



**SPACESTATION
LIVE**

1
00:00:11,340 --> 00:00:09,090
a big part of the mission of the

2
00:00:14,250 --> 00:00:11,350
International Space Station is to get

3
00:00:16,859 --> 00:00:14,260
humankind ready for future missions out

4
00:00:19,349 --> 00:00:16,869
into the solar system when those future

5
00:00:21,570 --> 00:00:19,359
astronauts set off they may want to take

6
00:00:25,589 --> 00:00:21,580
some of the comforts of home along with

7
00:00:28,050 --> 00:00:25,599
them perhaps their own plants but less

8
00:00:31,290 --> 00:00:28,060
oh for the ambience then maybe as a

9
00:00:32,790 --> 00:00:31,300
source of food for more on this story go

10
00:00:34,410 --> 00:00:32,800
this morning to my colleague bill

11
00:00:39,870 --> 00:00:34,420
hubscher at the Marshall Space Flight

12
00:00:41,610 --> 00:00:39,880
Center in Huntsville Alabama thanks Pat

13
00:00:43,080 --> 00:00:41,620

it is pretty much accepted in the

14

00:00:45,660 --> 00:00:43,090

scientific community that the physiology

15

00:00:48,060 --> 00:00:45,670

of plants and animals will change during

16

00:00:50,190 --> 00:00:48,070

long-duration flights in orbit but what

17

00:00:52,560 --> 00:00:50,200

about genetic changes we caught up with

18

00:00:55,920 --> 00:00:52,570

Amara Pereira investigating the plant

19

00:00:59,220 --> 00:00:55,930

DNA to see and learn more about why this

20

00:01:01,230 --> 00:00:59,230

is such an important field of study what

21

00:01:03,540 --> 00:01:01,240

I'm really interested in is how plants

22

00:01:05,310 --> 00:01:03,550

sense and respond to the environment and

23

00:01:08,550 --> 00:01:05,320

so in particular to the microgravity

24

00:01:10,919 --> 00:01:08,560

environment and so our first experiment

25

00:01:12,959 --> 00:01:10,929

was to look at a molecular level what

26

00:01:14,580 --> 00:01:12,969

are the changes that occur in plants

27

00:01:16,709 --> 00:01:14,590

when they grow under microgravity

28

00:01:23,419 --> 00:01:16,719

so our first experiment was called

29

00:01:28,889 --> 00:01:26,330

efficient with the Ames Research Center

30

00:01:31,169 --> 00:01:28,899

since it was our first experiment we had

31

00:01:33,870 --> 00:01:31,179

a little bit of a learning curve but not

32

00:01:36,450 --> 00:01:33,880

too much and the plant experiments are

33

00:01:39,090 --> 00:01:36,460

fairly easy to set up because we can

34

00:01:42,090 --> 00:01:39,100

send the seed dry mounted and they don't

35

00:01:45,090 --> 00:01:42,100

grow till it actually gets into the

36

00:01:47,730 --> 00:01:45,100

hardware in the MCS and get started by

37

00:01:49,889 --> 00:01:47,740

hydration so there is some period of

38

00:01:52,469 --> 00:01:49,899

time where the plants will the seeds

39

00:01:55,609 --> 00:01:52,479

will be not and so there's a little bit

40

00:01:58,399 --> 00:01:55,619

of time in terms of handover and

41

00:02:00,859 --> 00:01:58,409

before the experiment needs to start so

42

00:02:04,460 --> 00:02:00,869

we set up everything in the hardware at

43

00:02:06,440 --> 00:02:04,470

NASA Ames we took all our seat over

44

00:02:10,160 --> 00:02:06,450

there and use their hardware and set it

45

00:02:11,260 --> 00:02:10,170

up and the plants went up on the very

46

00:02:14,030 --> 00:02:11,270

last space shuttle

47

00:02:16,570 --> 00:02:14,040

sts-135 which is very special and we got

48

00:02:20,540 --> 00:02:16,580

to see that we got passes to see they'll

49

00:02:22,850 --> 00:02:20,550

take off and then the experiment was

50

00:02:27,140 --> 00:02:22,860

carried out so this was July 2011 and

51
00:02:29,360 --> 00:02:27,150
then on-orbit on the ISS we had two

52
00:02:33,140 --> 00:02:29,370
experimental runs back-to-back that was

53
00:02:35,180 --> 00:02:33,150
done in August of 2011 everything went

54
00:02:38,360 --> 00:02:35,190
pretty well we had excellent germination

55
00:02:41,540 --> 00:02:38,370
we would get imagers downlinked every

56
00:02:43,550 --> 00:02:41,550
six hours almost in real time so we knew

57
00:02:45,140 --> 00:02:43,560
exactly how well the experiment worked

58
00:02:47,120 --> 00:02:45,150
as far as the plants growing and

59
00:02:49,820 --> 00:02:47,130
everything and then at the end of the

60
00:02:52,040 --> 00:02:49,830
experiment the astronaut collected the

61
00:02:54,680 --> 00:02:52,050
samples and put them in the freezer so a

62
00:02:57,470 --> 00:02:54,690
new investigation is called plant RNA

63
00:02:59,509 --> 00:02:57,480

regulation we will use the same hardware

64

