



1
00:00:00,599 --> 00:00:01,599
>>> HI.

2
00:00:01,599 --> 00:00:04,870
I'M TRENT SMITH, THE VEGGIE
PROJECT MANAGER AT KENNEDY SPACE

3
00:00:04,870 --> 00:00:07,319
CENTER.

4
00:00:07,319 --> 00:00:12,390
TODAY WE HARVESTED OUR GROUND
PLANTS AND WE'RE GOING TO TALK

5
00:00:12,390 --> 00:00:14,840
ABOUT THAT A LITTLE BIT AND
MAYBE HAVE A LITTLE SURPRISE AT

6
00:00:14,840 --> 00:00:15,840
THE END.

7
00:00:15,840 --> 00:00:18,320
WE HAVE SOME PANELISTS HERE TO
TALK TO US ABOUT WHAT'S GOING ON

8
00:00:18,320 --> 00:00:19,320
AT NASA.

9
00:00:19,320 --> 00:00:27,400
I HAVE OUR DEPUTY CENTER
DIRECTOR, JANET PETRO.

10
00:00:27,400 --> 00:00:31,119
TO MY FURTHER LEFT, I HAVE RONNY
LAWSON.

11
00:00:31,119 --> 00:00:34,609
HE'S OUR ASSISTANT DIRECTOR FOR
THE INTERNATIONAL SPACE STATION

12
00:00:34,609 --> 00:00:37,800
HERE AT KENNEDY SPACE CENTER.

13
00:00:37,800 --> 00:00:41,440
FURTHER DOWN THE ROW, WE HAVE
LISA COLLOREDO.

14
00:00:41,440 --> 00:00:46,750
SHE'S OUR ASSOCIATE MANAGER FOR
THE COMMERCIAL CREW PROGRAM.

15
00:00:46,750 --> 00:00:50,409
AND AT THE END, BATTING LAST, WE
HAVE DR.

16
00:00:50,409 --> 00:00:56,679
GIOIA MASSA, OUR VEGGIE
LEAD SCIENTIST.

17
00:00:56,679 --> 00:01:03,739
[■APPLAUSE■]
>> THANK YOU.

18
00:01:03,739 --> 00:01:08,399
I'D LIKE TO ASK JANET TO TAKE A
COUPLE MINUTES AND TALK TO US

19
00:01:08,399 --> 00:01:11,430
ABOUT WHAT'S GOING ON HERE AT
KENNEDY SPACE CENTER.

20
00:01:11,430 --> 00:01:12,659
>> THANKS A LOT, TRENT.

21
00:01:12,659 --> 00:01:15,289
AND I REALLY WANT TO THANK YOU
FOR INVITING ME TO PARTICIPATE

22

00:01:15,289 --> 00:01:17,880
IN THIS EVENT TODAY.

23
00:01:17,880 --> 00:01:21,500
SOMETHING YOU MAY NOT KNOW ABOUT
ME IS ONE OF MY FAVORITE HOBBIES

24
00:01:21,500 --> 00:01:23,000
OR THINGS TO DO IS COOKING.

25
00:01:23,000 --> 00:01:26,320
I'M VERY PASSIONATE ABOUT
COOKING, SO I'M REALLY PLEASED

26
00:01:26,320 --> 00:01:30,840
TO BE HERE AND TO BE ABLE TO
HOPEFULLY TASTE SOME OF THIS

27
00:01:30,840 --> 00:01:33,329
STUFF YOU HAVE GROWING OVER
THERE.

28
00:01:33,329 --> 00:01:35,850
I'M ALSO GLAD THAT IT'S NOT
POTATOES.

29
00:01:35,850 --> 00:01:39,929
FOR SOME OF YOU WHO HAVE READ
THE MARTIAN AND THE WHOLE POTATO

30
00:01:39,929 --> 00:01:43,750
THING, I'M GLAD IT'S SOMETHING
ABOUT LETTUCE BECAUSE I LIKE

31
00:01:43,750 --> 00:01:45,170
THAT A LOT MORE.

32
00:01:45,170 --> 00:01:48,299
SO LET'S TALK A LITTLE BIT ABOUT
NASA.

33

00:01:48,299 --> 00:01:53,039

IT HAS A HUGE HERITAGE AND
LEGACY OF INNOVATION AND I

34

00:01:53,039 --> 00:01:56,909

PERSONALLY THINK THAT'S ONE OF
THE REASONS THAT WE'VE BEEN THE

35

00:01:56,909 --> 00:01:59,929

NUMBER ONE BEST PLACES TO WORK
FOR THREE YEARS IN A ROW IS

36

00:01:59,929 --> 00:02:02,450

BECAUSE WE HAVE A CULTURE OF
INNOVATION WITHIN OUR WORK

37

00:02:02,450 --> 00:02:04,630

FORCE.

38

00:02:04,630 --> 00:02:09,200

I THINK IT STARTS ALL THE WAY
FROM CHARLIE BOLDEN WHO HAS PUT

39

00:02:09,200 --> 00:02:13,310

OUT A LOT OF MEMOS AND IN ALMOST
EVERY TALK HE GIVES, HE TALKS

40

00:02:13,310 --> 00:02:17,210

ABOUT INNOVATION IN OUR WORK
FORCE AND ENCOURAGES US AND

41

00:02:17,210 --> 00:02:21,920

CHALLENGES US ALL THE WAY DOWN
TO EACH INDIVIDUAL EMPLOYEE AND

42

00:02:21,920 --> 00:02:28,530

TO BE INNOVATIVE AND ADD VALUE
TO WHAT WE DO EVERY DAY FOR OUR

43
00:02:28,530 --> 00:02:29,770
MISSION.

44
00:02:29,770 --> 00:02:32,280
I DON'T KNOW IF YOU SAW DR.

45
00:02:32,280 --> 00:02:34,860
DAVA
NEWMAN.

46
00:02:34,860 --> 00:02:38,330
LAST WEEK SHE HELD A SESSION
WITH A GROUP OF EMPLOYEES AND

47
00:02:38,330 --> 00:02:41,640
CHALLENGED THEM TO TALK ABOUT
WHAT ARE ADDITIONAL THINGS THEY

48
00:02:41,640 --> 00:02:43,960
COULD DO WITH INNOVATION.

49
00:02:43,960 --> 00:02:47,000
I KNOW LISA ROWE, ANOTHER ONE OF
OUR SENIOR LEADERS AT THE AGENCY

50
00:02:47,000 --> 00:02:51,590
LEVEL THIS PAST WEEK TALKED WITH
A GROUP OF DEPUTY CHIEF

51
00:02:51,590 --> 00:02:58,000
TECHNOLOGISTS AND ASKED THEM
WHAT WE CAN DO AS AN AGENCY TO

52
00:02:58,000 --> 00:03:02,150
BE MORE FORWARD LEANING AND
CHALLENGE OURS TO ADD MORE VALUE

53
00:03:02,150 --> 00:03:04,490
TO WHAT WE DO.

54
00:03:04,490 --> 00:03:07,540
SO VEGGIE■-- I'M NOT GOING TO
TALK VERY MUCH ABOUT VEGGIE

55
00:03:07,540 --> 00:03:12,370
BECAUSE I KNOW THERE ARE PEOPLE
FAR MORE KNOWLEDGEABLE ABOUT

56
00:03:12,370 --> 00:03:14,650
THIS PARTICULAR PROJECT, AND
YOU'RE GOING TO HEAR MORE ABOUT

57
00:03:14,650 --> 00:03:16,560
IT FROM THEM.

58
00:03:16,560 --> 00:03:21,530
WHAT I WANTED TO SAY WAS VEGGIE
WAS A LOW COST GROWTH CHAMBER

59
00:03:21,530 --> 00:03:25,190
AND IF YOU WATCHED THE NEWS
YESTERDAY WE KNOW THEY HARVESTED

60
00:03:25,190 --> 00:03:28,000
IT ON THE INTERNATIONAL SPACE
STATION.

61
00:03:28,000 --> 00:03:31,300
THE INTERNATIONAL SPACE STATION
IS A GREAT RESEARCH PLATFORM

62
00:03:31,300 --> 00:03:34,780
THAT WE HAVE FOR US THAT'S IN
LOWER EARTH ORBIT AND WE'RE

63
00:03:34,780 --> 00:03:38,850
LEARNING HOW TO LIVE AND WORK IN
THAT LOWER EARTH ORBIT SO THAT

64
00:03:38,850 --> 00:03:43,150
WE CAN GO BEYOND THAT INTO THE
PROVING GROUND AND THEN ONTO

65
00:03:43,150 --> 00:03:45,040
MARS AND OUR JOURNEY TO MARS.

66
00:03:45,040 --> 00:03:48,790
WHAT I THINK IS MOST IMPORTANT
ABOUT THAT IS HARVESTING THOSE

67
00:03:48,790 --> 00:03:52,120
VEGETABLES, WE ARE STILL ON THE
INTERNATIONAL SPACE STATION

68
00:03:52,120 --> 00:03:56,040
RELIANT ON THE EARTH, BUT AS WE
MOVE OUT TO MARS, WE'RE GOING TO

69
00:03:56,040 --> 00:03:58,290
HAVE TO LEARN HOW TO BE EARTH
INDEPENDENT.

70
00:03:58,290 --> 00:04:02,070
SO I THINK THIS IS A GREAT STEP
ON THE SPACE STATION THAT

71
00:04:02,070 --> 00:04:06,230
DEMONSTRATES HOW, THROUGH
INNOVATION AND TECHNOLOGY, WE

72
00:04:06,230 --> 00:04:10,060
CAN LEARN TO BE LESS EARTH
RELIANT SO WE CAN PROPEL

73
00:04:10,060 --> 00:04:15,430
OURSELVES ON THE JOURNEY TO MARS
MUCH, MUCH, MUCH QUICKER.

74

00:04:15,430 --> 00:04:18,210
AND THEN FINALLY I JUST WANTED
TO PUT IN A PLUG FOR WHAT WE'RE

75
00:04:18,210 --> 00:04:20,709
DOING HERE AT KENNEDY SPACE
CENTER.

76
00:04:20,709 --> 00:04:24,200
I THINK MOST OF YOU ■-- HOPEFULLY
MOST OF YOU HAVE HEARD OF OUR

77
00:04:24,200 --> 00:04:27,360
INNOVATION EXPO THAT'S COMING UP
IN OCTOBER.

78
00:04:27,360 --> 00:04:30,430
THIS IS AN ANNUAL EVENT AND
EVERY YEAR IT'S GOTTEN BETTER

79
00:04:30,430 --> 00:04:31,430
AND BETTER.

80
00:04:31,430 --> 00:04:34,900
IT'S HOSTED, EXECUTED AND
MANAGED BY A GROUP CALLED THE

81
00:04:34,900 --> 00:04:39,170
SPACEPORT INNOVATORS THAT ARE A
SELF-FORMED, SELF-MANAGED GROUP.

82
00:04:39,170 --> 00:04:43,350
EVERY YEAR THEY'VE DONE A REALLY
TREMENDOUS JOB OF DOING

83
00:04:43,350 --> 00:04:44,650
DIFFERENT THINGS ON IT.

84
00:04:44,650 --> 00:04:48,170
THIS YEAR I KNOW THEY'RE

INTENDING TO ENGAGE THE PUBLIC

85
00:04:48,170 --> 00:04:51,520
THROUGH THE VISITOR'S CENTER AT
THE SAME TIME THAT WE'RE HOLDING

86
00:04:51,520 --> 00:04:54,230
THE INNOVATION EXPO HERE ON
CENTER.

87
00:04:54,230 --> 00:04:58,100
SO I WANT TO ENCOURAGE EVERYBODY
TO PLEASE ATTEND THAT.

88
00:04:58,100 --> 00:05:00,040
ONE OF THE GREAT THINGS THEY DO
THERE IS THEY HAVE A KICK

89
00:05:00,040 --> 00:05:03,950
STARTING CAMPAIGN SO ALWAYS
LOOKING FOR INNOVATIVE IDEAS

90
00:05:03,950 --> 00:05:06,020
FROM EMPLOYEES TO COME.

91
00:05:06,020 --> 00:05:10,420
YOU PITCH YOUR IDEA TO THE GROUP
AND IF YOU WIN THROUGH THIS KICK

92
00:05:10,420 --> 00:05:12,889
STARTING CHALLENGE, YOU GET A
LITTLE BIT OF MONEY TO GO OFF

93
00:05:12,889 --> 00:05:16,560
AND DO SOMETHING INNOVATIVE THAT
WILL HELP ADD VALUE TO WHAT

94
00:05:16,560 --> 00:05:18,540
WE'RE DOING OUT HERE AT KENNEDY.

95

00:05:18,540 --> 00:05:19,540

THANK YOU.

96

00:05:19,540 --> 00:05:20,540

I LOOK FORWARD TO YOUR
QUESTIONS.

97

00:05:20,540 --> 00:05:21,540

>> AWESOME.

98

00:05:21,540 --> 00:05:22,540

THANK YOU, JANET.

99

00:05:22,540 --> 00:05:23,540

APPRECIATE IT.

100

00:05:23,540 --> 00:05:25,100

NEXT WE HAVE RONNY LAWSON WHO'S
GOING TO TALK A LITTLE BIT ABOUT

101

00:05:25,100 --> 00:05:29,380

THE SPACE STATION AND WHAT WE'RE
DOING NINE TIMES FASTER THAN A

102

00:05:29,380 --> 00:05:30,380

BULLET.

103

00:05:30,380 --> 00:05:31,380

>> GOOD MORNING.

104

00:05:31,380 --> 00:05:32,590

GLAD YOU ALL CAME OUT.

105

00:05:32,590 --> 00:05:34,560

JUST TO FOLLOW UP ON WHAT JANET
SAID, THERE'S SOMETHING YOU MAY

106

00:05:34,560 --> 00:05:36,620

NOT KNOW ABOUT ME.

107

00:05:36,620 --> 00:05:39,560

COOKING IS NOT MY BIG DEAL, BUT
I LIKE TO EAT.

108

00:05:39,560 --> 00:05:43,870

THAT'S A WELL KEPT SECRET.

109

00:05:43,870 --> 00:05:48,150

SINCE 1998 MYSELF AND A LOT OF
OTHER FOLKS OVER IN THE STATION

110

00:05:48,150 --> 00:05:52,460

PROGRAM, WE'VE BEEN ALL ABOUT
THE CONSTRUCTION AND THE

111

00:05:52,460 --> 00:05:55,370

MAINTENANCE AND KEEPING THE
SPACE STATION ON ORBIT AND

112

00:05:55,370 --> 00:05:56,370

FLYING.

113

00:05:56,370 --> 00:06:00,230

IT'S BEEN A REALLY BIG PART OF
SOME OF OUR CAREERS.

114

00:06:00,230 --> 00:06:03,490

SOMETIMES YOU GET SO BUSY DOING
WHAT YOU'RE DOING TO ASK THE

115

00:06:03,490 --> 00:06:06,240

QUESTION WHY ARE YOU DOING WHAT
YOU'RE DOING.

116

00:06:06,240 --> 00:06:10,270

WHAT WE SAW YESTERDAY WITH
VEGGIE, THAT'S WHY WE DID WHAT

117

00:06:10,270 --> 00:06:13,930

WE DID AND WHY WE'RE DOING WHAT
WE'RE DOING WITH SPACE STATION.

118

00:06:13,930 --> 00:06:18,360

STATION WAS DESIGNED AS A WORLD
CLASS LABORATORY FOR EXPLORATION

119

00:06:18,360 --> 00:06:22,370

AND BETTERMENT OF LIFE HERE ON
EARTH.

120

00:06:22,370 --> 00:06:24,680

THINGS THAT WE'RE LEARNING
THROUGH VEGGIE OR DEMONSTRATING

121

00:06:24,680 --> 00:06:28,200

THROUGH VEGGIE ARE GOING TO BE
COMPLETELY APPLICABLE NOT ONLY

122

00:06:28,200 --> 00:06:32,210

FOR EXPLORATION AS WE GO FORWARD
BUT ALSO HERE ON EARTH.

123

00:06:32,210 --> 00:06:34,900

GIOIA HAS SPOKEN TO ME A LITTLE
BIT ABOUT SOMETHING CALLED

124

00:06:34,900 --> 00:06:37,270

VERTICAL FARMING WHICH I HAD NO
IDEA ABOUT.

125

00:06:37,270 --> 00:06:40,639

IT'S HOW MUCH SOME OF THE SAME
CHALLENGES WE HAVE ON STATION

126

00:06:40,639 --> 00:06:46,951

FOR PLANT PRODUCTION AND GROWING
FOOD, URBAN AREAS HAVE AS FAR AS

127

00:06:46,951 --> 00:06:50,190

SPACE AND THE ABILITY TO GROW
FOOD.

