

VIEW FROM THE CUPOLA

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When I began my job with the ISS National Laboratory 10 years ago, I discovered how science in space benefits humanity on Earth. However, research on the space station became much more personal when I recently learned of results that could someday directly benefit me, along with the more than 2 million women around the world diagnosed with breast cancer each year.

Nearly three years ago, at age 37, I sat trembling in a dark ultrasound room. I will never forget the look on the doctor's face when she came in and told me I had breast cancer. I had no family history or risk factors and found the cancer accidentally. I was immediately struck with terror at the thought of my husband being left alone and our children growing up without me. As I struggled through surgery, chemotherapy, and hormone therapy, my dad lost his 21-year battle with brain cancer.

To say it was a difficult and frightening time is an understatement, but thankfully, my treatment was successful, and I am now in remission. However, others are not so lucky. When I learned about groundbreaking results from a biotechnology startup that leveraged microgravity to grow 3D cultures of breast and prostate cancer cells, the value of space-based research became real to me.

MicroQuin's investigation on the ISS revealed something astonishing—the survival of cancer cells depends on the regulation of environmental changes within the cells. This finding could lead to new treatments not just for breast and prostate cancers but for all types of cancer. The results can even be applied to other diseases. This issue's cover story takes readers through MicroQuin's journey to space to help patients on Earth.

The issue also showcases research from Axonis Therapeutics, a startup developing a gene therapy to restore neurological function in patients with currently incurable conditions like Alzheimer's, Parkinson's, and spinal cord injury. The company designed a viral vector that targets neurons to deliver the gene therapy but needed to test it in a mature human brain model. Developing such a model takes months on the ground, and often, the cells don't mature enough to accurately recapitulate how an adult human brain functions.

When Axonis sent frozen vials of mature neurons and astrocytes to the ISS and cultured the cells together, something incredible happened. The mature cells rapidly self-assembled into 3D brain organoids in a matter of days—a feat impossible on Earth. The study allowed Axonis to validate its viral vector to help advance the therapeutic toward clinical trials and laid the foundation for more complex brain organoid studies in low Earth orbit.

As we continue to drive innovation and push exploration further into space, we must ensure astronauts are safe from cosmic radiation that can cause cancer and other health issues. The third story in this issue highlights the success of the AstroRad vest, designed to protect astronauts on long-duration missions. ISS crew members assessed the wearability of AstroRad, developed by StemRad in partnership with Lockheed Martin, and provided valuable feedback to improve its design.

In the future, AstroRad will serve another important purpose—increasing accessibility to space. Women are particularly susceptible to health issues from radiation exposure because female breast tissue and reproductive organs are more sensitive to radiation. The AstroRad vest tested in space was designed specifically with women in mind and includes selective shielding to protect these sensitive areas.

As someone who has dealt with cancer head-on, I know the fear and uncertainty that come with that terrifying diagnosis. I am forever grateful to researchers like those highlighted in this issue who go to the ends of Earth and beyond in search of new treatments. It's hard sometimes to imagine how science in space directly impacts people's lives back on the ground, but stories like these make that connection real. Discoveries in space aren't just achievements on a space station—they are breakthroughs that could lead to a world where families like mine are filled with hope instead of fear in the face of cancer and other devastating diseases. ■