



SPARC WEEKLY



CARBON SINKS ABSORBED ALMOST NO CARBON IN 2023



Forests and other land ecosystems emitted almost as much carbon dioxide as they absorbed in 2023.

The world's forests, plants and soil absorbed almost no carbon in 2023, according to preliminary research from a group of international scientists. The three are considered land carbon sinks because they have the ability to absorb carbon dioxide from the atmosphere for their natural processes. However, a rapidly warming climate may be prohibiting the carbon sinks on land from performing effectively.

Carbon sinks are sites that "naturally remove potentially atmosphere-damaging carbon dioxide from the atmosphere,"

including forests and oceans, said Futurism. Land carbon sinks exist because "forests and other land ecosystems take up slightly more CO₂ as they grow than they release when plants die and decompose or burn each year," said New Scientist. From 2010 to 2022, the collective land carbon sink removed, on average, two gigatons of carbon from the atmosphere each year. However, in 2023 many of the sinks collapsed, removing only approximately 0.23 to 0.65 gigatons of carbon, the "lowest amount since 2003 and more than three times lower than the average over the past decade," New Scientist said.

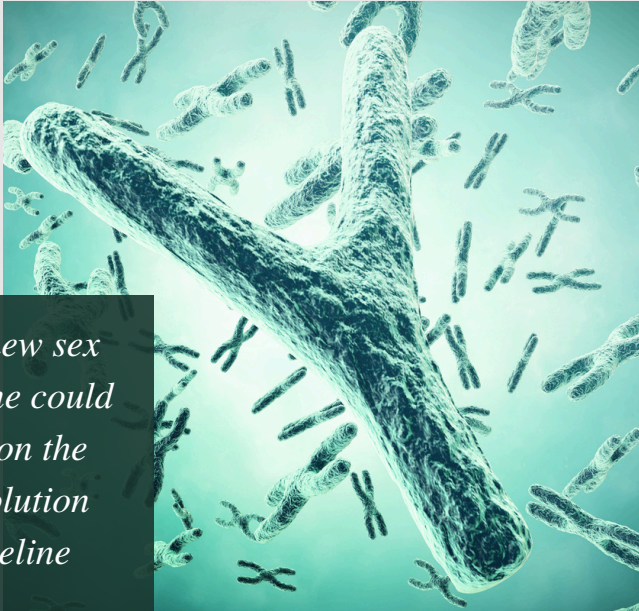
Much of the decrease is likely due to warming temperatures. "Imagine your plants at home: If you don't water them, they're not very productive, they don't grow, they don't take up carbon," Stephen Sitch, a study co-author, said to Reuters. "Put that on a big scale like the Amazon forest." Dipping carbon sink capacity is not rare and factors like the El Niño climate phenomenon contribute, but human-caused climate change is making temperatures warmer than they would get naturally, with 2023 becoming the warmest year on record.

<https://arxiv.org/pdf/2407.12447>

<https://www.newscientist.com/article/2440453-one-of-earths-major-carbon-sinks-collapsed-in-2023/>

<https://theweek.com/environment/earth-carbon-sinks-collapsing>

WHY THE Y CHROMOSOME IS VANISHING AND WHAT THIS MEANS FOR THE FUTURE



A new sex gene could be on the evolution pipeline

"When humans run out of Y chromosome, they might become extinct ... or they might evolve a new sex gene".

The biological sex of a human being is determined by which chromosomes make up that baby's genetic material. Females usually have two X chromosomes, while males tend to have one X and one Y chromosome. But research suggests that the Y chromosome has been rapidly degenerating over the course of our evolution. In fact, the gene may one day disappear altogether. Within the past 166 million years, "the human Y lost most of its 1,600-odd genes, a rate of nearly 10 per million years," said Darren Kent, a professor at the University of Kent and Peter Ellis, a lecturer at the University of Kent. The X chromosome contains

approximately 900 genes with multiple functions, whereas the Y has approximately 55 genes with only 27 of them being male-specific. Most of the Y is made of repetitive 'junk DNA'. With such an unstable composition, the Y chromosome is at risk of completely disappearing over the course of multiple generations.

"The early 'proto-Y' chromosome was originally the same size as the X chromosome and contained all the same genes," Kent and Ellis said. However, because males only have one copy of the chromosome, it does not have the opportunity to go through genetic recombination, which is the "shuffling of genes that occurs in each generation which helps to eliminate damaging gene mutations." Without recombination, Y chromosomal genes degenerate over time. "This significant gene loss over the centuries has lead scientists to predict that the Y chromosome might vanish entirely in about 11 million years," said Earth.com. The potential end of the Y chromosome could spell disaster for us, leading to the extinction of the human race. However, the new research offers an alternate possibility – we could evolve a new sex determining gene. But it's a double-edged sword; it could also lead to the separation of new species, driven by different sex determination systems.

