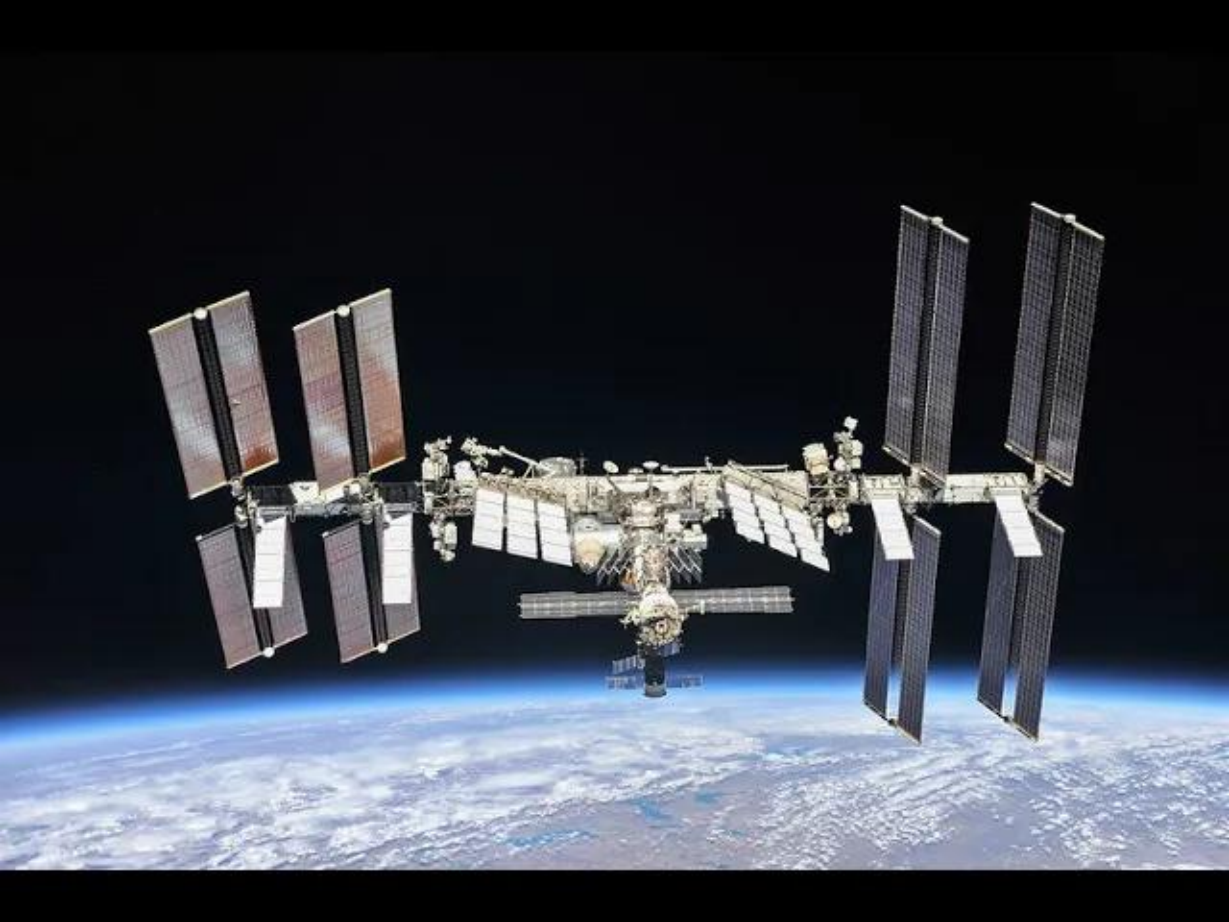

1
00:00:00,299 --> 00:00:03,049
(cheerful music)

2
00:00:05,730 --> 00:00:06,880
- Hey, I'm Thomas Zurbuchen,

3
00:00:06,880 --> 00:00:08,130
and the head of science at NASA,

4
00:00:08,130 --> 00:00:10,670
also known as Dr. Z.

5
00:00:10,670 --> 00:00:14,070
- And I'm Ellen Stofan,
also known as Dr. E.

