SILICON VALLEY

PODCAST

1
00:00:00,690 --> 00:00:04,120
Host (Matthew Buffington): You are listening
to NASA in Silicon Valley, Episode 68.

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00:00:04,120 --> 00:00:05,960
Frank, tell us about our guest today.

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00:00:05,960 --> 00:00:06,960
Frank Tavares: Hey, Matt!

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00:00:06,960 --> 00:00:10,900
Today, we’re talking with Kevin Sato, the
Project Scientist and Deputy Project Manager

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00:00:10,900 --> 00:00:13,429
of NASA’s Space Biology research projects.

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00:00:13,429 --> 00:00:18,351
So, space biology is basically figuring out
how humans can live in space, on Mars, on

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00:00:18,351 --> 00:00:20,340
the Moon, wherever we end up going.

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00:00:20,340 --> 00:00:24,380
And Kevin not only works on some of these
individual experiments, but also looks at

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00:00:24,380 --> 00:00:29,480
the big picture of developing a portfolio,
picking what experiments go when, and basically

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00:00:29,480 --> 00:00:30,840
planning all of that out for the future.

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00:00:30,840 --> 00:00:34,640
Host: And all of this is very relevant now,
as we’re getting ready for, towards the

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00:00:34,640 --> 00:00:40,469
end of this month, for SpaceX 13, where we’ll
be launching up to the International Space

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00:00:40,469 --> 00:00:44,280
Station, of which they’ll be several Ames
payload, and science experiments.

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00:00:44,280 --> 00:00:45,860
Frank Tavares: Yeah, definitely!

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00:00:45,860 --> 00:00:49,720
And Rodent Research is something that Kevin’s
worked on in the past, and Rodent Research

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00:00:49,720 --> 00:00:53,889
6 is one of the science experiments that will
be going up to the space station again.

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00:00:53,889 --> 00:00:58,149
Again, looking at, you know, how life changes
when it’s put into space.

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00:00:58,149 --> 00:01:03,229
Host: So on a similar note, we are a NASA
podcast but we are not the only NASA podcast!

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00:01:03,229 --> 00:01:07,001
And our friends over at the Johnson Space
Center have a podcast called Houston We Have

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00:01:07,001 --> 00:01:08,001
a Podcast.

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00:01:08,001 --> 00:01:11,900
We’re actually, as a special treat, going
to be doing a joint episode with those guys

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00:01:11,900 --> 00:01:16,510

next week, where we'll be talking about
SpaceX 13 and some of this work.

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00:01:16,510 --> 00:01:19,400
Frank Tavares: Yeah, and the really exciting
thing about that is we'll actually have

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00:01:19,400 --> 00:01:23,220
an astronaut calling in, so we'll be able
to get two ends of the spectrum, both the

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00:01:23,220 --> 00:01:28,270
astronauts that are on the space station actually
doing these experiments, and some of the scientists

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00:01:28,270 --> 00:01:32,060
that are developing those experiments, so
we're getting both perspectives.

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00:01:32,060 --> 00:01:36,420
Host: And so as a special shout out, also
from NASA's Headquarters, they're going

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00:01:36,420 --> 00:01:41,150
to be launching a new podcast this very week,
called Gravity Assist, that is going to be

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00:01:41,150 --> 00:01:46,860
run by our director of planetary scientist,
the famous Dr. Jim Green, is basically giving

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00:01:46,860 --> 00:01:51,860
a virtual tour of the solar system and beyond,
starting out with the Sun, building all the

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00:01:51,860 --> 00:01:55,250
way up into 10 episodes, that'll end in
Pluto.

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00:01:55,250 --> 00:02:03,530

But before we jump into our episode, a reminder,
we have a phone number, (650) 604-1400.

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00:02:03,530 --> 00:02:08,530
Any questions, comments, go ahead and give
us a call, and leave a message for us, and

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00:02:08,530 --> 00:02:11,270
we can figure out how to add that into the
podcast.

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00:02:11,270 --> 00:02:16,470
But for those of you who want to be on social
media, we're using the hashtag #NASASiliconValley.

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00:02:16,470 --> 00:02:17,470
But for today…

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00:02:17,470 --> 00:02:19,240
Frank Tavares: … Let's hear from Kevin
Sato.

38
00:02:19,240 --> 00:02:31,200
[Music]

39
00:02:31,200 --> 00:02:32,820
Matthew Buffington: We always start it off
the same.

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00:02:32,840 --> 00:02:34,530
Tell us a little bit about yourself.

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00:02:34,530 --> 00:02:37,580
What brought you to -- ? How did you join
NASA?

42
00:02:37,580 --> 00:02:39,310
How did you end up in Silicon Valley?

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00:02:39,310 --> 00:02:43,020
Kevin Sato: Actually, I didn't end up in Silicon
Valley.

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00:02:43,020 --> 00:02:45,290
I grew up in the Silicon Valley.

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00:02:45,290 --> 00:02:46,330
Host: That happens.

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00:02:46,330 --> 00:02:47,330
Kevin Sato: Yep.

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00:02:47,330 --> 00:02:48,500
I grew up in Mountain View.

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00:02:48,500 --> 00:02:49,500
Host: Really?

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00:02:49,500 --> 00:02:53,420
Kevin Sato: Went to Castro Elementary School,
Graham Middle School, and Los Altos High School.

