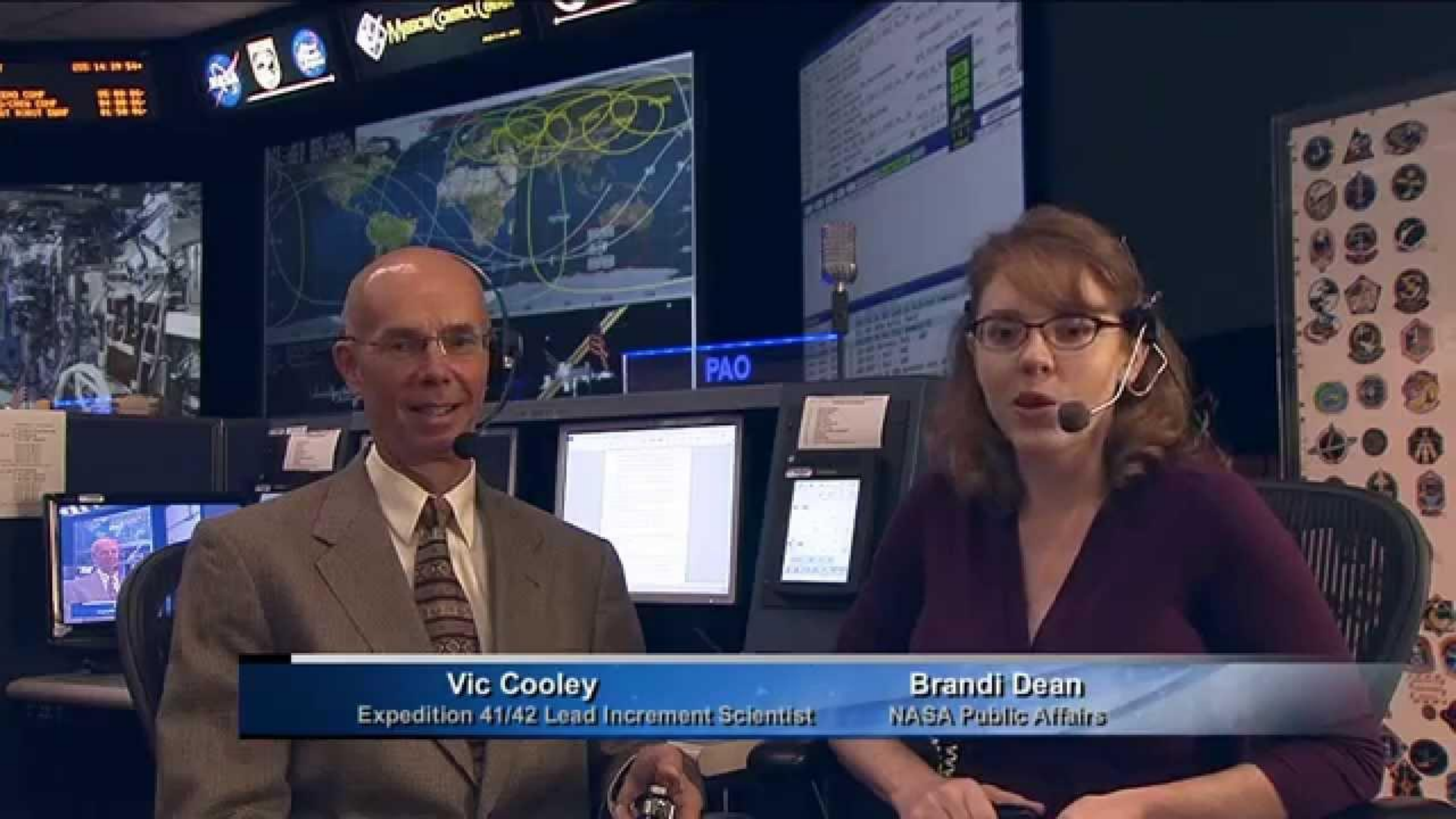
PAO
Vic Cooley
Expedition 41/42 Lead Increment Scientist
Brandi Dean
NASA Public Affairs

