
NASA

1
00:00:01,026 --> 00:00:02,946
[Daniel Huot] And welcome back
to Mission Control Houston.

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00:00:02,946 --> 00:00:06,416
As mentioned a little bit earlier I'm
joined on console now by Tara Ruttley,

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00:00:06,486 --> 00:00:09,396
one of our program scientists here
for the International Space Station.

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00:00:09,826 --> 00:00:12,146
So Tara thank you so much for joining me today.

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00:00:12,346 --> 00:00:14,226
It's going to be alot of fun.

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00:00:14,226 --> 00:00:16,836
Okay. Alright, well why don't we start
off...why don't you tell us a little bit

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00:00:16,836 --> 00:00:17,836
about your history.

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00:00:17,836 --> 00:00:20,756
So how you...where you grew up and
how eneded up working here at NASA.

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00:00:20,756 --> 00:00:20,846
[Tara Ruttley] Sure.

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00:00:20,846 --> 00:00:31,536
So I was born and raised in Louisiana
and I'd always wanted to work for NASA.

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00:00:31,536 --> 00:00:33,506
And I always wanted to kind of
be a...I'd always...I'm sorry.

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00:00:33,506 --> 00:00:36,026
I was born and raised in Louisiana and
I'd always wanted to work for NASA.

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00:00:36,026 --> 00:00:38,866
Particularly, I wanted to
be an astronaut and you know

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00:00:38,866 --> 00:00:41,106
when you're a kid you think,
"Oh astronaut, big dreams!"

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00:00:41,106 --> 00:00:44,446
And that's the kind of thing
that set me on my path.

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00:00:44,556 --> 00:00:48,186
But growing up people used to tell me and
students and teachers used to tell me,

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00:00:48,186 --> 00:00:50,416
"Well if you want to work for NASA you
have to get a degree in engineering.

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00:00:50,416 --> 00:00:51,416
It's gotta be in engineering."

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00:00:52,046 --> 00:00:56,096
But then I got to high school
and two things happened.

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00:00:56,096 --> 00:01:00,306
I got interested in biology
when we dissected a cat.

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00:01:00,856 --> 00:01:03,506
I know that's weird but it
was fascinating, right?

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00:01:03,506 --> 00:01:05,746
[Daniel] I can say I forgot
to do that in high school.

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00:01:05,746 --> 00:01:06,416
[Tara] Exactly!

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00:01:06,416 --> 00:01:11,586
So it was fascinating and I learned a
lot about physiology and the systems.

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00:01:12,646 --> 00:01:19,406
So the second thing that happened was I had
asked an astronaut on a field trip to Houston,

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00:01:19,886 --> 00:01:22,876
I said, you know the generic question
I think they all get these days,

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00:01:22,876 --> 00:01:24,096
"What do you have to do to be an astronaut?"

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00:01:24,186 --> 00:01:28,426
And he said, "Just enjoy what you're
doing, cause not everybody gets to be one.

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00:01:28,426 --> 00:01:32,046
And just enjoy what you're doing
and if you're a person who is fulfilled

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00:01:32,046 --> 00:01:35,876
and enjoying your career it'll all come
through and it'll just work out fine.

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00:01:35,876 --> 00:01:41,896
So I pursued my college degree in
science, and biology to be specific.

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00:01:41,896 --> 00:01:48,646

And then as I was moving along in that in
college I was realizing some of the experiments

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00:01:48,706 --> 00:01:52,666
that I wanted to do needed some
mechanical engineering interfaces

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00:01:52,666 --> 00:01:55,616
and needed some design and
I was not capable of that.

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00:01:56,066 --> 00:01:58,796
And that kind of stumped me and so I decided

36
00:01:58,796 --> 00:02:01,886
to pursue my Masters degree
in mechanical engineering.

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00:02:02,426 --> 00:02:03,126
And it was different.

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00:02:03,126 --> 00:02:06,756
It's a change but it was a good challenge
and that is exactly what I needed.