<https://theconversation.com/sex-genes-the-y-chromosome-and-the-future-of-men-32893>

<https://www.earth.com/news/will-men-disappear-the-y-chromosome-is-constantly-shrinking/>

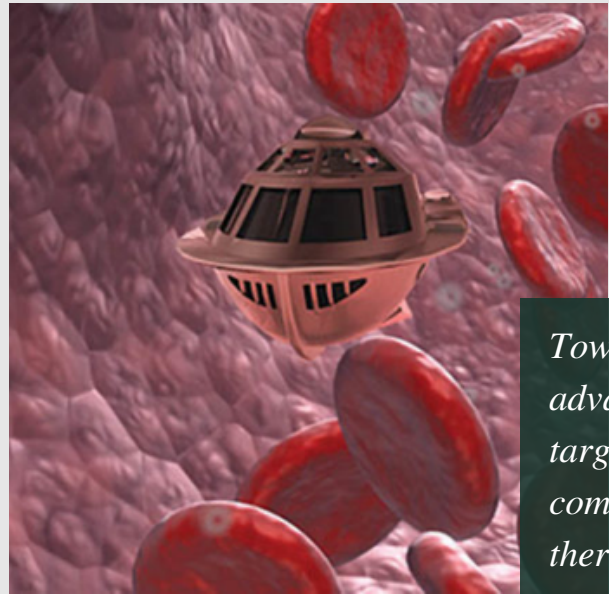
<https://theweek.com/science/y-chromosome-disappearing>

SCIENTISTS DEVELOP GRAIN-SIZED SOFT ROBOTS CONTROLLED BY MAGNETIC FIELDS FOR TARGETED DRUG DELIVERY

A team of scientists at Nanyang Technological University, Singapore (NTU Singapore) has developed grain-sized soft robots that can be controlled using magnetic fields for targeted drug delivery, paving the way to possible improved therapies in future.

The new soft robot developed by engineers at NTU's School of Mechanical and Aerospace Engineering (MAE) was reported in a paper published in the scientific journal *Advanced Materials*.

The study is believed to be the first reported instance of miniature robots that can transport up to four different drugs and release them in reprogrammable orders and doses. Compared to earlier small-scale robots which can only carry up to three types of drugs and cannot be programmed for release in order, the newly developed miniature robots offer precision functions that have the potential to significantly improve therapeutic outcomes while minimising side effects, said the research team. The NTU team had previously developed magnetically controlled miniature robots capable of complex manoeuvres such as 'swimming' through tight spaces and gripping tiny objects.



Toward advanced targeted combination therapy

Building on their earlier work, lead investigator, Assistant Professor Lum Guo Zhan from the School of Mechanical and Aerospace Engineering (MAE), said the team was inspired by the 1960s film 'Fantastic Voyage', in which a submarine crew was shrunk to the size of a cell to repair damage in an injured scientist's brain. "What was a scenario in a sci-fi movie is now becoming closer to reality with our lab's innovation." Asst Prof Lum said.

The grain-sized robot was created using smart magnetic composite materials (magnetic microparticles and polymer) that are non-toxic to humans.

In lab experiments, the robot accomplished tasks in water that mimicked conditions in the human body.

<https://onlinelibrary.wiley.com/doi/10.1002/adma.202408750>
<https://www.sciencedaily.com/releases/2024/10/241024131954.htm>
<https://schmetterermd.com/fantastic-voyage/>

NOT SCIENCE FICTION: STRANGE NEW FROG SPECIES IN MADAGASCAR SOUND LIKE THEY'RE FROM STAR TREK



*Amphibia: Anura: Mantellidae -
Morphologically cryptic
treefrogs from Madagascar*

If you believe all frogs croak, think again. Seven newly discovered species from the tree frog genus *Boophis*, found across the rainforests of Madagascar, make unique, bird-like whistling sounds to communicate with each other. Their strange, high-pitched calls reminded the research team, led by Professor Miguel Vences of the Technische Universität Braunschweig, Germany, of the whistle-like sound effects from the sci-fi series *Star Trek*.

“That’s why we named the frogs after Kirk, Picard, Sisko, Janeway, Archer, Burnham, and Pike—seven of the most iconic captains

from the sci-fi series,” says Professor Vences. “Not only do these frogs sound like sound effects from *Star Trek*, but it seems also fitting that to find them, you often have to do quite a bit of trekking! A few species are found in places accessible to tourists, but to find several of these species, we had to undertake major expeditions to remote forest fragments and mountain peaks. There’s a real sense of scientific discovery and exploration here, which we think is in the spirit of *Star Trek*,” explains Assistant Professor Mark D. Scherz from the Natural History Museum of Denmark at the University of Copenhagen, who was senior author on the study.

The otherworldly calls of these frogs are known as “advertisement calls”—a type of self-promotion that, according to the researchers, may convey information about the male frog’s suitability as a mate to females. This particular group lives along fast-flowing streams in the most mountainous regions of Madagascar—a loud background that may explain why the frogs call at such high pitches.

The research team urges greater awareness around the conservation of Madagascar’s biodiversity to ensure that these unique species and their habitats are preserved for the future. They also hope to continue exploring, to seek out new species in forests where no scientist has gone before.

<https://www.sciencedirect.com/science/article/pii/S1754504824000588?via%3Dihub>

<https://vertebrate-zoology.arphahub.com/article/121110/>

WHO ARE WE?

SPARC Robotics Team's mission and vision is to make our environment the best it can be. On a volunteer basis, we look at the problems that are happening around us and make them our problems, both as SPARC and individually, and help as much as we can with appropriate projects. NASA ACCP (Astro Camp Community Partners) was only in the US until four years ago. This year they came to Turkey with us after four years of traveling to many countries. ACCP educates school-age children from kindergarten to high school on science-related topics of interest with practical knowledge and application, while also supporting children's craft development, general culture and questioning skills. As SPARC, we have brought this training provided by NASA to our country in the most comprehensive way and our continuous communication with NASA not only enables us to improve our trainings day by day, but also gives us the opportunity to learn about the innovations in the field of STEM instantly, from the most accurate source and to spread the knowledge we have around us.



EDITOR

Hello, I'm Defne and I am the editor of this newsletter this week. Me and my dear friend Defne Ulu will be working together for future news. I hope you find it useful and I hope it has helped you to keep your mind out of your problems while reading it. Have a good week. See you next week!!