we observed thousands and thousands of changes at the molecular and genetic level when Scott Pelley was in space.

we observe changes and small molecules in the bloodstream changes and how genes go up and go down changes and how DNA was packaged and telomeres got longer.

the microbiome and the gut change we saw stresses in the body changes in his vision and also we've been looking intensely at immune cells which are notoriously adaptive and so we know that these cells are expected to change this is the first time ever that we've
studied a twin in spaceflight and one on the ground so you have the same genetic background in both individuals and are now looking at how the environment changes things in this case spaceflight.

the gene expression in Scott's white blood cells changed in flight seven percent of the gene expression persisted.

tsix months after his flight so genes are not on or off their throttle like your automobile engine seven percent of them were throttled in a different position.

even six months after point seven percent of genes sounds like a lot but
it's important to remember that it's the genes just changing their expression going up and down so Scott and Mark Kelly are still identical twins they may have had changes in their chromosomes so how DNA is packaged but at the end of the day and they're still gonna look like each other they're definitely still twins the big question is what about three years this should we expect to see you know basically three times the number of changes ten times the number of changes really we we don't know at this point because this is the first
study of its time this sets the bedrock of knowledge for all the future

astronaut studies the vision of the future would be you look at the entire genetic code all the molecular structures and changes in an individual and then customize what he or she will need for long term missions so this could be physical changes to how they do exercise and also even just how they take vitamins and how they even do manager microbiome really every molecule is fair game for making sure it's customized for each astronauts this research helps us in exploration by
understanding how the human body and mind responds to spaceflight; the space station is our stepping-stone to further journeys to the moon and to Mars.