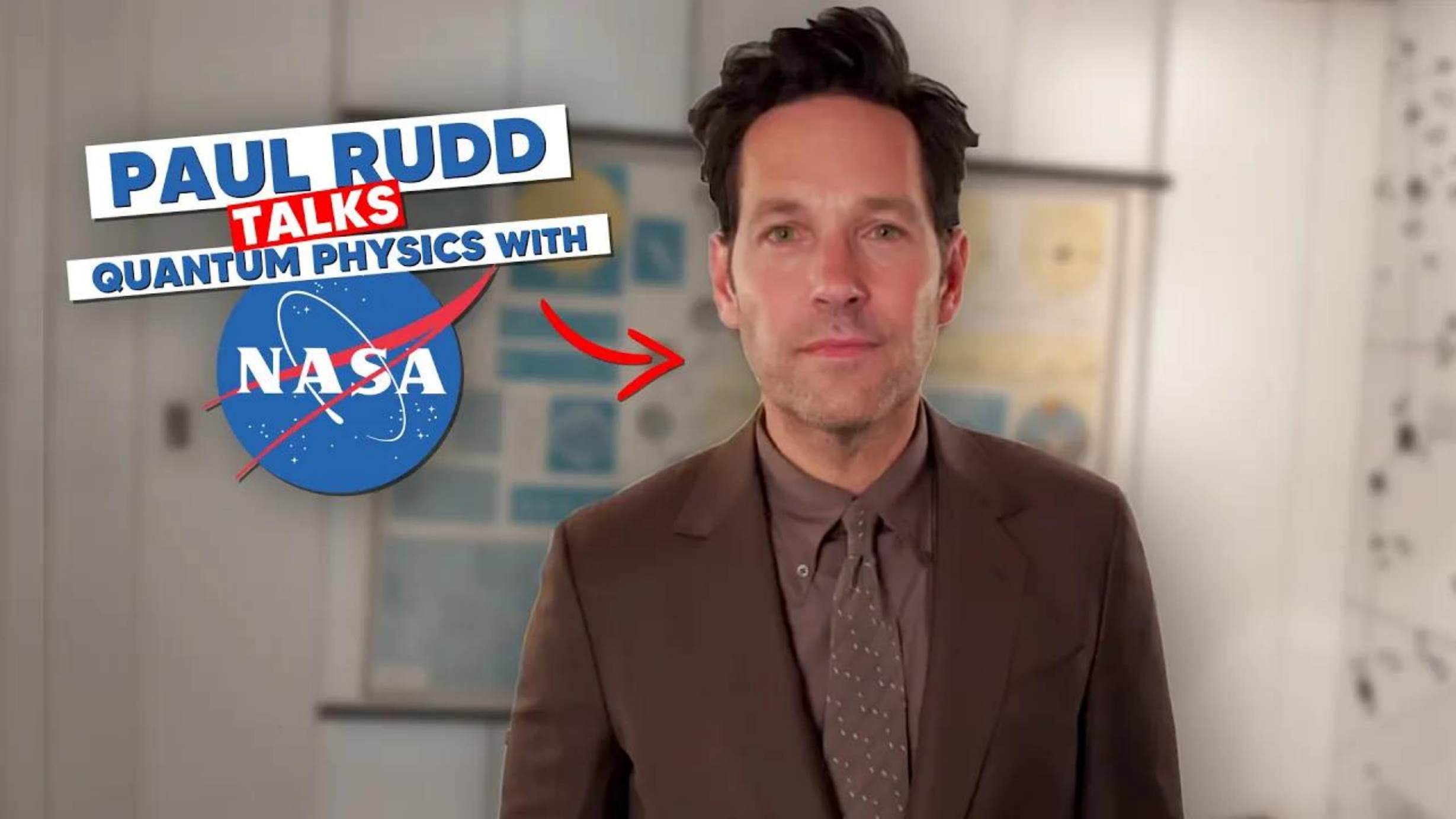
PAUL RUDD
TALKS
QUANTUM PHYSICS WITH
NASA

1
00:00:05,271 --> 00:00:06,539
Hi, I'm Paul Rudd

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00:00:06,539 --> 00:00:10,475
and I play Scott Lang, better known as Ant-Man.

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00:00:10,475 --> 00:00:14,581
In my latest movie, Ant-Man and the Wasp: Quantumania, I get to explore the quantum realm.

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00:00:14,881 --> 00:00:17,717
But what you might not know
is the quantum realm is a very real thing,

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00:00:17,951 --> 00:00:20,420
and NASA scientists explore it every day.

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00:00:20,620 --> 00:00:23,556
So, I have a few questions for the team

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00:00:23,556 --> 00:00:26,092
of quantum physicists at NASA.