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00:02:06,756 --> 00:02:12,506
And what I learned from myself was I'm a
multidisciplinary person and it's a good thing

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00:02:12,506 --> 00:02:16,856
to be able to pull all those different
fields together and produce something

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00:02:16,916 --> 00:02:18,406
that means something to somebody.

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00:02:18,406 --> 00:02:20,626
Like an experiment and hardware
that goes along with it.

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00:02:21,556 --> 00:02:26,816
And then I participated in several of
NASA's outreach activities as a student.

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00:02:27,026 --> 00:02:30,806
The graduate student research
program I was a participant in.

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00:02:30,806 --> 00:02:37,326
I participated in a few NASA's parabolic flight
opportunities for undergraduates with some

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00:02:37,326 --> 00:02:39,496
of my own experiments and my teams.

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00:02:39,496 --> 00:02:41,466
And so I was really just involved in math.

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00:02:41,466 --> 00:02:46,676
I was never actually a co-op because as a
biology student NASA didn't take co-ops.

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00:02:46,776 --> 00:02:49,826
They only took engineers
and Business Administration.

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00:02:50,426 --> 00:02:54,486
But I was fortunate enough, just
when I graduated with my Masters,

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00:02:54,486 --> 00:02:58,196
when I completed my Masters, NASA
reviewed my resume and there was an opening

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00:02:58,196 --> 00:03:02,676
in the biomedical systems division and
it was a brand new division here at NASA.

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00:03:02,876 --> 00:03:06,346

And that's exactly where I fit
cause I was so multidisciplinary.

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00:03:06,846 --> 00:03:12,896
And then when I got to NASA...you know the
Ph.D. was the end goal for me all the time.

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00:03:12,896 --> 00:03:14,606
I wanted to achieve that doctorate.

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00:03:15,026 --> 00:03:19,916
And so when I got to NASA, I worked at NASA for
about a year or two before I gave a good plan

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00:03:19,916 --> 00:03:24,596
to my management saying, "Here's
how my dissertation or my research

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00:03:24,646 --> 00:03:26,706
and an advanced degree would help NASA."

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00:03:26,706 --> 00:03:32,706
And they agreed and they were very supportive so
I pursued my Ph.D. in Neuroscience here locally

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00:03:32,956 --> 00:03:35,736
at the University of Texas Medical Branch.

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00:03:35,736 --> 00:03:41,616
And it was through the support of my
management and really the entire NASA program

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00:03:41,616 --> 00:03:44,596
and their belief in education
and contributing...coming back

63
00:03:44,596 --> 00:03:46,946
to the contributor that got me through that.

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00:03:46,946 --> 00:03:54,516
And so I was pursuing my Ph.D. while also
doing biomedical engineering for space station.

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00:03:54,516 --> 00:04:01,126
And what I did then was I helped to design and
certify flight hardware that will be launched

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00:04:01,126 --> 00:04:02,996
to space station for crew health.

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00:04:03,316 --> 00:04:06,766
So things like a defibrillator
or respiratory support pack

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00:04:06,766 --> 00:04:12,266
or just advanced medicine capabilities my
team was involved and responsible for that.

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00:04:12,806 --> 00:04:18,586
I also did a little bit of engineering work
related to the human research facilities

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00:04:18,586 --> 00:04:22,706
that happen on space station which is
the experimental side of the hardware.

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00:04:23,086 --> 00:04:31,856
And so I did that for about eight years and
then in 2007, 2008, I was kind of looking

72
00:04:31,856 --> 00:04:35,846
for a change after I had completed my
Ph.D. I was ready to do some science.

73
00:04:35,846 --> 00:04:39,816
And so I ended up here in the ISS
space station program science office.

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00:04:40,486 --> 00:04:42,206

And it's been a really, really great place.

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00:04:42,206 --> 00:04:45,106
I've been here about three
years now and I'm just immersed

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00:04:45,166 --> 00:04:47,656
in all the fun science that's
happening on space station.

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00:04:47,656 --> 00:04:51,586
And I tell you I didn't even have a clue
what was really happening with regard

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00:04:51,586 --> 00:04:56,506
to science till I got into this
office and we've learned so much.

