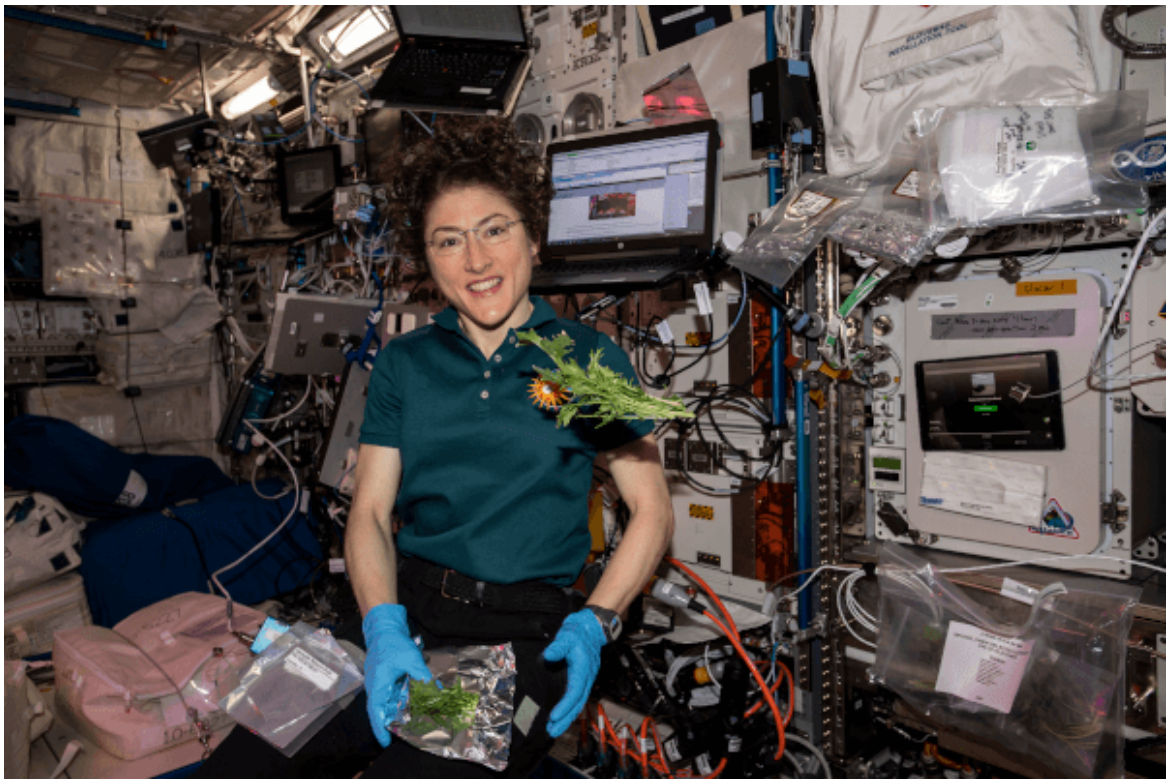
June 4, 2020

Cristina Koch is the first female astronaut to spend 328 days in space! Here's a little about her mission.



Cristine Koch on the ISS, studying the effects of microgravity on leafy greens.
Credit: NASA, space.com

American astronaut **Cristina Koch** is the first woman to have spent 328 days in space! She blasted off to the International Space Station on March 14, 2019, and just returned on February 5, 2020. This is the longest spaceflight undertaken by a woman. The previous record for a woman being in space is held by Peggy Whitson and was 288 days. Koch was also part of

the first all women's spacewalk on October 18, 2019.

What did she do up there for so long? Well, she did six spacewalks, and spent some time fixing the International Space Station. She also conducted different experiments on the ISS. She studied plant growth on the ISS, and set up instrumentation to facilitate 3D printing of human tissues (!) in space, amongst other things. Some of these such high tech experiments are helped by the lack of gravity in space.

Effects of micro (very little) or zero gravity on the human body: The amount of time she spent up there will also be very useful to scientists, as they will see the effects that being so long in space has on the female body. We already know that it causes bone and muscle loss in humans, and is also hard on the kidneys.

What did she miss while away? In her words, "Oh, how I miss the wind on my face, the feeling of raindrops, sand on my feet and the sound of the surf crashing on the Galveston beach… I cannot wait to feel and hear Earth again."

This article was adapted from articles on CNN and space.com by Sunaina Murthy

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The Nobel Prize in Medicine goes to three scientists for figuring out how the oxygen sensors in our bodies work!