128

00:06:50,190 --> 00:06:54,250

VEGGIE REALLY IS A GOOD TEST BED
FOR USING THIS KIND OF

129

00:06:54,250 --> 00:06:57,930

TECHNOLOGY IN THE FUTURE AS WE
GO FARTHER OUT INTO THE UNIVERSE

130

00:06:57,930 --> 00:07:01,630

BUT ALSO WHAT CAN WE DO HERE ON
EARTH.

131

00:07:01,630 --> 00:07:03,770

THE FOOD THAT THEY GET FROM
VEGGIE IS NOT GOING TO FEED THE

132

00:07:03,770 --> 00:07:04,770

CREW.

133

00:07:04,770 --> 00:07:07,200

THERE'S NOT THAT KIND OF VOLUME
THAT WE'RE GOING TO BE GROWING,

134

00:07:07,200 --> 00:07:11,770

BUT IT DOES PROVIDE SOME GOOD,
NUTRITIOUS FOOD THAT SHAKES

135

00:07:11,770 --> 00:07:14,180

THEIR DIET UP A LITTLE BIT
RATHER THAN THE STUFF THEY EAT

136

00:07:14,180 --> 00:07:16,070

EVERY DAY.

137

00:07:16,070 --> 00:07:19,160

THEY GET REALLY A GOOD
PHYSIOLOGICAL AND PSYCHOLOGICAL

138

00:07:19,160 --> 00:07:22,650
BOOST FROM THE ACT OF GARDENING
AND JUST THE AESTHETICS OF

139

00:07:22,650 --> 00:07:27,180
SEEING SOMETHING GROW IN THAT
STERILE ENVIRONMENT ON THE

140

00:07:27,180 --> 00:07:28,449
STATION.

141

00:07:28,449 --> 00:07:31,550
VEGGIE HAS REALLY BEEN A GREAT
THING THERE.

142

00:07:31,550 --> 00:07:35,650
WE'RE DOING A TON OF OTHER STUFF
THAT'S NEAR TERM AND FURTHER OUT

143

00:07:35,650 --> 00:07:38,790
THAT'S IN THAT SAME VANE OF
EXPLORATION LIKE VEGGIE.

144

00:07:38,790 --> 00:07:42,950
FOR INSTANCE, WE'RE DEVELOPING
ANOTHER PLANT HABITAT RIGHT NOW,

145

00:07:42,950 --> 00:07:46,690
THE ADVANCE PLANT HABITAT WHICH
AGAIN IS GOING TO BE USED FOR

146

00:07:46,690 --> 00:07:50,570
CROP SIZED PLANTS LIKE VEGGIE
DOES, BUT IT'S GOING TO BE ABLE

147

00:07:50,570 --> 00:07:54,760
TO CONTROL A LOT OF THE

VARIABLES THAT AFFECT PLANT

148

00:07:54,760 --> 00:08:00,570

GROWTH LIKE HUMIDITY,
TEMPERATURE, CARBON DIOXIDE, AND

149

00:08:00,570 --> 00:08:02,470

LIGHTING AND ALL OF THAT.

150

00:08:02,470 --> 00:08:05,419

WHERE VEGGIE IS A GOOD PLATFORM
FOR GROWING PLANTS, APH IS GOING

151

00:08:05,419 --> 00:08:09,070

TO BE A GOOD PLANT FORM OR
TAKING THOSE VARIABLES AND

152

00:08:09,070 --> 00:08:13,690

UNDERSTANDING EXACTLY WHAT
SPACE-GROWN PLANTS GO THROUGH

153

00:08:13,690 --> 00:08:16,710

BEING IN ZERO G AND A COMBINED
SPACE.

154

00:08:16,710 --> 00:08:20,949

THAT'S EXCITING TO US AND THAT
WILL BE READY NEXT YEAR TO GET

155

00:08:20,949 --> 00:08:23,290

READY TO FLY TO STATION.

156

00:08:23,290 --> 00:08:29,790

ALSO IN OUR SHOP WE ARE NOW
DOING A TON OF OTHER TYPE OF

157

00:08:29,790 --> 00:08:32,380

PROJECTS GOING ON RIGHT NOW THAT
ARE IN THIS SAME EXPLORATION

158

00:08:32,380 --> 00:08:33,380

VANE.

159

00:08:33,380 --> 00:08:38,159

WE'RE STUDYING THINGS LIKE BEING
ABLE TO GO AND BUILD STRUCTURES

160

00:08:38,159 --> 00:08:43,529

ON AN OUTPOST OR MINING GASES
AND EVEN ROCKET FUEL FROM

161

00:08:43,529 --> 00:08:44,529

REGALA.

162

00:08:44,529 --> 00:08:47,610

THEY'RE ALL GOING TO BE
IMPORTANT STEPPING STONES ALONG

163

00:08:47,610 --> 00:08:50,199

THE WAY IF WE'RE GOING TO MARS.

164

00:08:50,199 --> 00:08:54,139

VEGGIE IS A GOOD FIRST STEP AND
I'M EXCITED TO WORK WITH THE

165

00:08:54,139 --> 00:08:56,889

TEAM THAT PULLED THIS WORK.

166

00:08:56,889 --> 00:08:57,990

>> THANKS, RONNY.

167

00:08:57,990 --> 00:08:59,089

APPRECIATE IT.

168

00:08:59,089 --> 00:09:01,490

LISA IS GOING TO TALK TO US
ABOUT THE COMMERCIAL CREW

169

00:09:01,490 --> 00:09:04,990
PROGRAM AND A LITTLE ABOUT
COMMERCIAL SPACE.

170
00:09:04,990 --> 00:09:06,040
LISA?

171
00:09:06,040 --> 00:09:08,139
>> THANKS, TRENT.

172
00:09:08,139 --> 00:09:11,300
SOMETIMES PEOPLE WONDER WHY IS
COMMERCIAL CREW SITTING HERE

173
00:09:11,300 --> 00:09:16,029
WITH THE STATION PROJECT GOING
ON AND THE VEGGIE PROJECT.

174
00:09:16,029 --> 00:09:20,730
REALLY THE COMMERCIAL CREW
PROGRAM IS REALLY HAND IN HAND

175
00:09:20,730 --> 00:09:25,779
CONNECTED WITH THE ISS AND ALSO
THE AGENCY'S OVERALL PATH TO GET

176
00:09:25,779 --> 00:09:27,290
TO MARS.

177
00:09:27,290 --> 00:09:32,490
HAVING A COMMERCIALY AVAILABLE
VEHICLE THAT WILL TAKE CREW TO

178
00:09:32,490 --> 00:09:36,149
AND FROM STATION IS REALLY,
REALLY CRITICAL TO BETTER

179
00:09:36,149 --> 00:09:40,920
UNDERSTANDING THE CAPABILITIES
THAT WE NEED TO DEVELOP ON THE

180

00:09:40,920 --> 00:09:44,809

INTERNATIONAL SPACE STATION
LABORATORY AND ALSO THE LONG

181

00:09:44,809 --> 00:09:49,110

DURATION MISSIONS THAT ARE
COMING UP TO GET TO MARS IN A

182

00:09:49,110 --> 00:09:51,309

COUPLE OF REALLY IMPORTANT WAYS.

183

00:09:51,309 --> 00:09:56,329

ONE IS WE'RE GOING TO BE ■-- OUR
REQUIREMENT IS TO HAVE FOUR CREW

184

00:09:56,329 --> 00:10:00,529

ON OUR COMMERCIAL VEHICLE, SO
THIS IS ONE CREW MORE THAN WE

185

00:10:00,529 --> 00:10:06,519

CURRENTLY HAVE AVAILABLE ON THE
SOYUZ MISSIONS, SO THAT CREW AND

186

00:10:06,519 --> 00:10:11,050

THE TIME THAT THEY CAN SPEND ON
STATION TO DO SCIENCE IS LIKE

187

00:10:11,050 --> 00:10:12,089

GOLD.

188

00:10:12,089 --> 00:10:17,459

THEY HAVE A VERY LIMITED TIME,
AND THE EXTRA CREW WILL EQUATE

189

00:10:17,459 --> 00:10:21,079

TO ABOUT 40 HOURS OF RESEARCH
AND SCIENCE THAT THEY COULD TAKE

190

00:10:21,079 --> 00:10:26,139
ADVANTAGE OF TO DO PROJECTS LIKE
VEGGIE AND OTHER INNOVATIVE

191
00:10:26,139 --> 00:10:29,999
PROJECTS THAT ARE YET TO BE
COMING OUR WAY.

192
00:10:29,999 --> 00:10:32,059
ALL OF THOSE WILL HELP IN THE
PATH.

193
00:10:32,059 --> 00:10:36,139
WE'RE JUST ONE PIECE OF THE BIG
PUZZLE TO GET THE AGENCY TO GET

194
00:10:36,139 --> 00:10:38,449
TO MARS.

195
00:10:38,449 --> 00:10:42,949
WE ARE WORKING DAILY WITH OUR
COMMERCIAL PARTNERS.

196
00:10:42,949 --> 00:10:49,939
WE HAVE BOEING, CST-100 IS IN
DEVELOPMENT AS WE SPEAK AND THE

197
00:10:49,939 --> 00:10:52,350
SPACE-EX CREW DRAGON.

198
00:10:52,350 --> 00:10:58,610
AGAIN, WE'LL HAVE THE CAPABILITY
TO HAVE FOUR, BUT TYPICAL WITH

199
00:10:58,610 --> 00:11:04,740
INDUSTRY, IT OPENS UP A LOT OF
OPPORTUNITY FOR OTHER KIND OF

200
00:11:04,740 --> 00:11:06,320
INNOVATION.

201

00:11:06,320 --> 00:11:09,269

ALTHOUGH OUR COMMERCIAL
PROVIDERS ARE REQUIRED TO HAVE

202

00:11:09,269 --> 00:11:13,389

FOUR CREW, THEY HAVE
CAPABILITIES THAT WILL INCLUDE

203

00:11:13,389 --> 00:11:14,709

MORE THAN FOUR CREW.

204

00:11:14,709 --> 00:11:19,209

IT COULD BE FOR OTHER PAYLOADS
AND CARGO ON SCIENCE THAT COULD

205

00:11:19,209 --> 00:11:20,209

GO UP.

206

00:11:20,209 --> 00:11:23,339

IT COULD BE SOME EXPERIMENTS
THAT YOU ALL OR MAYBE YOUR KIDS

207

00:11:23,339 --> 00:11:26,930

OR SOMEBODY ELSE WILL BE
PROVIDING IN THE FUTURE.

208

00:11:26,930 --> 00:11:31,380

AGAIN, IT'S ALL THIS PATH FOR
THE AGENCY THE TO GET EXPERIENCE

209

00:11:31,380 --> 00:11:36,550

THE PROVEN GROUND TO GO FROM
WHAT WE KNOW NOW AND WHAT WE

210

00:11:36,550 --> 00:11:40,550

NEED TO KNOW TO SUSTAIN LONG
DURATION HUMAN SPACE FLIGHT TO

211

00:11:40,550 --> 00:11:41,550
GET TO MARS.

212
00:11:41,550 --> 00:11:44,940
IT'S GOING TO BE A BIG CHALLENGE
FOR THE AGENCY.

213
00:11:44,940 --> 00:11:48,429
IT'S A COUPLE OF YEAR MISSION.

214
00:11:48,429 --> 00:11:57,569
THIS IS ONE STEP TOWARDS THAT
JOURNEY TO MARS.

215
00:11:57,569 --> 00:12:03,769
>> AS A PAYLOAD MANAGER WE LOOK
FORWARD TO THE EXTRA CREW TIME.

216
00:12:03,769 --> 00:12:06,940
LASTLY, CERTAINLY NOT LEAST, WE
HAVE DR.

217
00:12:06,940 --> 00:12:09,220
GIOIA MASSA WHO'S GOING
TO TALK TO US A LITTLE ABOUT

218
00:12:09,220 --> 00:12:13,110
VEGGIE AND PLANTS IN SPACE AND
THE FUTURE OF PLANTS IN SPACE.

219
00:12:13,110 --> 00:12:15,459
GIOIA, TAKE IT AWAY.

220
00:12:15,459 --> 00:12:16,640
>> THANKS, TRENT.

221
00:12:16,640 --> 00:12:19,629
I'M HONORED TO BE UP HERE
REPRESENTING THE VEGGIE TEAM AND

222

00:12:19,629 --> 00:12:24,190

I'M SO HAPPY TO SEE A GREAT
PORTION OF THAT TEAM HERE.

223

00:12:24,190 --> 00:12:27,610

CONGRATULATIONS TO EVERYONE.

224

00:12:27,610 --> 00:12:30,069

VEGGIE REALLY IS ALL ABOUT TEAM
WORK.

225

00:12:30,069 --> 00:12:33,309

THE MORE INVOLVED I'VE GOTTEN,
THE MORE I'VE SEEN THAT SCIENCE

226

00:12:33,309 --> 00:12:38,119

IS JUST A VERY SMALL PART OF
EVERYTHING THAT IT TAKES TO DO

227

00:12:38,119 --> 00:12:42,990

RESEARCH IN SPACE, TO DO FOOD
PRODUCTION IN SPACE.

228

00:12:42,990 --> 00:12:47,529

WE ARE RESEARCH BUT WE'RE ALSO
MAKING SOMETHING TO EAT.

229

00:12:47,529 --> 00:12:49,199

WE HAVE A WONDERFUL TEAM.

230

00:12:49,199 --> 00:12:51,680

THE CORE OF THE TEAM IS KENNEDY
HERE.

231

00:12:51,680 --> 00:12:57,480

WE'VE REALLY EMBRACED THE PLANT
RESEARCH HERE, AND THIS IS KIND

232

00:12:57,480 --> 00:12:59,839

OF SPRUNG OUT OF THIS GROUP.

233

00:12:59,839 --> 00:13:04,309

BUT WE ALSO HAVE TEAM MEMBERS AT
JOHNSON SPACE FLIGHT CENTER,

234

00:13:04,309 --> 00:13:07,759

MARSHAL SPACE FLIGHT CENTER,
EVEN GLEN RESEARCH CENTER, AND

235

00:13:07,759 --> 00:13:10,069

OF COURSE THE FOLKS AT
HEADQUARTERS WHO HAVE REALLY

236

00:13:10,069 --> 00:13:13,170

ENABLED THIS TO GO ON.

237

00:13:13,170 --> 00:13:18,499

THE ASTRONAUTS WHO ARE OUR
INSPIRATION, OUR EXCITEMENT, WE

238

00:13:18,499 --> 00:13:21,690

CAN'T THANK THEM ENOUGH FOR ALL
THEIR HARD WORK ON THIS.

239

00:13:21,690 --> 00:13:26,189

THIS IS BUILDING ON DECADES OF
PLANT RESEARCH, OF RESEARCH IN

240

00:13:26,189 --> 00:13:30,779

PLANTED SPACE BIOLOGY,
BIOGENERATIVE LIFE SUPPORT

241

00:13:30,779 --> 00:13:33,179

SYSTEMS AND CONTROLLED
ENVIRONMENT AGRICULTURE THAT'S

242

00:13:33,179 --> 00:13:37,929

GONE ON AT NASA, AT
UNIVERSITIES, AND AT RESEARCH

243

00:13:37,929 --> 00:13:39,929

CENTERS AROUND THE WORLD.

244

00:13:39,929 --> 00:13:44,269

SO WE'RE BUILDING ON THIS REALLY
STRONG FOUNDATION OF KNOWLEDGE,

245

00:13:44,269 --> 00:13:48,620

AND WE HAVE A PUBLIC/PRIVATE
PARTNERSHIP THAT'S BEEN KEY.

246

00:13:48,620 --> 00:13:50,269

ACTUALLY SEVERAL.

247

00:13:50,269 --> 00:13:53,629

THE FIRST AND FOREMOST IS ORBIT
TECH WHICH DESIGNED AND BUILT

248

00:13:53,629 --> 00:13:57,269

THE VEGGIE HARDWARE THROUGH THE
NASA SMALL BUSINESS INNOVATIVE

249

00:13:57,269 --> 00:14:02,339

RESEARCH PROGRAM AND CONTINUED
TO WORK WITH US THROUGH

250

00:14:02,339 --> 00:14:05,519

DIFFERENT ITERATIONS OF VEGGIE
UNTIL WE GOT TO FLIGHT.