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00:02:53,420 --> 00:02:56,100
So, I know this area and I know this base.

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00:02:56,100 --> 00:03:00,920
Host: That's so rare in this area with having
the Google headquarters next door, Facebook

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00:03:00,920 --> 00:03:01,920
headquarters.

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00:03:01,920 --> 00:03:03,620
It's like this tech boom in this area.

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00:03:03,620 --> 00:03:05,630
It's kind of rare you find people who are
natives.

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00:03:05,630 --> 00:03:06,630
Kevin Sato: Yeah.

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00:03:06,630 --> 00:03:10,760
No, I remember when the Bay Area was actually
a large number of orchards.

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00:03:10,760 --> 00:03:11,819
Host: Yeah.

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00:03:11,819 --> 00:03:15,860
Kevin Sato: The actual part related to the
silicon part.

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00:03:15,860 --> 00:03:18,500
The semiconductor industry was just getting
started.

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00:03:18,500 --> 00:03:24,540
And so, it's been really a treat to see how
the Bay Area has grown up from one type of

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00:03:24,540 --> 00:03:26,459
technology through to the next generation.

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00:03:26,459 --> 00:03:27,459
Host: Wow.

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00:03:27,459 --> 00:03:31,890
Yeah, a while back we had an episode with
Jack Boyd where he was telling about the history

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00:03:31,890 --> 00:03:32,890
of the place.

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00:03:32,890 --> 00:03:39,970
I know a big part about putting an NACA, now
NASA, center in this area was also taking

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00:03:39,970 --> 00:03:45,830
advantage of you have Stanford, you have all
these universities, you have companies.

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00:03:45,830 --> 00:03:47,940
It's like this was just like a very fertile
ground.

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00:03:47,940 --> 00:03:52,890
So, I'd imagine growing up in this area, it
just seemed such a natural flow to end up

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00:03:52,890 --> 00:03:54,730
working over in NASA.

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00:03:54,730 --> 00:03:56,250
Kevin Sato: Yeah, it is.

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00:03:56,250 --> 00:04:01,930
I was lucky enough, or old enough, to actually
be able to remember back to Apollo.

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00:04:01,930 --> 00:04:06,319
In fact, one of the first things I remember
about NASA was being at my grandmother's house

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00:04:06,319 --> 00:04:09,190
one Sunday for dinner and we all went outside.

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00:04:09,190 --> 00:04:14,160
My dad and uncle somehow knew Gemini -- don't
remember which mission -- was actually going

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00:04:14,160 --> 00:04:15,190
to fly over.

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00:04:15,190 --> 00:04:17,830
And so, we looked up and we saw Gemini come

right over us.

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00:04:17,830 --> 00:04:18,830
That was the first thing.

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00:04:18,830 --> 00:04:20,650
But I remember all the Apollo missions.

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00:04:20,650 --> 00:04:23,880
But actually, my coming to work for NASA,
which is something I thought would never,

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00:04:23,880 --> 00:04:27,610
ever happen, was actually very accidental.

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00:04:27,610 --> 00:04:32,380
I was completing my postdoctoral fellowship.

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00:04:32,380 --> 00:04:38,600
And there was an opening that I was called
in for to actually work with the NASA Flight

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00:04:38,600 --> 00:04:40,800
Payloads group at that time.

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00:04:40,800 --> 00:04:48,030
And so, it was a complete shift where I would
no longer be doing research, but actually

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00:04:48,030 --> 00:04:53,350
working with principal investigators to translate
their dreams and their goals for their scientific

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00:04:53,350 --> 00:05:00,210
research into ones that they can actually
conduct into space to understand the usual:

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00:05:00,210 --> 00:05:03,070
how does life respond to space.

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00:05:03,070 --> 00:05:06,979
But a lot of the scientists were also interested
in not necessarily just exploration.

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00:05:06,979 --> 00:05:14,060
They were really interested in using the space
environment to understand how a particular

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00:05:14,060 --> 00:05:19,940
disease state occurred, and then turn that
back into understanding how we might be able

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00:05:19,940 --> 00:05:20,940
to solve that on Earth.

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00:05:20,940 --> 00:05:24,430
Host: I always get a kick out of, especially
taking to anybody who's working on payloads,

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00:05:24,430 --> 00:05:31,291
that mix of science, research, scientific
method, hypotheses, running experiments, but

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00:05:31,291 --> 00:05:36,200
also the engineering side of building a thing
that can survive a launch, that can get up

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00:05:36,200 --> 00:05:38,930
into the space station and do this.

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00:05:38,930 --> 00:05:42,710
But in your own background, was it more science?

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00:05:42,710 --> 00:05:44,320
Was it engineering, working on payloads?

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00:05:44,320 --> 00:05:45,950
Or was it both?

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00:05:45,950 --> 00:05:48,949
How did that even launch into working at NASA?

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00:05:48,949 --> 00:05:51,000
Kevin Sato: My background was straight science.

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00:05:51,000 --> 00:05:52,000
Host: Okay.

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00:05:52,000 --> 00:05:53,820
Kevin Sato: It was straight fundamental research.

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00:05:53,820 --> 00:05:59,060
I was focused in the areas of human cancer,
human molecular biology and development of

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00:05:59,060 --> 00:06:03,370
the cancer and how cells divide.