1
00:00:03,189 --> 00:00:01,829
good morning and welcome to the

2
00:00:05,670 --> 00:00:03,199
international space station flight

3
00:00:08,230 --> 00:00:05,680
control room we are here today with vic

4
00:00:11,190 --> 00:00:08,240
cooley who is the lead uh scientist for

5
00:00:12,390 --> 00:00:11,200
expedition 41 and 42. we just talked

6
00:00:14,390 --> 00:00:12,400
earlier this week with the lead

7
00:00:15,589 --> 00:00:14,400
scientist for the expedition that just

8
00:00:17,750 --> 00:00:15,599
ended so we're going to hear a little

9
00:00:19,670 --> 00:00:17,760
bit more now about what's coming up for

10
00:00:20,470 --> 00:00:19,680
expedition 41 over the next couple

11
00:00:22,470 --> 00:00:20,480
months

12
00:00:23,910 --> 00:00:22,480
just like all the other expeditions they

13
00:00:25,429 --> 00:00:23,920

have a plan of exactly what they're

14
00:00:27,589 --> 00:00:25,439
going to be researching and it includes

15
00:00:30,230 --> 00:00:27,599
a pretty wide variety including

16
00:00:31,990 --> 00:00:30,240
how human bodies respond to a weightless

17
00:00:34,630 --> 00:00:32,000
environment and physical science and

18
00:00:36,950 --> 00:00:34,640
material science and particle physics

19
00:00:38,310 --> 00:00:36,960
experiments all inside and outside of

20
00:00:40,150 --> 00:00:38,320
the station

21
00:00:41,830 --> 00:00:40,160
and then expedition 41 i think also

22
00:00:44,790 --> 00:00:41,840
features some new experiments in

23
00:00:45,590 --> 00:00:44,800
molecular molecular biology and genetics

24
00:00:47,270 --> 00:00:45,600
and

25
00:00:48,630 --> 00:00:47,280
one of them is even part of a new

26
00:00:50,150 --> 00:00:48,640
approach to station research so i think

27
00:00:52,630 --> 00:00:50,160
you're going to tell us all about all of

28
00:00:54,310 --> 00:00:52,640
that right yes i am brandi thanks so

29
00:00:56,790 --> 00:00:54,320
much for joining us i'm delighted to

30
00:00:58,709 --> 00:00:56,800
have this opportunity

31
00:01:01,110 --> 00:00:58,719
it one of the things i really enjoy

32
00:01:03,349 --> 00:01:01,120
doing in my job is describing and

33
00:01:05,830 --> 00:01:03,359
pointing out the synergy among the rich

34
00:01:08,230 --> 00:01:05,840
array of experiments we have in almost

35
00:01:09,750 --> 00:01:08,240
every area of science on the iss

36
00:01:11,990 --> 00:01:09,760
and when it comes to biological

37
00:01:13,270 --> 00:01:12,000
experiments most of them use model

38
00:01:17,030 --> 00:01:13,280

organisms

39
00:01:18,950 --> 00:01:17,040
species

40
00:01:20,870 --> 00:01:18,960
that at a molecular level have

41
00:01:22,950 --> 00:01:20,880
biological processes that are very

42
00:01:25,429 --> 00:01:22,960
similar to those in humans

43
00:01:27,429 --> 00:01:25,439
and sometimes it's unethical and it's

44
00:01:29,590 --> 00:01:27,439
always very expensive to do testing on

45
00:01:32,230 --> 00:01:29,600
humans so we use these model organisms

46
00:01:35,109 --> 00:01:32,240
to understand the biological processes

47
00:01:37,510 --> 00:01:35,119
in them with the expectation that

48
00:01:39,270 --> 00:01:37,520
that understanding will map into better

49
00:01:41,590 --> 00:01:39,280
understanding of those same biological

50
00:01:44,550 --> 00:01:41,600
processes in humans

51
00:01:46,870 --> 00:01:44,560
now when when i say biological processes

52
00:01:51,510 --> 00:01:46,880
and molecular pathways

53
00:01:52,870 --> 00:01:51,520
it turns out that molecular pathways are

54
00:01:55,429 --> 00:01:52,880
triggered by

55
00:01:57,030 --> 00:01:55,439
molecules on the surface of a cell

56
00:01:59,429 --> 00:01:57,040
usually on the outside surface but

57
00:02:02,789 --> 00:01:59,439
sometimes on the inside surface

58
00:02:05,190 --> 00:02:02,799
molecules then trigger complex chemistry