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00:04:56,506 --> 00:05:01,366
And now to the day I get to experiment,
and I get to play, and understand and learn

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00:05:01,366 --> 00:05:04,526
about all the different disciplines
in the science that's happening

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00:05:04,526 --> 00:05:06,006
on our orbiting laboratory up there.

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00:05:06,006 --> 00:05:10,516
So it's been...what the advice I got
was the best advice in the world,

83
00:05:11,006 --> 00:05:13,426
"Follow what it is what you love to do."

84
00:05:13,736 --> 00:05:15,976
And I could not even dream this up for myself.

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00:05:15,976 --> 00:05:17,456
So it's just so fun being here.

86
00:05:17,836 --> 00:05:21,096
[Daniel] So like you said, definitely
multidisciplinary so you'll get

87
00:05:21,096 --> 00:05:23,576
into as many things as you can that you enjoy.

88
00:05:23,736 --> 00:05:24,426
[Tara] Absolutely.

89
00:05:24,596 --> 00:05:26,366
Yeah, don't force anything right?

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00:05:26,366 --> 00:05:28,406
Just find what you love and do it.

91
00:05:28,406 --> 00:05:28,996
And you're right.

92
00:05:28,996 --> 00:05:30,716
You'll be successful if you're
doing what you love.

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00:05:30,996 --> 00:05:33,236
[Daniel] I actually came in
through the co-op program.

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00:05:33,236 --> 00:05:37,156
So NASA does a have lot of great educational
programs to reach out to universities.

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00:05:37,416 --> 00:05:38,966
And they're always looking for new talent.

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00:05:39,006 --> 00:05:39,566
[Tara] Absolutely.

97
00:05:39,566 --> 00:05:43,126
[Daniel] So we showed some of your
NEEMO footage a little bit earlier.

98
00:05:43,126 --> 00:05:47,226
So whay don't you talk a little bit about your
experience with that and how exciting that was.

99
00:05:47,426 --> 00:05:53,236
[Tara] Yeah, so when I was a new engineer
I'd learned about NASA's NEEMO mission

100
00:05:53,326 --> 00:05:57,506
and that's the NASA Extreme
Environment Mission Operations program.

101
00:05:57,506 --> 00:06:03,206
So about once a year NASA would send three
astronauts and an engineer or a scientist.

102
00:06:03,206 --> 00:06:05,106
Actually, they had been scientists until me.

103
00:06:05,106 --> 00:06:10,436
They would send us to work in an
underwater laboratory about 65 feet deep

104
00:06:10,906 --> 00:06:16,556
to do space analog type missions so
to simulate what your days would be

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00:06:16,556 --> 00:06:21,166
like in space while it trained the astronauts
for what it might be like to experience space

106
00:06:21,166 --> 00:06:25,846
by being extremely isolated and running a
timeline similar to what you'd see in space.

107
00:06:26,116 --> 00:06:30,216
And for the scientists involved, the
scientists had to bring with them a whole suite

108
00:06:30,216 --> 00:06:34,046
of their experiments that they wanted
to test out on the crew and some

109
00:06:34,156 --> 00:06:36,676
of them were physiological,
some of them are psychological.

110
00:06:36,856 --> 00:06:40,206
And I thought as a young engineer who
was working in biomedical hardware,

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00:06:40,206 --> 00:06:44,726
I thought why don't we engineer
and get involved in that.

112
00:06:44,726 --> 00:06:48,046
So I was new and no one was really
going to shut me down to early.

113
00:06:48,046 --> 00:06:51,766
I thank my management was always
so supportive and they agreed.

114
00:06:51,766 --> 00:06:52,986
They said lets give it a shot.

115
00:06:53,086 --> 00:06:58,016
So we proposed a mission to the project.

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00:06:58,016 --> 00:07:01,136
And so our mission was in 2004.

117
00:07:01,536 --> 00:07:03,316
There were four of us.

118
00:07:03,316 --> 00:07:07,676
So there was myself the first engineer,
and then Doug wheelock, Nick Patrick

119
00:07:07,676 --> 00:07:11,166
and John Herrington -- three astronauts.