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00:06:03,370 --> 00:06:10,780
And so, when it came to moving to the NASA
side, it was very much no longer that specific

106
00:06:10,780 --> 00:06:12,551
area where you're focusing.

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00:06:12,551 --> 00:06:16,949
You were really utilizing everything you had
learned as a scientist, because now you weren't

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00:06:16,949 --> 00:06:17,949
just looking at one thing.

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00:06:17,949 --> 00:06:23,979
You had to be able to understand the science
in many different areas, a drosophila focus,

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00:06:23,979 --> 00:06:28,020
cell, rodent, C. elegans, just microbiology.

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00:06:28,020 --> 00:06:29,020
A lot of different areas.

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00:06:29,020 --> 00:06:34,720
So, it was really interesting because I was
now pulling on all of my experience and education

113
00:06:34,720 --> 00:06:37,100
in order to work with the investigators.

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00:06:37,100 --> 00:06:43,229
But the really interesting thing was the folks
that I worked with, especially the engineers

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00:06:43,229 --> 00:06:49,240
and the operational people, because they were
very helpful in really learning what they

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00:06:49,240 --> 00:06:50,480
did, but learning their language.

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00:06:50,480 --> 00:06:53,830
Because I think something people don't think
about is, "It's science.

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00:06:53,830 --> 00:06:54,889
He can talk science."

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00:06:54,889 --> 00:07:01,040
But in a lot of ways, when you move from one
type of area of research or method into different

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00:07:01,040 --> 00:07:03,300
areas, you're actually learning to speak differently.

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00:07:03,300 --> 00:07:08,060

You're learning, in a lot of ways, a new language
and a new way to communicate and being able

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00:07:08,060 --> 00:07:11,680
to say, "Here's what the science needs to
engineer so they understand how to implement it.

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00:07:11,680 --> 00:07:14,780
Here's what science needs, so the operational
folks need it.

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00:07:14,789 --> 00:07:19,860
And then here's how we justify it so people
in business, in management, can understand

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00:07:19,860 --> 00:07:21,139
what's needed."

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00:07:21,139 --> 00:07:27,669
And so, that's been the interesting part about
my career here is that you're forever growing

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00:07:27,669 --> 00:07:32,070
and learning, and learning new ways to communicate
as I've been moving through the different

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00:07:32,070 --> 00:07:33,550
areas that I've been involved in.

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00:07:33,550 --> 00:07:39,789
Host: And so starting off, it was payloads
from the beginning or helping people design

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00:07:39,789 --> 00:07:40,789
those experiments?

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00:07:40,789 --> 00:07:41,789
Kevin Sato: Right.

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00:07:41,789 --> 00:07:43,030
It was science operations.

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00:07:43,030 --> 00:07:46,680
Basically, there are a series of phases that
we go though.

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00:07:46,680 --> 00:07:53,319
First phase was taking an investigation, translating
that into a flight capable investigation through

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00:07:53,319 --> 00:07:56,190
defining the requirements of that investigation.

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00:07:56,190 --> 00:08:03,090
For example, a principal investigator wanted
to be able to study how quail developed in

137
00:08:03,090 --> 00:08:04,090
space.

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00:08:04,090 --> 00:08:07,780
Now you have to say, "Okay, how do we translate
that into set of requirements that engineers

139
00:08:07,780 --> 00:08:10,740
can understand to develop the hardware [they
need]?"

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00:08:10,740 --> 00:08:15,310
So, they said, "Okay, the quail needed to
get air of this amount.

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00:08:15,310 --> 00:08:18,930
They need to be able to develop.

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00:08:18,930 --> 00:08:22,419
Like with anything, the eggs need to be turned
periodically."

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00:08:22,419 --> 00:08:23,419
Host: Yeah.

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00:08:23,419 --> 00:08:24,419
Kevin Sato: "They need a certain temperature."

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00:08:24,419 --> 00:08:28,889
So, you're looking at all these particular
perspectives of the investigation and turning

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00:08:28,889 --> 00:08:34,279
it into rather than "I need to do this study,"
like you would in a lab, to specific defined

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00:08:34,279 --> 00:08:39,469
specifications that anyone can look at and
go, "Okay, I know what you need so that I

148
00:08:39,469 --> 00:08:42,380
can run it operationally as well as engineering
wise."

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00:08:42,380 --> 00:08:47,100
That was a real large difference, because
you don't think in those terms necessarily

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00:08:47,100 --> 00:08:48,529
as a scientist.

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00:08:48,529 --> 00:08:54,890
You do subconsciously, but you never have
to really put it down on paper and tell someone

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00:08:54,890 --> 00:08:55,890
else.

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00:08:55,890 --> 00:08:59,650
Host: I imagine as a researcher, as a scientist,
you have a lab, you probably have a little

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00:08:59,650 --> 00:09:01,580
bit more freedom of like, "Okay, here's my
hypothesis.

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00:09:01,580 --> 00:09:03,310
This is what I'm looking at."

156
00:09:03,310 --> 00:09:06,170
Design the experiment, run the experiment,
control groups.

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00:09:06,170 --> 00:09:08,779
You do the whole rigmarole.

