
NASA
EPISODE ONE:
ORBITING LABORATORY

1
00:00:01,090 --> 00:00:06,260
Feeling weighed down? Feeling the
constant pull to the Earth? We all are.

2
00:00:06,260 --> 00:00:11,209
It's gravity, and it's a part of every
single thing we do including our science.

3
00:00:11,209 --> 00:00:16,850
But what if we're 250 miles above Earth
aboard the International Space Station - a

4
00:00:16,850 --> 00:00:21,050
laboratory like no other that offers
something we can't get on our home

5
00:00:21,120 --> 00:00:23,060
planet.

6
00:00:23,060 --> 00:00:55,360
[MUSIC]

7
00:00:55,360 --> 00:01:00,160
My name is Dr. Serena Aunon-Chancellor,
NASA astronaut. I recently flew to the

8
00:01:00,269 --> 00:01:05,759
International Space Station aboard
Expedition 56 and 57. My relationship

9
00:01:05,759 --> 00:01:09,750
with microgravity is that I got to live
in microgravity for a hundred and ninety

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00:01:09,750 --> 00:01:15,180
seven days when I was on orbit. So many
people ask what is microgravity.

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00:01:15,180 --> 00:01:18,450

Why do you float onboard the
International Space Station? Gravity acts

12
00:01:18,450 --> 00:01:22,440
upon all objects. We're never truly in
zero gravity onboard the space station

13
00:01:22,440 --> 00:01:26,610
but because the space station is
traveling so fast around the surface of

14
00:01:26,610 --> 00:01:30,630
the Earth, we're actually in a constant
freefall and that's why everything and

15
00:01:30,630 --> 00:01:34,400
everybody appears to float onboard the
space station.

16
00:01:34,400 --> 00:01:35,940
We are experiencing the

17
00:01:35,940 --> 00:01:40,920
Earth's gravity. In fact we're actually
experiencing about 90% of what you all

18
00:01:40,920 --> 00:01:44,970
experience on the surface of the Earth.
The difference is we're just moving so

19
00:01:44,970 --> 00:01:49,860
fast that as we fall we actually fall
around the earth and that defines orbit

20
00:01:49,860 --> 00:01:54,210
so microgravity means we're not, you know,
it's not the absence of mass which of

21
00:01:54,210 --> 00:01:58,560
course creates gravity, but all the

objects together are in the same

22
00:01:58,560 --> 00:02:02,549
gravitational field and all falling
together. So yes it is a lot of fun

23
00:02:02,549 --> 00:02:07,170
floating around of course it's one of the
exciting parts of being up here on board

24
00:02:07,170 --> 00:02:10,590
and being an astronaut, but even more
importantly it lends itself to all the

25
00:02:10,590 --> 00:02:13,709
amazing experiments that we can do on
board that take advantage of that

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00:02:13,709 --> 00:02:17,609
microgravity environment to do things
that we can't do on Earth but that can

27
00:02:17,609 --> 00:02:19,600
benefit life back on Earth.

28
00:02:19,600 --> 00:02:22,560
The important thing is it's so different
than what we

29
00:02:22,560 --> 00:02:26,310
have here on the ground where everything
is pulled by the Earth at what we call

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00:02:26,310 --> 00:02:32,730
one force of gravity. And what that does
is it allows you to see the small forces,

31
00:02:32,730 --> 00:02:38,459
the small processes, the small effects of
what goes on in life cell development or

32
00:02:38,459 --> 00:02:43,829
technical processes like combustion or
fluid flow, and it helps you understand

33
00:02:43,829 --> 00:02:48,120
things that you may not have fully
understood on Earth where you see

34
00:02:48,120 --> 00:02:51,810
something happening, something assembling
or disassembling, or the shape of

35
00:02:51,810 --> 00:02:56,599
something now going into three dimensions
and you learn ah that's really what was

36
00:02:56,600 --> 00:03:00,560
driving this thing on Earth that we
didn't really understand.

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00:03:00,560 --> 00:03:02,640
On Earth, gravity is affecting

38
00:03:02,640 --> 00:03:06,310
all research we do
and sometimes that can get in the way.

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00:03:06,310 --> 00:03:09,709
Studying things in different
environments can give a better picture

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00:03:09,709 --> 00:03:14,269
of how they work. From diseases to fires,
and even things that make up products

41
00:03:14,269 --> 00:03:15,840
like milk or shampoo.