59
00:02:07,990 --> 00:02:05,200
reactions within the cell and those are

60
00:02:10,070 --> 00:02:08,000
the molecular pathways and signaling

61
00:02:11,990 --> 00:02:10,080
transduction pathways that scientists

62
00:02:13,030 --> 00:02:12,000
over the past few decades have begun to

63
00:02:15,510 --> 00:02:13,040

understand

64
00:02:16,949 --> 00:02:15,520
it's extremely complex but these are the

65
00:02:19,589 --> 00:02:16,959
kinds of

66
00:02:22,070 --> 00:02:19,599
chemical and biological processes that

67
00:02:24,949 --> 00:02:22,080
are at the very building block level and

68
00:02:27,110 --> 00:02:24,959
fundamental level of life in all forms

69
00:02:28,550 --> 00:02:27,120
in eukaryotic cells in animal and

70
00:02:31,670 --> 00:02:28,560
implant cells

71
00:02:33,509 --> 00:02:31,680
okay well so i guess that leads into

72
00:02:35,670 --> 00:02:33,519
on this particular expedition they're

73
00:02:37,110 --> 00:02:35,680
going to be doing some experiments on

74
00:02:39,430 --> 00:02:37,120
rodents right can you tell us a little

75
00:02:41,030 --> 00:02:39,440
bit about that and also about the the

76
00:02:43,589 --> 00:02:41,040
way it'll be done the habitat the

77
00:02:46,470 --> 00:02:43,599
rodents will live in certainly

78
00:02:49,910 --> 00:02:46,480
in 2011 the national research council

79
00:02:53,430 --> 00:02:49,920
recommended that nasa continue its long

80
00:02:55,030 --> 00:02:53,440
line of research into rodents as a model

81
00:02:56,869 --> 00:02:55,040
for muscle atrophy and bone

82
00:03:00,149 --> 00:02:56,879
demineralization

83
00:03:02,550 --> 00:03:00,159
there was a a suite of hardware known as

84
00:03:04,710 --> 00:03:02,560
the animal enclosure module and you can

85
00:03:07,670 --> 00:03:04,720
see some photos of that here

86
00:03:09,990 --> 00:03:07,680
yes uh well this is the the

87
00:03:12,390 --> 00:03:10,000
animal enclosure module system

88
00:03:14,070 --> 00:03:12,400

redesigned for the space station

89
00:03:16,790 --> 00:03:14,080
the animal enclosure module actually

90
00:03:19,110 --> 00:03:16,800
flew 27 times on the shuttle but it was

91
00:03:21,750 --> 00:03:19,120
only designed to support

92
00:03:23,589 --> 00:03:21,760
mice and rats for up to 19 days of

93
00:03:25,589 --> 00:03:23,599
course we need longer periods than that

94
00:03:27,830 --> 00:03:25,599
on the station and the upcoming

95
00:03:29,910 --> 00:03:27,840
experiment that's coming up uh houses

96
00:03:32,789 --> 00:03:29,920
rodents for up to 30 days

97
00:03:35,750 --> 00:03:32,799
so the hardware consists of three parts

98
00:03:37,589 --> 00:03:35,760
a transporter unit the the 20 mice will

99
00:03:39,830 --> 00:03:37,599
launch on the upcoming space flight

100
00:03:41,910 --> 00:03:39,840
which has just moved to the september

101
00:03:44,630 --> 00:03:41,920
20th is the launch date

102
00:03:47,830 --> 00:03:44,640
um those 20 mice will launch in the

103
00:03:49,589 --> 00:03:47,840
transporter unit unit aboard the spacex

104
00:03:51,190 --> 00:03:49,599
dragon capsule

105
00:03:56,229 --> 00:03:51,200
and

106
00:03:57,990 --> 00:03:56,239
habitat on the iss to which they will be

107
00:03:59,190 --> 00:03:58,000
transferred after they arrive

108
00:04:01,270 --> 00:03:59,200
are equipped with video and

109
00:04:03,350 --> 00:04:01,280
environmental control

110
00:04:05,830 --> 00:04:03,360
equipment to make sure that

111
00:04:08,470 --> 00:04:05,840
the occupants are comfortable and in in

112
00:04:11,830 --> 00:04:08,480
humane conditions uh at every phase of

113
00:04:14,149 --> 00:04:11,840

their uh both the trip up and

114
00:04:16,229 --> 00:04:14,159
while they're on the space station okay

115
00:04:17,670 --> 00:04:16,239
well that sounds like it should be very

116
00:04:19,349 --> 00:04:17,680
interesting