251

00:14:05,519 --> 00:14:08,639

IN ADDITION, WE'VE HAD OTHER
COMPANIES THAT HAVE BEEN

252

00:14:08,639 --> 00:14:13,769

INVOLVED THAT HAVE PROVIDED
TECHNICAL EXPERTISE AND RESEARCH

253

00:14:13,769 --> 00:14:16,819
AND SUPPORT FOR THIS PROJECT AND
WE REALLY CAN'T THANK THEM

254
00:14:16,819 --> 00:14:17,819
ENOUGH.

255
00:14:17,819 --> 00:14:23,089
WE'VE HAD EDUCATORS AND FELLOWS
AND STUDENTS AND INTERNS

256
00:14:23,089 --> 00:14:26,329
INVOLVED IN THIS AND WE'RE
ACTUALLY JUST BEGINNING A NEW

257
00:14:26,329 --> 00:14:31,420
EDUCATION PROGRAM WITH FAIRCHILD
TROPIC BOTANIC GARDENS IN SOUTH

258
00:14:31,420 --> 00:14:33,939
FLORIDA WHERE THEY'RE GOING TO
ENGAGE HUNDREDS OF SCHOOL

259
00:14:33,939 --> 00:14:37,600
CHILDREN TO HELP US SELECT THE
NEXT CROPS THAT MAY BE GROWN IN

260
00:14:37,600 --> 00:14:38,600
VEGGIE.

261
00:14:38,600 --> 00:14:43,239
WE'RE REALLY EXCITED ABOUT THAT
AND ALL THE POTENTIAL FOR

262
00:14:43,239 --> 00:14:45,040
VEGGIE.

263
00:14:45,040 --> 00:14:48,879
WE'VE BEEN FORTUNATE BECAUSE
VEGGIE HAS SHOWN US THAT WE CAN

264

00:14:48,879 --> 00:14:52,980

GROW PLANTS IN SPACE SIMILARLY
TO HOW WE'RE GROWING THEM HERE

265

00:14:52,980 --> 00:14:54,360

ON EARTH.

266

00:14:54,360 --> 00:14:58,199

THAT'S GREAT BECAUSE IT OPENS UP
A LOT OF POTENTIAL FOR NEW

267

00:14:58,199 --> 00:15:02,350

RESEARCH THAT WE CAN BE DOING
HERE, TESTING AND THEN FLYING UP

268

00:15:02,350 --> 00:15:03,440

THERE.

269

00:15:03,440 --> 00:15:06,880

IT ALSO GIVES US A LOT OF
CONFIDENCE THAT WE CAN GROW FOOD

270

00:15:06,880 --> 00:15:12,529

IN VEGGIE AND IN VEGGIE
FOLLOW-ONS TO FEED THE CREW AND

271

00:15:12,529 --> 00:15:15,350

TO DO IT SAFELY.

272

00:15:15,350 --> 00:15:19,230

IT'S BEEN A WONDERFUL EXPERIENCE
FOR ME AND I THINK I CAN SPEAK

273

00:15:19,230 --> 00:15:23,009

ON BEHALF OF THE TEAM THAT FOR
ALL OF US WE'VE REALLY ENJOYED

274

00:15:23,009 --> 00:15:24,009

IT.

275

00:15:24,009 --> 00:15:29,389

I THINK THE APPEAL OF VEGGIE IS,
AS SOME OF MY FELLOW SPEAKERS

276

00:15:29,389 --> 00:15:32,629

HAVE SAID, WE ENGAGE NOT JUST
THE GARDENERS BUT THE PEOPLE WHO

277

00:15:32,629 --> 00:15:35,170

LIKE TO COOK AND THE PEOPLE WHO
LIKE TO EAT AND THAT'S A PRETTY

278

00:15:35,170 --> 00:15:39,179

BIG PERCENTAGE OF THE
POPULATION.

279

00:15:39,179 --> 00:15:43,869

I THINK WE WERE ALL A LITTLE
SURPRISED AT HOW ENGAGING IT WAS

280

00:15:43,869 --> 00:15:47,809

FOR THE GENERAL PUBLIC, BUT
THAT'S JUST WONDERFUL.

281

00:15:47,809 --> 00:15:55,670

I THINK VEGGIE IS REALLY FROM
THE EARTH, OF THE EARTH, FOR THE

282

00:15:55,670 --> 00:15:57,600

EARTH AND FOR THE FUTURE.

283

00:15:57,600 --> 00:16:01,959

AS ONE OF MY FAVORITE QUOTES
FROM YESTERDAY'S MEDIA FEEDING

284

00:16:01,959 --> 00:16:07,839

FRENZY IS, IT'S A REALLY
INSPIRING SALAD.

285

00:16:07,839 --> 00:16:12,329

IT'S A MOMENTOUS SALAD.

286

00:16:12,329 --> 00:16:18,059

I THINK WITH THAT, WE WILL GO TO
THE VIDEO OF THE CREW

287

00:16:18,059 --> 00:16:19,239

HARVESTING.

288

00:16:19,239 --> 00:16:29,220

>> WE'RE STANDING BY NOW FOR THE
FIRST CONSUMPTION OF ONE OF

289

00:16:29,220 --> 00:16:32,589

THESE RED ROMAINE LETTUCE LEAVES
THAT HAS BEEN GROWN IN THE

290

00:16:32,589 --> 00:16:35,470

MICROGRAVITY OF SPACE.

291

00:16:35,470 --> 00:16:42,379

>> THIS IS AN ASTRONAUT
HARVESTING HALF THE LEAVES FOR

292

00:16:42,379 --> 00:16:45,170

THE CONSUMPTION HARVEST, AND
THEN THE OTHER HALF ARE GOING TO

293

00:16:45,170 --> 00:16:49,540

BE RETURNED HERE FOR SCIENCE
ANALYSIS.

294

00:16:49,540 --> 00:16:52,829

THE FIRST SET OF PLANTS WHICH
WERE GROWN LAST YEAR WERE

295

00:16:52,829 --> 00:16:56,829

RETURNED FOR SCIENTIFIC ANALYSIS
AND THAT REALLY ENABLED US TO

296

00:16:56,829 --> 00:17:00,220

HAVE THE CREW BE ABLE TO EAT THE
PLANTS THIS TIME.

297

00:17:00,220 --> 00:17:04,990

WITH THAT, WE'RE GOING TO DO
SOME HARVESTING OF OUR OWN.

298

00:17:04,990 --> 00:17:09,419

THIS PLANT HERE IS ACTUALLY NOT
THE RED ROMAINE LETTUCE.

299

00:17:09,419 --> 00:17:16,220

THIS IS CHINESE CABBAGE WHICH
WE'LL FLY UP AGAIN.

300

00:17:16,220 --> 00:17:26,679

WE ARE GOING TO HARVEST SOME OF
THESE LEAVES.

301

00:17:26,679 --> 00:17:27,679

GET MY GLOVES.

302

00:17:27,679 --> 00:17:30,870

WE'RE TRYING TO TAKE CARE OF THE
PLANT IN A VERY CLEAN WAY AND SO

303

00:17:30,870 --> 00:17:33,960

THAT'S WHY THE ASTRONAUTS
GENERALLY WERE WEARING GLOVES

304

00:17:33,960 --> 00:17:35,510

WHEN THEY HANDLED THE PLANTS.

305

00:17:35,510 --> 00:17:40,340

ESPECIALLY ON SPACE STATION
WHERE IT'S PRETTY TRICKY TO

306

00:17:40,340 --> 00:17:42,210

CLEAN YOUR PRODUCE.

307

00:17:42,210 --> 00:17:49,669

WE'RE GOING TO USE GRAVITY TO
WORK ON OUR BEHALF HOWEVER, SO

308

00:17:49,669 --> 00:17:52,970

WE DON'T HAVE TO WORRY ABOUT
LEAVES FLOATING AWAY LIKE THEY

309

00:17:52,970 --> 00:17:53,970

DID.

310

00:17:53,970 --> 00:17:56,549

>> YESTERDAY, KJELL LINDGREN,
WHEN HE HARVESTED THE LETTUCE,

311

00:17:56,549 --> 00:17:59,519

HE SET DOWN A LEAF AND IT
STARTED FLOATING AWAY.

312

00:17:59,519 --> 00:18:02,289

SCOTT KELLY CAME IN AND HELPED
OUT.

313

00:18:02,289 --> 00:18:12,659

>> I THINK HE WAS HOPING THERE
WAS VELCRO ON THE BACK OF IT BUT

314

00:18:12,659 --> 00:18:15,179

WE DIDN'T HAVE ANY VELCRO.

315

00:18:15,179 --> 00:18:16,690

>> SALAD■--

>> WELL TRAVELED.

316

00:18:16,690 --> 00:18:20,041

>> ABOUT A MONTH AGO I TOOK
SALAD UP TO DAY ON THE HILL, SO

317

00:18:20,041 --> 00:18:24,580
SALAD IS KIND OF OUR AMBASSADOR
FOR VEGGIE 03.

318

00:18:24,580 --> 00:18:27,700
SHE WAS IN MANY PHOTOGRAPHS WITH
A COUPLE ASTRONAUTS WHO WERE

319

00:18:27,700 --> 00:18:29,990
THERE, REED WISEMAN AND BUTCH
WILL MORE.

320

00:18:29,990 --> 00:18:33,049
CHARLIE BOLDEN HELD HER AND WE
TALKED ABOUT THE ASTRONAUTS

321

00:18:33,049 --> 00:18:37,250
EATING AND THE MEMBERS OF
CONGRESS AND THE STAFFERS WHO

322

00:18:37,250 --> 00:18:41,450
MAKE THE LAWS WERE ALL VERY
EXCITED TO MEET SALAD.

323

00:18:41,450 --> 00:18:44,880
THAT'S HER NAME BY THE WAY,
SALAD.

324

00:18:44,880 --> 00:18:51,919
WE ARE GOING TO GET SEEDS JUST
LIKE SALAD FLOWN UP ON THE NEXT

325

00:18:51,919 --> 00:18:53,570
SPACE EX MISSION.

326

00:18:53,570 --> 00:18:56,240
WE'RE TARGETING SPACE-EX 8.

327

00:18:56,240 --> 00:18:57,250

WE'LL SEE WHEN THAT FLIES.

328

00:18:57,250 --> 00:18:58,370

WE'LL SEE IF WE MAKE THAT.

329

00:18:58,370 --> 00:19:02,960

WE'LL GET IT ON SPACE-EX 8 OR 9
AND WE'LL HAVE THOSE POSITIONED

330

00:19:02,960 --> 00:19:06,730

AND THE ASTRONAUTS WILL BE ABLE
TO GROW THOSE WHEN THEY'RE

331

00:19:06,730 --> 00:19:07,730

READY.

332

00:19:07,730 --> 00:19:12,260

THE NEXT CROP ON SPACE STATION,
AT LEAST THAT'S EDIBLE, WILL BE

333

00:19:12,260 --> 00:19:13,260

CABBAGE.

334

00:19:13,260 --> 00:19:17,230

>> THESE DWARF TOMATO PLANTS ARE
PLANTS WE'RE HOPING TO FLY IN A

335

00:19:17,230 --> 00:19:18,230

COUPLE OF YEARS AS WELL.

336

00:19:18,230 --> 00:19:20,350

WE'VE BEEN DOING A LOT OF
RESEARCH HERE ON WHAT OTHER

337

00:19:20,350 --> 00:19:27,559

CROPS WE MIGHT GROW IN VEGGIE
AND DWARF TOMATOES ARE AN

338

00:19:27,559 --> 00:19:31,950

EXCELLENT CANDIDATE.

339

00:19:31,950 --> 00:19:37,059

RIGHT NOW I'M GOING TO SANITIZE
THE CABBAGE LEAVES USING SOME

340

00:19:37,059 --> 00:19:39,179

WIPES, THE SAME WAY THAT THE
CREW DID ON ORBIT.

341

00:19:39,179 --> 00:19:42,620

WHILE I'M DOING THAT, I THINK WE
CAN PLAY THE NEXT VIDEO WHICH

342

00:19:42,620 --> 00:19:48,440

SHOWS THE CREW ENJOYING THE
FRUITS OF THEIR LABOR.

343

00:19:48,440 --> 00:19:50,589

>> WHOO HOO!

344

00:19:50,589 --> 00:19:51,669

>> CHEERS!

345

00:19:51,669 --> 00:19:53,820

>> THAT'S AWESOME.

346

00:19:53,820 --> 00:19:55,969

>> TASTES GOOD.

347

00:19:55,969 --> 00:19:57,039

>> YEAH.

348

00:19:57,039 --> 00:20:01,339

>> KIND OF LIKE ARUGULA.

349

00:20:01,339 --> 00:20:03,499

>> IT'S FRESH.

350

00:20:03,499 --> 00:20:13,529

>> SOME OIL AND VINEGAR.

351

00:20:13,529 --> 00:20:29,210

>> THAT'S GOOD.

352

00:20:29,210 --> 00:20:52,729

>> THAT LOOKS COOL.

353

00:20:52,729 --> 00:21:20,600

>> ALL RIGHT, SO GIOIA IS JUST
NOW GETTING THE CABBAGE LEAVES

354

00:21:20,600 --> 00:21:25,870

IN BETWEEN THE PRO SAN WIPES AND
THAT'S A CITRIC ACID-BASED

355

00:21:25,870 --> 00:21:29,300

SOLUTION THAT OUR TEAM AT
KENNEDY MADE UP.

356

00:21:29,300 --> 00:21:30,830

WE HAVE TEN WIPES PER BAG.

357

00:21:30,830 --> 00:21:35,820

THIS IS ONE THAT WE USED FOR OUR
GROUND CONTROL EARLIER.

358

00:21:35,820 --> 00:21:40,770

THEY PUT IT IN BETWEEN THE WIPES
TO MAKE GOOD CONTACT AND SHE'S

359

00:21:40,770 --> 00:21:46,170

GOING TO COMPRESS IT FOR■-- IN
TEXAS WE SAY 30 MISSISSIPPI.

360

00:21:46,170 --> 00:21:49,600
LIGHTLY DOING IT BECAUSE YOU
WANT TO MAKE SURE IT MAKES GOOD

361
00:21:49,600 --> 00:21:51,610
CONTACT.

362
00:21:51,610 --> 00:21:54,159
THEN IT SHOULD BE GOOD TO EAT.

363
00:21:54,159 --> 00:21:57,230
WHEN WE DID THE ANALYSIS, THE
PLANTS THAT WE LOOKED AT AND

364
00:21:57,230 --> 00:22:00,470
TESTED CAME BACK AS CLEAN IF NOT
CLEANER THAN THOSE THAT YOU

365
00:22:00,470 --> 00:22:02,700
WOULD BUY IN A GROCERY STORE.

366
00:22:02,700 --> 00:22:05,950
THIS IS REALLY JUST A
PRECAUTIONARY STEP THAT WE DO,

367
00:22:05,950 --> 00:22:07,580
JUST LIKE YOU DO AT HOME.

368
00:22:07,580 --> 00:22:10,610
YOU WASH YOUR PLANTS BEFORE YOU
EAT THEM TYPICALLY.

369
00:22:10,610 --> 00:22:13,159
MOST OF YOU PROBABLY DO.

370
00:22:13,159 --> 00:22:19,460
THAT'S WHAT WE'RE DOING, AND
THEN WE DO HAVE SOME OIL, SOME

371

00:22:19,460 --> 00:22:24,169
EXTRA VIRGIN OLIVE OIL, BALSAMIC
VINEGAR, AND WE'RE GOING TO

372

00:22:24,169 --> 00:22:29,799
TASTE THE FRUITS OF OUR VEGGIE
TEAM'S LABOR HERE SOON.

373

00:22:29,799 --> 00:22:33,230
AND IN ADDITION TO THAT, WE'RE
GOING TO TEST OUT THE VEGGIE 03

374

00:22:33,230 --> 00:22:36,120
CROP AND WE'LL SEE MAYBE A
COMPARATIVE DIFFERENCE.

375

00:22:36,120 --> 00:22:38,779
I THINK THE CREW■-- THIS IS MY
PERSONAL OPINION BECAUSE I'VE

376

00:22:38,779 --> 00:22:41,659
TRIED BOTH■-- I THINK THEY'RE
GOING TO LIKE THE CABBAGE EVEN

377

00:22:41,659 --> 00:22:45,850
MORE.

378

00:22:45,850 --> 00:22:47,849
I'LL LET YOU MAKE YOUR OWN
JUDGMENT.

379

00:22:47,849 --> 00:22:49,739
>> ARE WE GOING TO GET A BITE OF
BOTH?