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00:03:15,840 --> 00:03:19,159
One of the main
things we perform on the ISS is science

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00:03:19,159 --> 00:03:23,540
in fact probably 70 to 80 percent of our
day is performing scientific experiments.

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00:03:23,540 --> 00:03:28,189
The International Space Station is a
great place to do research for several

45
00:03:28,189 --> 00:03:32,689
perspectives. One of those is it's a big
huge satellite orbiting the Earth, so if

46
00:03:32,689 --> 00:03:35,389
you have an instrument that wants to
look at the Earth or look out at space

47
00:03:35,389 --> 00:03:39,650
we provide the power, we provide the data,
the platform for it. You don't have to go

48
00:03:39,650 --> 00:03:44,750
do your own new satellite. The outside of
the ISS is also a very extreme

49
00:03:44,750 --> 00:03:49,040
environment and sometimes you learn
things by exposing your hardware, your

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00:03:49,040 --> 00:03:53,569
your polymers, or whatever to a different
environment you'll see something happen

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00:03:53,569 --> 00:03:58,579
different than what is on the Earth, but
probably one of the most pervasive uses

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00:03:58,579 --> 00:04:02,419
of the ISS is just the microgravity
environment. The things that we do inside

53
00:04:02,419 --> 00:04:07,909
the ISS to be able to do your experiment
in space without gravity which we've all

54
00:04:07,909 --> 00:04:11,389
lived with forever here on the ground
which we live with every day and we

55
00:04:11,389 --> 00:04:15,799
don't even realize how it governs so
many things that happen around us. If you

56
00:04:15,799 --> 00:04:20,419
take gravity away now some of the small
phenomena, some of the small processes

57
00:04:20,419 --> 00:04:24,949
and forces start to come out and you can
see them and you can see the behaviors

58
00:04:24,949 --> 00:04:29,300
of your experiment happening differently
in space and in microgravity than you

59
00:04:29,300 --> 00:04:30,297
would on the ground.

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00:04:30,297 --> 00:04:33,289
It takes a lot of
people to make all of that microgravity

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00:04:33,289 --> 00:04:39,349
science happen. Four thousand scientists
companies and students from over 100

62
00:04:39,349 --> 00:04:43,820

countries have sent more than 2700
experiments to the orbiting laboratory.

63
00:04:43,820 --> 00:04:49,849
Over the past 20 years, these studies
have unlocked new discoveries and even

64
00:04:49,849 --> 00:04:53,974
kicked off hundreds of new microgravity
experiments.

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00:04:53,974 --> 00:04:55,430
We're studying the

66
00:04:55,430 --> 00:05:01,610
physiology of how blood flow and the
fluids in our body shift as the result

67
00:05:01,610 --> 00:05:02,520
of microgravity.

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00:05:02,520 --> 00:05:05,990
Yesterday I spent some
time setting up a Veggie experiment. We'll

69
00:05:05,990 --> 00:05:08,720
actually be growing mizuna lettuce up
here.

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00:05:08,720 --> 00:05:09,710
Drew and I actually have been

71
00:05:09,710 --> 00:05:13,760
helping start a new experiment called
the Cold Atom Lab which will create one

72
00:05:13,760 --> 00:05:16,790
of the coldest places in the universe
right here on the space station, almost

73
00:05:16,790 --> 00:05:18,880
at Absolute Zero.

74
00:05:18,880 --> 00:05:21,110
But who are these
scientists? And how do they get their

75
00:05:21,110 --> 00:05:25,520
research to the space station? This
season we'll take you behind the scenes

76
00:05:25,520 --> 00:05:30,140
of the years of preparing an experiment
for space. You'll see it launched off the

77
00:05:30,140 --> 00:05:34,430
planet and splash back down in the ocean,
and hear what it's like to hand off your

78
00:05:34,430 --> 00:05:38,990
research to the astronauts who serve as
the eyes and hands of the scientists

79
00:05:39,000 --> 00:05:42,340
aboard the International Space Station.

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00:05:42,340 --> 00:05:50,960
[Music]

81
00:05:51,160 --> 00:05:56,280
This is our first project that is going
up to the station, and our first project

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00:05:56,290 --> 00:05:59,500
working with anyone involved in the
space program, so it's a very exciting

83
00:05:59,500 --> 00:06:05,170
time for us. It'll be interesting to see

how all of our planning is played out