Wicked Problems, Wolfpack Solutions • Global Change

The Day Before a Breakthrough

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ABSTRACT

Have you heard of the XPRIZE? It's a global competition to crowdsource solutions to some of the world's biggest challenges. Right now, their biggest competition ever is open — \$100 Million for Carbon Removal — to take CO₂ out of air. Here's one idea: What if a super-fast enzyme called carbonic anhydrase (the same type of enzyme that helps you breathe) could help pick CO₂ molecules out of thin air? And what if a textile fabric (almost like the kind you wear) could be turned into a giant filter to help the enzyme do its job? NC State University researchers can already do this at lab scale; Sonja Salmon, Ph.D. explores how and what the implications may be.

Sonja Salmon holds a bachelor's degree in textile chemistry and Ph.D. in fiber and polymer science from NC State. She worked 22 years in industrial research and development at the world's largest enzyme company developing new, sustainable technologies for textile, paper, water, laundry and CO₂ capture processes. She is now teaching and conducting research on biobased and biocatalytic textiles and process, with special emphasis on innovations for CO₂ capture, new approaches for textile waste remediation and increased biobased materials utilization, especially in the textile sector. Salmon is an associate professor and industrial partnerships manager for Wilson College of Textiles at NC State.

Visit the web version of this article to view interactive content.

The Day Before a Breakthrough (Sonja Salmon)

This video was originally produced for an audience of entering first-year and transfer students at NC State University as a part of an interdisciplinary experience. It is available for noncommercial reuse under a Creative Commons Attribution Noncommercial 4.0 License, <https://creativecommons.org/licenses/by-nc/4.0/>.

TRANSCRIPT**SUPPLEMENTAL MATERIALS**

1. [Biocatalytic Textiles for CO₂ Capture](#) presentation by Dr. Salmon.
2. [Dr. Salmon's "Crazy Idea" website](#)
3. [Carbon Dioxide Absorbs and Re-emits Infrared Radiation](#). From University Corporation for Atmospheric Research's Center for Science Education.

4. Fecht, S. (2021, Feb 25). [How exactly does carbon dioxide cause global warming?](#) *State of the Planet*, Columbia Climate School.
5. [What levels of CO₂ are typical indoors?](#) from Minnesota Department of Health.
6. Hausfather, Z. (2019, Feb 25). [Extreme CO₂ levels could trigger clouds 'tipping point' and 8C of global warming.](#) *Carbon Brief*.
7. Hoornweg, D. and Bhada-Tata, P. (2012). [What a Waste: A Global Review of Solid Waste Management.](#)
8. [How Do You Solve a Problem Like Carbon Removal in 100 Seconds? | XPRIZE.](#)
\$100M is on the line, the largest incentive prize in history, and answers are what the planet needs. XPRIZE Vice President of Energy and Climate, Marcius Extavour poses the question: What does a \$100M idea look like? [Learn more about the competition.](#)
9. [Carbon Capture Sequestration and Reuse, Webisode 1: The Basics | Earth Institute.](#)
This webisode introduces the concepts of carbon capture, sequestration and reuse.
10. [How carbon capture plant works | ABB.](#) This older but informative video shows the general principles of an MEA-based carbon capture plant, which is currently the dominant technology used in various industrial sectors for CO₂ gas separations.
11. [Carbon Capture Technology Explained | Seachange.](#) For the engineers who work on carbon removal at a large scale, the dream is to devise a closed-loop system in which the carbon released could be treated as a commodity or resource, rather than a waste product.
12. [Money Is Pouring Into Carbon Capture Tech, But Challenges Remain | CNBC.](#) Elon Musk, Microsoft and oil giants like Occidental and Exxon Mobil are investing in carbon capture technologies. Carbon Engineering and Climeworks are two start-ups that have built machines to suck CO₂ straight out of the atmosphere in a process known as direct air capture. But the technology faces a number of challenges, one of which is that there's currently no market for the captured CO₂. As a result, some companies are selling their captured CO₂ to oil companies, which use it to produce even more oil.