
Trent Smith

1
00:00:29,430 --> 00:00:26,700
[Music]

2
00:00:34,840 --> 00:00:29,440
[Applause]

3
00:00:36,630 --> 00:00:34,850
[Music]

4
00:00:43,490 --> 00:00:36,640
[Applause]

5
00:00:52,020 --> 00:00:43,500
[Music]

6
00:01:06,740 --> 00:00:54,790
[Applause]

7
00:01:11,010 --> 00:01:09,240
hey good afternoon once again I'm Joshua

8
00:01:13,109 --> 00:01:11,020
Santora and I'm coming to you live from

9
00:01:15,179 --> 00:01:13,119
the Kennedy Space Center sort of

10
00:01:17,219 --> 00:01:15,189
obviously with the way things are these

11
00:01:18,929 --> 00:01:17,229
days I'm coming to you from my house but

12
00:01:21,060 --> 00:01:18,939
still talking about some amazing work

13
00:01:23,279 --> 00:01:21,070

happening at America's spaceport as we

14
00:01:26,070 --> 00:01:23,289
like to call it certainly the spaceport

15
00:01:28,710 --> 00:01:26,080
that has the most epic history and in

16
00:01:30,570 --> 00:01:28,720
history and so we want to talk today a

17
00:01:32,820 --> 00:01:30,580
little bit about things that you can be

18
00:01:35,100 --> 00:01:32,830
doing at home believe it or not so we're

19
00:01:37,529 --> 00:01:35,110
talking about growing plans from popcorn

20
00:01:38,880 --> 00:01:37,539
so you might be asking yourself number

21
00:01:41,279 --> 00:01:38,890
one how do you do this and number two

22
00:01:43,380 --> 00:01:41,289
why is NASA concerned about this and we

23
00:01:45,480 --> 00:01:43,390
will get to that in just a minute here

24
00:01:46,710 --> 00:01:45,490
but first up we want to make sure we

25
00:01:48,529 --> 00:01:46,720
highlight the fact that we are a

26
00:01:50,850 --> 00:01:48,539
spaceport and we are open for business

27
00:01:53,639 --> 00:01:50,860
specifically today we are honing in on

28
00:01:55,770 --> 00:01:53,649
the research and technology arm of what

29
00:01:59,459 --> 00:01:55,780
we do here so we're involved with Space

30
00:02:00,929 --> 00:01:59,469
Station activities as well as some

31
00:02:02,149 --> 00:02:00,939
really interesting research happening

32
00:02:04,889 --> 00:02:02,159
here on the ground to support

33
00:02:07,020 --> 00:02:04,899
exploration let's jump right into it now

34
00:02:09,199 --> 00:02:07,030
so I'm gonna go ahead and bring over my

35
00:02:12,840 --> 00:02:09,209
guest I want to introduce you first

36
00:02:15,210 --> 00:02:12,850
Gioia Massa joy is a life sciences

37
00:02:20,370 --> 00:02:15,220
project scientist joy thanks for being

38
00:02:22,920 --> 00:02:20,380

here yeah and and we also had today

39
00:02:24,390 --> 00:02:22,930
Trent Smith Trent how are you doing

40
00:02:29,789 --> 00:02:24,400
today veggie project manager and

41
00:02:31,940 --> 00:02:29,799
self-proclaimed nerd doing great thanks

42
00:02:34,979 --> 00:02:31,950
for odds putting all this together Josh

43
00:02:37,500 --> 00:02:34,989
yeah absolutely so we want to jump right

44
00:02:42,030 --> 00:02:37,510
in here and we'll get to the how do you

45
00:02:43,979 --> 00:02:42,040
grow popcorn yourselves in the at your

46
00:02:46,199 --> 00:02:43,989
home in just a little bit but let's talk

47
00:02:53,910 --> 00:02:46,209
about why does NASA have plant

48
00:02:55,949 --> 00:02:53,920
scientists at all well really the Center

49
00:02:58,920 --> 00:02:55,959
for the agency in addition to being

50
00:03:00,630 --> 00:02:58,930
America's spaceport so we have plant

51
00:03:03,810 --> 00:03:00,640
research going on here

52
00:03:07,680 --> 00:03:03,820
for a couple of different things we have

53
00:03:09,780 --> 00:03:07,690
people that look at fundamental plant

54
00:03:12,360 --> 00:03:09,790
responses to their environment and they

55
00:03:15,120 --> 00:03:12,370
use space to and how plants who sense

56
00:03:18,840 --> 00:03:15,130
and respond to things like gravity but

57
00:03:21,420 --> 00:03:18,850
what we do try to do is more applied

58
00:03:23,160 --> 00:03:21,430
space crop production looking at how to

59
00:03:30,390 --> 00:03:23,170
grow food for the astronauts in the

60
00:03:32,550 --> 00:03:30,400
future Trent from your perspective what

61
00:03:34,290 --> 00:03:32,560
are what what are we talking about when

62
00:03:36,210 --> 00:03:34,300
I talk about plant scientists we're

63
00:03:38,699 --> 00:03:36,220

trying to learn things and grow and get

64
00:03:40,949 --> 00:03:38,709
smarter for the purpose of exploration

65
00:03:44,160 --> 00:03:40,959
so what does that look like why are we

66
00:03:46,500 --> 00:03:44,170
doing this what are we learning well you

67
00:03:49,530 --> 00:03:46,510
know when we go to Mars we're gonna need

68
00:03:51,570 --> 00:03:49,540