00:03:01,850 --> 00:02:59,519

as before we will have some

65

00:03:04,759 --> 00:03:01,860

modifications to the experimental setup

66

00:03:06,289 --> 00:03:04,769

just to refine it a little bit more and

67

00:03:09,289 --> 00:03:06,299

to make it more physiologically relevant

68

00:03:12,410 --> 00:03:09,299

to how plants grow or noth for example

69

00:03:14,390 --> 00:03:12,420

we will actually include time points

70

00:03:15,860 --> 00:03:14,400

there will be a temporal component to

71

00:03:18,800 --> 00:03:15,870

the experiment because the first

72

00:03:21,620 --> 00:03:18,810

experiment was just harvested after five

73

00:03:24,140 --> 00:03:21,630

days but because we saw some interesting

74

00:03:27,160 --> 00:03:24,150

changes in the development of the plant

75

00:03:30,229 --> 00:03:27,170

roots in microgravity completed one 1g

76
00:03:31,849 --> 00:03:30,239
we proposed to have two time points so

77
00:03:34,880 --> 00:03:31,859
we can dissect that difference a little

78
00:03:37,520 --> 00:03:34,890
bit better why is the station such an

79
00:03:40,840 --> 00:03:37,530
important platform for you in your

80
00:03:43,520 --> 00:03:40,850
investigation in particular well I think

81
00:03:45,979 --> 00:03:43,530
it's mainly because we cannot replicate

82
00:03:47,840 --> 00:03:45,989
those conditions on earth I mean we have

83
00:03:49,540 --> 00:03:47,850
different simulations but they're not

84
00:03:52,960 --> 00:03:49,550
quite the same thing

85
00:03:55,150 --> 00:03:52,970
and in order to understand how plants

86
00:03:57,730 --> 00:03:55,160
respond to microgravity this is one of

87
00:04:00,160 --> 00:03:57,740
the particularly long-term microgravity

88
00:04:02,230 --> 00:04:00,170

so we could use different kinds of

89

00:04:04,780 --> 00:04:02,240

platforms if we just wanted to look at

90

00:04:07,270 --> 00:04:04,790

what happens instantly or within a few

91

00:04:09,340 --> 00:04:07,280

minutes but if we want to see how do

92

00:04:11,110 --> 00:04:09,350

plants adapt to this environment and

93

00:04:13,330 --> 00:04:11,120

grow over a period of time then we need

94

00:04:15,640 --> 00:04:13,340

to have sustained microgravity so I

95

00:04:20,890 --> 00:04:15,650

think the space station is our best

96

00:04:23,500 --> 00:04:20,900

option clearly in terms of space and

97

00:04:25,690 --> 00:04:23,510

long-duration missions it's important to

98

00:04:28,510 --> 00:04:25,700

understand and be able to grow plants in

99

00:04:31,180 --> 00:04:28,520

space but the space environment has

100

00:04:34,480 --> 00:04:31,190

various adverse or unfavorable

101
00:04:37,720 --> 00:04:34,490
unfamiliar conditions compared to our

102
00:04:41,620 --> 00:04:37,730
plants encounter on earth so we think it

103
00:04:43,510 --> 00:04:41,630
is a good it can give us important

104
00:04:45,580 --> 00:04:43,520
information as to how plants can deal

105
00:04:48,340 --> 00:04:45,590
with other adverse situations here on

106
00:04:51,370 --> 00:04:48,350
earth I mean we know the climate is

107
00:04:56,700 --> 00:04:51,380
changing we know we need to grow more

108
00:05:00,880 --> 00:04:56,710
plants and more unfavorable habitats so

109
00:05:04,480 --> 00:05:00,890
all of all of these things can be useful

110
00:05:07,120 --> 00:05:04,490
we can get useful information towards

111
00:05:10,690 --> 00:05:07,130
answering some of those questions doing

112
00:05:12,400 --> 00:05:10,700
space research has been really exciting

113
00:05:15,220 --> 00:05:12,410

and one of the nicest things about it is

114

00:05:18,880 --> 00:05:15,230

how excited the students get so as an

115

00:05:21,100 --> 00:05:18,890

educator it it inspires so much interest

116

00:05:26,080 --> 00:05:21,110

and enthusiasm and so we've had a lot of

117

00:05:28,210 --> 00:05:26,090

students who've been wanted to come and

118

00:05:30,450 --> 00:05:28,220

work in the lab and be exposed to this

119

00:05:32,430 --> 00:05:30,460

research

120

00:05:34,409 --> 00:05:32,440

a quick look now inside the payload

121

00:05:36,270 --> 00:05:34,419

operations integration Center Mission

122

00:05:37,800 --> 00:05:36,280

Control for science on the International

123

00:05:39,689 --> 00:05:37,810

Space Station where NASA flight

124

00:05:40,830 --> 00:05:39,699

controllers are on-site 24 hours a day

125

00:05:42,749 --> 00:05:40,840

seven days a week

126

00:05:44,969 --> 00:05:42,759

to guide and manage scientific

127

00:05:46,439 --> 00:05:44,979

discoveries in orbit and that'll do it