120
00:07:11,596 --> 00:07:16,246
And we spent 10 days underwater off
the coast of Florida, 65 feet deep

121
00:07:16,246 --> 00:07:23,016
and in a laboratory doing our experiments
and training simulations for the astronauts.

122
00:07:23,016 --> 00:07:28,416
Now typically that habitat, which
is called Aquarius, is run by NOAA.

123
00:07:28,416 --> 00:07:29,386
It's owned by NOAA.

124
00:07:29,446 --> 00:07:33,206
And usually its used by the
marine biologists year-round.

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00:07:33,426 --> 00:07:37,256
Marine biologists will write proposals
to come and live in the habitat for days

126
00:07:37,256 --> 00:07:40,206
and investigate the coral reefs
that are protected in the area.

127
00:07:40,676 --> 00:07:45,886
So it's a real functioning scientific laboratory
and then NASA will interrupt once a year

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00:07:45,886 --> 00:07:50,126
or so with us and all of our gear
and get a space analog mission.

129
00:07:50,396 --> 00:07:55,686
So that was that was really, truly fascinating,
especially as a young engineer to be able

130
00:07:55,686 --> 00:08:00,646
to create a set of new hardware, gain ideas
from others and everybody brings their hardware

131
00:08:00,646 --> 00:08:06,536
to the table and then you're kind of crammed
underwater for 65 feet deep for 10 days

132
00:08:06,536 --> 00:08:08,756
with three astronauts forced
to use your hardware.

133
00:08:08,756 --> 00:08:12,736
You get some pretty good feedback on whether
they might be good candidates for space.

134
00:08:13,706 --> 00:08:17,866
[Daniel] Okay, and that NEEMO again an extreme
environment like the International Space Station

135
00:08:17,866 --> 00:08:21,136
where it's really necessary to put these
things in the full extent of what they're going

136
00:08:21,136 --> 00:08:22,886
to be able to do to really test them out.

137
00:08:23,016 --> 00:08:23,346
[Tara] Right.

138
00:08:23,576 --> 00:08:27,336
[Daniel] So now lets switch over to a

little bit of station science stuff.

139
00:08:27,336 --> 00:08:28,546
You obviuosly love what you do.

140
00:08:28,546 --> 00:08:29,576
You're very excited.

141
00:08:29,696 --> 00:08:29,976
[Tara] Yeah.

142
00:08:29,976 --> 00:08:33,546
[Daniel] What are some of the more interesting
science activities we have going on and things

143
00:08:33,546 --> 00:08:35,786
that you're really happy to be involved with.

144
00:08:35,986 --> 00:08:39,686
[Tara] One thing I think people don't realize
is how many investigations are happening

145
00:08:39,686 --> 00:08:40,786
at any one given time.

146
00:08:41,086 --> 00:08:46,506
And right now there are all almost 200
investigations or experiments happening

147
00:08:46,506 --> 00:08:49,626
on space station at any one given time.

148
00:08:49,756 --> 00:08:50,906
[Daniel] So alot of work for the crews.

149
00:08:50,906 --> 00:08:55,816
[Tara] A lot of work for the crew and
its the only laboratory ever in the world

150
00:08:55,936 --> 00:09:02,336
where you will find laboratory modules put
together by...in different disciplines.

151
00:09:02,336 --> 00:09:05,846
So for example, nowhere on earth
will you see a materials sciences lab

152
00:09:05,846 --> 00:09:10,226
with the cell biology lab, and a human
physiology lab all...you know fluid physics lab,

153
00:09:10,226 --> 00:09:13,656
all attached because those people have
nothing in common scientifically, really.

154
00:09:13,656 --> 00:09:15,286
[Daniel] So again, multidisciplinary.

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00:09:15,286 --> 00:09:19,136
[Tara] Multidisciplinary and none of
these modules were tested on the ground.

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00:09:19,136 --> 00:09:21,486
They were all put together
on orbit for the first time.

157
00:09:21,486 --> 00:09:24,666
So engineering and you know...and
wonder itself...But

158
00:09:24,976 --> 00:09:26,846
as an orbiting laboratory, it's what it is.