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00:09:08,779 --> 00:09:13,630
But there's only so much stuff that can go
to the space station, and it takes a lot of

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00:09:13,630 --> 00:09:15,880
effort and a lot of money to get something
up on the space station.

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00:09:15,880 --> 00:09:18,279
So, I'd imagine it's just like -- I don't
know.

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00:09:18,279 --> 00:09:19,930
I'm just making this up.

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00:09:19,930 --> 00:09:24,470
You can tell me if I'm wrong -- I'm thinking
of a funnel of people propose a lot of ideas,

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00:09:24,470 --> 00:09:29,190
a lot of investigations, a lot of theories,
and then that slowly gets whittled down to,

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00:09:29,190 --> 00:09:33,380

"Okay, what's an actual real experience and
how can we actually put it up?"

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00:09:33,380 --> 00:09:38,090
Is that kind of how it works, to narrow down
who wins and goes up to the space station?

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00:09:38,090 --> 00:09:39,090
Kevin Sato: Yeah.

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00:09:39,090 --> 00:09:40,090
Yeah, exactly.

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00:09:40,090 --> 00:09:43,130
The way it works is NASA puts out regular
what's called NASA research announcements,

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00:09:43,130 --> 00:09:44,130
their solicitations.

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00:09:44,130 --> 00:09:49,700
For flight investigations, they go through
basically three series of reviews.

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00:09:49,700 --> 00:09:52,320
The first one is a peer review.

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00:09:52,320 --> 00:09:54,709
Scientists from the scientific community come
in.

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00:09:54,709 --> 00:09:57,640
They review all of the grants for scientific
merit.

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00:09:57,640 --> 00:09:58,970
Is it worth doing?

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00:09:58,970 --> 00:10:02,290

Is it addressing a question that's worth asking?

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00:10:02,290 --> 00:10:07,540
And is the science that is being conducted
of high merit and worth us funding?

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00:10:07,540 --> 00:10:12,490
Once those receive a passing score, they then
get passed on to the different centers who

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00:10:12,490 --> 00:10:15,420
have the expertise, and we look at them for
now technical feasibility.

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00:10:15,420 --> 00:10:16,420
Host: Okay.

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00:10:16,420 --> 00:10:17,870
Kevin Sato: Exactly as you said.

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00:10:17,870 --> 00:10:20,360
Can you actually conduct this experiment in
space?

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00:10:20,360 --> 00:10:25,220
Can we actually turn this into a flight experiment
within the constraints, the requirements,

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00:10:25,220 --> 00:10:27,410
and capabilities we have available?

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00:10:27,410 --> 00:10:33,240
Then once they receive a score for that, it's
combined with the main peer review score.

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00:10:33,240 --> 00:10:37,880
Then we look at it at the headquarters levels
in terms of programmatics and funding.

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00:10:37,880 --> 00:10:40,970
Do we have the funding for how many can we
support?

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00:10:40,970 --> 00:10:45,930
Programmatically, does it actually fit what
we're interested in and our objectives for

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00:10:45,930 --> 00:10:49,530
exploration: standard fundamental knowledge
advancement?

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00:10:49,530 --> 00:10:53,709
Once all of those are considered, then the
final whittling goes down, as you said, to

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00:10:53,709 --> 00:10:59,459
funnel where a certain select few are then
recommended to, in our case, the space life

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00:10:59,459 --> 00:11:07,020
and physical sciences research and applications
director for his approval to fund those particular

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00:11:07,020 --> 00:11:08,020
investigations.

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00:11:08,020 --> 00:11:11,000
Once that's done, the principal investigators
are notified.

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00:11:11,000 --> 00:11:15,260
Then for us at the center, when I was doing
flight payloads, the fun begins.

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00:11:15,260 --> 00:11:19,870
Because then we meet the PIs, we learn about
what they're doing, and we now take the first

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00:11:19,870 --> 00:11:26,010

steps to defining their experiment requirements
in terms of flight investigation.

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00:11:26,010 --> 00:11:27,610
And then we go from there.

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00:11:27,610 --> 00:11:31,100
Host: In the role that you're working in even
now, it's like you're not just working on

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00:11:31,100 --> 00:11:33,110
one experiment and one thing.

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00:11:33,110 --> 00:11:38,300
You're looking at a whole suite, like the
whole of the program, all these different

201
00:11:38,300 --> 00:11:39,770
experiments and different things.

202
00:11:39,770 --> 00:11:41,060
Kevin Sato: Yes.

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00:11:41,060 --> 00:11:46,910
Now I'm working more on the programmatic side
with the strategic and tactical planning,

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00:11:46,910 --> 00:11:53,920
but also looking across our entire portfolio
of investigations to identify which experiments

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00:11:53,920 --> 00:12:01,740
we want to fly in which priority orders based
on what we know is currently the programmatic

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00:12:01,740 --> 00:12:07,350
needs not just for NASA Space Biology, but
also for the human research project.

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00:12:07,350 --> 00:12:10,230
Possibly also with respect to commercial and
other areas.

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00:12:10,230 --> 00:12:16,430
But primarily, what do we need to understand
and know in order to safely fly humans to

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00:12:16,430 --> 00:12:18,430
the moon and to Mars again.

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00:12:18,430 --> 00:12:22,010
And so, that's why I work across all the portfolios.