to grow some of the food or to

69
00:03:53,610 --> 00:03:51,580
supplement the nutrition and so right

70
00:03:55,050 --> 00:03:53,620
now with veggie on space station and the

71
00:03:57,120 --> 00:03:55,060
ground research that we do at Kennedy

72
00:04:00,300 --> 00:03:57,130
we're learning right now just how to

73
00:04:02,040 --> 00:04:00,310
grow and eat plants so you know it's

74
00:04:04,830 --> 00:04:02,050
it's really about the stepping stone

75
00:04:10,350 --> 00:04:04,840
approach to growing plants on the moon

76
00:04:11,250 --> 00:04:10,360
and then Mars for astronaut nutrition so

77
00:04:12,720 --> 00:04:11,260
can you talk a little bit about this

78
00:04:24,140 --> 00:04:12,730
picture we talked about growing plants

79
00:04:30,240 --> 00:04:27,690
and then the very first set of lettuce

80
00:04:32,700 --> 00:04:30,250
in veggie so peas are small plants

81
00:04:34,950 --> 00:04:32,710
member on the space station and this was

82
00:04:37,830 --> 00:04:34,960
the first time that we had grown these

83
00:04:42,740 --> 00:04:37,840
lettuce plants and confetti and Trent

84
00:04:50,000 --> 00:04:46,580
yeah that that's funny he was such a pro

85
00:04:52,130 --> 00:04:50,010
when he harvested that that crop I mean

86
00:04:54,470 --> 00:04:52,140
if you look at the photo there were only

87
00:04:56,780 --> 00:04:54,480
three plants but we had six plants that

88
00:04:58,430 --> 00:04:56,790

we'd hope to grow so we were only 50% on

89
00:05:00,440 --> 00:04:58,440
that one but that was our first time

90
00:05:02,870 --> 00:05:00,450
ever so you know a lot of times when you

91
00:05:04,130 --> 00:05:02,880
bat 500 your first time it could be a

92
00:05:05,660 --> 00:05:04,140
failure or it could be a success

93
00:05:08,330 --> 00:05:05,670
depending on how you look at it but you

94
00:05:09,890 --> 00:05:08,340
saw the smile on his face and they were

95
00:05:13,430 --> 00:05:09,900
really excited about the harvest that

96
00:05:15,800 --> 00:05:13,440
harvest there were new astronauts there

97
00:05:18,530 --> 00:05:15,810
and even a cosmonaut so it was a big

98
00:05:20,210 --> 00:05:18,540
deal for the crew and when we think

99
00:05:22,100 --> 00:05:20,220
about just the nature of that you

100
00:05:24,080 --> 00:05:22,110
mentioned kind of 50% being good for

101
00:05:25,280 --> 00:05:24,090
your first time most people hear that

102
00:05:28,190 --> 00:05:25,290
and they might not they might not

103
00:05:29,780 --> 00:05:28,200
understand why that's true so for for

104
00:05:31,130 --> 00:05:29,790
you and I we understand that life and

105
00:05:32,810 --> 00:05:31,140
space is different but for those who may

106
00:05:34,250 --> 00:05:32,820
not really come and be able to kind of

107
00:05:36,200 --> 00:05:34,260
wrap their minds around why is it so

108
00:05:38,540 --> 00:05:36,210
different to grow plants in space what

109
00:05:41,270 --> 00:05:38,550
are some of the challenges that that

110
00:05:42,970 --> 00:05:41,280
make this so challenging try let's start

111
00:05:45,710 --> 00:05:42,980
with you and enjoy over to you right

112
00:05:49,150 --> 00:05:45,720
yeah you know really growing plants and

113
00:05:51,260 --> 00:05:49,160

space is really difficult because of

114
00:05:53,840 --> 00:05:51,270
watering right when we water our plants

115
00:05:56,030 --> 00:05:53,850
here like around in my house I'd go to

116
00:05:57,860 --> 00:05:56,040
the kitchen I fill up my picture and I

117
00:06:01,310 --> 00:05:57,870
just water them right and the water

118
00:06:02,990 --> 00:06:01,320
drains down but in space when to water

119
00:06:05,719 --> 00:06:03,000
your plants you haven't at first of all

120
00:06:07,130 --> 00:06:05,729
need a pot to hold your dirt even if you

121
00:06:09,770 --> 00:06:07,140
use dirt at all right we're studying

122
00:06:11,540 --> 00:06:09,780
ways to grow plants you know like we do

123
00:06:13,070 --> 00:06:11,550
gone to ground hydroponically but you

124
00:06:15,080 --> 00:06:13,080
can't really it's more difficult to do

125
00:06:16,780 --> 00:06:15,090
that in space so we need to contain the

126
00:06:19,790 --> 00:06:16,790
dirt we need to contain the roots and

127
00:06:22,640 --> 00:06:19,800
you know photons don't care about

128
00:06:24,110 --> 00:06:22,650
gravity that water does so when we grew

129
00:06:26,240 --> 00:06:24,120
those plants we weren't sure how the

130
00:06:28,219 --> 00:06:26,250
watering was going to work and that is

131
00:06:30,680 --> 00:06:28,229
why we lost two of the plants and

132
00:06:33,020 --> 00:06:30,690
actually with that experiment we have

133
00:06:35,840 --> 00:06:33,030