159
00:09:26,846 --> 00:09:27,906
It's a laboratory.

160
00:09:28,636 --> 00:09:32,386
And all the research disciplines they

span, you know, across fluid physics,

161
00:09:32,436 --> 00:09:37,436
to fundamental physics, the human physiology,
and cell biology and technology development.

162
00:09:37,436 --> 00:09:41,736
Just you think of it if it's affected
by microgravity it can be done.

163
00:09:42,296 --> 00:09:43,386
It's really fascinating.

164
00:09:43,876 --> 00:09:47,296
[Daniel] Okay do you have a favorite
experiment going on right now.

165
00:09:47,296 --> 00:09:47,886
[Tara] I do.

166
00:09:47,886 --> 00:09:48,776
Well I have two.

167
00:09:49,156 --> 00:09:52,976
One is the Alpha Magnetic Spectrometer.

168
00:09:53,266 --> 00:09:53,476
[Daniel] Okay.

169
00:09:53,476 --> 00:09:57,266
[Tara] And this is a big machine that sits
on the outside of the space station truss.

170
00:09:57,386 --> 00:10:03,476
And it scans the skies looking for cosmic
rays and hits that could measure particles

171
00:10:03,516 --> 00:10:07,466
that could tell us a little bit

about dark matter and dark energy

172
00:10:07,686 --> 00:10:12,526
and maybe even help it tell us about a
new form of matter called strangelets.

173
00:10:12,636 --> 00:10:15,856
So when you when you're trying to
answer questions relating to dark matter

174
00:10:15,856 --> 00:10:19,656
and dark energy, it leads to things
like trying to answer the questions

175
00:10:19,656 --> 00:10:21,536
of the origin of our universe, you know.

176
00:10:22,026 --> 00:10:26,336
Most of what we see is only
five-percent of matter that's

177
00:10:26,486 --> 00:10:29,276
in the universe, the stars,
you know the planets.

178
00:10:29,396 --> 00:10:31,026
The other 95-percent we can't even see.

179
00:10:31,026 --> 00:10:31,806
We know it's out there.

180
00:10:31,806 --> 00:10:33,256
We want to find it and map it.

181
00:10:33,636 --> 00:10:37,236
You know the dark matter...you
know and all that's going back

182
00:10:37,236 --> 00:10:39,636

to the Big Bang theory and antimatter.

183
00:10:40,056 --> 00:10:42,276
So where there was equal...where
there was matter

184
00:10:42,276 --> 00:10:44,396
in the beginning there should
be equal parts antimatter.

185
00:10:44,646 --> 00:10:46,016
We obviously can see the matter.

186
00:10:46,406 --> 00:10:47,726
We can't see the antimatter.

187
00:10:47,726 --> 00:10:48,626
We're looking for it.

188
00:10:48,986 --> 00:10:50,976
So this machine's out there.

189
00:10:50,976 --> 00:10:53,106
It's constantly scanning the skies.

190
00:10:53,106 --> 00:10:56,826
Was developed by Nobel laureate and
he's collecting data that's going

191
00:10:56,826 --> 00:10:59,606
to maybe find evidence for
dark matter, antimatter

192
00:10:59,956 --> 00:11:02,606
and a new form of matter called strangelets.

193
00:11:02,686 --> 00:11:05,376
Which is strange in itself but
we haven't created that kind

194
00:11:05,376 --> 00:11:06,396
of in a matter here on the earth.

195
00:11:06,396 --> 00:11:08,396
But we can theorize that it exists.

196
00:11:08,886 --> 00:11:12,756
So it's fundamental discoveries
and that part just fascinates me

197
00:11:12,756 --> 00:11:14,136
because it gets back to who we are.

198
00:11:14,746 --> 00:11:16,686
And everybody wants to know that, right?

199
00:11:16,746 --> 00:11:17,146
[Daniel] That's right.

200
00:11:17,226 --> 00:11:18,216
[Tara] We're all interested in that.

