39:21,829 --> 00:39:19,839
certainly give you very valuable insight

1029
00:39:23,270 --> 00:39:21,839
in defining

1030
00:39:24,630 --> 00:39:23,280
what

1031
00:39:26,310 --> 00:39:24,640
from a scientific

1032
00:39:28,950 --> 00:39:26,320
scientific perspective would be called

1033
00:39:31,109 --> 00:39:28,960
parameter space so you get some ideas

1034
00:39:32,230 --> 00:39:31,119
about what types of structures you can

1035
00:39:34,310 --> 00:39:32,240
expect

1036
00:39:36,069 --> 00:39:34,320
and you can narrow down the field that

1037
00:39:37,670 --> 00:39:36,079
you're searching but you cannot get

1038
00:39:40,829 --> 00:39:37,680

complete structure simply from

1039
00:39:43,829 --> 00:39:40,839
computational studies but certainly we

1040
00:39:46,230 --> 00:39:43,839
have we have worked with the academic

1041
00:39:48,470 --> 00:39:46,240
community including stanford

1042
00:39:50,069 --> 00:39:48,480
in defining the areas of research that

1043
00:39:51,190 --> 00:39:50,079
we believe are important to the

1044
00:39:53,109 --> 00:39:51,200
community

1045
00:39:55,030 --> 00:39:53,119
and we're certainly hoping to move

1046
00:39:56,550 --> 00:39:55,040
forward in building collaborations

1047
00:39:57,670 --> 00:39:56,560
between those who approach those

1048
00:39:59,430 --> 00:39:57,680
problems

1049
00:40:01,750 --> 00:39:59,440
from both the commercial side who are

1050
00:40:03,829 --> 00:40:01,760
interested in drug development and those

1051
00:40:06,069 --> 00:40:03,839
mostly in the academic community who are

1052
00:40:07,750 --> 00:40:06,079
working from the target side with

1053
00:40:10,309 --> 00:40:07,760
specific diseases

1054
00:40:12,630 --> 00:40:10,319
whether they're associated with aging

1055
00:40:15,829 --> 00:40:12,640
autoimmune diseases or neurodegenerative

1056
00:40:17,510 --> 00:40:15,839
and musculoskeletal disorders

1057
00:40:19,430 --> 00:40:17,520
okay let's go to the phone bridge now

1058
00:40:24,069 --> 00:40:19,440
where we have a question from tariq

1059
00:40:29,270 --> 00:40:26,309
hello thank you i just i had a follow-up

1060
00:40:30,870 --> 00:40:29,280
question for uh andy uh petro um andy i

1061
00:40:34,309 --> 00:40:30,880
was just kind of curious what the

1062
00:40:36,710 --> 00:40:34,319
timeline for uh robonaut two's legs uh

1063
00:40:38,790 --> 00:40:36,720

would be uh given a successful talking

1064
00:40:40,950 --> 00:40:38,800
on wednesday how long will the crew have

1065
00:40:42,150 --> 00:40:40,960
to wait before they unpack them and

1066
00:40:43,910 --> 00:40:42,160
and um

1067
00:40:46,470 --> 00:40:43,920
you know just uh what are you hoping to

1068
00:40:50,950 --> 00:40:46,480
see when when it's all attached a free

1069
00:40:55,750 --> 00:40:53,349
yeah okay i'd have to check with the the

1070
00:40:57,349 --> 00:40:55,760
team to know exactly what their schedule

1071
00:41:00,630 --> 00:40:57,359
is i know that through

1072
00:41:03,829 --> 00:41:00,640
uh the next months it'll be um unpacked

1073
00:41:06,150 --> 00:41:03,839
and attached august to september time

1074
00:41:07,190 --> 00:41:06,160
frame is is a big milestone where they

1075
00:41:09,270 --> 00:41:07,200
will

1076
00:41:10,790 --> 00:41:09,280
have the new backpack

1077
00:41:13,430 --> 00:41:10,800