two seeds in one of the pillows and that

134
00:06:37,490 --> 00:06:35,850
one didn't terminate at all so you know

135
00:06:39,409 --> 00:06:37,500
it really Illustrated a lot of the

136
00:06:41,510 --> 00:06:39,419
issues we're gonna have growing plants

137
00:06:43,550 --> 00:06:41,520
on Mars and the moon is you know

138
00:06:45,830 --> 00:06:43,560

watering your plants and then see

139
00:06:47,990 --> 00:06:45,840
germination and then of course keeping

140
00:06:49,550 --> 00:06:48,000
the plants healthy that was things that

141
00:06:53,210 --> 00:06:49,560
we learned later Joya what do you want

142
00:06:55,340 --> 00:06:53,220
to add on that well

143
00:06:57,200 --> 00:06:55,350
I think the watering is the biggest

144
00:06:59,480 --> 00:06:57,210
challenge and you know I think we have a

145
00:07:01,730 --> 00:06:59,490
really good video that you can show of

146
00:07:04,520 --> 00:07:01,740
commander Chris Hadfield bringing out a

147
00:07:07,430 --> 00:07:04,530
wet washcloth to kind of illustrate why

148
00:07:10,940 --> 00:07:07,440
this is such a challenge so you know

149
00:07:13,850 --> 00:07:10,950
he's adding water to a cloth and he'll

150
00:07:17,030 --> 00:07:13,860
get this plop really really wet and then

151
00:07:19,460 --> 00:07:17,040
he starts to bring it out and this was

152
00:07:21,110 --> 00:07:19,470
actually an experiment designed by

153
00:07:22,910 --> 00:07:21,120
schoolchildren and it's a it's a

154
00:07:25,850 --> 00:07:22,920
brilliant experiment so you do this

155
00:07:29,650 --> 00:07:25,860
really wet cloth and as she squeezes it

156
00:07:33,050 --> 00:07:29,660
you'll start to see this film of water

157
00:07:35,540 --> 00:07:33,060
coating the edges of the cloth and it

158
00:07:38,120 --> 00:07:35,550
gets thicker and thicker and the film of

159
00:07:41,450 --> 00:07:38,130
water is it's a tube of water around

160
00:07:45,200 --> 00:07:41,460
that washcloth and it starts to crawl up

161
00:07:47,630 --> 00:07:45,210
his hands and coat the surfaces so you

162
00:07:51,200 --> 00:07:47,640
can see that and if you think of that

163
00:07:53,060 --> 00:07:51,210

washcloth like a plant root the same

164
00:07:56,240 --> 00:07:53,070
thing is happening to your plant roots

165
00:07:59,480 --> 00:07:56,250
and the reason that this is important is

166
00:08:02,360 --> 00:07:59,490
because plant roots need air they

167
00:08:04,909 --> 00:08:02,370
breathe oxygen they have a process

168
00:08:06,890 --> 00:08:04,919
called respiration which you know it's

169
00:08:10,190 --> 00:08:06,900
similar to our process of respiration

170
00:08:13,210 --> 00:08:10,200
they need oxygen to keep the cells alive

171
00:08:15,740 --> 00:08:13,220
the chute also but plant shoots also

172
00:08:17,680 --> 00:08:15,750
generate oxygen through the process of

173
00:08:21,170 --> 00:08:17,690
photosynthesis when the lights are on

174
00:08:23,510 --> 00:08:21,180
and they get oxygen from the air but in

175
00:08:27,380 --> 00:08:23,520
the roots when you have that much water

176
00:08:30,440 --> 00:08:27,390
it's really hard to get the oxygen in to

177
00:08:33,709 --> 00:08:30,450
the plant roots and so your plants are

178
00:08:37,159 --> 00:08:33,719
always either getting too much water in

179
00:08:40,339 --> 00:08:37,169
space or not enough water and then you

180
00:08:42,409 --> 00:08:40,349
have problems with roof and if you can't

181
00:08:45,380 --> 00:08:42,419
have good words you can't have happy

182
00:08:47,240 --> 00:08:45,390
plants so I think the water issue is one

183
00:08:51,200 --> 00:08:47,250
of the biggest chop functions that we're

184
00:08:53,780 --> 00:08:51,210
dealing with so far plants in general

185
00:08:57,079 --> 00:08:53,790
seem to adapt pretty well to other

186
00:08:59,420 --> 00:08:57,089
aspects of the space flight condition as

187
00:09:01,970 --> 00:08:59,430
long as you have things like fans to

188
00:09:05,080 --> 00:09:01,980

move the air and let faith to guide the

189
00:09:10,750 --> 00:09:08,180
so kind of a segue here this is

190
00:09:13,160 --> 00:09:10,760
obviously kind of some of that beautiful

191
00:09:14,960 --> 00:09:13,170
just plant growth in space obviously we

192
00:09:17,030 --> 00:09:14,970
saw some lettuce earlier which is great

193
00:09:18,920 --> 00:09:17,040
for nutrition this is not so good for

194
00:09:24,140 --> 00:09:18,930
nutrition but what's the value in seeing

195
00:09:26,180 --> 00:09:24,150
a flower in space so I'll take that and

196
00:09:28,700 --> 00:09:26,190
enjoy it just add on I just wanted to

197
00:09:30,860 --> 00:09:28,710
mention that the flower was really one