201
00:11:18,216 --> 00:11:21,026
The second one is quicker I think.

202
00:11:21,026 --> 00:11:27,716
And it's an ongoing investigation about
looking at how microbes respond in microgravity

203
00:11:27,926 --> 00:11:30,406
and particularly bacteria and viruses.

204
00:11:30,696 --> 00:11:33,486
Some of them, not all, but some
of them become more aggressive.

205
00:11:33,906 --> 00:11:40,316

They may replicate faster and be more
just attackful in their nature and it may

206
00:11:40,316 --> 00:11:42,866
in fact be a stress response to
the microgravity environment.

207
00:11:42,986 --> 00:11:47,296
We care about that because of crew health
and it's a closed environment on orbit.

208
00:11:47,326 --> 00:11:48,756
So we want to try to control that.

209
00:11:48,986 --> 00:11:51,766
But on the ground we care
about it for other reasons.

210
00:11:51,766 --> 00:11:56,076
For example, one team has
found a gene responsible

211
00:11:56,076 --> 00:11:58,256
for creating the virulence in salmonella.

212
00:11:58,586 --> 00:12:01,466
And salmonella is the bacteria
that causes food poisoning.

213
00:12:01,536 --> 00:12:05,816
So since we've been able to identify
some of the causes of its aggression now,

214
00:12:05,816 --> 00:12:08,976
thanks to the microgravity environment,
that team has been able to come back

215
00:12:08,976 --> 00:12:15,256
and develop a formulated vaccine that could
potentially be used for food poisoning.

216
00:12:15,506 --> 00:12:17,736
And so that vaccine is in the initial phases

217
00:12:17,736 --> 00:12:20,686
of FDA approval right now as
an investigational new drug.

218
00:12:20,686 --> 00:12:22,776
I don't know if you've ever had food poisoning?

219
00:12:22,776 --> 00:12:23,156
[Daniel] I have.

220
00:12:23,156 --> 00:12:23,696
It's not pleasant.

221
00:12:23,696 --> 00:12:24,806
[Tara] You're begging for a cure.

222
00:12:25,136 --> 00:12:29,366
It's not pleasant so maybe one day...it
takes a while for these things to happen

223
00:12:29,366 --> 00:12:30,916
and get through the FDA approval process.

224
00:12:30,946 --> 00:12:34,256
But I'm waiting, looking forward to it.

225
00:12:34,256 --> 00:12:35,726
[Daniel] I think everybody will be.

226
00:12:35,766 --> 00:12:38,286
But I mean that...alot of that what
you just talked about just goes

227
00:12:38,286 --> 00:12:41,536

to show you have these experiments and
this research being done on the station

228
00:12:41,536 --> 00:12:45,946
that has these...you know, a hard-core direct
results that can be seen here down on Earth,

229
00:12:46,256 --> 00:12:47,946
something like curing food poisoning.

230
00:12:47,946 --> 00:12:52,516
But then on the other end of the spectrum
the Alpha Magnetic Spectrometer...these grand

231
00:12:52,516 --> 00:12:56,226
questions about where we come from, the origins
universe and what the universe is made of.

232
00:12:56,346 --> 00:12:56,486
[Tara] Yeah.

233
00:12:56,656 --> 00:12:59,386
[Daniel] So a vast array of things
going onboard the station.

234
00:12:59,476 --> 00:12:59,806
[Tara] Crazy cool.

235
00:12:59,806 --> 00:13:01,776
[Daniel] Obviously a very exciting job.

236
00:13:01,776 --> 00:13:02,646
[Tara] Very exciting.

237
00:13:03,066 --> 00:13:06,266
[Daniel] Well Tara I want to thank you very much
for being here today and give us a little bit

238
00:13:06,266 --> 00:13:09,676

of a look inside of the window
of station science.

239
00:13:09,676 --> 00:13:11,486
Again, thank you very much.

240
00:13:11,486 --> 00:13:12,456
[Tara] You are very welcome.

241
00:13:12,456 --> 00:13:13,106
Thanks for having me.

242
00:13:13,106 --> 00:13:14,066
It's always fun to share it.