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00:12:22,010 --> 00:12:28,709
Then we then hand those to the various implementation
groups or our, definitionally speaking, that

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00:12:28,709 --> 00:12:29,709
study.

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00:12:29,709 --> 00:12:32,320
I'm still doing definition work and working
with PIs, but less so.

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00:12:32,320 --> 00:12:37,510
We have a group of really great people who
are portfolio leads, and also our mission

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00:12:37,510 --> 00:12:42,870
scientists who are now the next generation
of folks who are taking experiments out to

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00:12:42,870 --> 00:12:43,870
space.

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00:12:43,870 --> 00:12:49,970
Host: Early on in the podcast, we'd spoke
with David Smith who's in the space bioscience

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00:12:49,970 --> 00:12:54,900
group, and also Elizabeth Pane on some of
the working on payloads and different things.

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00:12:54,900 --> 00:12:59,790
Basically, your day-to-day is working with
these people, understanding these experiments,

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00:12:59,790 --> 00:13:03,730
and getting them all lined up to become a
reality.

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00:13:03,730 --> 00:13:08,800
I know one of the big competencies, one of
the big things that Ames does, is focusing

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00:13:08,800 --> 00:13:11,100
on space biology.

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00:13:11,100 --> 00:13:12,690
So, talk a little bit about that.

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00:13:12,690 --> 00:13:17,330
I love the catchphrase of the International
Space Station of working off the earth for

225
00:13:17,330 --> 00:13:18,899
the earth.

226
00:13:18,899 --> 00:13:24,350
Why is it important to have space biology
or space biosciences?

227
00:13:24,350 --> 00:13:26,029
What are we looking for?

228
00:13:26,029 --> 00:13:27,250
What we trying to understand?

229
00:13:27,250 --> 00:13:32,580
Kevin Sato: Right, so space biology is actually
a very unique field of study.

230
00:13:32,580 --> 00:13:36,330
I think most people when they think about
research, you're doing it in gravity, you're

231
00:13:36,330 --> 00:13:40,779
doing it in 1G on earth, and you're doing
it in an environment that you can control

232
00:13:40,779 --> 00:13:43,149
that basically life evolved in.

233
00:13:43,149 --> 00:13:51,279
Now when you leave earth, all of those norms
that you understand biology to function by,

234
00:13:51,279 --> 00:13:54,830
all of the norms that you do research by,
change completely.

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00:13:54,830 --> 00:14:00,720
For example, if you go into orbit, you're
basically in freefall, you're in microgravity,

236
00:14:00,720 --> 00:14:03,580
and life biology changes.

237
00:14:03,580 --> 00:14:09,100
You see changes where you no longer have the
standard gradient of fluid pressure, for example,

238
00:14:09,100 --> 00:14:11,670
on the body from the head to the feet.

239
00:14:11,670 --> 00:14:14,300
All that begins to equalize out.

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00:14:14,300 --> 00:14:22,170
Mechanical stimulations that we get from walking
or moving are reduced or eliminated.

241
00:14:22,170 --> 00:14:26,760
And so, you need to start to think in terms
of what is going on in the absence of the

242
00:14:26,760 --> 00:14:27,760
gravity.

243
00:14:27,760 --> 00:14:31,970
But also, the science itself is also thinking
about "If I'm going to conduct this research

244
00:14:31,970 --> 00:14:35,290
in space, why do I need to conduct it there?

245
00:14:35,290 --> 00:14:39,850
What can spaceflight, that environment, tell
me that I cannot do on earth?"

246
00:14:39,850 --> 00:14:42,010
There are a lot of things.

247
00:14:42,010 --> 00:14:47,209
For example, there are potential disease syndromes
such as I think everyone understands osteoporosis.

248
00:14:47,209 --> 00:14:48,220
Host: Okay.

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00:14:48,220 --> 00:14:49,839
Yeah, like bone density.

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00:14:49,839 --> 00:14:51,629
Kevin Sato: Bone density, correct.

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00:14:51,629 --> 00:14:56,840
On earth, that takes years and years, almost
a lifetime, to occur.

252
00:14:56,840 --> 00:15:03,760
To study that over someone's lifetime means
that 80, 90 years before you get any understanding.

253
00:15:03,760 --> 00:15:09,670
However, it's known that when astronauts go
into space, and we've seen this in rodents,

254
00:15:09,670 --> 00:15:12,490
there's an almost immediate start in loss
of bone.

255
00:15:12,490 --> 00:15:13,490
Host: Really?

256
00:15:13,490 --> 00:15:14,490
Kevin Sato: Yes.

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00:15:14,490 --> 00:15:22,370
And so the idea, the understanding, is that
there's somehow a disconnect between how bone

258
00:15:22,370 --> 00:15:25,350
is degraded and bone is formed.

259
00:15:25,350 --> 00:15:32,740
On earth, there's a homeostasis, meaning there's
a static change with how you lose bone and

260
00:15:32,740 --> 00:15:36,130
gain bone, because you remodel your bone throughout
your life.

261
00:15:36,130 --> 00:15:43,690
In spaceflight, as in osteoporosis, there's

a disconnect between the bone loss and the

262
00:15:43,690 --> 00:15:48,630
stimuli to stimulate the cells that will come
in and form bone.

263
00:15:48,630 --> 00:15:49,790
That's no longer there.