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00:00:26,926 --> 00:00:29,069
Hi, Paul. My name is Dr. Ethan Elliott

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00:00:29,069 --> 00:00:31,931
and I'm a quantum physicist working on the Cold Atom Lab,

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00:00:31,931 --> 00:00:34,300
NASA's first quantum science laboratory in space.

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00:00:34,634 --> 00:00:36,736
And I'm excited to answer your questions.

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00:00:36,736 --> 00:00:38,738
But first, what is quantum science?

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00:00:39,305 --> 00:00:42,108
Quantum mechanics describes our universe on the smallest scales,

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00:00:42,208 --> 00:00:44,811
where tiny particles can also behave like waves, meaning

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00:00:44,811 --> 00:00:47,614
they can be in two places at once or they can move through each other.

16
00:00:47,881 --> 00:00:50,150
Now, what questions do you have for me?

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00:00:50,850 --> 00:00:54,687
How does quantum science impact our lives here on Earth?

18
00:00:55,355 --> 00:00:57,257
Quantum science is behind many of the technologies

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00:00:57,257 --> 00:01:01,027
that we use every day, including your phone, computer, GPS,

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00:01:01,528 --> 00:01:03,963
or even MRI scanners for medical imaging.

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00:01:04,264 --> 00:01:06,933
In the movies, you can shrink down and go into the quantum realm.

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00:01:07,233 --> 00:01:08,668
We can't do that.

23
00:01:08,668 --> 00:01:12,472
But what we can do is make the quantum realm itself bigger.

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00:01:13,206 --> 00:01:15,175
And this is the purpose of the Cold Atom Lab,

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00:01:15,175 --> 00:01:17,444
which orbits the Earth inside the International Space Station.

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00:01:18,211 --> 00:01:19,579
Secondly, how can NASA's

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00:01:19,579 --> 00:01:22,949
quantum science help unlock some of the universe's biggest mysteries?

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00:01:23,316 --> 00:01:25,952
In recent decades, scientists have come up with

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00:01:25,952 --> 00:01:28,201
a new way to study the quantum world.

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00:01:28,201 --> 00:01:29,638
Using lasers and magnetic fields,

31
00:01:29,689 --> 00:01:33,126
the Cold Atom Lab can create macroscopic quantum objects.

32
00:01:33,626 --> 00:01:35,495
It can amplify quantum effects,

33
00:01:35,495 --> 00:01:37,797
and then we put these big quantum objects into space

34
00:01:38,131 --> 00:01:40,800
because that gives them more time to interact with gravity

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00:01:41,167 --> 00:01:42,402
because they're floating in orbit

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00:01:42,402 --> 00:01:44,671
and not crashing into anything the way they would on Earth.

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00:01:45,038 --> 00:01:47,574
And we care about new ways to study gravity because

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00:01:47,774 --> 00:01:50,643
dark energy, dark matter, those are just words.

39
00:01:50,910 --> 00:01:54,147
They're names for gravitational effects that we don't understand.

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00:01:54,547 --> 00:01:58,151
In ultracold temperatures, they're like a quantum lens that will

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00:01:58,151 --> 00:02:01,287
hopefully one day allow us to see further into the gravitational unknown.

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00:02:01,521 --> 00:02:04,190
Studying quantum mechanics with ultracold atoms,

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00:02:04,324 --> 00:02:08,661
these are the hardest experiments that you can do on a tabletop on Earth,

44
00:02:09,062 --> 00:02:10,830
and they're even harder to do in space.

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00:02:10,830 --> 00:02:13,199
With the Cold Atom Lab now operating in space,

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00:02:13,533 --> 00:02:15,602
some of the achievements that we've been able to demonstrate

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00:02:15,602 --> 00:02:20,006
so far are creating the first macroscopic quantum object in orbit.

48
00:02:20,240 --> 00:02:24,110
We've created the first quantum bubbles, which cannot be done on Earth,

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00:02:24,144 --> 00:02:29,182
and we've recently created two simultaneously
existing Bose-Einstein Condensates,

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00:02:29,182 --> 00:02:32,652

two large quantum objects with which we can form exotic molecules

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00:02:32,919 --> 00:02:35,182
or perform new experiments of gravity.

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00:02:35,182 --> 00:02:37,590
For everything that we do know about quantum mechanics,

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00:02:37,590 --> 00:02:39,759
there's a lot that we don't know.

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00:02:39,759 --> 00:02:42,228
And space opens up new avenues to explore these.

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00:02:42,729 --> 00:02:45,632
Thank you, Paul, for your interest in this deep dive into the quantum realm.

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00:02:46,199 --> 00:02:49,405
Hopefully together we can inspire the next generation of quantum superheroes