Hibernating marmots don’t seem to age - could humans do the same?

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The yellow-bellied marmot (Marmota flaviventris)
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A KEY sign of ageing slows right down when marmots are hibernating. This suggests we might be able to induce similar changes to put humans in suspended animation for long-distance space travel. “They may not age during this process,” says Gabriela Pinho at the University of California, Los Angeles (UCLA).

Pinho has been studying wild yellow-bellied marmots – a kind of ground squirrel – in Colorado. These animals hibernate for up to eight months a year, dropping their body

Starting in 2004, Pinho and her colleagues followed 73 female marmots from birth to death, taking regular blood samples. These were analysed by Steve Horvath, also at UCLA, who has shown that the age of many species can be estimated from epigenetic changes in blood cells – essentially, a build-up of chemical labels added to certain DNA sequences.

These changes usually accumulate steadily over an animal's lifetime. But in the marmots, there is a striking cyclical pattern, says Pinho, with most changes occurring in summer when the animals are active.

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The finding suggests that the ageing process slows during hibernation, and Pinho thinks this is likely to be true for all animals that hibernate. "When I first saw this, I was like, 'Wow, what we suspected is actually happening'," she says.

The results could help us induce hibernation in people, both for medical reasons and for space travel. Several studies have shown that hibernation protects rodents and human cells against radiation damage, says Pinho, so it could help human space exploration. What had been less clear is whether it also slows ageing.

This matters if we want to travel beyond Mars, says John Bradford at SpaceWorks in Atlanta, Georgia, whose team has studied the possibility of putting people into stasis for NASA. "This delayed ageing with hibernation would be critical," he says. "Identifying any mechanisms in animals that could be delaying ageing in low metabolic conditions is obviously needed in order to understand how this may translate to humans."

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Hibernating animals do tend to live longer than other similarly sized animals, says Bradford, but this could just be because they are less likely to be caught by predators or be exposed to harsh conditions.

"The finding that certain ageing-related epigenetic changes slow down during seasonal hibernation is very exciting and consistent with the hypothesis that ageing slows down during hibernation," says Sinisa Hrvatin at Harvard Medical School, whose team has discovered a "brain switch" that seems to induce hibernation.

“It is an amazing study,” says Christopher Turbill at Western Sydney University in Australia, who has shown that hibernation slows another sign of ageing, the shortening of the protective telomeres at the ends of our chromosomes.

A correlation between winter and rate of ageing doesn’t show that hibernation is the key factor, says Turbill.

However, when combined with his work, it adds weight to the idea that hibernation is responsible.

Reference: bioRxiv, DOI: 10.1101/2021.03.07.434299

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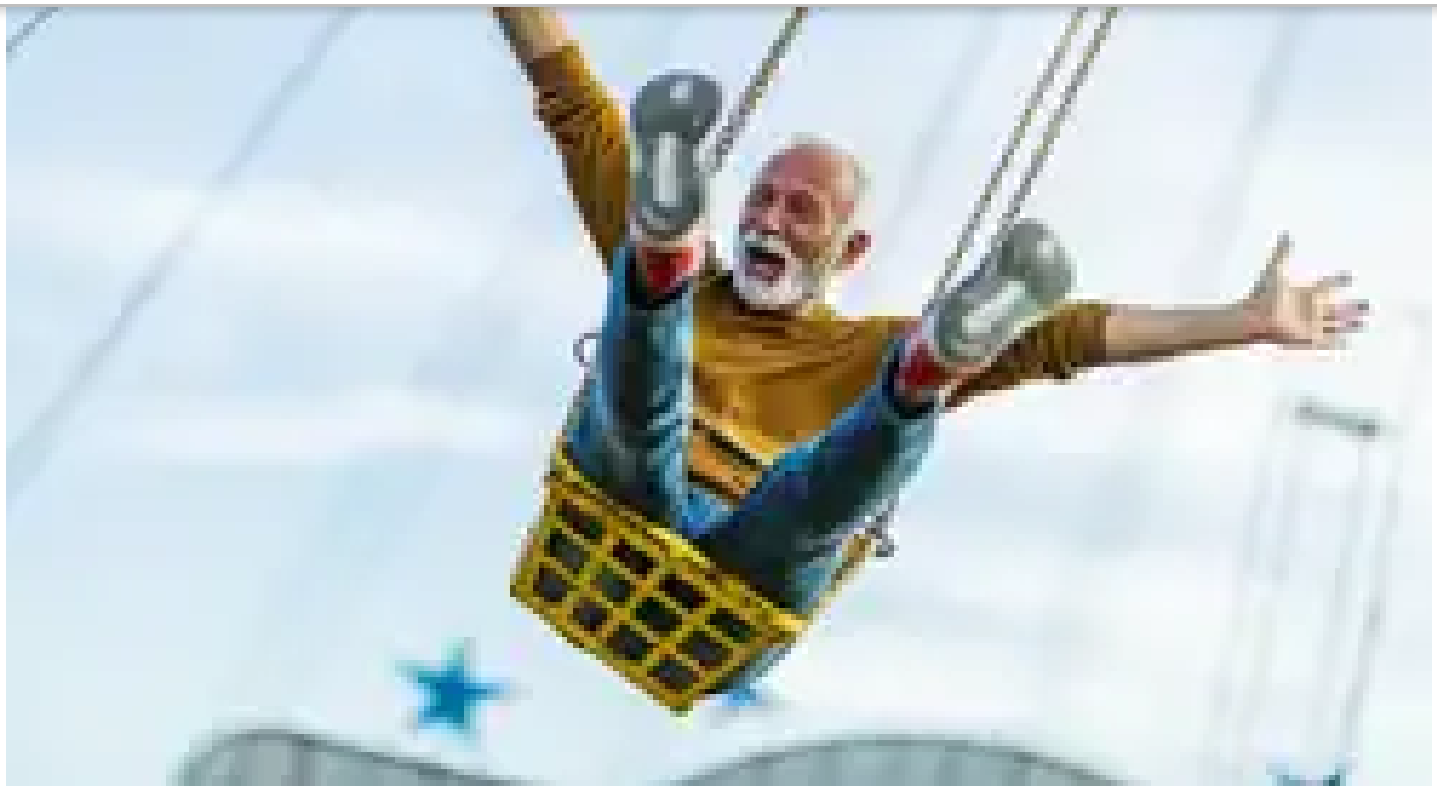

