



## WHY IS SPACE TRAVEL SO DANGEROUS?

**Video transcript: “What living in space did to me”**

*CMDR CHRIS HADFIELD:*

Once in a while you actually hear a meteorite ricochet off the outside of the space station. You hear a thump or a bang or a crack as something runs into the station and it's a reminder of where you actually are.

When you're inside a building, you think you're kind of bullet proof. But when you hear one of those hit, you recognise that you're actually in an aluminium bubble. But like anywhere else, you get used to where you are and you focus on the reality of it.

We of course are worried about increased radiation on the space station. We always get a higher dosage than people on Earth, just like folks that live at high altitude. But when the Sun's been particularly active, we have parts of the station that are better shielded where we can retreat to if we absolutely had to.

I increased muscle mass, I lost fat and I kept my bone density everywhere except across my hip cradle and my upper femurs, and there I lost about 8%. What's critical is that I lost 8% of the soft trabecular bone, which is impact resistant. So when I came back, I was very susceptible to a broken hip and it'll take about a year for that to reverse and for my bone to grow back.

There's a list of problems we have to solve to leave Earth's orbit reliably. One of them is bone loss. I think we've beaten a lot of the ones that were on the list a few years ago with the medical research that's going on, but we have got to solve the bone loss problem.

Radiation, power generation, navigation, *in situ* resource management – all of that needs to be done also but it's one of the problems.

*Images (in order of appearance):*

- *Expedition 34 Flight Engineer Chris Hadfield. Credit: NASA/Victor Zelentsov*
- *The International Space Station. Credit: NASA*
- *Chris Hadfield looks through windows while working controls at a robotic workstation in the Cupola of the International Space Station. Credit: NASA*
- *Chris Hadfield after setting up the Human Research Facility. Credit: NASA*

- *Chris Hadfield holds bubble detectors for the RaDI-N 2 investigation in the International Space Station. Credit: NASA*
- *The Sun during a X1.4 class flare. Credit: NASA*
- *'The brightness of the Sun'. Credit: NASA*
- *Chris Hadfield performs a fitness evaluation in the International Space Station. Credit: NASA*
- *Peripheral Quantitative Computed Tomography (PQCT) for detailed pictures of the ankle bone. Credit: Canadian Space Agency, 2014*
- *Chris Hadfield on a cardio machine. Hadfield via Twitter: "Heart and lungs, on the cardio machine to see exactly how bodies readapt. I have empathy for the cries of newborns." Credit: Canadian Space Agency, 2014*
- *The Expedition 35 crew members. Credit: NASA*
- *Chris Hadfield undergoing preflight training on the BP Reg experiment with lead researcher Richard Hughson, PhD. Credit: Canadian Space Agency, 2014*
- *Expedition 32-33 backup crew member Chris Hadfield. Credit: NASA*
- *The International Space Station photographed by Expedition 27 crew member Paolo Nespoli. Credit: NASA*