198
00:09:33,380 --> 00:09:30,870
of our first ornamentals and it was the

199
00:09:40,100 --> 00:09:33,390
first ornamental and veggie and the

200
00:09:41,720 --> 00:09:40,110
flower really for the I'm sorry the the

201
00:09:43,280 --> 00:09:41,730
flower though you need a flower to

202
00:09:45,320 --> 00:09:43,290
produce free so if you're growing

203
00:09:47,690 --> 00:09:45,330
tomatoes if you're growing peppers or

204
00:09:49,610 --> 00:09:47,700
anything like that for vitamin C or or

205
00:09:52,720 --> 00:09:49,620
any other nutrition you'll need to get a

206
00:09:54,920 --> 00:09:52,730
flower than a fruit so the that was good

207
00:10:09,140 --> 00:09:54,930
go ahead what do you what more do you

208
00:10:12,590 --> 00:10:09,150
got to add on that well he did a

209
00:10:18,050 --> 00:10:12,600
wonderful job saving those plants we had

210
00:10:20,120 --> 00:10:18,060
some problems with water and well

211
00:10:24,260 --> 00:10:20,130
remembers with lots of really early

212
00:10:27,260 --> 00:10:24,270
morning calls from the station but when

213
00:10:29,270 --> 00:10:27,270

when they started flowering rose it was

214
00:10:31,880 --> 00:10:29,280
also this thing of beauty

215
00:10:34,970 --> 00:10:31,890
and I think that was something that he

216
00:10:35,270 --> 00:10:34,980
didn't realize what an impact that would

217
00:10:38,570 --> 00:10:35,280
have

218
00:10:40,850 --> 00:10:38,580
but Scott actually made a bouquet from

219
00:10:43,940 --> 00:10:40,860
the zinnias that he harvested that he

220
00:10:46,190 --> 00:10:43,950
threw there were enough flowers and you

221
00:10:48,530 --> 00:10:46,200
know was the first time there was a

222
00:10:52,190 --> 00:10:48,540
flower arrangement in space you know and

223
00:10:54,920 --> 00:10:52,200
and and so I think for me I felt really

224
00:10:58,070 --> 00:10:54,930
humbled to be a part of generating

225
00:11:02,960 --> 00:10:58,080
something that that was art in space as

226
00:11:04,130 --> 00:11:02,970
well so thinking about obviously we're

227
00:11:05,570 --> 00:11:04,140
getting better and better we're learning

228
00:11:08,329 --> 00:11:05,580
more and more about growing in low Earth

229
00:11:09,340 --> 00:11:08,339
orbit but for NASA we have our eyes set

230
00:11:11,439 --> 00:11:09,350
on the moon

231
00:11:14,139 --> 00:11:11,449
with the vision for Mars we have the

232
00:11:16,240 --> 00:11:14,149
Artemis program so what are what are

233
00:11:18,639 --> 00:11:16,250
kind of the future challenges as we look

234
00:11:20,199 --> 00:11:18,649
to move beyond a platform that certainly

235
00:11:22,960 --> 00:11:20,209
we haven't mastered yet but that we're

236
00:11:24,910 --> 00:11:22,970
good at what's next for us where those

237
00:11:29,699 --> 00:11:24,920
challenges lie and being the best at

238
00:11:38,410 --> 00:11:34,780

well you know we've started with lettuce

239
00:11:40,900 --> 00:11:38,420
leafy green crops and we're figuring out

240
00:11:43,120 --> 00:11:40,910
how to understand the food safety of

241
00:11:45,430 --> 00:11:43,130
those plants as we grow them in space

242
00:11:47,920 --> 00:11:45,440
because food safety is really important

243
00:11:50,650 --> 00:11:47,930
you know just as its it's a challenge to

244
00:11:53,019 --> 00:11:50,660
water your crops it's also a challenge

245
00:11:56,110 --> 00:11:53,029
to wash your vegetables right it's even

246
00:11:58,920 --> 00:11:56,120
hard to wash your hands in space and so

247
00:12:02,110 --> 00:11:58,930
we have to understand how to keep the

248
00:12:05,499 --> 00:12:02,120
plants clean and safe to eat here's a

249
00:12:08,379 --> 00:12:05,509
wonderful shot of Jessica and the other

250
00:12:10,840 --> 00:12:08,389
astronauts having some mizuna mustard

251
00:12:13,150 --> 00:12:10,850
recently on the space station which they

252
00:12:17,439 --> 00:12:13,160
mixed with the packaged food and and

253
00:12:20,319 --> 00:12:17,449
seemed to really enjoy we were also

254
00:12:24,430 --> 00:12:20,329
working on you know solving the problems

255
00:12:26,139 --> 00:12:24,440
of watering selecting new crops for

256
00:12:27,939 --> 00:12:26,149
space that's another thing that we have

257
00:12:29,970 --> 00:12:27,949
a lot of work going on here at Kennedy

258
00:12:32,680 --> 00:12:29,980
Space Center and and around the country

259
00:12:35,620 --> 00:12:32,690
with students helping us and I can talk

260
00:12:38,769 --> 00:12:35,630
more about that later and then we're

261
00:12:41,410 --> 00:12:38,779
working on designing the growth systems

262
00:12:44,470 --> 00:12:41,420