264
00:15:49,790 --> 00:15:53,470
So, you get more accumulative bone loss than
you do bone formation.

265
00:15:53,470 --> 00:16:01,529
And that's what could give an osteo product
like state in bones in astronauts and rodents.

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00:16:01,529 --> 00:16:08,140
One of the questions that's out there is does
this particular state really describe what

267
00:16:08,140 --> 00:16:11,449
happens in the disease state on Earth.

268
00:16:11,449 --> 00:16:14,420
There's a lot of indications that, yes, that’s
true.

269
00:16:14,420 --> 00:16:20,790
But it's an area that's of very high and strong
research that we at Ames are actually very,

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00:16:20,790 --> 00:16:21,790
very much involved in.

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00:16:21,790 --> 00:16:29,180
We have scientists finding major breakthroughs
in how it might be occurring at a mechanistic

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00:16:29,180 --> 00:16:36,510
level, and also how we may be able to identify
some countermeasures that may stop that particular

273
00:16:36,510 --> 00:16:37,510
state.

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00:16:37,510 --> 00:16:42,519
Host: Yeah, I think naturally when you think
about these biology experiments in space,

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00:16:42,519 --> 00:16:50,180
"Biology in Space," naturally you tend to
think of on going to Mars, humans going to

276
00:16:50,180 --> 00:16:54,580
the moon, living long term out in space, how
that affects you.

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00:16:54,580 --> 00:16:56,889
There's a natural connect to that.

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00:16:56,889 --> 00:17:00,880
But there's also a lot of pharmaceutical industries.

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00:17:00,880 --> 00:17:06,409
There's other things that you can learn that
can help us living on earth that aren't necessarily

280
00:17:06,409 --> 00:17:08,730
related towards the journey to Mars.

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00:17:08,730 --> 00:17:13,350
But it's just like things that you can learn
about how microgravity affects biology that

282
00:17:13,350 --> 00:17:14,470
can help us out here.

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00:17:14,470 --> 00:17:16,339
Kevin Sato: Yeah, and that's key, I think.

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00:17:16,339 --> 00:17:23,889
Although a while ago, there was actually an
NIH, National Institutes of Health, call for

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00:17:23,889 --> 00:17:28,919
research investigations that required the
use of the spaceflight environment in order

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00:17:28,919 --> 00:17:32,980
to address specific disease questions on earth.

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00:17:32,980 --> 00:17:37,620
One of the investigators who was one of the
payload specialist astronauts years ago on

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00:17:37,620 --> 00:17:42,820
the space shuttle and is studying aging -- because
there's a lot of aging analogs that occur

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00:17:42,820 --> 00:17:50,389
-- had identified that T cells, which are
an important part of your immune system that

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00:17:50,389 --> 00:17:55,940
activate cells that produce the B cells that
produce antibodies, weren't stimulated to

291
00:17:55,940 --> 00:17:58,859
become activated so they can do that work.

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00:17:58,859 --> 00:18:02,929
And so, that was actually funded by the National
Institutes of Health.

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00:18:02,929 --> 00:18:09,629
There are companies who are actually using
the space environment because of the acceleration

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00:18:09,629 --> 00:18:17,110
in possible analog disease states in space
in order to actually investigate possible

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00:18:17,110 --> 00:18:21,509
countermeasure drugs, that they can see whether
it works or not.

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00:18:21,509 --> 00:18:27,610
And based on that, they can either come back
and say, "Hey, let's go look at this further.

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00:18:27,610 --> 00:18:32,330
This compound looks like one that we might
be able to use for further drug testing."

298
00:18:32,330 --> 00:18:38,799
Or the idea ultimately is the ability to maybe
use the space environment to validate drugs.

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00:18:38,799 --> 00:18:44,210
Now it's a little harder because you have
a limited number of specimens you can study.

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00:18:44,210 --> 00:18:51,139
But I think the key is the fact that, as I
mentioned with osteoporosis, there are certain

301
00:18:51,139 --> 00:18:56,080
physical states, physiological states, in
the human body, or the animal, or in other

302
00:18:56,080 --> 00:19:02,280
model organisms like drosophila, C. elegans,
and especially bacteria where you're seeing

303
00:19:02,280 --> 00:19:08,940
changes occur at a much more rapid rate that
you can actually analyze within a certain

304
00:19:08,940 --> 00:19:13,559
shorter period of time and get really good
research data that we may be able to base

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00:19:13,559 --> 00:19:19,739
some commercial basis for a drug, identification
of a countermeasure, or potential therapeutic

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00:19:19,739 --> 00:19:20,739
target.

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00:19:20,739 --> 00:19:21,739
Host: Wow.

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00:19:21,739 --> 00:19:23,990
I remember the last time when we were hanging
out and talking.

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00:19:23,990 --> 00:19:26,559
I think we were talking about some of the
rodent research stuff.

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00:19:26,559 --> 00:19:31,919
You were talking about how some of the new
upcoming experiments of it's not only just

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00:19:31,919 --> 00:19:35,919
like, hey, this is some of the stuff that
NASA is working on to understand the journey

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00:19:35,919 --> 00:19:41,639
to Mars, to understand how this knowledge
can benefit us here on earth.