380

00:22:49,739 --> 00:22:51,580
>> YOU ARE GOING TO GET A BITE
OF BOTH.

381

00:22:51,580 --> 00:22:54,370

THEN WE'RE GOING TO CALL UP A
COUPLE OF OUR AUDIENCE MEMBERS

382

00:22:54,370 --> 00:22:56,539

AND LET THEM TASTE FOR
THEMSELVES.

383

00:22:56,539 --> 00:22:57,980

I HOPE YOU'RE HUNGRY.

384

00:22:57,980 --> 00:23:02,010

>> I WAS TALKING TO RONNY AND
SAID, I CAN'T IMAGINE HOW GOOD

385

00:23:02,010 --> 00:23:03,460

FRESH LETTUCE IS UP THERE.

386

00:23:03,460 --> 00:23:04,580

I CRAVE THAT.

387

00:23:04,580 --> 00:23:06,610

SOMETIMES YOU JUST REALLY WANT
SOMETHING.

388

00:23:06,610 --> 00:23:10,570

HE SAID THAT HE'LL BE REALLY
IMPRESSED WHEN THEY START

389

00:23:10,570 --> 00:23:16,879

GRILLING STEAKS UP THERE.

390

00:23:16,879 --> 00:23:22,520

>> IF YOU WANT TO SQUIRT A
LITTLE OIL AND VINEGAR■-- THIS

391

00:23:22,520 --> 00:23:25,200

IS MY FINE COMPLIMENTS FROM
HOME.

392

00:23:25,200 --> 00:23:27,509
I GOT YOUNG KIDS, SO THIS IS
WHAT WE USE.

393
00:23:27,509 --> 00:23:29,110
>> I DO HAVE A QUESTION.

394
00:23:29,110 --> 00:23:34,920
WAS THERE ANY DIFFERENCE BETWEEN
THE LETTUCE GROWN UP THERE AND

395
00:23:34,920 --> 00:23:38,329
THE LETTUCE GROWN ON THE GROUND?

396
00:23:38,329 --> 00:23:43,260
>> FROM A FOOD SAFETY
STANDPOINT, EVERYTHING WAS GOOD.

397
00:23:43,260 --> 00:23:47,090
OUR TEAM HERE ACTUALLY DID A
MINERAL COMPOSITION.

398
00:23:47,090 --> 00:23:51,049
THEY RAN ANTIOXIDANT ACTIVITY.

399
00:23:51,049 --> 00:23:59,070
WHAT MAKES IT RED IS ANTHOCYANIN
WHICH IS AN ANTIOXIDANT.

400
00:23:59,070 --> 00:24:01,710
EVERYTHING WAS PRETTY MUCH THE
SAME.

401
00:24:01,710 --> 00:24:03,429
WE HAD THREE PLANTS LAST YEAR.

402
00:24:03,429 --> 00:24:05,539
WE HAD FIVE GROUND PLANTS.

403

00:24:05,539 --> 00:24:08,409
FOR THE NUMBER, IT WAS HARD TO
KNOW.

404
00:24:08,409 --> 00:24:09,480
GO AHEAD AND DIG IN.

405
00:24:09,480 --> 00:24:12,620
THIS IS THE ONE TIME YOU DON'T
NEED PERMISSION.

406
00:24:12,620 --> 00:24:13,620
GIVE IT A TRY.

407
00:24:13,620 --> 00:24:15,090
>> YOU'RE NOT GOING TO HAVE ANY
OIL?

408
00:24:15,090 --> 00:24:19,509
>> I'M GOING TO TRY IT BOTH
BEFORE AND AFTER.

409
00:24:19,509 --> 00:24:22,779
>> BALSAMIC VINEGAR, YUM.

410
00:24:22,779 --> 00:24:33,309
>> THEY MADE A VERY BIG POINT OF
TALKING ABOUT THE BALSAMIC

411
00:24:33,309 --> 00:24:35,789
VINEGAR AND THE OLIVE OIL.

412
00:24:35,789 --> 00:24:36,789
VERY CUTE.

413
00:24:36,789 --> 00:24:39,240
>> VERY DIFFERENT, VERY
DIFFERENT.

414

00:24:39,240 --> 00:24:40,240

DELICIOUS.

415

00:24:40,240 --> 00:24:44,829

>> COME ON UP AND GRAB SOME
PRODUCE.

416

00:24:44,829 --> 00:24:53,330

>> THIS IS WAY BETTER THAN WHAT
I WOULD GROW IN MY GARDEN.

417

00:24:53,330 --> 00:24:58,340

>> PART OF OUR VEGGIE TEAM, MARY
ACTUALLY IS A MICROBIOLOGIST AND

418

00:24:58,340 --> 00:25:00,040

MICHELLE IS A CHEMIST.

419

00:25:00,040 --> 00:25:04,220

SO WHEN I SAY THE VEGGIE TEAM
DID AN ANALYSIS, HERE'S PART OF

420

00:25:04,220 --> 00:25:06,120

THE VEGGIE TEAM THAT DID IT, SO
THANK YOU.

421

00:25:06,120 --> 00:25:11,179

HOW ABOUT EVERYBODY THAT'S ON
VEGGIE AND WORKED VEGGIE, RAISE

422

00:25:11,179 --> 00:25:13,409

THEIR HAND.

423

00:25:13,409 --> 00:25:16,759

LOOK AT THAT.

424

00:25:16,759 --> 00:25:22,890

[■APPLAUSE■]

>> GIOIA, WHEN YOU GET A MOMENT,

425

00:25:22,890 --> 00:25:23,890

PAPER TOWELS?

426

00:25:23,890 --> 00:25:25,710

>> THANK YOU, YOU ALL DID GREAT.

427

00:25:25,710 --> 00:25:26,980

TASTES GOOD.

428

00:25:26,980 --> 00:25:34,139

>> WHY DID WE PICK THE LETTUCE
THAT WE PICKED?

429

00:25:34,139 --> 00:25:38,019

>> I MENTIONED THAT WE'RE
STANDING ON A STRONG FOUNDATION.

430

00:25:38,019 --> 00:25:42,330

SO THAT WAS ACTUALLY TESTED FOR
A NUMBER OF YEARS HERE AT

431

00:25:42,330 --> 00:25:47,560

KENNEDY SPACE CENTER FOR ITS
PRODUCTIVITY.

432

00:25:47,560 --> 00:25:51,029

IT'S A VERY PRODUCTIVE SALAD
CROP.

433

00:25:51,029 --> 00:25:52,029

IT GROWS VERY WELL.

434

00:25:52,029 --> 00:25:54,659

IT HAS VERY RELIABLE
GERMINATION.

435

00:25:54,659 --> 00:25:56,020

IT'S VERY ATTRACTIVE.

436

00:25:56,020 --> 00:26:00,470

IT HAS HIGH LEVELS OF
ANTIOXIDANTS WHICH MOST RED

437

00:26:00,470 --> 00:26:01,600

VEGETABLES DO.

438

00:26:01,600 --> 00:26:07,129

IT COULD BE A POTENTIAL COUNTER
MEASURE AGAINST SPACE RADIATION

439

00:26:07,129 --> 00:26:08,590

DAMAGE.

440

00:26:08,590 --> 00:26:13,690

IT ALSO, AS A LETTUCE, HAS VERY
LOW NATURAL MICROBIAL LEVELS, SO

441

00:26:13,690 --> 00:26:18,009

A LOT OF BACTERIA DO NOT GROW ON
THE LEAVES.

442

00:26:18,009 --> 00:26:23,929

AND IT TASTES PRETTY GOOD, TOO.

443

00:26:23,929 --> 00:26:27,250

>> SO YOU'VE TRIED IT.

444

00:26:27,250 --> 00:26:30,220

LISA, WHICH ONE DID YOU LIKE
BETTER?

445

00:26:30,220 --> 00:26:31,220

JUST CURIOUS.

446

00:26:31,220 --> 00:26:34,659

>> I THINK I LIKE THE CABBAGE
BETTER BUT THEY'RE BOTH REALLY

447
00:26:34,659 --> 00:26:35,659
GOOD.

448
00:26:35,659 --> 00:26:36,659
>> RONNY?

449
00:26:36,659 --> 00:26:37,659
>> CABBAGE.

450
00:26:37,659 --> 00:26:38,659
>> JANET?

451
00:26:38,659 --> 00:26:41,669
>> I LIKED BOTH BUT I'M LEANING
TOWARDS THE CABBAGE.

452
00:26:41,669 --> 00:26:43,379
>> I THINK THIS IS REALLY
TELLING.

453
00:26:43,379 --> 00:26:46,610
THE CABBAGE■-- AND I'LL LET
GIOIA, AS SOON AS SHE GETS A

454
00:26:46,610 --> 00:26:51,580
CHANCE TO STOP SERVING US ALL,
TELL THE STORY.

455
00:26:51,580 --> 00:26:54,090
PART OF THE HUMAN RESEARCH
PROGRAM, THE TEAM HERE AT

456
00:26:54,090 --> 00:26:55,690
KENNEDY SPACE CENTER, DR.

457
00:26:55,690 --> 00:26:57,799
RAY
WHEELER AND GIOIA AND MICHELLE

458

00:26:57,799 --> 00:27:02,210

AND MARY AND A NUMBER OF OTHERS
HAVE STUDIED A NUMBER OF THESE

459

00:27:02,210 --> 00:27:07,519

LEAFY GREENS, AND THE CABBAGE
SCORED THE HIGHEST FOR ITS

460

00:27:07,519 --> 00:27:08,519

FLAVOR.

461

00:27:08,519 --> 00:27:12,240

SO THAT IS ONE OF THE DECIDING
FACTORS WHY IT'S A PRIMARY PART

462

00:27:12,240 --> 00:27:14,820

OF VEGGIE 03 IS WE WANT THE
ASTRONAUTS TO TASTE THE MOST

463

00:27:14,820 --> 00:27:16,129

FLAVORFUL LEAFY GREEN.

464

00:27:16,129 --> 00:27:19,759

>> NUTRITIONALLY ARE THEY PRETTY
CLOSE TO THE VALUES?

465

00:27:19,759 --> 00:27:21,749

>> I WOULD DEFER TO THE DOCTOR
ON THAT.

466

00:27:21,749 --> 00:27:23,220

>> I'M GOING TO GET SOMETHING TO
EAT.

467

00:27:23,220 --> 00:27:30,890

NUTRITIONALLY, THE CABBAGE DID
NOT SCORE AS HIGHLY AS SOME OF

468

00:27:30,890 --> 00:27:35,749

THE OTHER CROPS, BUT IT HAD THE
HIGHEST RATINGS FROM A

469

00:27:35,749 --> 00:27:47,259

HORTICULTURAL POINT OF VIEW, SO
IT WAS VERY EASY TO GROW, VERY

470

00:27:47,259 --> 00:27:49,139

VIGOROUS.

471

00:27:49,139 --> 00:27:51,080

SO IT WAS ACTUALLY A GREAT PLANT
TO GROW.

472

00:27:51,080 --> 00:27:54,879

IT SCORED VERY HIGHLY THERE, AND
FROM THE TASTE TEST, IT SCORED

473

00:27:54,879 --> 00:27:56,200

INCREDIBLY HIGHLY.

474

00:27:56,200 --> 00:28:01,309

SO WE GREW EIGHT DIFFERENT
VARIETIES OF LEAFY GREENS,

475

00:28:01,309 --> 00:28:04,559

INCLUDING OUTREACHES BUT WE HAD
OTHERS THAT WE WERE HOPING WOULD

476

00:28:04,559 --> 00:28:06,559

BE A GOOD CANDIDATE.

477

00:28:06,559 --> 00:28:10,470

WE HARVESTED A LARGE AMOUNT AND
SENT THEM REFRIGERATED TO

478

00:28:10,470 --> 00:28:13,639

JOHNSON SPACE CENTER WHERE THEY
HAVE THE ADVANCED FOOD

479

00:28:13,639 --> 00:28:17,450

TECHNOLOGY GROUP WHO ARE PART OF
OUR LARGER VEGGIE TEAM AND THE

480

00:28:17,450 --> 00:28:19,809

LAB.

481

00:28:19,809 --> 00:28:21,580

THAT'S WHERE THEY DO THE TASTE
TESTS.

482

00:28:21,580 --> 00:28:26,649

THEY DID A TASTE PANEL OF THE
TOP FOUR GROWING VEGETABLES THAT

483

00:28:26,649 --> 00:28:30,309

HAD THE HIGHEST NUTRITION AND
THE BEST GROWTH AND THE CHINESE

484

00:28:30,309 --> 00:28:33,549

CABBAGE SCORED MOST HIGHLY OF
ALL OF THOSE.

485

00:28:33,549 --> 00:28:39,600

WE WERE DELIGHTED AND THAT'S HOW
WE'VE SELECTED IT FOR THE NEXT

486

00:28:39,600 --> 00:28:40,600

FLIGHT.

487

00:28:40,600 --> 00:28:43,370

>> YOU ALSO SELECTED IT, SO I
THINK THAT'S PRETTY COOL.

488

00:28:43,370 --> 00:28:48,100

WHILE GIOIA GETS HER SNACK,
LET'S OFFER ANYONE IN THE

489

00:28:48,100 --> 00:28:49,100

AUDIENCE HAVE A QUESTION?

490

00:28:49,100 --> 00:28:50,850

DOWN IN FRONT, GENTLEMAN IN THE GREEN SHIRT.

491

00:28:50,850 --> 00:28:51,850

I THOUGHT IT WAS THE GENTLEMAN BEHIND HER.

492

00:28:51,850 --> 00:28:52,850

PLEASE, GO AHEAD.

493

00:28:52,850 --> 00:28:54,600

>> I AM MENTORING A 10-YEAR-OLD NASA GIRL FROM WISCONSIN WHO

494

00:28:54,600 --> 00:28:56,350

ALSO LOVES TO COOK.

495

00:28:56,350 --> 00:28:59,309

SO THIS QUESTION IS FOR HER.

496

00:28:59,309 --> 00:29:02,379

SHE KNOWS THAT YOU'RE NOT SUPPOSED TO CUT LETTUCE, YOU

497

00:29:02,379 --> 00:29:06,669

TEAR LETTUCE BECAUSE IT AFFECTS THE TASTE, AND SHE FELT THAT IT

498

00:29:06,669 --> 00:29:09,600

LOOKED LIKE THEY WERE DOING SURGERY ON THE LETTUCE, BETWEEN

499

00:29:09,600 --> 00:29:12,139

THE GLOVES AND THE SCISSORS AND EVERYTHING.

500

00:29:12,139 --> 00:29:17,139
SHE WANTED TO KNOW WHY THEY
DIDN'T TEAR INTO IT.

501
00:29:17,139 --> 00:29:21,009
>> I'M GOING TO DEFER TO GIOIA,
BUT PART OF THAT, TOO, IS

502
00:29:21,009 --> 00:29:23,700
BECAUSE WE DIDN'T WANT THEIR
HANDS■-- WE WANTED THEIR HANDS

503
00:29:23,700 --> 00:29:27,169
TO BE CLEAN WHEN THEY WERE
CUTTING THE LETTUCE.

504
00:29:27,169 --> 00:29:30,190
I'LL DEFER TO GIOIA FOR THE
CUTTING PART.

505
00:29:30,190 --> 00:29:35,240
>> ORIGINALLY WHEN WE DID THE
HARVEST LAST YEAR, WE BROUGHT

506
00:29:35,240 --> 00:29:37,440
THE PLANTS BACK FROZEN.

507
00:29:37,440 --> 00:29:44,840
SO ONE OF THE THINGS WE SENT WAS
A TOOL SET UP WHICH HAD SCISSORS

508
00:29:44,840 --> 00:29:54,210
AND FORCEPS BECAUSE WE WANTED TO
SEE WHAT WERE THE NATIVE

509
00:29:54,210 --> 00:29:57,649
MICROBIAL LEVELS ON THE PLANT
SURFACE.

510
00:29:57,649 --> 00:30:00,350

THE TOOLS WERE ALREADY THERE.

511

00:30:00,350 --> 00:30:03,720

WE JUST ADAPTED THIS HARVEST
PROCEDURE TO THAT.

512

00:30:03,720 --> 00:30:07,110

THEY WEREN'T REALLY ALLOWED TO
EAT THE ENTIRE PLANT THIS TIME.

513

00:30:07,110 --> 00:30:11,509

WE WANTED TO STILL BRING BACK
SOME OF THE PLANT FOR SCIENTIFIC

514

00:30:11,509 --> 00:30:13,649

EXPERIMENTATION.