117
00:04:21,110 --> 00:04:19,359
um i know there are also going to be

118
00:04:22,550 --> 00:04:21,120
some experiments involving fish and

119
00:04:26,070 --> 00:04:22,560
frogs as well

120
00:04:28,150 --> 00:04:26,080
yes those are other uh model organisms i

121
00:04:30,710 --> 00:04:28,160
believe uh i don't know if the chart

122
00:04:31,909 --> 00:04:30,720
showed it or not but the model organisms

123
00:04:36,469 --> 00:04:31,919
that

124
00:04:39,430 --> 00:04:36,479
experiments on the upcoming increment

125
00:04:41,189 --> 00:04:39,440
uh bacteria and fungi

126
00:04:43,110 --> 00:04:41,199
and plants

127
00:04:45,670 --> 00:04:43,120
and there you see the mice but also

128
00:04:47,670 --> 00:04:45,680
fruit flies and fish

129
00:04:50,550 --> 00:04:47,680
in the case of plants we have four

130
00:04:53,749 --> 00:04:50,560
experiments and the most common

131
00:04:55,430 --> 00:04:53,759
model plant among the

132
00:04:57,510 --> 00:04:55,440
the whole

133
00:05:00,870 --> 00:04:57,520
kingdom plant kingdom one of the most

134
00:05:03,270 --> 00:05:00,880
common research model organisms is fail

135
00:05:04,390 --> 00:05:03,280
fail crests or sometimes mouse ear

136
00:05:06,870 --> 00:05:04,400
crests

137
00:05:08,070 --> 00:05:06,880
the linnaeus name is arabidopsis

138
00:05:10,550 --> 00:05:08,080

thelania

139
00:05:12,390 --> 00:05:10,560
it's a very common small flowering plant

140
00:05:14,870 --> 00:05:12,400
and and we know the entire genome of

141
00:05:17,510 --> 00:05:14,880
this plant and it's widely used

142
00:05:18,790 --> 00:05:17,520
uh in research by researchers throughout

143
00:05:20,150 --> 00:05:18,800
the world

144
00:05:22,550 --> 00:05:20,160
now in this case obviously those

145
00:05:25,749 --> 00:05:22,560
biological processes are not as mappable

146
00:05:28,230 --> 00:05:25,759
into a human as they are from the mice

147
00:05:30,629 --> 00:05:28,240
and the fish and so forth but in the

148
00:05:32,469 --> 00:05:30,639
case of plants we want to better

149
00:05:34,629 --> 00:05:32,479
understand the molecular pathways and

150
00:05:36,950 --> 00:05:34,639
signal transduction so that we can

151
00:05:39,670 --> 00:05:36,960
optimize biomass production both in

152
00:05:42,150 --> 00:05:39,680
space flight and on earth for better

153
00:05:43,189 --> 00:05:42,160
feeding the world's population

154
00:05:46,230 --> 00:05:43,199
so

155
00:05:48,790 --> 00:05:46,240
it turns out that there is a new thrust

156
00:05:51,990 --> 00:05:48,800
in nasa it's the leading approach to

157
00:05:54,390 --> 00:05:52,000
make the genetic and molecular

158
00:05:57,029 --> 00:05:54,400
pathway type of information

159
00:05:59,670 --> 00:05:57,039
that we're discovering on

160
00:06:02,710 --> 00:05:59,680
space flight of these model organisms

161
00:06:05,029 --> 00:06:02,720
widely available in a public open source

162
00:06:08,070 --> 00:06:05,039
platform this program is known as gene

163
00:06:09,270 --> 00:06:08,080

lab and one of the plant experiments

164
00:06:11,189 --> 00:06:09,280
flown by

165
00:06:12,870 --> 00:06:11,199
researchers

166
00:06:15,510 --> 00:06:12,880
centered at kennedy space center in

167
00:06:18,870 --> 00:06:15,520
florida is known as biological research

168
00:06:21,189 --> 00:06:18,880
in canisters brick 19. simon gilroy is

169
00:06:23,590 --> 00:06:21,199
the pi for that experiment

170
00:06:25,749 --> 00:06:23,600
and that will be the first experiment in

171
00:06:28,710 --> 00:06:25,759
the gene lab family

172
00:06:30,870 --> 00:06:28,720
where we will make open all the results

173
00:06:32,230 --> 00:06:30,880
of at the genetic and molecular level of

174
00:06:35,990 --> 00:06:32,240
how the plant

175
00:06:37,590 --> 00:06:36,000
adapts to uh space flight in the case of

176