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00:19:41,639 --> 00:19:46,240
But also going into how the teams are formatted
and how the teams can work together and different

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00:19:46,240 --> 00:19:48,460
things that you guys have learned about.

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00:19:48,460 --> 00:19:49,909
Go ahead and talk a little bit about some
of that stuff.

316
00:19:49,909 --> 00:19:50,909
Kevin Sato: Yeah.

317
00:19:50,909 --> 00:19:54,470
Everything we do here at NASA, which is, I
think, one of the most exciting things we

318
00:19:54,470 --> 00:19:57,940
do, is we work in teams.

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00:19:57,940 --> 00:20:00,950
We work in teams that have different specializations.

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00:20:00,950 --> 00:20:01,950
We have scientists.

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00:20:01,950 --> 00:20:03,929
We have people who know operations.

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00:20:03,929 --> 00:20:08,529
These are all the guys that make things happen
for us, for a scientist.

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00:20:08,529 --> 00:20:09,529
We have engineers.

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00:20:09,529 --> 00:20:11,389
We have people who are business, project managers.

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00:20:11,389 --> 00:20:12,389
We have PAO, education.

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00:20:12,389 --> 00:20:13,389
Host: Yeah, yeah.

327
00:20:13,389 --> 00:20:14,749
Kevin Sato: We work in teams.

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00:20:14,749 --> 00:20:19,389
It's that interaction of the teams that make
the science happen.

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00:20:19,389 --> 00:20:21,769
In the case of the rodent research.

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00:20:21,769 --> 00:20:25,919
There's a lot of different things that have
to happen for a rodent research experiment.

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00:20:25,919 --> 00:20:29,349
There's the identification of the science
and what the requirements are that the scientists

332
00:20:29,349 --> 00:20:36,499
do, as well as working with our flight internal
animal care and use committee in order to

333
00:20:36,499 --> 00:20:42,230
understand how we work with the animals to
make sure it's done in a humane and ethical

334
00:20:42,230 --> 00:20:43,230
manner.

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00:20:43,230 --> 00:20:46,390
Because the animals are very important for
research, they always have been, and we look

336
00:20:46,390 --> 00:20:51,919
at them as partners in understanding in our
trip to Mars.

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00:20:51,919 --> 00:20:58,759
Once those are done, it gets handed off to
our engineers and ops people to be able to

338
00:20:58,759 --> 00:21:02,590
then take that and translate it into an actual
flight.

339
00:21:02,590 --> 00:21:04,139
What hardware do we need?

340
00:21:04,139 --> 00:21:07,380
What kits do we need to bring up in order
to support the animals?

341
00:21:07,380 --> 00:21:13,360
What operational needs do we have in order
to change out food, change out the water supply

342
00:21:13,360 --> 00:21:16,049
system, send them up, bring them back?

343
00:21:16,049 --> 00:21:21,999
But on top of that, where you see the integration
of work within a project and within a specific

344
00:21:21,999 --> 00:21:26,450
flight, there's also the interplay that occurs
between flights.

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00:21:26,450 --> 00:21:31,009
Because as you're working on one investigation,
you're starting to work on another or you're

346
00:21:31,009 --> 00:21:32,009
finishing another.

347
00:21:32,009 --> 00:21:33,009

Host: This is layered.

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00:21:33,009 --> 00:21:34,009
Yeah.

349
00:21:34,009 --> 00:21:35,009
Kevin Sato: It's just layered.

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00:21:35,009 --> 00:21:36,009
Yeah.

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00:21:36,009 --> 00:21:40,599
And it's like that for any investigations
we do for flight payloads for any model organism.

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00:21:40,599 --> 00:21:48,440
That's one of the larger challenges, making
sure that the teams are able to work in a

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00:21:48,440 --> 00:21:53,479
manner where they complete one and start another
or begin another while they're beginning to

354
00:21:53,479 --> 00:21:57,299
work and deal with one study that they're
already doing.

355
00:21:57,299 --> 00:22:04,769
And so, it's a very dynamic environment, and
it's one in which it's very exciting because

356
00:22:04,769 --> 00:22:08,549
you're constantly learning something new,
you're constantly doing something different,

357
00:22:08,549 --> 00:22:12,190
or you're constantly learning something that
you did the last time that you changed and

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00:22:12,190 --> 00:22:13,769
all of a sudden there's an improvement.

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00:22:13,769 --> 00:22:19,559
But on the bottom line that I think we get
as a team, and the greatest kick we get, is

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00:22:19,559 --> 00:22:24,679
when a scientific investigator comes back
and says, "Hey, I can address all my objective's

361
00:22:24,679 --> 00:22:25,679
specific aims.

362
00:22:25,679 --> 00:22:26,999
I can do my research.

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00:22:26,999 --> 00:22:28,679
And I really want to thank you."

364
00:22:28,679 --> 00:22:29,899
That's really rewarding.

365
00:22:29,899 --> 00:22:33,429
Because what you end up feeling, even though
you're not doing the science, is the fact

366
00:22:33,429 --> 00:22:39,169
that you've enabled something to occur that
is going to benefit space exploration and

367
00:22:39,169 --> 00:22:42,159
potentially earth and humans in general.

368
00:22:42,159 --> 00:22:46,340
Host: That's a really cool thing I've enjoyed
and thing that I've loved about talking with

369
00:22:46,340 --> 00:22:55,389

people during the podcast is also it really
takes all different types to make this place

370
00:22:55,389 --> 00:22:57,519
run.