515

00:30:13,649 --> 00:30:15,760

SO WE JUST HAD THEM REMOVE
SELECTED LEAVES.

516

00:30:15,760 --> 00:30:19,269

BUT I THINK PART OF THE REASON
ALSO IS BECAUSE KJELL IS A

517

00:30:19,269 --> 00:30:22,399

DOCTOR AND WE THOUGHT HE MIGHT
BE A LITTLE MORE COMFORTABLE

518

00:30:22,399 --> 00:30:24,480

DOING SURGERY.

519

00:30:24,480 --> 00:30:26,769

IT WAS MOSTLY JUST TO KEEP
THINGS CLEAN.

520

00:30:26,769 --> 00:30:30,570

THEY CLEANED THE TOOLS WITH THE
SAME PRODUCE SANITIZING WIPES

521
00:30:30,570 --> 00:30:33,450
BEFORE AND AFTER USE.

522
00:30:33,450 --> 00:30:35,109
GOOD QUESTION.

523
00:30:35,109 --> 00:30:38,299
>> I SEE A VEGGIE TEAM MEMBER
BACK THERE.

524
00:30:38,299 --> 00:30:39,789
CHUCK SPURN.

525
00:30:39,789 --> 00:30:44,799
>> I UNDERSTAND FROM LOOKING AT
THE PHOTOS THAT YOU PROVIDED

526
00:30:44,799 --> 00:30:48,240
EVERY DAY THAT THE PLANTS ON
ORBIT GREW ACTUALLY BETTER THAN

527
00:30:48,240 --> 00:30:49,590
THE PLANTS IN OUR GROUND
CONTROL.

528
00:30:49,590 --> 00:30:53,749
I WONDER IF THERE'S ANY THEORIES
AS TO WHY THAT IS IN THE VEGGIE

529
00:30:53,749 --> 00:30:55,189
SYSTEM.

530
00:30:55,189 --> 00:30:57,830
>> I HAVE A COUPLE THEORIES.

531
00:30:57,830 --> 00:31:02,340
IT WAS ACTUALLY A LOT OF FUN
LETTING THE CREW KNOW THAT THEY

532

00:31:02,340 --> 00:31:05,279

WERE WINNING.

533

00:31:05,279 --> 00:31:09,820

WHEN WE DID START INJECTING
WATER DIRECTLY INTO THE PILLOWS,

534

00:31:09,820 --> 00:31:13,779

WHEN THE LITTLE PLANT IN PLANT B
POPPED A LEAF OUT ON SUNDAY, IT

535

00:31:13,779 --> 00:31:15,100

WAS A BIG SURPRISE.

536

00:31:15,100 --> 00:31:19,490

I HAD GIVEN UP ON THAT PLANT
ACTUALLY.

537

00:31:19,490 --> 00:31:21,850

SO WE STARTED WATERING THAT
PILLOW AGAIN.

538

00:31:21,850 --> 00:31:26,879

THOSE PLANTS REALLY WERE AHEAD
OF OUR GROUND PLANTS AND I THINK

539

00:31:26,879 --> 00:31:31,980

PART OF THAT IS BECAUSE YOU HAVE
MORE EFFECTIVE WICKING OR

540

00:31:31,980 --> 00:31:34,690

MOISTURE WICKING IN SPACE
BECAUSE IT DOESN'T NEED TO FIGHT

541

00:31:34,690 --> 00:31:37,230

AGAINST GRAVITY.

542

00:31:37,230 --> 00:31:41,119

OUR GROUND PLANTS, IF WE PUT TOO

MUCH WATER INTO THE PLANT PILLOW

543

00:31:41,119 --> 00:31:44,500

FOR INSTANCE, IT WOULD DRIP
THROUGH ONE OF THE CORNERS.

544

00:31:44,500 --> 00:31:48,269

I BELIEVE I ONLY RECALL ONE
INSTANCE WHERE THEY ONLY ADDED A

545

00:31:48,269 --> 00:31:50,880

PARTICULAR AMOUNT OF WATER
BECAUSE IT STARTED COMING OUT

546

00:31:50,880 --> 00:31:53,090

ONE OF THE SEAMS.

547

00:31:53,090 --> 00:31:57,649

I THINK IT BASICALLY HAS TO DO
WITH PASSIVE WICKING AND THE

548

00:31:57,649 --> 00:31:59,190

LACK OF GRAVITY.

549

00:31:59,190 --> 00:32:02,719

GIOIA, DO YOU HAVE ANYTHING?

550

00:32:02,719 --> 00:32:06,960

>> I WOULD AGREE, WE GREW OUR
GROUND CONTROL HERES IN

551

00:32:06,960 --> 00:32:10,470

CONTROLLED ENVIRONMENT CHAMBERS
THAT WERE SET TO MIMIC THE SPACE

552

00:32:10,470 --> 00:32:14,499

STATION ENVIRONMENT FOR
TEMPERATURE, RELATIVE HUMIDITY

553

00:32:14,499 --> 00:32:16,700
AND CARBON DIOXIDE.

554
00:32:16,700 --> 00:32:22,580
SO WE TRIED TO ELIMINATE AS MANY
VARIABLES AS WE CAN.

555
00:32:22,580 --> 00:32:27,240
WE USED EXACTLY THE SAME FLIGHT
HARDWARE FOR THE OPERATIONS.

556
00:32:27,240 --> 00:32:32,769
SO GRAVITY HAS A LOT OF
DIFFERENT IMPACTS ON THINGS, BUT

557
00:32:32,769 --> 00:32:37,749
FLUIDS AND GAS MOVEMENTS ARE
PROBABLY ONE OF THE MAIN ONES.

558
00:32:37,749 --> 00:32:41,990
I THINK WATERING YOUR PLANTS IN
SPACE AND WATERING THEM THE SAME

559
00:32:41,990 --> 00:32:46,370
ON THE GROUND IS ONE OF THE
BIGGEST CHALLENGES BECAUSE THE

560
00:32:46,370 --> 00:32:49,320
FLUIDS JUST BEHAVE SO VERY
DIFFERENTLY.

561
00:32:49,320 --> 00:32:56,669
I SORT OF LIKEN WATERING PLANTS
IN MICROGRAVITY TO BEING ON THAT

562
00:32:56,669 --> 00:33:00,389
KNIFE EDGE BETWEEN FLOODING AND
DROUGHT.

563
00:33:00,389 --> 00:33:03,330

YOU'RE ALWAYS TRYING TO FIND
THAT HAPPY MEDIUM.

564

00:33:03,330 --> 00:33:05,519

I THINK THEY DID REALLY WELL UP
THERE.

565

00:33:05,519 --> 00:33:08,629

THE ASTRONAUTS TOOK REALLY GOOD
CARE OF THEM.

566

00:33:08,629 --> 00:33:15,210

DOWN HERE, WE AGAIN HAD GRAVITY
WORKING AGAINST US SO, YEAH, I

567

00:33:15,210 --> 00:33:17,909

THINK IT'S PROBABLY JUST WATER.

568

00:33:17,909 --> 00:33:21,320

>> I THINK THE ASTRONAUTS WON,
FOR SURE.

569

00:33:21,320 --> 00:33:25,700

>> I'D LIKE TO KNOW IF THE
PLANTS THAT YOU HAVE BOTH HERE

570

00:33:25,700 --> 00:33:28,720

AND UP AT THE STATION GROW AT
THE SAME SPEED THAT THE

571

00:33:28,720 --> 00:33:30,740

TRADITIONAL PLANTS GROW.

572

00:33:30,740 --> 00:33:34,120

CAN YOU SPEED UP THE PROCESS?

573

00:33:34,120 --> 00:33:36,530

>> WHEN WE GROW PLANTS IN
CONTROLLED ENVIRONMENTS LIKE

574

00:33:36,530 --> 00:33:41,350

VEGGIE, WE ARE SPEEDING UP QUITE
A LOT OVER PLANTS GROWING

575

00:33:41,350 --> 00:33:45,220

OUTSIDE BECAUSE WE'VE ELIMINATED
A LOT OF THE STRESS.

576

00:33:45,220 --> 00:33:48,049

STRESS IS REALLY WHAT SLOWS
PLANTS DOWN.

577

00:33:48,049 --> 00:33:52,110

WE DID STILL HAVE SOME WATER
STRESS DURING THIS EXPERIMENT

578

00:33:52,110 --> 00:33:54,850

WHERE THEY DIDN'T GET QUITE
ENOUGH WATER AND WE HAD THE CREW

579

00:33:54,850 --> 00:33:58,830

MANUALLY INTERVENE, SO THAT DID
SLOW THEM DOWN FOR A COUPLE OF

580

00:33:58,830 --> 00:34:02,870

DAYS BUT THAT WAS PRETTY SIMILAR
BETWEEN GROUND AND FLIGHT.

581

00:34:02,870 --> 00:34:05,860

SO WE'RE STILL WORKING ON
GETTING THAT HAPPY MEDIUM WITH

582

00:34:05,860 --> 00:34:07,230

THE WATERING.

583

00:34:07,230 --> 00:34:11,230

AS FAR AS WE CAN TELL, THE
GROWTH RATE WAS PRETTY MUCH THE

584

00:34:11,230 --> 00:34:12,790
SAME.

585
00:34:12,790 --> 00:34:15,810
>> THIS QUESTION IS FOR DR.

586
00:34:15,810 --> 00:34:16,810
MASSA.

587
00:34:16,810 --> 00:34:19,260
I WOULDN'T HAVE THOUGHT THERE
WOULD BE CAREERS AT NASA IN

588
00:34:19,260 --> 00:34:20,260
GROWING PLANTS.

589
00:34:20,260 --> 00:34:22,650
CAN YOU TALK A LITTLE ABOUT THE
IMPORTANCE OF THIS AND WHY

590
00:34:22,650 --> 00:34:25,909
STUDENTS SHOULD CONSIDER COMING
TO NASA?

591
00:34:25,909 --> 00:34:28,850
>> GOOD QUESTION.

592
00:34:28,850 --> 00:34:32,990
THE MORE I GET EXPOSED TO WHAT
GOES ON AT NASA, THE MORE

593
00:34:32,990 --> 00:34:34,429
CAREERS I SEE.

594
00:34:34,429 --> 00:34:38,510
THERE'S SO MANY THINGS THAT ONE
CAN DO INVOLVED WITH SPACE

595
00:34:38,510 --> 00:34:42,170

FLIGHT, ALMOST ANYTHING THAT YOU
CAN THINK OF.

596

00:34:42,170 --> 00:34:46,960

THE PLANT SCIENCE FOR ME, I WAS
INSPIRED BY AN EDUCATOR WHEN I

597

00:34:46,960 --> 00:34:49,800

WAS YOUNG WHO WAS INVITED HERE
AND LEARNED ABOUT THE PLANT

598

00:34:49,800 --> 00:34:54,220

RESEARCH AT KENNEDY AND I JUST
THOUGHT THE WHOLE THING WAS

599

00:34:54,220 --> 00:34:56,990

FASCINATING AND DECIDED THAT I
WANTED TO DO THAT.

600

00:34:56,990 --> 00:35:02,280

IT TOOK ME A WHILE, BUT I GOT
HERE EVENTUALLY.

601

00:35:02,280 --> 00:35:06,620

I'M VERY FORTUNATE TO BE DOING
WHAT I DO BECAUSE I THINK IT'S

602

00:35:06,620 --> 00:35:08,450

AWESOME.

603

00:35:08,450 --> 00:35:12,100

I THINK THERE ARE SO MANY
INTERESTING CAREERS THAT

604

00:35:12,100 --> 00:35:13,520

STUDENTS CAN DO.

605

00:35:13,520 --> 00:35:17,340

WHEN YOU PUT A SPACE SPIN ON
THINGS, IT JUST MAKES IT THAT

606

00:35:17,340 --> 00:35:18,340

MUCH COOLER.

607

00:35:18,340 --> 00:35:21,370

WE'RE ALL PART OF THIS
INCREDIBLE TEAM AND WE'RE ALL

608

00:35:21,370 --> 00:35:24,970

WORKING TOWARDS THE SAME GOALS.

609

00:35:24,970 --> 00:35:27,010

WE CAN'T DO IT ALONE.

610

00:35:27,010 --> 00:35:31,900

I THINK ANY CAREER THAT YOU
ENGAGE IN, IF YOU THINK ABOUT

611

00:35:31,900 --> 00:35:36,380

WHAT WOULD THAT BE LIKE IF I DID
IT WORKING FOR SPACE, IT JUST

612

00:35:36,380 --> 00:35:38,010

MAKES IT MUCH MORE INTERESTING,
IN MY OPINION.

613

00:35:38,010 --> 00:35:39,910

I'M A LITTLE BIASED.

614

00:35:39,910 --> 00:35:41,400

>> THANKS, GIOIA.

615

00:35:41,400 --> 00:35:44,250

WE HAVE ONE DOWN HERE?

616

00:35:44,250 --> 00:35:48,670

>> I WAS JUST WONDERING, NOW
THAT WE'VE GONE FROM PACKING A

617

00:35:48,670 --> 00:35:52,430

PICNIC BASKET FOR SPACE FLIGHT
TO ACTUALLY BEGINNING TO GROW

618

00:35:52,430 --> 00:35:56,440

ALONG THE WAY, ONE OF THE CROPS
I'M INTERESTED IN ARE HERBS AND

619

00:35:56,440 --> 00:36:02,380

SPICES BECAUSE THOSE ARE THE
ONES THAT CAN REALLY ADD FLAVOR

620

00:36:02,380 --> 00:36:05,900

TO THE CREW AND MIGHT BE OF
GREAT INTEREST TO THEM.

621

00:36:05,900 --> 00:36:09,730

>> IT'S DEFINITELY A REALLY
IMPORTANT AREA.

622

00:36:09,730 --> 00:36:12,960

THE RUSSIANS HAVE ALREADY DONE
SOME WORK WHERE THEY GROW ONIONS

623

00:36:12,960 --> 00:36:19,900

IN SPACE AND THE CREW MIXES THEM
WITH THE PACKAGED FOOD AND THAT

624

00:36:19,900 --> 00:36:22,890

SHOWS THAT THIS IS SOMETHING
THAT'S DESIRABLE.

625

00:36:22,890 --> 00:36:27,660

WITH THE FLUID SHIFT IN SPACE
FLIGHT WHERE EVERYTHING POOLS UP

626

00:36:27,660 --> 00:36:31,480

IN YOUR HEAD AND YOU GET THE
KIND OF PUFFY FACE, THE SENSE OF

627

00:36:31,480 --> 00:36:34,170

TASTE IS A LITTLE BIT MUTED.

628

00:36:34,170 --> 00:36:37,690

FROM ANECDOTAL EVIDENCE, THE
CREW REALLY WANTS THINGS LIKE

629

00:36:37,690 --> 00:36:42,500

HOT SAUCE AND SPICES BECAUSE
THEY CAN'T TASTE THINGS QUITE AS

630

00:36:42,500 --> 00:36:46,400

WELL WHICH IS WHY SOME OF THE
MORE STRONG FLAVORED VEGETABLES

631

00:36:46,400 --> 00:36:49,210

MIGHT BE A LOT BETTER FOR SPACE
AS WELL.

632

00:36:49,210 --> 00:36:52,700

BUT HERBS WOULD BE ANOTHER WAY
TO GET AT THAT.

633

00:36:52,700 --> 00:36:58,590

WE'VE DONE SOME TESTING WITH
ONIONS IN THE PAST, CHIVES, ALSO

634

00:36:58,590 --> 00:37:00,910

BASIL.

635

00:37:00,910 --> 00:37:03,510

MINT COULD EASILY BE GROWN.

636

00:37:03,510 --> 00:37:04,510

WE LOOKED AT OREGANO.

637

00:37:04,510 --> 00:37:06,300

THAT WAS A LITTLE TRICKIER.

638

00:37:06,300 --> 00:37:10,910

SOME OF THE WOODIER HERBS LIKE
ROSEMARY, THEY WOULD TAKE A

639

00:37:10,910 --> 00:37:13,790

WHILE BUT THERE'S NO REASON THAT
THEY COULDN'T BE GROWN IF WE HAD

640

00:37:13,790 --> 00:37:16,280

A DEDICATED SPACE STATION HERB
GARDEN.

641

00:37:16,280 --> 00:37:19,360

>> I'D LIKE TO TAKE THAT ONE
QUESTION.

642

00:37:19,360 --> 00:37:20,490

WHAT HERBS WOULD YOU GROW?

643

00:37:20,490 --> 00:37:21,490

>> GARLIC.