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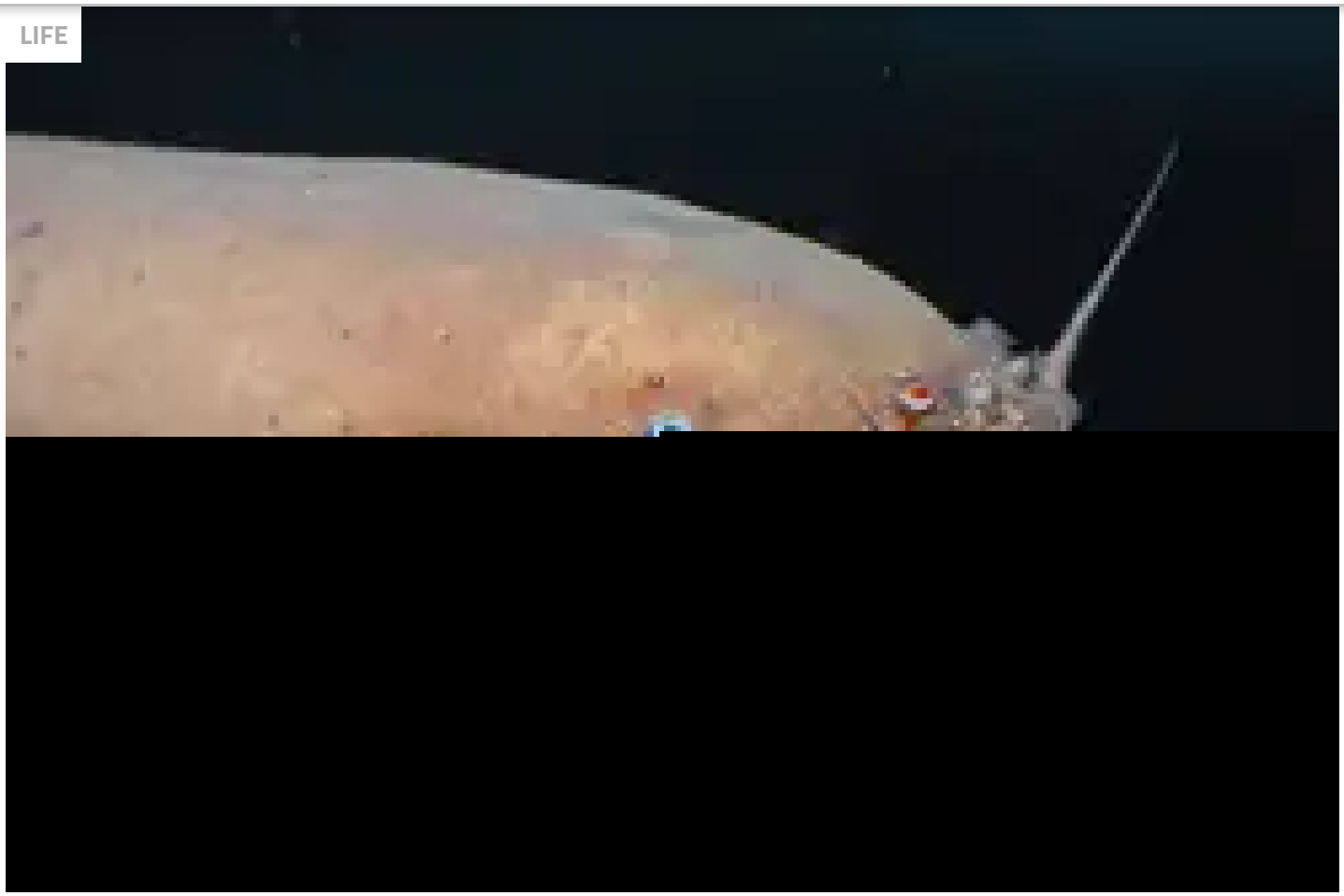

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