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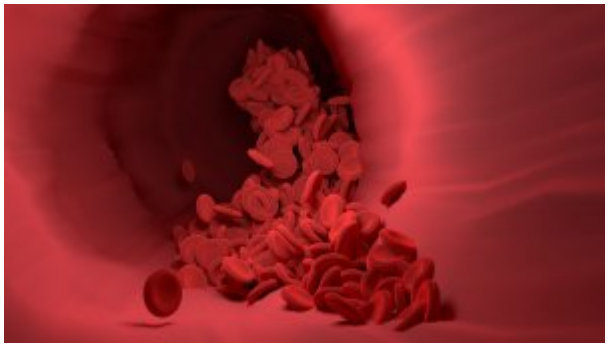


The news: Three scientists have just been awarded the Nobel Prize in Medicine for figuring out how the cells in our body respond to the levels of oxygen that they receive.

Why do we need oxygen? Our cells use oxygen to convert food into energy.

How does oxygen get into our system? Hemoglobin, on red blood cells, binds to oxygen and carries it around the body.

Our bodies are very clever and figure out how to function during different circumstances. When we exercise for example, our cells need more oxygen, and then when we are done, we don't need as much. How do our bodies adapt to these situations? There is a protein called EPO that is made in our kidneys. Once this gets out into our blood, it functions to stimulate the production of red blood cells. Therefore, EPO helps to increase the levels of oxygen in our systems.

It was not known how EPO works – what signals the kidney to increase or decrease the amount of EPO in production?

And the Nobel Prize in Medicine goes to….! Three scientists, William G. Kaelin at Harvard Medical School, Peter J. Ratcliffe at Oxford University, and Gregg L. Semenza at Johns Hopkins University were just awarded the Nobel Prize in Medicine for figuring out how this oxygen sensor works.

It was known that there is a protein complex called Hypoxia Inducible Factor (HIF), which binds to EPO when there is less oxygen in the blood, and stimulates it to start working to mediate the oxygen levels in the blood. The mechanism by which HIF is turned on and off though, was not well understood until the three scientists figured it out.

Why is this important? There are human diseases such as cancer, where the cells are rapidly growing and need lots of oxygen. The thought is that if one is able to turn off the oxygen supply to those cells, one could stop their growth. There are other diseases, such as anemia (low levels of oxygen in the blood) and various forms of heart disease that could also potentially be helped by adjusting the levels of oxygen in the blood. Understanding the cellular mechanism by which oxygen levels are sensed and modulated in the blood helps in the design of medicines to treat these conditions.

Written by: Sunaina Murthy

June 4, 2020

Quiz on parts of the human body

Geometry has a new shape. Introducing the “Scutoid”

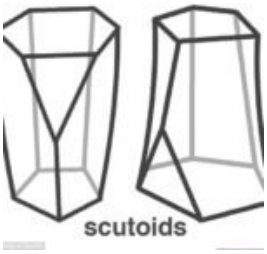
Credit: Smithsonian Mag

Epithelial cells are the cells that make up barriers and linings in our bodies – think of skin, and the lining of the heart or your throat or stomach. These sheets can bend and stretch, yet block dirt and germs from getting in, and separate different parts of the body from each other.

While skin looks like one continuous stream of stretchiness, it is actually made up of a number of individual epithelial cells joined together. Researchers have been trying to figure out what shape these skin cells would have to be in to form the

barrier that they do, yet allow the stretchiness and elasticity that is required to function. They modeled it on a computer, and to their surprise, came up with a new shape that would allow all of that, with maximum efficiency as nature needs it to be.

Introducing the scutoid (pronounced as scooootoid)! This weird name is inspired by the triangle-shaped part of a beetle's thorax called the scutellum. Check it out!



Credit: Daily Mail

Credit: Nature Communications

So it's all well and good to come up with the perfectly efficient shape in theory, but then one has to check and see if the hypothesis is true. Researchers at The University of Seville, in Spain, and at Lehigh University in Pennsylvania, USA, looked for this scutoid in the epithelial cells of fruit flies, zebra fish and mammalian tissue, and found that this shape actually exists!

Pretty cool, huh? So why does it matter? It matters because when some people get sick, they need help from others. Some may need an organ transplant. There may not be a donor who matches their blood type and so on. Well scientists are trying to grow organs in a laboratory so that they can help more sick people. Now that they have the shape and structure of the basic building block, this may help them a lot!

Written by: Sunaina Murthy and Biyash Choksey