644

00:37:21,490 --> 00:37:23,590

>> HOW ABOUT YOU, RONNY?

645

00:37:23,590 --> 00:37:26,980

WHAT WOULD YOU GROW ON THE WAY
TO MARS?

646

00:37:26,980 --> 00:37:29,070

>> BEEF.

647

00:37:29,070 --> 00:37:31,619

>> I WAS THINKING OF A CUPCAKE
PLANT MYSELF.

648

00:37:31,619 --> 00:37:32,770

>> TOMATOES.

649

00:37:32,770 --> 00:37:35,400

>> HOW ABOUT YOU, LISA?

650

00:37:35,400 --> 00:37:38,900

>> I WOULD PROBABLY WANT SOME
FRUIT LIKE BLUEBERRIES OR

651

00:37:38,900 --> 00:37:41,100

STRAWBERRIES, SOMETHING LIKE
THAT.

652

00:37:41,100 --> 00:37:45,560

>> ONE OF THE FRUIT THAT OUR
TEAM IS LOOKING AT, GIOIA, YOU

653

00:37:45,560 --> 00:37:47,700

WANT TO LET THE CAT OUT OF THE
BAG?

654

00:37:47,700 --> 00:37:49,720

>> WE HAVE DONE WORK WITH
STRAWBERRIES IN THE PAST AND

655

00:37:49,720 --> 00:37:53,360

THAT'S A GOOD CANDIDATE BUT WE
ARE CURRENTLY WORKING ON DWARF

656

00:37:53,360 --> 00:37:56,490

FRUIT TREES, SPECIFICALLY DWARF
PLUMS.

657

00:37:56,490 --> 00:37:59,620

WE HAVE A NUMBER OF DWARF PLUMB
LINES GROWING.

658

00:37:59,620 --> 00:38:01,540

THEY'RE AMAZING.

659

00:38:01,540 --> 00:38:05,600

THEY START FROM A SEED TO
PRODUCING ANOTHER FRUIT WITHIN

660

00:38:05,600 --> 00:38:07,470
ABOUT A YEAR.

661

00:38:07,470 --> 00:38:10,190
IN TERMS OF FRUIT TREES THAT'S A
VERY FAST LIFE CYCLE.

662

00:38:10,190 --> 00:38:15,920
THEY STAY VERY LOW, CREEPING,
ALMOST A VINY TYPE PLUMB.

663

00:38:15,920 --> 00:38:19,580
WE'RE HOPING SOMETHING LIKE THAT
CAN GO UP IN VEGGIE SOME TIME

664

00:38:19,580 --> 00:38:20,580
SOON.

665

00:38:20,580 --> 00:38:23,330
>> I'LL ADD, INTERESTING TO ME
THAT I'VE LEARNED ABOUT THE

666

00:38:23,330 --> 00:38:27,300
PLUMS IS IT ACTUALLY HELPS WITH
BONE REMODELLING WHICH MEANS IT

667

00:38:27,300 --> 00:38:32,410
HELPS BUILD BONE COULD BE
BENEFICIAL FOR FOLKS STEPPING

668

00:38:32,410 --> 00:38:35,110
OUT INTO THE SOLAR SYSTEM.

669

00:38:35,110 --> 00:38:36,150
ANY OTHER QUESTIONS?

670

00:38:36,150 --> 00:38:37,590
RIGHT UPFRONT HERE.

671
00:38:37,590 --> 00:38:38,590
DR.

672
00:38:38,590 --> 00:38:41,430
WANDA JONES, PLEASE.

673
00:38:41,430 --> 00:38:42,430
>> HI.

674
00:38:42,430 --> 00:38:43,740
MY QUESTION IS FOR DR.

675
00:38:43,740 --> 00:38:44,740
MASSA.

676
00:38:44,740 --> 00:38:48,890
VEGGIE, WHAT ARE SOME OF THE
APPLICATIONS THAT VEGGIE HAS

677
00:38:48,890 --> 00:38:52,320
HERE ON EARTH AND SOME OF THE
BENEFITS TO MANKIND HERE?

678
00:38:52,320 --> 00:38:54,500
>> THAT'S A GREAT QUESTION.

679
00:38:54,500 --> 00:39:00,930
AS RONNY ALLUDED TO, URBAN
AGRICULTURE IS GETTING MORE

680
00:39:00,930 --> 00:39:03,130
IMPORTANT.

681
00:39:03,130 --> 00:39:05,040
THERE ARE A LOT OF PEOPLE ON
THIS PLANET.

682

00:39:05,040 --> 00:39:08,230

WE'RE GROWING ALL THE TIME AND A
LOT OF PEOPLE LIVE IN URBAN

683

00:39:08,230 --> 00:39:09,680

AREAS.

684

00:39:09,680 --> 00:39:12,310

THERE'S A LOT OF WORK GOING ON
IN THE CONTROLLED ENVIRONMENT

685

00:39:12,310 --> 00:39:18,410

AGRICULTURE FIELD ON OPTIMIZING
INDOOR PLANT PRODUCTION AND KIND

686

00:39:18,410 --> 00:39:21,950

OF SEEING HOW MANY PLANTS YOU
CAN GROW IN A GIVEN VOLUME WHICH

687

00:39:21,950 --> 00:39:24,140

IS EXACTLY WHAT WE WANT TO DO
FOR SPACE.

688

00:39:24,140 --> 00:39:28,970

WE STOP THINKING ABOUT AREA AND
WE START THINKING ABOUT VOLUME.

689

00:39:28,970 --> 00:39:31,690

WE'RE LEARNING A LOT OF LESSONS
WITH VEGGIE AND WE'RE GOING TO

690

00:39:31,690 --> 00:39:34,380

LEARN A LOT MORE WITH THE
ADVANCED PLANT HABITAT ABOUT

691

00:39:34,380 --> 00:39:37,690

FUNDAMENTAL PLANT PHYSIOLOGY.

692

00:39:37,690 --> 00:39:41,430
THERE'S BEEN DECADES OF RESEARCH
HERE AT KENNEDY SPACE CENTER

693
00:39:41,430 --> 00:39:44,840
LOOKING AT LIGHTING SPECIFICALLY
FOR PLANTS.

694
00:39:44,840 --> 00:39:48,080
THAT'S WHY VEGGIE USES THE LIGHT
EMITTING DIODES THAT YOU SEE.

695
00:39:48,080 --> 00:39:50,430
IT CASTS A PURPLE LIGHT.

696
00:39:50,430 --> 00:39:55,170
THIS IS BECAUSE WE'RE
SPECIFICALLY TUNING THOSE LIGHTS

697
00:39:55,170 --> 00:39:59,160
TO THE FREQUENCIES THAT PLANTS
NEED AND THE INTENSITIES THAT

698
00:39:59,160 --> 00:40:01,780
PLANTS NEED.

699
00:40:01,780 --> 00:40:06,070
SUNLIGHT MIGHT BE FREE, BUT IT'S
ACTUALLY NOT ALL THAT FREE WHEN

700
00:40:06,070 --> 00:40:09,940
YOU HAVE TO THINK OF THE COST OF
COOLING AND OTHER ASPECTS OF

701
00:40:09,940 --> 00:40:11,370
USING SUNLIGHT.

702
00:40:11,370 --> 00:40:16,000
IF WE CAN USE ELECTRIC LIGHTING
TO CUSTOM LIGHT OUR PLANTS, WE

703

00:40:16,000 --> 00:40:19,240

CAN INCREASE THE PRODUCTIVITY,
AND SO A LOT OF THIS RESEARCH

704

00:40:19,240 --> 00:40:24,170

HAS TRANSLATED INTO COMMERCIAL
HORTICULTURAL AREAS.

705

00:40:24,170 --> 00:40:28,060

IN TERMS OF THE MEDIA, THE
SUBSTRATE, THE WATERING SYSTEM,

706

00:40:28,060 --> 00:40:30,620

WE'RE LEARNING A LOT OF LESSONS
FROM THAT AS WELL.

707

00:40:30,620 --> 00:40:34,610

AND JUST THE TYPES OF CROPS,
THAT'S A BIG ONE.

708

00:40:34,610 --> 00:40:36,700

IF YOU'RE GROWING THINGS OUT IN
YOUR GARDEN, YOU DON'T HAVE TO

709

00:40:36,700 --> 00:40:39,530

WORRY ABOUT HOW BIG THE PLANTS
ARE, BUT IF YOU'RE DOING THIS IN

710

00:40:39,530 --> 00:40:44,450

A MORE URBAN SETTING OR INDOOR
GARDENING, YOU WANT SMALL CROPS

711

00:40:44,450 --> 00:40:47,890

THAT HAVE WHAT WE CALL A HIGH
HARVEST INDEX WHICH IS THE

712

00:40:47,890 --> 00:40:52,110

PROPORTION OF EDIBLE TO THE
TOTAL YIELD.

713

00:40:52,110 --> 00:40:55,610

THE STEMS AND LEAVES AREN'T
SOMETHING YOU CAN EAT SO YOU

714

00:40:55,610 --> 00:40:59,040

HAVE TO FIGURE OUT A WAY TO
RECYCLE THAT TO RECAPTURE THOSE

715

00:40:59,040 --> 00:41:07,120

NUTRIENTS WHICH IS SOMETHING OUR
TEAM HAS WORKED ON AS WELL.

716

00:41:07,120 --> 00:41:10,630

ALL OF THESE LESSONS ARE GOING
TO TRANSLATE TO MORE SUSTAINABLE

717

00:41:10,630 --> 00:41:14,420

FOOD PRODUCTION FOR THE FUTURE.

718

00:41:14,420 --> 00:41:15,430

>> THANKS.

719

00:41:15,430 --> 00:41:17,940

WE HAVE ONE MORE QUESTION HERE.

720

00:41:17,940 --> 00:41:19,360

>> HI.

721

00:41:19,360 --> 00:41:25,000

I WONDERED, BASICALLY ASTRONAUT
SCOTT KELLY HAD SAID WHEN HE

722

00:41:25,000 --> 00:41:28,940

TASTED THE LETTUCE THAT IT
TASTED LIKE ARUGULA.

723

00:41:28,940 --> 00:41:32,590

I KNOW IT WASN'T ARUGULA, SO I

JUST WONDERED WHAT WAS THE

724

00:41:32,590 --> 00:41:37,450

DIFFERENCE IN THE TASTE AND THEN
HOW DOES THE WATER GET ABSORBED

725

00:41:37,450 --> 00:41:38,450

IN THE SOIL?

726

00:41:38,450 --> 00:41:39,810

HOW DOES IT GROW?

727

00:41:39,810 --> 00:41:41,589

WHAT MAKES IT STICK?

728

00:41:41,589 --> 00:41:46,590

>> THE ARUGULA COMMENT WAS
REALLY INTERESTING BECAUSE WE

729

00:41:46,590 --> 00:41:49,670

WERE WONDERING IF THE LETTUCE
WOULD BE MORE BITTER.

730

00:41:49,670 --> 00:41:52,320

IF YOU'VE GROWN LETTUCE IN YOUR
GARDEN HERE, WHEN IT GETS A

731

00:41:52,320 --> 00:41:55,800

LITTLE OLD OR WHEN IT'S UNDER
SOME STRESS, IT WILL GET A

732

00:41:55,800 --> 00:41:56,800

LITTLE MORE BITTER.

733

00:41:56,800 --> 00:42:00,510

LETTUCE IS ACTUALLY A LATEX
BEARING PLANT AND IT CAN BUILD

734

00:42:00,510 --> 00:42:04,300

UP A LITTLE MORE OF THAT LATEX
AND THAT GIVES IT A BITTER

735

00:42:04,300 --> 00:42:05,300
FLAVOR.

736

00:42:05,300 --> 00:42:07,770
I THINK THE ARUGULA COULD HAVE
BEEN BECAUSE THERE WAS SOME

737

00:42:07,770 --> 00:42:11,260
STRESS IN MICROGRAVITY AND THEN
THERE WAS ALSO THE WATER STRESS

738

00:42:11,260 --> 00:42:15,090
THAT WE MENTIONED WHICH THE
PLANTS KIND OF GREW OUT OF, BUT

739

00:42:15,090 --> 00:42:18,640
THAT COULD LEAVE A RESIDUAL
FLAVOR.

740

00:42:18,640 --> 00:42:21,250
BECAUSE OF THAT FLUID SHIFT, I
THINK THEY PROBABLY REALLY

741

00:42:21,250 --> 00:42:23,930
ENJOYED THAT FLAVOR BECAUSE IT'S
A STRONGER FLAVOR.

742

00:42:23,930 --> 00:42:28,840
THE CABBAGE IS ACTUALLY MORE OF
A BITTER GREEN THAN LETTUCE, AND

743

00:42:28,840 --> 00:42:33,100
EVERYONE SEEMS TO REALLY ENJOY
THAT FLAVOR AS WELL.

744

00:42:33,100 --> 00:42:38,030
IN TERMS OF HOW THE PLANTS

ACTUALLY GROW, WE USE A BAKED

745

00:42:38,030 --> 00:42:39,030

CERAMIC.

746

00:42:39,030 --> 00:42:40,920

I'M GOING TO PULL THIS GUY OUT.

747

00:42:40,920 --> 00:42:44,610

THIS IS WHAT WE CALL A PLANT
PILLOW.

748

00:42:44,610 --> 00:42:47,800

THERE ARE SORT OF SMALL
PARTICLES.

749

00:42:47,800 --> 00:42:50,060

IT ALMOST LOOKS LIKE KITTY
LITTER BUT IT'S NOT.

750

00:42:50,060 --> 00:42:52,120

IT'S A BAKED CLAY.

751

00:42:52,120 --> 00:42:55,790

THEN WE HAVE ALSO A CONTROLLED
RELEASE FERTILIZER IN THERE, A

752

00:42:55,790 --> 00:42:59,220

POLYMER-COATED FERTILIZER MIXED
WITH THIS CLAY.

753

00:42:59,220 --> 00:43:04,020

WE FILL UP THIS PLANT PILLOW
WITH THAT AND PUT SOME WICK IN

754

00:43:04,020 --> 00:43:10,750

TO ACT AS A CONDUITS TO WATER.

755

00:43:10,750 --> 00:43:14,680

YOU CAN SEE THAT THERE'S FABRIC
ON THE WATER SO THIS ALLOWS THE

756

00:43:14,680 --> 00:43:19,000

PLANT TO WICK UP FROM A
RESERVOIR THAT IT'S SITTING ON.

757

00:43:19,000 --> 00:43:21,400

WE HAVE THE ABILITY TO ADD WATER
DIRECTLY.

758

00:43:21,400 --> 00:43:25,230

THE ASTRONAUTS START BY
INITIALLY PRIMING THAT PILLOW.

759

00:43:25,230 --> 00:43:27,680

EVERYTHING IS SENT UP COMPLETELY
DRY.

760

00:43:27,680 --> 00:43:29,500

THE SEEDS ARE PLANTED DRY.

761

00:43:29,500 --> 00:43:32,661

THE PLANTS THAT WERE GROWN AND
HARVESTED YESTERDAY ON SPACE

762

00:43:32,661 --> 00:43:36,900

STATION, THEY'VE BEEN UP THERE
FOR A YEAR AND A HALF.

763

00:43:36,900 --> 00:43:39,740

WE PLANTED THOSE SEEDS A LONG
TIME AGO.

764

00:43:39,740 --> 00:43:41,530

I GUESS THEY HAD BEEN PLANTED
FOR A YEAR AND A HALF.

765

00:43:41,530 --> 00:43:44,930

THEY'VE BEEN UP THERE FOR A BIT

OVER A YEAR, AND THEY STILL WERE

766

00:43:44,930 --> 00:43:48,610

VIALE WHICH GOES TO SHOW THAT
SEEDS REALLY WILL STORE VERY

767

00:43:48,610 --> 00:43:51,020

WELL FOR LONG PERIODS OF TIME.

768

00:43:51,020 --> 00:43:54,370

WHEN THEY ADD WATER, THE SEEDS
START TO GERMINATE AND THE PLANT

769

00:43:54,370 --> 00:44:00,660

IS DRAWING WATER UP AND
TRANSPIRING IT THROUGH THE

770

00:44:00,660 --> 00:44:01,660

LEAVES.

771

00:44:01,660 --> 00:44:07,750

THAT WATER IS RECLAIMED ON SPACE
STATION AND RECYCLED AND REUSED.

772

00:44:07,750 --> 00:44:11,420

IT'S A NICE SYSTEM FOR CLEANING
YOUR WATER AS WELL.

773

00:44:11,420 --> 00:44:17,120

THEN THE PLANTS JUST GROW UNTIL
YOU HARVEST THEM.