371
00:22:57,519 --> 00:23:04,769
It's also good because there's so many people
who watched Star Wars as kids or watched SpaceCamp

372
00:23:04,769 --> 00:23:09,809
or Star Trek, or people who are inspired by
the stuff, and they're like "Love NASA."

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00:23:09,809 --> 00:23:16,059
But maybe math is not their thing, or maybe
writing isn't their thing, or business classes.

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00:23:16,059 --> 00:23:21,259
It's like no matter what your area of interest
is, there's a role to play.

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00:23:21,259 --> 00:23:25,590
It's when you take these smart people no matter
what they're doing, no matter what their skillset

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00:23:25,590 --> 00:23:31,369
or what they're working on, being science,
engineering, technology.

377
00:23:31,369 --> 00:23:38,750
Or if it's mission support, business cases,
logistics, human resources.

378
00:23:38,750 --> 00:23:40,340
It all matches together.

379
00:23:40,340 --> 00:23:44,399
And by everybody working together, that synergy,
you come up with something greater than the

380
00:23:44,399 --> 00:23:45,710
sum of its parts.

381
00:23:45,710 --> 00:23:47,590
Kevin Sato: Absolutely.

382
00:23:47,590 --> 00:23:53,980
The neat thing is that everyone is so excited
about making things happen.

383
00:23:53,980 --> 00:23:55,549
These are folks that go over the top.

384
00:23:55,549 --> 00:24:00,769
They go beyond expectations because they know
that the benefits to gain are great.

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00:24:00,769 --> 00:24:05,220
The other thing, too, that's neat is we don't
just work within Ames, and you fly.

386
00:24:05,220 --> 00:24:07,299
We're actually working with other centers.

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00:24:07,299 --> 00:24:12,690
There are the group at Johnson Space Center,
Marshall Space Flight Center, Kennedy, Glenn.

388
00:24:12,690 --> 00:24:18,090
All of us are working together to fly a particular
investigator or fly a series of experiments.

389
00:24:18,090 --> 00:24:25,210
One of the greatest things is you can talk
to folks who think "They're so far away from

390
00:24:25,210 --> 00:24:26,889
what we're doing, but they're trying to help

us."

391
00:24:26,889 --> 00:24:28,960
And they come back and say, "You're doing
this.

392
00:24:28,960 --> 00:24:29,979
You need this.

393
00:24:29,979 --> 00:24:31,070
You have to have this."

394
00:24:31,070 --> 00:24:35,741
Or they're asking us questions that are actually
[unintelligible] think of, "I didn't think

395
00:24:35,741 --> 00:24:37,440
about that."

396
00:24:37,440 --> 00:24:38,440
They understand it.

397
00:24:38,440 --> 00:24:41,300
Then when it goes to flight, they're right
there.

398
00:24:41,300 --> 00:24:42,600
They're our advocates.

399
00:24:42,600 --> 00:24:47,989
They're fighting to get everything we need
to get our experiments conducted in space

400
00:24:47,989 --> 00:24:49,169
and completed.

401
00:24:49,169 --> 00:24:55,010
It's just really amazing when they talk about
NASA as a family and NASA as a team regardless

402
00:24:55,010 --> 00:24:56,950
of what center you're at.

403
00:24:56,950 --> 00:25:03,169
Everyone is working together for one goal,
and that's to get exploration up.

404
00:25:03,169 --> 00:25:08,940
That goal includes making sure that the science,
the engineering, whatever we need to do, is

405
00:25:08,940 --> 00:25:13,039
being accomplished at those levels to make
that happen.

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00:25:13,039 --> 00:25:16,419
It's a really neat environment to see that.

407
00:25:16,419 --> 00:25:18,470
It really is that large a family.

408
00:25:18,470 --> 00:25:20,009
Host: Excellent.

409
00:25:20,009 --> 00:25:25,019
For folks who are listening to the podcast,
anybody who has questions for Kevin, want

410
00:25:25,019 --> 00:25:26,490
to hit us up.

411
00:25:26,490 --> 00:25:27,799
We are on Twitter @NASAAmes.

412
00:25:27,799 --> 00:25:30,469
We're using the hashtag #NASASiliconValley.

413

00:25:30,469 --> 00:25:33,731
If folks have questions, they can come on
over, hit you up on Twitter, and we'll get

414
00:25:33,731 --> 00:25:35,870
back to you and we'll go back and forth.

415
00:25:35,870 --> 00:25:42,979
But considering the work for the space station
is an ongoing thing, this isn't going to be

416
00:25:42,979 --> 00:25:45,710
the last time that we talk to you and your
team.

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00:25:45,710 --> 00:25:47,600
Thanks so much for coming on over.

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00:25:47,600 --> 00:25:48,340
Kevin Sato: Thank you very much.

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00:25:48,340 --> 00:25:51,740
I appreciate you giving the opportunity to
talk a little about what I do and what we

420
00:25:51,750 --> 00:25:58,849
do as NASA on flight payloads to help us get
along with the exploration out to Mars and

421
00:25:58,849 --> 00:26:00,320
beyond low earth orbit.

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00:26:00,320 --> 00:26:00,820
Host: Excellent.