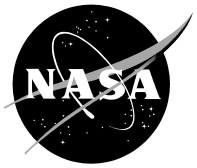

National Aeronautics and
Space Administration

Hold for Release Until
Presented by Witness

Sept. 21, 2021

Committee on Science, Space, and Technology
Subcommittee on Space and Aeronautics

U.S. House of Representatives

Statement of:
Dr. Kate Rubins
Astronaut
National Aeronautics and Space Administration

117th Congress

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Subcommittee on Space and Aeronautics
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Good morning Chairman Byer, Ranking Member Babin, and Members of the Subcommittee. I am Kate Rubins, a NASA Astronaut, veteran of two long-duration missions aboard the International Space Station (ISS), and a molecular biologist.

Thank you for the opportunity to share details of the cutting-edge science we are doing on the ISS, and to highlight the tremendous value in having a spaceborne laboratory, where we can do research not possible on Earth.

I have spent 300 days, combined on two six-month missions, living and working aboard the ISS. As a researcher, and sometimes simultaneously as the test subject providing biological samples for further study on the ground, I can share first hand the importance and the unique opportunity for scientific advancements and research made possible by having a research laboratory outside the bonds and limitations of gravity.

The ISS is the only place we can currently conduct long-duration research on how living in microgravity affects the human body, and test technologies that will take us farther into deep space. The ISS has offered over two decades of human research opportunities in a way that no other platform has been able to accomplish.

The things we have learned so far provide a great foundation for us as we reach even further away from our home planet. For the future exploration of the Moon and Mars, we need the capability to autonomously monitor the microbial health of spacecraft and planetary habitats, and to potentially identify DNA-based life as well. The ISS gives researchers an environment in which they can test DNA sequencing in microgravity and refine the sequencing processes.

During my first mission to the Space Station in 2016, I had the honor of being the first person to ever sequence DNA in microgravity, eventually sequencing more than two billion base pairs of DNA in collaboration with a world-class team of researchers on the ground. During my most recent expedition to space this past year, I was able to build on my past work conducting new DNA sequencing activities. With the ability to sequence DNA in space, astronauts could diagnose an illness, or identify microbes growing in the ISS or another habitable spacecraft and determine whether they represent a health concern.

I also spent many hours during my mission with my arms in the Life Science Glovebox conducting the Cardinal Heart experiment. My breath was taken away by the sight of beating heart cells in microgravity for the first time. Cardinal Heart studies how changes in gravity affect cardiovascular cells at the cellular and tissue levels. Not only will this research contribute to our success in future space exploration, but it could also impact how we develop treatments for heart disease on Earth. Results could provide new understanding of heart problems on Earth, help identify new treatments, and support development of screening measures to predict cardiovascular risk prior to spaceflight.

As a third example, I took hundreds of microbial samples for the Three-Dimensional Microbial Monitoring (3DMM) study. This experiment provides sequencing and analyses on samples collected from 1,000 different locations within the Space Station. By advancing our understanding of the Space Station microbiome, this work helps identify potential risks and supports developing countermeasures to mitigate those risks.

The ISS is a world-class research laboratory where we as astronauts are able to perform research developed by scientists across the world. It is also the most powerful example of collaboration that I have ever witnessed, and I believe one of the most (if not the most) powerful examples that exists. The world needs this example of nations coming together for the greater good and to see how many amazing things can be accomplished when we work together in harmony.

For more than 20 years, NASA has maintained a continuous human presence in Earth orbit, developing technology, skills, and knowledge needed for the human exploration of the Moon and Mars.

The ISS is an active, vibrant laboratory, where we are making the next steps of space exploration possible. As we set our sights on the Moon and beyond, it is the knowledge and practical experience we have gained from more than twenty years of continuous human presence and research on the Space Station that will pave a successful path forward. What we learn also has impacts on Earth in human health, technology development, and even commercial growth.

I hope the foregoing information regarding scientific research operations on the International Space Station has helped shed some light on the value and importance of having a space-based research platform for scientists like me to push the boundaries of the known world, and to learn how we as a species will adapt as we reach further into the universe. I appreciate the opportunity to appear before this Subcommittee. I look forward to answering any questions you may have.