774

00:44:17,120 --> 00:44:23,850

>> LOOKS LIKE WE HAVE A QUESTION
DOWN HERE.

775

00:44:23,850 --> 00:44:27,540

>> YOU MENTIONED YOU GREW
LETTUCE LAST YEAR SO THIS IS THE

776

00:44:27,540 --> 00:44:28,770

SECOND GROWOUT.

777

00:44:28,770 --> 00:44:32,610

HAVE YOU SEEN ANY DIFFERENCE
BETWEEN GROWOUTS AT THIS EARLY

778

00:44:32,610 --> 00:44:33,610

STAGE?

779

00:44:33,610 --> 00:44:39,770

AND THE SECOND QUESTION, DO WE
HAVE ANYTHING ELSE TO GROW?

780

00:44:39,770 --> 00:44:42,110

>> WE REALLY HAVEN'T SEEN TOO
MANY DIFFERENCES.

781

00:44:42,110 --> 00:44:45,670

I THINK THE GERMINATION AND
GROWTH RATE WERE VERY SIMILAR.

782

00:44:45,670 --> 00:44:51,610

WE SAW THE PLANTS GROW A LITTLE
BETTER THIS TIME THAN LAST TIME.

783

00:44:51,610 --> 00:44:54,930

WE DID HAVE TO HAVE THE CREW ADD
WATER DIRECTLY TO THOSE PLANT

784

00:44:54,930 --> 00:44:58,850

PILLOWS AT ABOUT THE SAME TIME
AS LAST TIME.

785

00:44:58,850 --> 00:45:03,550

WE HAD MORE PLANTS GROW THIS
TIME WHICH WAS GREAT.

786

00:45:03,550 --> 00:45:07,520

IN TERMS OF THE SEEDS BEING
STORED FOR SO LONG, I DON'T

787

00:45:07,520 --> 00:45:09,700

THINK THAT WAS AN ISSUE.

788

00:45:09,700 --> 00:45:13,970

WE MAY HAVE HAD A LITTLE BIT
LOWER GERMINATION, A COUPLE OF

789

00:45:13,970 --> 00:45:17,550

SEEDS■-- PILLOWS THAT ONLY HAD
ONE SEED COME OUT WHEN WE PUT

790

00:45:17,550 --> 00:45:21,610

TWO IN EACH ONE, BUT WE'LL HAVE
TO LOOK AT THAT.

791

00:45:21,610 --> 00:45:24,780

WE HAVE ONE ADDITIONAL SET OF
PLANT PILLOWS UP THERE.

792

00:45:24,780 --> 00:45:28,130

IF YOU SEE OUR LOGOS ON A LOT OF
OUR SHIRTS HERE, THERE ARE SOME

793

00:45:28,130 --> 00:45:30,960

FLOWERS ON THEM AND THOSE ARE
THE ZINNIAS.

794

00:45:30,960 --> 00:45:36,190

ORIGINALLY WE HAD SENT TWO SETS
OF LETTUCE AND A SET OF ZINNIAS.

795

00:45:36,190 --> 00:45:39,580

ZINNIAS ARE SMALL LITTLE
DAISY-LIKE PLANTS.

796

00:45:39,580 --> 00:45:42,890

WE TESTED THOSE BECAUSE WE

WEREN'T SURE IF THE CREW WOULD

797

00:45:42,890 --> 00:45:46,580

BE ABLE TO EAT THE PRODUCE RIGHT
AWAY AND WE WANTED THEM TO HAVE

798

00:45:46,580 --> 00:45:49,990

SOMETHING THEY COULD GROW AND
ENJOY WHILE THEY WERE WAITING

799

00:45:49,990 --> 00:45:53,840

FOR US TO GET THE DATA AND TO
GET ALL OF THE APPROVALS THAT WE

800

00:45:53,840 --> 00:45:57,260

NEEDED FOR THE CREW TO ACTUALLY
EAT WHAT THEY GREW.

801

00:45:57,260 --> 00:46:00,650

SO WE SENT THE ZINNIAS UP THERE
AND THEY'RE STILL THERE.

802

00:46:00,650 --> 00:46:03,830

WE'RE HOPING THAT NOW THAT
THEY'VE GOTTEN A TASTE FOR

803

00:46:03,830 --> 00:46:07,920

GROWING CROPS UP THERE THAT THE
CURRENT CREW WILL BE INTERESTED

804

00:46:07,920 --> 00:46:08,920

IN GROWING THOSE.

805

00:46:08,920 --> 00:46:12,760

THEN AGAIN, AS TRENT SAID, WE'LL
SEND SOME MORE PILLOWS UP ON THE

806

00:46:12,760 --> 00:46:15,880

NEXT SPACE-EX MISSION AS WELL
WITH THE CABBAGE AND MORE

807

00:46:15,880 --> 00:46:16,880

LETTUCE.

808

00:46:16,880 --> 00:46:19,700

>> I CAN ADD TO THAT A LITTLE
BIT.

809

00:46:19,700 --> 00:46:23,250

THE REASON WHY WE HAD A SECOND
CROP OF LETTUCE RATHER THAN THE

810

00:46:23,250 --> 00:46:24,680

ZINNIAS WAS CREW TIME.

811

00:46:24,680 --> 00:46:28,270

WE ARE VERY, VERY CHALLENGED
WITH CREW TIME.

812

00:46:28,270 --> 00:46:31,580

WHEN COMMERCIAL CREW GETS FLYING
AND WE HAVE THAT 7th CREW MEMBER

813

00:46:31,580 --> 00:46:35,800

ON SPACE STATION AND WE DOUBLE
THE RESEARCH TIME, HOPEFULLY

814

00:46:35,800 --> 00:46:39,520

WE'LL GET A LOT MORE RESEARCH
DONE AND AS A VEGGIE GUY OF

815

00:46:39,520 --> 00:46:41,600

COURSE I'M HOPING TO GET MORE
CROPS GROWN.

816

00:46:41,600 --> 00:46:44,430

I JUST WANTED TO MENTION THAT.

817

00:46:44,430 --> 00:46:45,760

BRIAN, PLEASE.

818

00:46:45,760 --> 00:46:47,090

>> QUICK QUESTION.

819

00:46:47,090 --> 00:46:53,270

IF YOU GET THE DREAM PAYLOAD OF
SOMETHING THAT MAKES STEAK, IS

820

00:46:53,270 --> 00:46:56,381

THERE A CHANCE OF GROWING A
POTATO OR SOMETHING WITH VEGGIE?

821

00:46:56,381 --> 00:46:59,850

IS THAT A POSSIBILITY?

822

00:46:59,850 --> 00:47:04,010

>> FOR THE BELOW GROUND CROPS
WE'LL NEED TO DESIGN SOMETHING A

823

00:47:04,010 --> 00:47:06,500

LITTLE DIFFERENT THERE THE
PILLOWS.

824

00:47:06,500 --> 00:47:10,950

WE CAN GROW A RADISH WHERE IT
POPS UP ABOVE THE TOP WHERE MOST

825

00:47:10,950 --> 00:47:16,400

OF THE ROOTS ARE GROWN BELOW
GROUND.

826

00:47:16,400 --> 00:47:19,200

WE WOULD NEED TO DESIGN A
SLIGHTLY DIFFERENT ROOTING

827

00:47:19,200 --> 00:47:22,570

SYSTEM BECAUSE RIGHT NOW THEY
DON'T HAVE A WAY TO OPEN THESE

828

00:47:22,570 --> 00:47:24,290

PILLOWS AND ACCESS THEM.

829

00:47:24,290 --> 00:47:26,890

BUT IT'S TOTALLY POSSIBLE.

830

00:47:26,890 --> 00:47:31,790

I KNOW YOU DON'T LIKE POTATOES,
JANET, BUT WE ACTUALLY HAVE DONE

831

00:47:31,790 --> 00:47:36,480

A TREMENDOUS AMOUNT OF POTATO
RESEARCH HERE AT KENNEDY SPACE

832

00:47:36,480 --> 00:47:41,130

CENTER AND GROWN WORLD RECORD
YIELDS OF POTATOES IN CHAMBERS

833

00:47:41,130 --> 00:47:42,180

THAT WE'VE HAD HERE.

834

00:47:42,180 --> 00:47:45,260

WE HAVE ONE OF THE WORLD POTATO
EXPERTS WHO'S A PLANT

835

00:47:45,260 --> 00:47:48,930

PHYSIOLOGIST HERE AND A MEMBER
OF OUR VEGGIE TEAM.

836

00:47:48,930 --> 00:47:53,010

I THINK WE COULD TOTALLY MODIFY
FOR POTATOES.

837

00:47:53,010 --> 00:47:56,830

THEY'VE EVEN GROWN PEANUTS AND
THEY ARE A COOL CROP BECAUSE

838

00:47:56,830 --> 00:48:00,320

THEY BURY THEIR FLOWER STOCK.

839

00:48:00,320 --> 00:48:02,410

AND THAT'S WHERE THE NUT FORMS.

840

00:48:02,410 --> 00:48:03,460

IT'S UNDERGROUND.

841

00:48:03,460 --> 00:48:07,240

SO THEY HAD TO DESIGN A WHOLE
MODIFIED SYSTEM SPECIFICALLY TO

842

00:48:07,240 --> 00:48:09,660

ALLOW THAT TO HAPPEN.

843

00:48:09,660 --> 00:48:12,130

WE HAVE AN INCREDIBLE TEAM OF
ENGINEERS WHO ARE REALLY

844

00:48:12,130 --> 00:48:17,600

CREATIVE, SO I THINK WE CAN COME
UP WITH SOMETHING.

845

00:48:17,600 --> 00:48:20,900

>> MY QUESTION IS ACTUALLY FOR
THE OTHER THREE MEMBERS OF THE

846

00:48:20,900 --> 00:48:21,900

PANEL.

847

00:48:21,900 --> 00:48:23,080

I AM AN EDUCATOR.

848

00:48:23,080 --> 00:48:26,540

I TEACH MIDDLE AND HIGH SCHOOL
STUDENTS OVER IN ORLANDO.

849

00:48:26,540 --> 00:48:29,610

I'VE HAD THE TREMENDOUS HONOR OF
BEING ABLE TO WORK WITH THE

850

00:48:29,610 --> 00:48:32,400

VEGGIE TEAM FOR THE PAST THREE
SUMMERS AND TAKEN THE

851

00:48:32,400 --> 00:48:34,990

INFORMATION THAT I'VE LEARNED
ABOUT THE RESEARCH AND

852

00:48:34,990 --> 00:48:38,010

INTEGRATED IT INTO MY CLASS
LESSON PLANS AND SHARED IT WITH

853

00:48:38,010 --> 00:48:39,380

OTHER TEACHERS.

854

00:48:39,380 --> 00:48:42,300

ONE OF THE WONDERFUL THINGS
ABOUT VEGGIE IS THAT MY STUDENTS

855

00:48:42,300 --> 00:48:46,370

CONNECT VERY EASILY WITH VEGGIE
BECAUSE THEY CAN RELATE TO THE

856

00:48:46,370 --> 00:48:47,370

LETTUCE.

857

00:48:47,370 --> 00:48:50,360

I WANTED TO ASK THE OTHER PANEL
MEMBERS IN REGARDS TO COMMERCIAL

858

00:48:50,360 --> 00:48:53,660

CREW, INTERNATIONAL SPACE
STATION, AND KENNEDY SPACE

859

00:48:53,660 --> 00:48:57,850

CENTER, IF YOU HAD THE
OPPORTUNITY TO TALK WITH MIDDLE

860

00:48:57,850 --> 00:49:01,250
SCHOOL AND HIGH SCHOOL STUDENTS,
WHAT WOULD YOU SHARE WITH THEM

861
00:49:01,250 --> 00:49:04,180
THAT YOU FEEL WOULD HELP THEM■--
THAT WOULD EASILY HELP THEM

862
00:49:04,180 --> 00:49:08,710
CONNECT WITH THE VERY IMPORTANT
MESSAGE THAT ALL THREE OF YOU

863
00:49:08,710 --> 00:49:11,430
COULD SHARE WITH THEM ABOUT YOUR
PROGRAM?

864
00:49:11,430 --> 00:49:19,470
>> WHO WANTS TO GO FIRST?

865
00:49:19,470 --> 00:49:23,810
>> I THINK GIOIA TOUCHED ON IT A
LITTLE BEFORE.

866
00:49:23,810 --> 00:49:27,760
I CAME INTO NASA LATE AND I HAD
A VISION, EVEN THOUGH I GREW UP

867
00:49:27,760 --> 00:49:31,031
RIGHT OUTSIDE THE GATES, THAT
EVERYBODY INSIDE THE GATES OF

868
00:49:31,031 --> 00:49:34,680
THE SPACE CENTER LIKE THESE
WORLD CLASS LAB COAT-WEARING

869
00:49:34,680 --> 00:49:39,240
DESIGN TESTS AND ENGINEERS AND
SHE TOUCHED ON IT BEFORE,

870
00:49:39,240 --> 00:49:43,840

THERE'S A JOB FOR ANYONE IN ANY
FIELD AT THE SPACE CENTER.

871

00:49:43,840 --> 00:49:50,530

I LOOK AT CHRIS AND THE GUYS WHO
WORK IN THE COM AREA, ENGLISH

872

00:49:50,530 --> 00:49:53,600

MAJORS AND COMMUNICATIONS MAJORS
PROBABLY DON'T REALIZE THAT

873

00:49:53,600 --> 00:49:56,510

THERE'S A HUGE CAREER
OPPORTUNITY AT NASA AND IT'S

874

00:49:56,510 --> 00:50:01,370

JUST AS IMPORTANT AS ANYTHING
ANY OF US DO.

875

00:50:01,370 --> 00:50:04,560

PEOPLE WHO WORK WITH THEIR
HANDS, MACHINISTS, THERE'S JUST

876

00:50:04,560 --> 00:50:08,980

SUCH A VARIETY OF POTENTIAL
CAREERS.

877

00:50:08,980 --> 00:50:11,210

I DON'T THINK WE DO A GOOD JOB
OF SELLING THAT BECAUSE I THINK

878

00:50:11,210 --> 00:50:14,690

THE GENERAL COMMUNITY AND THE
SCHOOL KIDS THINK IF IT'S NOT

879

00:50:14,690 --> 00:50:18,040

TRADITIONAL STEM, THEY HAVE NO
PLACE IN NASA.

880

00:50:18,040 --> 00:50:21,950

I THINK■-- JUST TO TELL YOU
SOMETHING THAT WE'VE BEEN

881
00:50:21,950 --> 00:50:25,790
TALKING ABOUT RECENTLY, THERE'S
AN INITIATIVE GOING ON THAT THE

882
00:50:25,790 --> 00:50:31,650
ISS PROGRAM IS WORKING CALLED
HUNCH WHICH WORKS WITH HIGH

883
00:50:31,650 --> 00:50:35,070
SCHOOL STUDENTS, PALM BAY
PARTICULARLY THAT WE SUPPORT,

884
00:50:35,070 --> 00:50:42,230
WHERE KIDS ARE MACHINISTS OR
THEY'RE USING THE SEWERS, STUFF

885
00:50:42,230 --> 00:50:45,430
FROM THE FASHION DESIGN, TO
BUILD SPACE FLIGHT HARDWARE FOR

886
00:50:45,430 --> 00:50:47,150
NASA.

887
00:50:47,150 --> 00:50:50,510
TO ME, TALKING ABOUT GETTING
KIDS EXCITED AND KEEPING THEM IN

888
00:50:50,510 --> 00:50:54,660
SCHOOL, THAT'S THE KIND OF STUFF
THAT WILL DO IT.

889
00:50:54,660 --> 00:50:57,991
>> FIRST OF ALL, I CAN
APPRECIATE YOU AS A TEACHER, YOU

890
00:50:57,991 --> 00:51:01,660
BEING HERE AND TRANSLATING

INFORMATION TO STUDENTS IS

891

00:51:01,660 --> 00:51:04,390

PROBABLY THE BEST THING TO DO,
HONESTLY.

892

00:51:04,390 --> 00:51:07,440

ANYTHING THAT YOU TAKE BACK,
THEY'RE GOING TO RELATE TO YOU

893

00:51:07,440 --> 00:51:10,520

AND THEREFORE THEY'RE GOING TO
PROBABLY GET INTERESTED IN THE

894

00:51:10,520 --> 00:51:11,520

SUBJECT MATTER.