and be able to

1078
00:41:14,069 --> 00:41:13,440
uh unhook the extension cord and allow

1079
00:41:16,950 --> 00:41:14,079
it

1080
00:41:19,670 --> 00:41:16,960
to move freely around

1081
00:41:22,390 --> 00:41:19,680
inside the station modules

1082
00:41:24,550 --> 00:41:22,400
the uh the idea is they won't free fly

1083
00:41:26,710 --> 00:41:24,560
it'll always be

1084
00:41:28,550 --> 00:41:26,720
holding on to something

1085
00:41:31,510 --> 00:41:28,560
you know as a as a safety factor

1086
00:41:33,750 --> 00:41:31,520
actually so it'll always be

1087
00:41:36,710 --> 00:41:33,760
grasping

1088
00:41:40,150 --> 00:41:36,720

a a foothold as it moves around the

1089
00:41:44,950 --> 00:41:42,230
okay back in the room uh go ahead please

1090
00:41:47,030 --> 00:41:44,960
uh yes uh scott johnson i'm with the

1091
00:41:50,309 --> 00:41:47,040
nasa social and also with space flight

1092
00:41:51,589 --> 00:41:50,319
insider this is a robonaut question

1093
00:41:53,430 --> 00:41:51,599
um

1094
00:41:54,790 --> 00:41:53,440
i guess sort of from a historical

1095
00:41:57,750 --> 00:41:54,800
perspective

1096
00:42:00,230 --> 00:41:57,760
what was the original thought process as

1097
00:42:02,470 --> 00:42:00,240
far as making robonaut in a humanoid

1098
00:42:05,270 --> 00:42:02,480
form was that more of a

1099
00:42:07,510 --> 00:42:05,280
practical thing or was that more for

1100
00:42:09,589 --> 00:42:07,520
public engagement because people relate

1101
00:42:11,990 --> 00:42:09,599
to things that look like themselves or

1102
00:42:14,470 --> 00:42:12,000
is that was that driven by

1103
00:42:17,589 --> 00:42:14,480
what works

1104
00:42:19,670 --> 00:42:17,599
uh yes uh and i've heard that the

1105
00:42:21,109 --> 00:42:19,680
project team described the fact that

1106
00:42:23,349 --> 00:42:21,119
working with something that looks a

1107
00:42:25,589 --> 00:42:23,359
little bit more like us might uh be

1108
00:42:27,910 --> 00:42:25,599
easier in some ways but i think the

1109
00:42:28,950 --> 00:42:27,920
biggest factor is just the practicality

1110
00:42:33,349 --> 00:42:28,960
of

1111
00:42:38,150 --> 00:42:33,359
work in the same environment move

1112
00:42:43,750 --> 00:42:40,230
operate the same kinds of switches and

1113
00:42:46,470 --> 00:42:43,760

other devices work with the same tools

1114
00:42:48,710 --> 00:42:46,480
making it interchangeable essentially

1115
00:42:50,470 --> 00:42:48,720
in that sense with it with the humans

1116
00:42:52,950 --> 00:42:50,480
that are using the same system so you

1117
00:42:54,230 --> 00:42:52,960
don't need to redesign different

1118
00:42:57,190 --> 00:42:54,240
interfaces

1119
00:42:58,950 --> 00:42:57,200
for this robot you it can use what has

1120
00:43:02,710 --> 00:42:58,960
already been designed for the humans to

1121
00:43:05,750 --> 00:43:04,550
a worth i'm here with the nasa social

1122
00:43:07,270 --> 00:43:05,760
and i'm a photographer with

1123
00:43:09,030 --> 00:43:07,280
weheadtoday.com

1124
00:43:10,230 --> 00:43:09,040
it's a question for camille i was

1125
00:43:12,230 --> 00:43:10,240
wondering if you could talk a little bit

1126
00:43:14,230 --> 00:43:12,240
about the impact of the delays that this

1127
00:43:15,589 --> 00:43:14,240