for the future you know for for

263
00:12:47,259 --> 00:12:44,480

something in space in microgravity space

264
00:12:49,960 --> 00:12:47,269
to grow is pretty limited and so we have

265
00:12:52,480 --> 00:12:49,970
to keep these these growth chambers

266
00:12:54,280 --> 00:12:52,490
small but we want to get high yields we

267
00:12:55,860 --> 00:12:54,290
want to get a lot of productivity if you

268
00:12:59,079 --> 00:12:55,870
want to get a lot of food out of it

269
00:13:01,600 --> 00:12:59,089
maybe when we go to the surface of Mars

270
00:13:03,429 --> 00:13:01,610
we'll have more space I think you have a

271
00:13:07,960 --> 00:13:03,439
picture we can show of what a large

272
00:13:10,360 --> 00:13:07,970
surface chamber might look like that

273
00:13:12,970 --> 00:13:10,370
that's something you know where we would

274
00:13:15,519 --> 00:13:12,980
love to have an ability to really grow

275
00:13:18,220 --> 00:13:15,529
enough food to supplement the diet for a

276
00:13:20,420 --> 00:13:18,230
crew that's living on Mars so this is an

277
00:13:22,730 --> 00:13:20,430
artist concept but it would

278
00:13:25,280 --> 00:13:22,740
a really exciting thing you know if we

279
00:13:29,240 --> 00:13:25,290
can get to that point and we have to get

280
00:13:31,519 --> 00:13:29,250
to that point the prepared package diet

281
00:13:34,850 --> 00:13:31,529
and I think you have a video showing

282
00:13:36,530 --> 00:13:34,860
what the packaged diet looks like you

283
00:13:41,510 --> 00:13:36,540
know the astronauts that are eating this

284
00:13:44,960 --> 00:13:41,520
hey pre packed food they enjoy it

285
00:13:47,449 --> 00:13:44,970
meals are a really big deal in space all

286
00:13:50,150 --> 00:13:47,459
of the food is actually really good

287
00:13:52,670 --> 00:13:50,160
it gets very high ratings before it gets

288
00:13:56,360 --> 00:13:52,680

sent to space but everything has to be

289
00:14:00,800 --> 00:13:56,370
stabilized or freeze-dried they add

290
00:14:04,460 --> 00:14:00,810
water and you know that diet while

291
00:14:06,889 --> 00:14:04,470
really good may not be enough for

292
00:14:10,490 --> 00:14:06,899
something like a trip to Mars because

293
00:14:13,519 --> 00:14:10,500
when you store this food the vitamins

294
00:14:15,980 --> 00:14:13,529
and the quality degrade over time and

295
00:14:17,389 --> 00:14:15,990
that's not an issue on the international

296
00:14:20,510 --> 00:14:17,399
space station where they're getting new

297
00:14:22,699 --> 00:14:20,520
food every few months but for a trip to

298
00:14:24,890 --> 00:14:22,709
Mars that food may have to be sent ahead

299
00:14:28,490 --> 00:14:24,900
and may be sitting on the surface of

300
00:14:30,850 --> 00:14:28,500
Mars when they arrive for their return

301
00:14:33,140 --> 00:14:30,860
journey and if it doesn't have enough

302
00:14:35,510 --> 00:14:33,150
nutrition to meet the needs of the

303
00:14:38,630 --> 00:14:35,520
astronauts we have to figure out a way

304
00:14:41,600 --> 00:14:38,640
to supplement that diet with fresh

305
00:14:43,550 --> 00:14:41,610
vegetables to provide that nutrition so

306
00:14:45,790 --> 00:14:43,560
that everybody can be safe and healthy

307
00:14:49,699 --> 00:14:45,800
for the trip to Mars in the journey home

308
00:14:51,170 --> 00:14:49,709
yeah I want to actually come back to

309
00:14:52,490 --> 00:14:51,180
something you mentioned Julia I would

310
00:14:54,350 --> 00:14:52,500
love to talk about citizen science a

311
00:14:55,550 --> 00:14:54,360
little bit trying if you are there I

312
00:14:57,320 --> 00:14:55,560
think you might have frozen on this for

313
00:14:59,180 --> 00:14:57,330

a second but I think your back if you

314
00:15:00,350 --> 00:14:59,190
could talk about some citizen science

315
00:15:01,850 --> 00:15:00,360
efforts I know that we have some really

316
00:15:03,800 --> 00:15:01,860
cool collaborations with students across

317
00:15:06,019 --> 00:15:03,810
the country and then let's dive into

318
00:15:07,519 --> 00:15:06,029
this popcorn challenge because we want

319
00:15:08,690 --> 00:15:07,529
to deliver on that let people know how

320
00:15:11,750 --> 00:15:08,700
they can be growing plans from their

321
00:15:13,519 --> 00:15:11,760
popcorn at home so I just wanted to

322
00:15:15,319 --> 00:15:13,529
mention that you know joy talked about

323
00:15:17,930 --> 00:15:15,329
the the benefits and the reasons why

324
00:15:19,160 --> 00:15:17,940
we're growing plants but you know since

325
00:15:20,960 --> 00:15:19,170
you mentioned the technologies right

326
00:15:23,240 --> 00:15:20,970
you've got to clean your food you need