895

00:51:11,520 --> 00:51:14,880

SO I REALLY APPRECIATE YOU BEING
HERE AND DOING THAT FOR US

896

00:51:14,880 --> 00:51:18,050

BECAUSE IT'S REALLY EVERYBODY
GETTING THE WORD OUT THAT REALLY

897

00:51:18,050 --> 00:51:23,480

AFFECTS AND CONNECTS WITH
PEOPLE.

898

00:51:23,480 --> 00:51:28,340

FROM A COMMERCIAL CREW
STANDPOINT, I THINK ONE THING IS

899

00:51:28,340 --> 00:51:33,020

HUMAN SPACE FLIGHT IS KIND OF
COOL IN GENERAL.

900

00:51:33,020 --> 00:51:35,350

IF YOU'VE EVER HAD AN
OPPORTUNITY FOR YOUR KIDS,

901

00:51:35,350 --> 00:51:38,710

YOU'RE CLOSE ENOUGH THAT ONCE
WE'RE STARTING TO HAVE LAUNCHES

902

00:51:38,710 --> 00:51:43,720

AGAIN WITH PEOPLE ON BOARD,
HUMANS ON BOARD, THAT'S JUST■--

903

00:51:43,720 --> 00:51:46,760

I DON'T KNOW IF THERE'S ANYTHING
ELSE THAT CAN RECREATE THAT

904

00:51:46,760 --> 00:51:49,330

EXCITEMENT AND THAT FEELING WHEN
YOU'RE STANDING THERE AND

905

00:51:49,330 --> 00:51:52,820

REALIZING THERE ARE PEOPLE THAT
ARE BEING LAUNCHED.

906

00:51:52,820 --> 00:51:54,300

THAT'S ONE WAY.

907

00:51:54,300 --> 00:51:59,100

AND THEN I FEEL LIKE IT'S A
LITTLE BIT RELATABLE BUT AT SOME

908

00:51:59,100 --> 00:52:05,430

POINT, THERE WAS A TIME WHEN THE
GENERAL PUBLIC DIDN'T HAVE

909

00:52:05,430 --> 00:52:07,430

CAPABILITY OR ACCESS TO FLYING
ON AN AIRPLANE.

910

00:52:07,430 --> 00:52:12,620

IT WAS LIMITED TO JUST A FEW
MILITARY AND■-- IT WAS A VERY

911

00:52:12,620 --> 00:52:14,900

SMALL PERCENTAGE OF THE
POPULATION.

912

00:52:14,900 --> 00:52:18,390

THERE'S GOING TO BE A DAY WHERE
THEY'RE GOING TO BE BUYING

913

00:52:18,390 --> 00:52:22,520

SEATS, BUYING RIDES TO GO TO
SPACE.

914

00:52:22,520 --> 00:52:28,380

I THINK THEY CAN RELATE TO GOING
FURTHER AND DOING DIFFERENT

915

00:52:28,380 --> 00:52:29,380

THINGS.

916

00:52:29,380 --> 00:52:34,370

BUYING A SEAT ON A SPACE PLANE
WILL BE KIND OF COOL AND AT SOME

917

00:52:34,370 --> 00:52:38,960

POINT WE'RE GOING TO BE ABLE TO
DO THAT.

918

00:52:38,960 --> 00:52:41,170

>> I WOULD ALSO LIKE TO THANK
YOU FOR BEING A TEACHER.

919

00:52:41,170 --> 00:52:46,070

I HAVE A NUMBER OF RELATIVES, MY
SISTER IS A TEACHER, A BUNCH OF

920

00:52:46,070 --> 00:52:50,981

FRIENDS IN ORLANDO AS WELL AS MY
DAUGHTER-IN-LAW IN VARIOUS GRADE

921

00:52:50,981 --> 00:52:56,840
LEVELS FROM FIRST GRADE UP
THROUGH HIGH SCHOOL.

922
00:52:56,840 --> 00:52:58,090
SO I APPLAUD YOU FOR THAT.

923
00:52:58,090 --> 00:53:01,780
AND I KNOW HOW DIFFICULT IT IS
FOR TEACHERS TO BE ABLE TO

924
00:53:01,780 --> 00:53:06,050
INTRODUCE CURRICULUM AND
INTRODUCE TOPICS THAT ISN'T

925
00:53:06,050 --> 00:53:09,560
EXACTLY WHAT'S ON THEIR LESSON
PLAN.

926
00:53:09,560 --> 00:53:12,140
SO I REALLY APPRECIATE YOU
REACHING OUT.

927
00:53:12,140 --> 00:53:15,780
I WOULD ENCOURAGE YOU TO ■-- WE
HAVE A LOT OF PROGRAMS NOT JUST

928
00:53:15,780 --> 00:53:19,721
HERE AT KENNEDY SPACE CENTER BUT
THROUGHOUT THE AGENCY WHERE WE

929
00:53:19,721 --> 00:53:22,620
INTERACT WITH THE EDUCATOR
COMMUNITY.

930
00:53:22,620 --> 00:53:26,200
OUR OFFICE OF EDUCATION AT THE
AGENCY LEVEL, WE RUN A NUMBER OF

931
00:53:26,200 --> 00:53:31,730

THESE AGENCY PROGRAMS RIGHT HERE
FROM KENNEDY SPACE CENTER THAT I

932

00:53:31,730 --> 00:53:34,230

WOULD BET THAT MOST TEACHERS■--
I KNOW THE ONES THAT EVEN MY

933

00:53:34,230 --> 00:53:37,560

FRIENDS AND FAMILY, THEY DON'T
KNOW ANYTHING ABOUT IT.

934

00:53:37,560 --> 00:53:42,340

IT'S BECAUSE OF THE TIME THAT
YOU HAVE AS A TEACHER TO BE ABLE

935

00:53:42,340 --> 00:53:45,940

TO LOOK OUT AND SEE WHAT ELSE IS
AROUND IN THE COMMUNITY.

936

00:53:45,940 --> 00:53:51,120

IF I WERE TO HAVE MY DREAM
MOMENT, IT WOULD BE ABLE TO GET

937

00:53:51,120 --> 00:53:55,410

THE EDUCATORS IN A ROOM AND JUST
HAVE FOR A COUPLE HOURS OR

938

00:53:55,410 --> 00:53:58,840

WHATEVER AND TALK TO THEM ABOUT
THE EXISTING PROGRAMS THAT WE

939

00:53:58,840 --> 00:54:02,940

HAVE AVAILABLE TO THEM NOT JUST
HERE AT KENNEDY SPACE CENTER BUT

940

00:54:02,940 --> 00:54:04,210

THROUGHOUT THE AGENCY.

941

00:54:04,210 --> 00:54:06,620

WE HAVE A GREAT EDUCATOR

RESOURCE CENTER THAT I THINK

942

00:54:06,620 --> 00:54:08,800

HARDLY EVER GETS USED.

943

00:54:08,800 --> 00:54:11,770

WE DO HAVE A PROGRAM WHERE I
THINK IT'S THE SIXTH GRADERS

944

00:54:11,770 --> 00:54:14,950

COME AND VISIT AT OUR VISITOR'S
CENTER FOR FREE A DAY IN

945

00:54:14,950 --> 00:54:18,780

DECEMBER WHICH IS GREAT AT
INSPIRING THE KIDS BUT I THINK

946

00:54:18,780 --> 00:54:22,850

THAT JUST TOUCHES THE■-- IT'S
THE TIP OF THE ICEBERG ON WHAT

947

00:54:22,850 --> 00:54:27,360

WE ACTUALLY HAVE AVAILABLE AND
WHAT WE COULD AFFORD OR WHAT WE

948

00:54:27,360 --> 00:54:31,420

COULD OFFER TO EDUCATORS THAT
WOULD ENRICH THEIR STUDENTS'

949

00:54:31,420 --> 00:54:33,100

LIVES.

950

00:54:33,100 --> 00:54:34,750

ONE LAST THING THAT I THOUGHT
WAS INTERESTING BECAUSE I HAVE A

951

00:54:34,750 --> 00:54:38,430

DAUGHTER AND WE WERE TALKING
ABOUT DIFFERENT CAREERS AT NASA

952

00:54:38,430 --> 00:54:41,410

AND I WAS TALKING TO DR.

953

00:54:41,410 --> 00:54:44,010

NEWMAN

ABOUT SHE'S INTERESTED IN

954

00:54:44,010 --> 00:54:45,010

FASHION DESIGN.

955

00:54:45,010 --> 00:54:50,430

I'M LIKE, COME ON, DON'T YOU

WANT TO DO THE STEM STUFF.

956

00:54:50,430 --> 00:54:55,580

DAVA IS A PHD AND SHE DOES THE

SPACE SUIT THING AND SHE SAID

957

00:54:55,580 --> 00:54:59,270

THINK ABOUT THE IMPACT OF

GETTING GIRLS AND YOUNG WOMEN

958

00:54:59,270 --> 00:55:01,910

WHO MIGHT BE INTERESTED IN

FASHION DESIGN INTO DESIGNING

959

00:55:01,910 --> 00:55:05,670

THE NEXT GENERATION SPACE SUITS,

SO I THOUGHT THAT WAS A COOL

960

00:55:05,670 --> 00:55:06,670

CONNECTION.

961

00:55:06,670 --> 00:55:10,230

I THINK IF WE CONTINUE TO LOOK

TO MAKE THOSE CONNECTIONS, WE'LL

962

00:55:10,230 --> 00:55:13,560

BE ABLE TO HELP DO WHAT YOU'RE

ALREADY DOING.

963

00:55:13,560 --> 00:55:14,560

>> AWESOME.

964

00:55:14,560 --> 00:55:15,820

THANKS SO MUCH.

965

00:55:15,820 --> 00:55:19,420

DO WE HAVE ONE LAST QUESTION
FROM THE AUDIENCE?

966

00:55:19,420 --> 00:55:22,450

RIGHT DOWN HERE IN FRONT.

967

00:55:22,450 --> 00:55:26,260

>> GOOD AFTERNOON, EVERYONE.

968

00:55:26,260 --> 00:55:31,230

I WAS WONDERING IF WE END UP
HAVING THE LONG-TERM GARDEN IN

969

00:55:31,230 --> 00:55:35,210

THE SPACE STATION, IS THERE A
PLAN TO REPLENISH THE MINERALS

970

00:55:35,210 --> 00:55:38,610

IN THE CLAY BECAUSE I KNOW THAT
A LOT OF MINERALS ARE TAKEN BY

971

00:55:38,610 --> 00:55:39,610

THE VEGETABLES.

972

00:55:39,610 --> 00:55:44,330

>> HOW WE WOULD MAINTAIN THE
MINERALS AND RECYCLE THEM WHEN

973

00:55:44,330 --> 00:55:48,610

WE HAVE MARTIAN GARDENS SO TO

SPEAK.

974

00:55:48,610 --> 00:55:50,900

COMPOSTING WOULD BE ONE.

975

00:55:50,900 --> 00:55:55,410

I KNOW SOME OF OUR TEAM HERE ARE
WORKING ON ASH AND I'LL TURN

976

00:55:55,410 --> 00:55:57,820

THAT OVER TO GIOIA BECAUSE I
THINK SHE KNOWS A LITTLE BIT

977

00:55:57,820 --> 00:56:01,350

MORE ON THAT AND MAYBE TALK
ABOUT HOW WE GET THERE.

978

00:56:01,350 --> 00:56:04,500

>> THAT'S AN EXCELLENT QUESTION.

979

00:56:04,500 --> 00:56:08,540

THIS IS NOT FOR LONG TERM.

980

00:56:08,540 --> 00:56:12,650

THIS IS FOR MICROGRAVITY AND
EVERYTHING HAS TO BE CONTAINED

981

00:56:12,650 --> 00:56:16,130

BUT THERE'S NOT AN EASY WAY TO
CLEAN OUT THOSE PILLOWS, TO

982

00:56:16,130 --> 00:56:18,650

REPLANT THEM.

983

00:56:18,650 --> 00:56:22,800

WE'VE DONE A LOT OF WORK HERE ON
HYDROPONICS WHICH IS A GREAT

984

00:56:22,800 --> 00:56:26,970

TECHNIQUE BECAUSE YOU CAN HAVE
THE NUTRIENTS IN A SOLUTION.

985

00:56:26,970 --> 00:56:30,740

WE'VE DONE A LOT OF WORK ON
COMPOSTING WHERE YOU CAN TAKE

986

00:56:30,740 --> 00:56:35,950

THE INEDIBLE PLANT WASTE AND USE
MICROORGANISMS, BACTERIAL

987

00:56:35,950 --> 00:56:39,720

BIOREACTORS TO RECLAIM THOSE
NUTRIENTS.

988

00:56:39,720 --> 00:56:44,400

WE HAVE VERY ACTIVE WORK ON
WATER PROCESSING HERE, TAKING

989

00:56:44,400 --> 00:56:49,510

GRAY WATER, WASH WATER, AND
OTHER TYPES OF DIRTY WATER AND

990

00:56:49,510 --> 00:56:53,010

BEING ABLE TO RECLAIM THE
NUTRIENTS OUT OF THAT USING

991

00:56:53,010 --> 00:56:57,020

BACTERIA AND THEN YOU COULD FEED
THOSE NUTRIENTS INTO THE PLANTS.

992

00:56:57,020 --> 00:57:01,040

IT'S ALL PART OF THIS GREATER
KIND OF REGENERATIVE SUSTAINABLE

993

00:57:01,040 --> 00:57:04,290

LIFE SUPPORT SYSTEM AND USING
BIOLOGY.

994

00:57:04,290 --> 00:57:08,310

AS TRENT WAS SAYING, WE HAVE A
BIG PROJECT RIGHT NOW ON

995

00:57:08,310 --> 00:57:11,210

BIO■CHAR.

996

00:57:11,210 --> 00:57:14,680

THAT'S TAKING THE PLANT WASTE
AND ESSENTIALLY MAKING CHARCOAL

997

00:57:14,680 --> 00:57:19,110

OUT OF IT AND MIXING THAT IN
WITH GROWTH MEDIA.

998

00:57:19,110 --> 00:57:27,460

WE'RE INTERESTED IN LOOKING AT
MARS REG A-LIST TO BE ABLE TO

999

00:57:27,460 --> 00:57:30,320

STUDY HOW WELL PLANTS WOULD GROW
IN THAT.

1000

00:57:30,320 --> 00:57:33,330

IF YOU WANT TO HAVE A SUBSTRATE
TO HELP SUPPORT THE PLANTS,

1001

00:57:33,330 --> 00:57:37,090

MAYBE THE NUTRIENTS ARE COMING
FROM THE SOLUTION BUT THE

1002

00:57:37,090 --> 00:57:42,640

REGALIS CAN SUPPORT THE ROOTS
AND GIVE THEM SOMETHING TO GROW

1003

00:57:42,640 --> 00:57:43,650

IN.

1004

00:57:43,650 --> 00:57:45,230

WE HAVE A LOT OF DIFFERENT
AREAS.

1005

00:57:45,230 --> 00:57:49,020

WE HAVEN'T REALLY SOLVED ALL OF
THOSE PROBLEMS BUT THERE'S A LOT

1006

00:57:49,020 --> 00:57:51,000

OF RESEARCH THAT NEEDS TO BE
DONE.

1007

00:57:51,000 --> 00:57:57,180

IF YOU'RE INTERESTED, WE COULD
USE ALL THE HELP WE CAN GET.

1008

00:57:57,180 --> 00:57:59,510

>> ON OUR WAY TO MARS, WE'RE
GOING TO GROW PLANTS.

1009

00:57:59,510 --> 00:58:03,190

WE HAVE THE KENNEDY SPACE CENTER
GETTING READY FOR THE MULTI-USER

1010

00:58:03,190 --> 00:58:07,802

SPACE PART AND SUPPORTING THE
PLANT BIOLOGY WE DO ON THE SPACE

1011

00:58:07,802 --> 00:58:09,430

STATION.

1012

00:58:09,430 --> 00:58:14,840

UTILIZING SPACE STATION AS A
STEPPING STONE AND THE

1013

00:58:14,840 --> 00:58:18,040

COMMERCIAL CREW ARE GOING TO
DOUBLE OUR TIME ON SPACE STATION

1014

00:58:18,040 --> 00:58:23,070

AND BRING BACK OUR CAPABILITY TO
FLY FROM THE UNITED STATES.

1015

00:58:23,070 --> 00:58:24,320

THANK YOU ALL.

1016

00:58:24,320 --> 00:58:28,920

IF YOU WANT TO LEARN MORE YOU
CAN GO TO [NASA.GOV/ISS](https://www.nasa.gov/iss).

1017

00:58:28,920 --> 00:58:29,920

THANK YOU AGAIN.