6
00:00:14,070 --> 00:00:17,490
Welcome to another
episode of E.Z. Science.

7
00:00:17,490 --> 00:00:20,330
So, Thomas, we're here at the
Steven F. Udvar-Hazy Center

8
00:00:20,330 --> 00:00:22,320
in Chantilly, Virginia,

9
00:00:22,320 --> 00:00:24,530
at the tail of the Discovery space shuttle

10
00:00:24,530 --> 00:00:27,390
because we're celebrating
a very special anniversary.

11
00:00:27,390 --> 00:00:28,223
- That's right.

12
00:00:28,223 --> 00:00:30,720

I just talked to my kid
who just started college.

13
00:00:30,720 --> 00:00:34,370
He's 18 years old and
astronauts have been in orbit

14
00:00:34,370 --> 00:00:36,310
for his entire life.

15
00:00:36,310 --> 00:00:38,660
There has been an American
in the space station

16
00:00:38,660 --> 00:00:41,540
and international partners
during this same time.

17
00:00:41,540 --> 00:00:43,070
For 20 years,

18
00:00:43,070 --> 00:00:44,880
the space station has been inhabited.

19
00:00:44,880 --> 00:00:46,440
And what an amazing anniversary

20
00:00:46,440 --> 00:00:48,630
of international cooperation.

21
00:00:48,630 --> 00:00:50,860
The six bedroom building up there,

22
00:00:50,860 --> 00:00:52,940
the length of a football field or so,

23
00:00:52,940 --> 00:00:55,800
inhabited and doing science.

24
00:00:55,800 --> 00:00:56,633
- It's incredible.

25
00:00:56,633 --> 00:00:57,840
And we feel a really close connection

26
00:00:57,840 --> 00:00:59,300
to the International Space Station,

27
00:00:59,300 --> 00:01:01,550
because about a third
of Discovery's missions,

28
00:01:01,550 --> 00:01:03,280
were helping to construct it.

29
00:01:03,280 --> 00:01:06,150
There's modules on the space
station from the United States,

30
00:01:06,150 --> 00:01:09,430
from Japan, from the European
Space Agency and Russia.

31
00:01:09,430 --> 00:01:13,160
And it's such a great example
of international cooperation,

32
00:01:13,160 --> 00:01:15,440
how even though sometimes
we don't get along here

33
00:01:15,440 --> 00:01:16,273
on the ground,

34
00:01:16,273 --> 00:01:18,480
we can literally go to a higher plane

35

00:01:18,480 --> 00:01:20,170
and find a way to cooperate.

36
00:01:20,170 --> 00:01:24,180
- That's right, 240
astronauts from 19 countries.

37
00:01:24,180 --> 00:01:26,780
Nearly 3000 experiments
and many of them of course,

38
00:01:26,780 --> 00:01:27,870
on the inside,

39
00:01:27,870 --> 00:01:30,790
but we have multiple experiments
from three disciplines

40
00:01:30,790 --> 00:01:33,080
hanging from the outside
of the space station.

41
00:01:33,080 --> 00:01:36,520
I'll pick up one, the
structure of neutron stars.

42
00:01:36,520 --> 00:01:38,030
The internal structure of that

43
00:01:38,030 --> 00:01:40,520
is measured by the NICER experiment.

44
00:01:40,520 --> 00:01:43,400
And that is right now taking measurements

45
00:01:43,400 --> 00:01:47,240
of x-rays in the sky
from the space station.

46

00:01:47,240 --> 00:01:48,073
- That's amazing.

47
00:01:48,073 --> 00:01:49,940
And, you know, my favorite experiment is,

48
00:01:49,940 --> 00:01:51,510
actually it has to do with human health.

49
00:01:51,510 --> 00:01:52,930
And I think a lot of people don't realize

50
00:01:52,930 --> 00:01:54,830
how much research has been done

51
00:01:54,830 --> 00:01:56,810
on the International Space Station

52
00:01:56,810 --> 00:01:58,140
around human health.

53
00:01:58,140 --> 00:02:01,070
You know, almost half
of the Apollo astronauts

54
00:02:01,070 --> 00:02:02,930
either got an infection in space

55
00:02:02,930 --> 00:02:05,160
or got an infection soon
after they returned.