mission is faced on say the biological

1128
00:43:17,510 --> 00:43:15,599
and the living tissue supplies that are

1129
00:43:18,710 --> 00:43:17,520
going up for these experiments

1130
00:43:21,349 --> 00:43:18,720
yeah the

1131
00:43:24,069 --> 00:43:21,359
they're very sensitive of course these

1132
00:43:26,870 --> 00:43:24,079
biological samples and have to be

1133
00:43:29,270 --> 00:43:26,880
contained in a specific environment so

1134
00:43:32,069 --> 00:43:29,280
the delays do cause

1135
00:43:35,109 --> 00:43:32,079
a little bit of challenges

1136
00:43:38,309 --> 00:43:35,119
and so we watch that as as time goes

1137
00:43:41,109 --> 00:43:39,430
go ahead

1138
00:43:43,910 --> 00:43:41,119

i'm bill jelen with nasa social and with

1139
00:43:45,750 --> 00:43:43,920
mrexcel.com the specific cell phone

1140
00:43:47,190 --> 00:43:45,760
that's used inside the phone set you

1141
00:43:49,190 --> 00:43:47,200
said it was a nexus do you have a model

1142
00:43:51,190 --> 00:43:49,200
number and how long will those last with

1143
00:43:54,230 --> 00:43:51,200
the solar panels before they're not

1144
00:43:56,870 --> 00:43:54,240
usable anymore

1145
00:43:58,790 --> 00:43:56,880
yeah it is a nexus s uh

1146
00:44:00,790 --> 00:43:58,800
phone and it uses an android operating

1147
00:44:02,069 --> 00:44:00,800
system um

1148
00:44:03,349 --> 00:44:02,079
the

1149
00:44:05,190 --> 00:44:03,359
we've

1150
00:44:06,550 --> 00:44:05,200
as far as you know we expect them to

1151
00:44:09,510 --> 00:44:06,560
last um

1152
00:44:11,750 --> 00:44:09,520
for the duration of the orbital lifetime

1153
00:44:13,990 --> 00:44:11,760
which in this case is going to be

1154
00:44:16,150 --> 00:44:14,000
uh less than one year but at least

1155
00:44:18,710 --> 00:44:16,160
probably seven to eight months

1156
00:44:20,710 --> 00:44:18,720
uh the solar panels will recharge the

1157
00:44:22,550 --> 00:44:20,720
batteries which should allow it to

1158
00:44:26,309 --> 00:44:22,560
continue functioning

1159
00:44:29,670 --> 00:44:27,750
you know so

1160
00:44:35,109 --> 00:44:29,680
we think it's you know suitable for this

1161
00:44:39,349 --> 00:44:38,150
okay any final questions

1162
00:44:40,950 --> 00:44:39,359
seeing none

1163
00:44:42,390 --> 00:44:40,960

we will go ahead and wrap it up as you

1164
00:44:44,309 --> 00:44:42,400
can tell there is an awful lot of

1165
00:44:46,470 --> 00:44:44,319
exciting science and technology about to

1166
00:44:48,790 --> 00:44:46,480
go up into space tomorrow

1167
00:44:49,750 --> 00:44:48,800
on the dragon spacecraft powered by

1168
00:44:51,430 --> 00:44:49,760
falcon

1169
00:44:54,710 --> 00:44:51,440
and our next televised event will be the

1170
00:44:55,670 --> 00:44:54,720
launch which occurs at 4 58 pm eastern

1171
00:44:57,510 --> 00:44:55,680
time

1172
00:44:59,750 --> 00:44:57,520
the launch of spacex 3 and nasa

1173
00:45:01,990 --> 00:44:59,760
television will begin our coverage at 3

1174
00:45:03,589 --> 00:45:02,000
45 pm tomorrow

1175
00:45:06,470 --> 00:45:03,599
in the meantime you can keep up with all

1176
00:45:09,510 --> 00:45:06,480
the occurrences on social media uh by

1177
00:45:12,309 --> 00:45:09,520
following at nasa and at spacex and

1178
00:45:14,710 --> 00:45:12,319
using the hashtag iss you can always