327
00:15:25,220 --> 00:15:23,250
to be able to grow your food you know

328
00:15:26,720 --> 00:15:25,230
and if the plants get sick well then you

329
00:15:28,160 --> 00:15:26,730
need a way to detect that so there's a

330
00:15:31,490 --> 00:15:28,170
number of technologies that we're

331
00:15:33,470 --> 00:15:31,500
developing so the astronauts can go you

332
00:15:34,400 --> 00:15:33,480
know do what they need to do on Mars all

333
00:15:36,559 --> 00:15:34,410
the science that we want

334
00:15:38,360 --> 00:15:36,569
go do and hopefully you have robots and

335
00:15:39,769 --> 00:15:38,370
sensors helping the grow the plant and

336
00:15:41,509 --> 00:15:39,779
you know it's not just us there's

337
00:15:44,809 --> 00:15:41,519
actually people all around the country

338
00:15:46,699 --> 00:15:44,819

working on this and and part of the team

339
00:15:48,740 --> 00:15:46,709
helping us select crops and figure

340
00:15:53,030 --> 00:15:48,750
things out is you know the Fairchild

341
00:15:55,819 --> 00:15:53,040
challenge so we had this year I think

342
00:15:57,439 --> 00:15:55,829
more than 200 schools I'd have to check

343
00:15:58,819 --> 00:15:57,449
that but I think more than 200 middle

344
00:16:02,480 --> 00:15:58,829
school and high schools all across the

345
00:16:04,340 --> 00:16:02,490
country growing plans for it and you

346
00:16:06,350 --> 00:16:04,350
know the type of plants that we need

347
00:16:08,030 --> 00:16:06,360
right now are compact they need to

348
00:16:11,720 --> 00:16:08,040
germinate reliably they need to grow

349
00:16:13,429 --> 00:16:11,730
fast and they need to be robust so you

350
00:16:16,519 --> 00:16:13,439
know you could think if the plant can

351
00:16:17,920 --> 00:16:16,529
grow in 50 different classrooms and all

352
00:16:20,150 --> 00:16:17,930
these different conditions and

353
00:16:21,650 --> 00:16:20,160
microbiology kind of going on in these

354
00:16:24,800 --> 00:16:21,660
different classrooms and that's probably

355
00:16:27,499 --> 00:16:24,810
a pretty robust plant and so we have

356
00:16:29,689 --> 00:16:27,509
just thousands of student citizen

357
00:16:31,369 --> 00:16:29,699
scientists across the country growing

358
00:16:35,150 --> 00:16:31,379
the plants collecting the data and

359
00:16:37,460 --> 00:16:35,160
cleaning it up and into you know Google

360
00:16:39,230 --> 00:16:37,470
Docs and what we along with the

361
00:16:42,319 --> 00:16:39,240
statistician at the Fairchild tropical

362
00:16:46,129 --> 00:16:42,329
garden get to look at the data and you

363
00:16:48,740 --> 00:16:46,139

know we actually flew plants that were

364
00:16:51,620 --> 00:16:48,750
first identified and tested by students

365
00:16:52,879 --> 00:16:51,630
and so for me it's so exciting to go

366
00:16:56,809 --> 00:16:52,889
look at Twitter because they're all

367
00:17:00,559 --> 00:16:56,819
posting on Twitter and I think it's at

368
00:17:02,150 --> 00:17:00,569
grow beyond Earth so there's part of the

369
00:17:04,010 --> 00:17:02,160
Fairchild tropical botanic garden

370
00:17:05,689 --> 00:17:04,020
thousands of student citizen science is

371
00:17:08,419 --> 00:17:05,699
helping us select the next set of crops

372
00:17:11,569 --> 00:17:08,429
and that was really really terrific and

373
00:17:13,610 --> 00:17:11,579
so you know I'm hoping that more people

374
00:17:16,130 --> 00:17:13,620
can figure out what you know how NASA do

375
00:17:18,079 --> 00:17:16,140
this and some of the plants were looking

376
00:17:20,419 --> 00:17:18,089
at are also known as micro greening and

377
00:17:22,760 --> 00:17:20,429
microgreens are just young plants that

378
00:17:25,549 --> 00:17:22,770
you can grow and your grow them is along

379
00:17:28,069 --> 00:17:25,559
and they only take you know most of time

380
00:17:30,169 --> 00:17:28,079
about 10 10 to 20 days maybe at the

381
00:17:32,690 --> 00:17:30,179
longest and you can actually produce

382
00:17:34,640 --> 00:17:32,700
quite a bit of food and the microgreens

383
00:17:37,610 --> 00:17:34,650
are actually typically more nutritious

384
00:17:39,919 --> 00:17:37,620
than two fully grown mature plant and

385
00:17:42,110 --> 00:17:39,929
actually I grow microgreens at home just

386
00:17:43,909 --> 00:17:42,120
for fun and with my kids and when we

387
00:17:47,180 --> 00:17:43,919
talked about the popcorn challenge I

388
00:17:48,110 --> 00:17:47,190

went and gave it a try and you know you

389
00:17:52,970 --> 00:17:48,120
can grow a plant

390
00:17:56,690 --> 00:17:52,980
Cornell was shocked yeah and I want to

391
00:17:59,240 --> 00:17:56,700
say too that the growing beyond Earth