00:06:39,270 --> 00:06:37,600
plants in space they don't have to

177
00:06:40,070 --> 00:06:39,280
support their own weight

178
00:06:41,670 --> 00:06:40,080
so

179
00:06:42,629 --> 00:06:41,680
they're like in gravity

180
00:06:45,270 --> 00:06:42,639
correct

181
00:06:46,790 --> 00:06:45,280
uh so there isn't the signaling the

182
00:06:49,110 --> 00:06:46,800
mechanical signaling there's no

183
00:06:51,110 --> 00:06:49,120
mechanical loading

184
00:06:53,909 --> 00:06:51,120
the plant doesn't have to hold itself up

185
00:06:55,990 --> 00:06:53,919
against gravity so there's real time

186
00:06:57,990 --> 00:06:56,000
signaling that goes on in the plant

187
00:06:59,670 --> 00:06:58,000
cells that cause the plant cells to be

188
00:07:01,430 --> 00:06:59,680

stronger when they do have to support

189
00:07:03,670 --> 00:07:01,440
their own gravity when they don't have

190
00:07:06,550 --> 00:07:03,680
to support their own gravity

191
00:07:08,790 --> 00:07:06,560
cellular changes happen it chemistry

192
00:07:10,870 --> 00:07:08,800
changes within the cell happens and

193
00:07:12,469 --> 00:07:10,880
understanding those chemical changes may

194
00:07:15,589 --> 00:07:12,479
help scientists to

195
00:07:17,830 --> 00:07:15,599
genetically engineer plants on earth

196
00:07:19,350 --> 00:07:17,840
as well as for space travel that will

197
00:07:21,270 --> 00:07:19,360
result in

198
00:07:23,270 --> 00:07:21,280
better biomass production for the

199
00:07:25,270 --> 00:07:23,280
earth's population and for space

200
00:07:26,550 --> 00:07:25,280
travelers and i think you told me that

201
00:07:27,510 --> 00:07:26,560
this is kind of part of that new

202
00:07:29,029 --> 00:07:27,520
approach that we mentioned at the

203
00:07:31,510 --> 00:07:29,039
beginning how is this how is this new

204
00:07:34,469 --> 00:07:31,520
and different for us well um

205
00:07:36,309 --> 00:07:34,479
unlike earlier biological research

206
00:07:37,670 --> 00:07:36,319
that was flown on the shuttle or even

207
00:07:39,430 --> 00:07:37,680
earlier space

208
00:07:42,150 --> 00:07:39,440
vehicles by nasa

209
00:07:44,309 --> 00:07:42,160
that data was available to a small

210
00:07:46,710 --> 00:07:44,319
number of researchers that were that got

211
00:07:48,710 --> 00:07:46,720
the grant and were funded by nasa or the

212
00:07:51,830 --> 00:07:48,720
nasa researchers themselves

213
00:07:53,670 --> 00:07:51,840

the new platform the gene lab program

214
00:07:55,749 --> 00:07:53,680
uh will

215
00:07:58,550 --> 00:07:55,759
build an infrastructure for

216
00:08:01,909 --> 00:07:58,560
collecting organizing and disseminating

217
00:08:04,390 --> 00:08:01,919
this data in an open source way to any

218
00:08:06,390 --> 00:08:04,400
any researcher or student in in the

219
00:08:09,110 --> 00:08:06,400
world that wants to access it you know

220
00:08:11,270 --> 00:08:09,120
we have models for this for example in

221
00:08:13,749 --> 00:08:11,280
the seti the search for extraterrestrial

222
00:08:15,029 --> 00:08:13,759
intelligence anyone can

223
00:08:17,909 --> 00:08:15,039
look for

224
00:08:19,749 --> 00:08:17,919
data among the seti

225
00:08:22,309 --> 00:08:19,759
receiving signals that we receive from

226
00:08:24,309 --> 00:08:22,319
deep space from the wide array of radio

227
00:08:26,869 --> 00:08:24,319
telescopes that we have and so forth to

228
00:08:30,309 --> 00:08:26,879
try to detect signals from outer space

229
00:08:33,190 --> 00:08:30,319
there's also models of this um in uh in

230
00:08:35,829 --> 00:08:33,200
other forms of genetic and protein

231
00:08:37,750 --> 00:08:35,839
folding where people could you know i

232
00:08:40,469 --> 00:08:37,760
remember a decade or so ago it was

233
00:08:42,949 --> 00:08:40,479
popular for computer enthusiasts to

234
00:08:45,110 --> 00:08:42,959
