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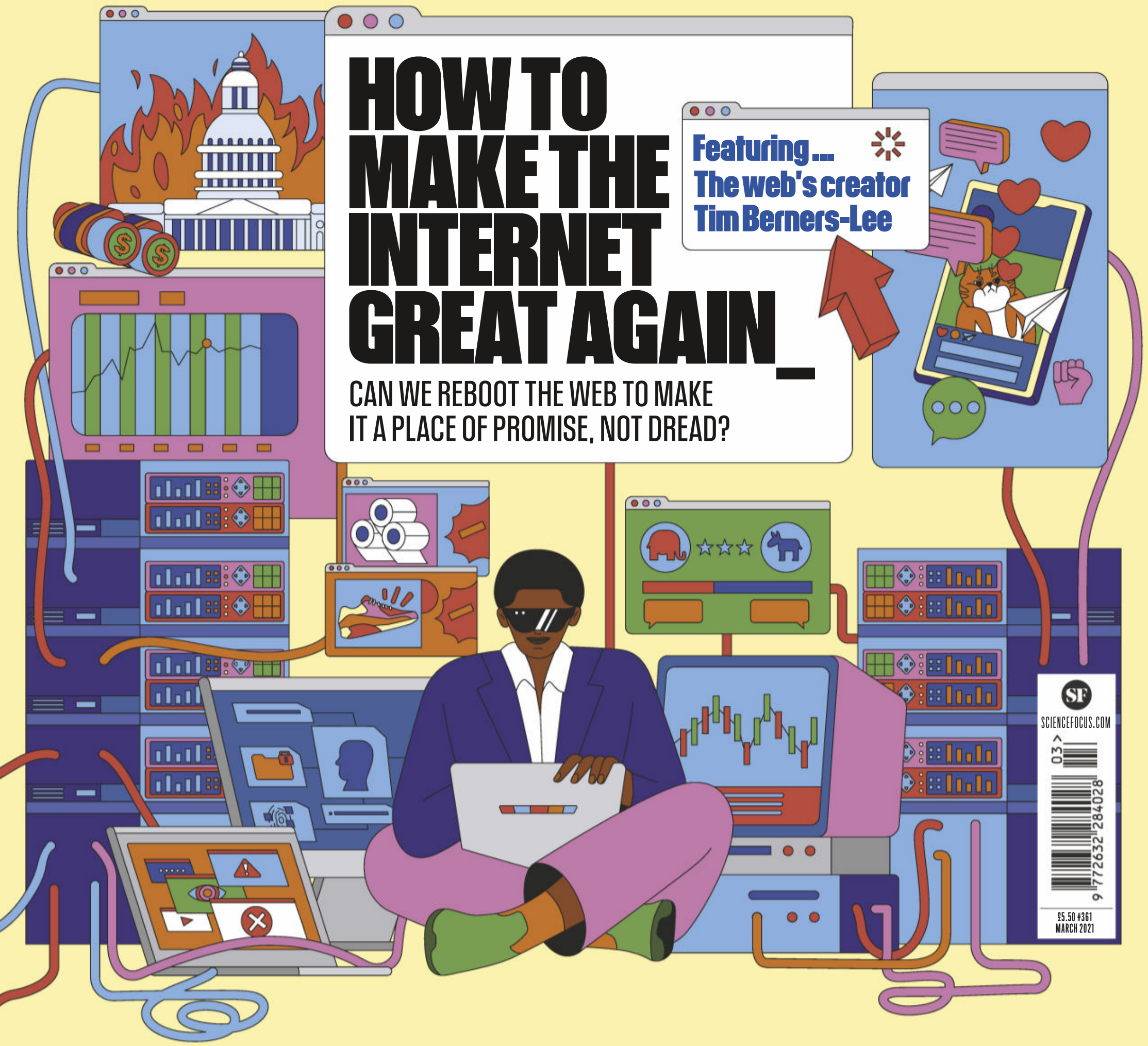

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Long-distance space travel will expose astronauts to dangerous levels of radiation

Eating spinach could protect astronauts from space radiation

One of the biggest barriers to long-distance space travel is how to protect astronauts from the damaging effects of space radiation. Cosmic rays and proton storms from the Sun expose spacefarers to dangerous levels of radiation that the human body has not evolved to handle.

However, an antioxidant-rich diet could go some way to protecting cardiovascular health in space.

"If we want to see human long-distance space travel, we need to understand the impact of space-induced disease and how to protect our bodies from it," said Dr Jesper Hjortnaes of the Leiden University Medical Center in the Netherlands.

> **"We need to understand space-induced disease and how to protect our bodies from it"**

Radiation can be damaging to proteins and DNA, causing cancer and potentially affecting the heart. In a paper published in *Frontiers In Cardiovascular Medicine*, Hjortnaes and his team reviewed the evidence of how radiation affects cardiovascular health, and what can be done to protect astronauts. The team looked at evidence from people who had received radiation therapy for cancer, as well as mouse studies of radiation exposure.

They found that radiation could lead to myocardial remodelling: healthy heart tissue is replaced by tough, fibrous tissue, potentially leading to heart failure. Exposure can also cause the build-up of fats and cholesterol in blood vessels, which can cause strokes or heart attacks.

The researchers went on to look at the evidence surrounding protective measures, including radio-protective drugs and changes in diet. They found that an antioxidant-rich diet, including plenty of green vegetables such as spinach, as well as beetroot and tomatoes, was "promising" in reducing the harmful effects of radiation.

However, there is little conclusive evidence, so more research is needed.

"We need to develop human-based tissue platforms, such as heart-on-a-chip systems, that can simulate real human disease, outside of the human body, to unravel the mechanisms at play in space radiation-induced cardiovascular disease," said Hjortnaes.