392
00:18:00,860 --> 00:17:59,250
program that Fairchild track mentally

393
00:18:04,400 --> 00:18:00,870
what we have these you know hundreds of

394
00:18:07,130 --> 00:18:04,410
school also has another component which

395
00:18:09,799 --> 00:18:07,140
will be announced via Twitter on

396
00:18:14,060 --> 00:18:09,809
Saturday through this NASA at home and

397
00:18:17,180 --> 00:18:14,070
that's to design a growth chamber so you

398
00:18:19,820 --> 00:18:17,190
anybody needs watching can design a

399
00:18:23,180 --> 00:18:19,830
plant growth chamber for space draw it

400
00:18:26,090 --> 00:18:23,190
out send a description in and we get

401
00:18:28,850 --> 00:18:26,100
ideas this way we've done this with

402
00:18:31,040 --> 00:18:28,860
elementary school students and we've got

403
00:18:33,260 --> 00:18:31,050
some really amazing ideas and some of

404
00:18:35,419 --> 00:18:33,270
the concepts we've actually started

405
00:18:38,150 --> 00:18:35,429
building either at Kennedy Space Center

406
00:18:41,570 --> 00:18:38,160
or in the growing beyond Earth

407
00:18:44,510 --> 00:18:41,580
innovation studio to test out some of

408
00:18:46,490 --> 00:18:44,520
these really innovative concepts so we

409
00:18:48,350 --> 00:18:46,500
we need everybody to help with this

410
00:18:51,350 --> 00:18:48,360
there are a lot of challenges associated

411
00:18:53,360 --> 00:18:51,360
with with growing plants and in space

412
00:18:56,720 --> 00:18:53,370
and feeding our astronauts in the future

413
00:18:57,860 --> 00:18:56,730

so we really can use your help yeah so

414
00:18:59,299 --> 00:18:57,870
let's jump in here now

415
00:19:02,180 --> 00:18:59,309
so while you're thinking about the

416
00:19:03,470 --> 00:19:02,190
design for a plant growth chamber here's

417
00:19:05,270 --> 00:19:03,480
something you can be doing again as

418
00:19:07,130 --> 00:19:05,280
Trent mentioned you were talking about

419
00:19:15,080 --> 00:19:07,140
you can have products here in seven to

420
00:19:17,870 --> 00:19:15,090
ten days so take a look at this most

421
00:19:20,540 --> 00:19:17,880
people have one hander right now we

422
00:19:23,120 --> 00:19:20,550
thought hey we could grow popcorn shoots

423
00:19:26,000 --> 00:19:23,130
for this challenge you choose your

424
00:19:27,890 --> 00:19:26,010
container you calculate the area where

425
00:19:30,440 --> 00:19:27,900
the plants are going to grow and then

426
00:19:33,560 --> 00:19:30,450
you count out the number of seeds that

427
00:19:34,700 --> 00:19:33,570
you want to grow in that area and once

428
00:19:37,580 --> 00:19:34,710
you've counted out your seats you're

429
00:19:39,220 --> 00:19:37,590
going to soak them for eight to twelve

430
00:19:41,289 --> 00:19:39,230
hours

431
00:19:45,700 --> 00:19:41,299
you're going to choose your substrate

432
00:19:47,830 --> 00:19:45,710
your soil paper towel sand whatever you

433
00:19:49,419 --> 00:19:47,840
want to go through then you're going to

434
00:19:50,740 --> 00:19:49,429
fill your container with that substrate

435
00:19:54,340 --> 00:19:50,750
you don't need much maybe just a

436
00:19:58,419 --> 00:19:54,350
centimeter then you add your water and

437
00:20:00,280 --> 00:19:58,429
then you add your wet seeds depending on

438
00:20:03,070 --> 00:20:00,290

the lighting conditions that you give

439
00:20:05,620 --> 00:20:03,080
them they can have a completely

440
00:20:14,200 --> 00:20:05,630
different look and a totally different

441
00:20:19,930 --> 00:20:16,300
all right so just again kind of taking a

442
00:20:21,610 --> 00:20:19,940
a recap there so we're talking about

443
00:20:22,120 --> 00:20:21,620
popcorn that you can find in your

444
00:20:23,980 --> 00:20:22,130
cupboard

445
00:20:26,620 --> 00:20:23,990
whether it be kind of a bottle of just

446
00:20:28,570 --> 00:20:26,630
kernels or Trenton joy I think we said

447
00:20:31,390 --> 00:20:28,580
that you can you you you could cut open

448
00:20:33,310 --> 00:20:31,400
a bag of microwave popcorn and try it I

449
00:20:36,250 --> 00:20:33,320
think the results will be mixed but you

450
00:20:39,190 --> 00:20:36,260
could use even that yeah I don't see why

451
00:20:41,130 --> 00:20:39,200
not yeah and I want to thank Christina

452
00:20:43,660 --> 00:20:41,140
Johnson our wonderful NASA postdoctoral

453
00:20:47,440 --> 00:20:43,670
fellow and her children for putting

454
00:20:54,010 --> 00:20:47,450
together that amazing video but yeah you

455
00:20:56,860 --> 00:20:54,020
know as long as their uncle's cool so

456
00:20:59,050 --> 00:20:56,870
we're gonna post more details on on

457