56
00:02:05,160 --> 00:02:06,310
Because what we've discovered

57
00:02:06,310 --> 00:02:08,560
is that when you put
humans in microgravity,

58
00:02:08,560 --> 00:02:11,110
their immune system
doesn't function as well.

59
00:02:11,110 --> 00:02:13,030
And we've actually done enough experiments

60
00:02:13,030 --> 00:02:14,620
on the International Space Station

61
00:02:14,620 --> 00:02:17,370
to realize it's the T cell part

62
00:02:17,370 --> 00:02:20,200
of your immune response in your body

63
00:02:20,200 --> 00:02:22,000
that's being suppressed.

64
00:02:22,000 --> 00:02:25,600
Now, that's fascinating because
we can use that information

65
00:02:25,600 --> 00:02:29,050
to better understand how
our immune system works.

66
00:02:29,050 --> 00:02:31,350
And obviously right now
in the time of COVID,

67
00:02:31,350 --> 00:02:33,920
that's really important information.

68
00:02:33,920 --> 00:02:36,150
- The other thing that
I think about a lot is,

69

00:02:36,150 --> 00:02:37,986
and I actually talked
to astronauts about it

70
00:02:37,986 --> 00:02:39,730
who have been up there
for substantial times,

71
00:02:39,730 --> 00:02:42,970
is the importance of this
experiment called Veggie.

72
00:02:42,970 --> 00:02:44,260
It sounds just how what it is,

73
00:02:44,260 --> 00:02:46,810
it's actually growing plants in space.

74
00:02:46,810 --> 00:02:48,970
And what's really exciting is for them,

75
00:02:48,970 --> 00:02:50,470
you know, we know psychologically

76
00:02:50,470 --> 00:02:53,320
that's really an important
part of a livable environment

77
00:02:53,320 --> 00:02:56,200
to have plants green that live there,

78
00:02:56,200 --> 00:02:58,070
and frankly, also that they can eat.

79
00:02:58,070 --> 00:02:59,450
And they'll offer, especially,

80
00:02:59,450 --> 00:03:02,140
some of the very spicy

plants that are out there.

81
00:03:02,140 --> 00:03:05,480
But a lot of our research is
being done with these plants

82
00:03:05,480 --> 00:03:06,800
to just really learn how,

83
00:03:06,800 --> 00:03:09,870
of course, as we prepare
for longer duration travel,

84
00:03:09,870 --> 00:03:11,990
how we can use that kind of platform

85
00:03:11,990 --> 00:03:15,000
to grow food and to have
that livable environment.

86
00:03:15,000 --> 00:03:17,000
- Yeah, it was funny when
I talked to Scott Kelly,

87
00:03:17,000 --> 00:03:18,880
after he came back from his year in space.

88
00:03:18,880 --> 00:03:21,500
He talked about how much
growing flowers in space,

89
00:03:21,500 --> 00:03:23,610
how much that meant to
him in that long year

90
00:03:23,610 --> 00:03:26,070
that he was up on the
International Space Station,

91

00:03:26,070 --> 00:03:28,490
which reminds me of one of
the most important things

92
00:03:28,490 --> 00:03:29,860
we use the ISS for,

93
00:03:29,860 --> 00:03:31,560
that we haven't mentioned.

94
00:03:31,560 --> 00:03:34,600
This whole issue of
learning to live in space

95
00:03:34,600 --> 00:03:36,770
is critical for getting humans,

96
00:03:36,770 --> 00:03:38,070
not just back to the moon,

97
00:03:38,070 --> 00:03:39,230
but onto Mars.

98
00:03:39,230 --> 00:03:41,240
It's that seven month journey to Mars,

99
00:03:41,240 --> 00:03:43,200
time on Mars, time back.

100
00:03:43,200 --> 00:03:44,480
The International Space Station,

101
00:03:44,480 --> 00:03:46,330
we've been using it as a platform

102
00:03:46,330 --> 00:03:48,530
to get humans ready,

103

00:03:48,530 --> 00:03:50,510
to get our technologies ready

104
00:03:50,510 --> 00:03:52,890
to go further out into the solar system.