share their computers and look for

235
00:08:46,870 --> 00:08:45,120
patterns among proteins and

236
00:08:47,670 --> 00:08:46,880
and genomic data

237
00:08:50,150 --> 00:08:47,680
so

238
00:08:52,230 --> 00:08:50,160

this gene lab is kind of taking that

239
00:08:55,030 --> 00:08:52,240
concept

240
00:08:56,389 --> 00:08:55,040
to heart and but in this case the the

241
00:08:59,030 --> 00:08:56,399
central data that's going to be made

242
00:09:02,389 --> 00:08:59,040
available is data from the iss

243
00:09:03,990 --> 00:09:02,399
experiments for various model organisms

244
00:09:06,150 --> 00:09:04,000
so you know as a scientist yourself

245
00:09:07,590 --> 00:09:06,160
putting putting yourself in the place of

246
00:09:09,670 --> 00:09:07,600
the people who aren't already connected

247
00:09:11,269 --> 00:09:09,680
to space station research somehow what

248
00:09:13,509 --> 00:09:11,279
what is there to be excited about about

249
00:09:15,910 --> 00:09:13,519
that well this data will slowly

250
00:09:17,829 --> 00:09:15,920
accumulate starting with this brick 19

251
00:09:19,670 --> 00:09:17,839
experiment and then be available for

252
00:09:20,949 --> 00:09:19,680
researchers who might have slightly

253
00:09:23,829 --> 00:09:20,959
different

254
00:09:25,990 --> 00:09:23,839
hypothesis to investigate you know the

255
00:09:28,790 --> 00:09:26,000
the particular uh investigator in the

256
00:09:31,590 --> 00:09:28,800
brick 19 experiment has a particular

257
00:09:32,470 --> 00:09:31,600
very dedicated hypothesis to uh to test

258
00:09:37,430 --> 00:09:32,480
for

259
00:09:39,350 --> 00:09:37,440
novel

260
00:09:41,269 --> 00:09:39,360
hypothesis that no one else has thought

261
00:09:43,269 --> 00:09:41,279
of yet a student a graduate student may

262
00:09:45,670 --> 00:09:43,279
think of that or may develop a thesis

263
00:09:46,790 --> 00:09:45,680

out of that and the data is available to

264
00:09:49,430 --> 00:09:46,800
him

265
00:09:51,110 --> 00:09:49,440
he he or even research companies don't

266
00:09:53,190 --> 00:09:51,120
have to spend a lot of money to go

267
00:09:54,630 --> 00:09:53,200
obtain the data it's already there for

268
00:09:56,870 --> 00:09:54,640
them so there's really no telling what

269
00:09:58,550 --> 00:09:56,880
might come out of it well it is very

270
00:10:00,710 --> 00:09:58,560
exciting in that sense and i know that

271
00:10:03,509 --> 00:10:00,720
at nasa headquarters

272
00:10:05,750 --> 00:10:03,519
it is a very it is the leading program

273
00:10:07,509 --> 00:10:05,760
among all the biological experiments

274
00:10:09,829 --> 00:10:07,519
it's it's really a new research model

275
00:10:11,430 --> 00:10:09,839
it's not focused on a single experiment

276
00:10:13,750 --> 00:10:11,440
or a single piece of hardware it's a

277
00:10:15,990 --> 00:10:13,760
whole family of investigations and then

278
00:10:17,750 --> 00:10:16,000
all the data from all of those model

279
00:10:19,750 --> 00:10:17,760
organism investigations is made

280
00:10:21,910 --> 00:10:19,760
available to the public that sounds

281
00:10:23,269 --> 00:10:21,920
really exciting so we will look forward

282
00:10:24,790 --> 00:10:23,279
to i guess seeing some of the

283
00:10:27,030 --> 00:10:24,800
experiments in real time as they take

284
00:10:28,550 --> 00:10:27,040
place on the space station and then uh

285
00:10:30,470 --> 00:10:28,560
hopefully hearing more from scientists

286
00:10:31,670 --> 00:10:30,480
who have ideas about how to use it and

287
00:10:33,190 --> 00:10:31,680
i'm sure we'll be hearing more from you

288
00:10:34,790 --> 00:10:33,200

over the course of the next couple of

289
00:10:36,630 --> 00:10:34,800
expeditions as well to come back as

290
00:10:38,870 --> 00:10:36,640
often as you'll have me all right thanks