00:21:01,030 --> 00:20:59,060
Twitter and other social media platforms

458
00:21:02,710 --> 00:21:01,040
to kind of allow you to know what you

459
00:21:05,020 --> 00:21:02,720
need to do but again it's really pretty

460
00:21:06,730 --> 00:21:05,030
simple there it's pulling the kernels

461
00:21:08,650 --> 00:21:06,740
finding a container to put them in

462
00:21:10,930 --> 00:21:08,660
having something to plant them in now

463
00:21:12,820 --> 00:21:10,940

just excuse me Christina mentioned a few

464
00:21:13,960 --> 00:21:12,830
different things and I'm sure there's a

465
00:21:18,310 --> 00:21:13,970
lot more creative things you can come up

466
00:21:19,480 --> 00:21:18,320
with women mention st. soil sand we

467
00:21:20,980 --> 00:21:19,490
talked to I think she mentioned even

468
00:21:28,210 --> 00:21:20,990
just paper towels just laying them on

469
00:21:29,980 --> 00:21:28,220
paper towels that works right I was

470
00:21:33,070 --> 00:21:29,990
gonna mention that I just did it on felt

471
00:21:36,070 --> 00:21:33,080
you can do it on a towel as long as the

472
00:21:38,230 --> 00:21:36,080
sub street and hold water it will allow

473
00:21:40,030 --> 00:21:38,240
the the kernel to germinate and the

474
00:21:41,950 --> 00:21:40,040
kernel has a lot of energy in it so

475
00:21:43,570 --> 00:21:41,960
actually you can grow them in the dark

476
00:21:45,370 --> 00:21:43,580
so they don't you go give them any

477
00:21:46,540 --> 00:21:45,380
photosynthesis and they're gonna go

478
00:21:48,400 --> 00:21:46,550
looking for the light and they're

479
00:21:50,710 --> 00:21:48,410
converting a lot of the sugar into the

480
00:21:52,630 --> 00:21:50,720
stock so actually if you grow them in

481
00:21:55,210 --> 00:21:52,640
light or dark it will change the flavor

482
00:21:58,570 --> 00:21:55,220
and it's pretty it's pretty interesting

483
00:22:00,580 --> 00:21:58,580
I would recommend that you uh they need

484
00:22:03,910 --> 00:22:00,590
not eat it because I grew a lot of other

485
00:22:06,280 --> 00:22:03,920
stuff with my kernels but you know it's

486
00:22:08,290 --> 00:22:06,290
a part of an experiment I guess yeah

487
00:22:10,120 --> 00:22:08,300
we're encouraging everyone if you worked

488
00:22:12,130 --> 00:22:10,130

in a lab whether it be in grade school

489
00:22:13,990 --> 00:22:12,140
or otherwise you know that eating your

490
00:22:15,310 --> 00:22:14,000
experiments is not generally a wise

491
00:22:17,620 --> 00:22:15,320
thing so we're encouraging folks to not

492
00:22:19,180 --> 00:22:17,630
eat those products you can send us

493
00:22:21,250 --> 00:22:19,190
actually send us your photos and your

494
00:22:24,100 --> 00:22:21,260
data NASA at home there in the video

495
00:22:25,870 --> 00:22:24,110
also there on screen now enjoy a trip

496
00:22:27,370 --> 00:22:25,880
final thoughts from you all just what

497
00:22:27,670 --> 00:22:27,380
are you looking forward to the most in

498
00:22:28,990 --> 00:22:27,680
the next

499
00:22:33,820 --> 00:22:29,000
five to ten years when it comes to

500
00:22:39,610 --> 00:22:33,830
plants and NASA and exploration well for

501
00:22:42,070 --> 00:22:39,620
me I think it'll be you know something I

502
00:22:44,110 --> 00:22:42,080
haven't seen in my lifetime and I'm

503
00:22:47,140 --> 00:22:44,120
really excited to have people on the

504
00:22:50,490 --> 00:22:47,150
moon again the first woman and the next

505
00:22:53,950 --> 00:22:50,500
man and hopefully they'll be grown class

506
00:23:00,280 --> 00:22:53,960
yeah I just I want to echo what joyeux

507
00:23:02,860 --> 00:23:00,290
said you know I can't wait to see the

508
00:23:05,590 --> 00:23:02,870
crews on the moon growing plants for

509
00:23:07,270 --> 00:23:05,600
nutrition and just being part of the

510
00:23:09,060 --> 00:23:07,280
team that helps make it happen that's

511
00:23:11,140 --> 00:23:09,070
what I'm really looking forward to

512
00:23:13,600 --> 00:23:11,150
awesome we'll enjoy a trip thanks to

513
00:23:15,160 --> 00:23:13,610

both of you a quick plug for everybody

514
00:23:16,960 --> 00:23:15,170
out there we're gonna be posting

515
00:23:18,520 --> 00:23:16,970
additional social media content over the

516
00:23:19,930 --> 00:23:18,530
course of the next 10 days and then

517
00:23:22,390 --> 00:23:19,940
we'll come back again with a couple more

518
00:23:24,850 --> 00:23:22,400
folks from the plant life sciences area

519
00:23:27,760 --> 00:23:24,860
and kind of talk about the before and

520
00:23:29,620 --> 00:23:27,770
after of this project so again joy and

521
00:23:31,300 --> 00:23:29,630
Trent thank you to you both and look