105
00:03:52,890 --> 00:03:53,753
- That's exactly right.

106
00:03:53,753 --> 00:03:56,920
There's a number of
experiments going on right now

107
00:03:56,920 --> 00:03:58,340
on the space station

108
00:03:58,340 --> 00:04:00,460
that are really about life support systems

109
00:04:00,460 --> 00:04:02,360
that we want to use to go beyond,

110
00:04:02,360 --> 00:04:05,440
go to the moon first as
part of the Artemis program.

111
00:04:05,440 --> 00:04:08,040
And of course, we have
one eye on Mars already

112
00:04:08,040 --> 00:04:09,270
because of course,

113
00:04:09,270 --> 00:04:11,870
robotically we're on the
way there with perseverance,

114
00:04:11,870 --> 00:04:12,703
but with humans,

115
00:04:12,703 --> 00:04:14,840
we want to follow and go there also.

116
00:04:14,840 --> 00:04:17,150
And yet that space station will forever be

117
00:04:17,150 --> 00:04:18,020
in the history of that,

118
00:04:18,020 --> 00:04:20,980
because the technologies were
really developed right there.

119
00:04:20,980 --> 00:04:23,040
- The ISS has been an incredible platform

120
00:04:23,040 --> 00:04:24,800
for student experiments.

121
00:04:24,800 --> 00:04:28,810
So, every year at any
given time up on the ISS,

122
00:04:28,810 --> 00:04:30,210
there are experiments going on

123
00:04:30,210 --> 00:04:31,680
that were sent up there by students,

124
00:04:31,680 --> 00:04:32,740
high school students,

125
00:04:32,740 --> 00:04:35,090
even elementary school
students at one point,

126
00:04:35,090 --> 00:04:36,160

college students,

127
00:04:36,160 --> 00:04:37,950
it's an incredible platform

128
00:04:37,950 --> 00:04:40,510
to let students get
that first understanding

129
00:04:40,510 --> 00:04:41,750
of how does science work?

130
00:04:41,750 --> 00:04:43,330
How do you design an experiment?

131
00:04:43,330 --> 00:04:45,830
How do you get a result
and what do you do with it?

132
00:04:45,830 --> 00:04:46,880
- That's exactly right.

133
00:04:46,880 --> 00:04:48,050
And for me,

134
00:04:48,050 --> 00:04:49,580
kind of when I think of the space station,

135
00:04:49,580 --> 00:04:52,750
I think of it as a victory
of the human spirit

136
00:04:52,750 --> 00:04:55,110
and to coming together
as the earth as one,

137
00:04:55,110 --> 00:04:56,670
explore as one,

138
00:04:56,670 --> 00:04:57,820
both on the human side,

139
00:04:57,820 --> 00:04:59,180
but also the scientific side.

140
00:04:59,180 --> 00:05:01,850
So, I just really wanna
congratulate the entire team

141
00:05:01,850 --> 00:05:03,740
that has been part of that, building it,

142
00:05:03,740 --> 00:05:05,820
but also doing the entire 20 years,

143
00:05:05,820 --> 00:05:08,990
running this highly complex
machine internationally.

144
00:05:08,990 --> 00:05:09,823
And I look forward

145
00:05:09,823 --> 00:05:12,100
to everything we're gonna
learn in the future as well.

146
00:05:12,100 --> 00:05:13,900
- It's an incredible success

147
00:05:13,900 --> 00:05:15,860
and we can't congratulate enough

148
00:05:15,860 --> 00:05:17,870
the International Space Station team

149
00:05:17,870 --> 00:05:18,930
and all the countries,

150
00:05:18,930 --> 00:05:20,950
the European Space Agency, Russia,

151
00:05:20,950 --> 00:05:24,520
obviously the US and Japan
who've been the key core heart

152
00:05:24,520 --> 00:05:26,430
of the ISS team.

153
00:05:26,430 --> 00:05:28,650
Well, I think we're
just about out of time.

154
00:05:28,650 --> 00:05:31,350
Thank you for joining
us for another episode