Science on the Frontlines: Ecosystems, AI Innovation, and Political Resistance

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Abstract:

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Abstract

To facilitate and enhance communication, JOSHA presents a curated selection of research summaries spanning critical scientific, technological, and societal developments. This edition covers the environmental and sovereignty risks posed by a new U.S. military base in the Galápagos Islands, the rise of tiny machine learning (tinyML) as a low-cost AI solution in the Global South, and Microsoft's claim of creating a new state of matter to advance quantum computing. Also featured is an exploration of how stand-up comedy helped a researcher overcome stage fright and improve scientific communication. Finally, an editorial examines the impact of President Trump's second-term policies on science, including deep funding cuts, restrictions on research, and the rollback of global collaborations. Explore the full articles for a deeper understanding of these important topics.

1. Military Base Threatens Galápagos Islands

By María José Navarrete Méndez, Gabriela Mena González, Leticia M.Ochoa Ochoa

The U.S. military base authorized on the Galápagos Islands in December 2024 raises serious environmental, constitutional, and sovereignty concerns. Protected as a UNESCO World Heritage Site, the Galápagos are safeguarded by Ecuador's constitution, which prohibits harm to fragile ecosystems. Historical precedents, like the U.S. base on Baltra Island during World War II, show the lasting ecological damage such installations can cause. This new base risks repeating these impacts while undermining Ecuador's sovereignty under agreements granting U.S. personnel immunity. Environmentalists argue this decision violates Ecuador's commitments to international treaties, including the Convention on Biological Diversity. They call on global stakeholders to protect the islands' unique biodiversity and advocate for sustainable alternatives to preserve this irreplaceable natural heritage.

This article was previously published in *Science, Volume 387, Issue 6736* on February 20, 2025.

Read the full article here.

2. Cutting AI Down to Size

By Sandeep Ravindran

The article highlights the growing adoption of tiny machine learning (tinyML) in the Global South as a low-cost, low-power alternative to traditional AI. Unlike large language models, tinyML operates on energy-efficient devices and addresses local challenges such as plant disease detection, wildlife tracking, and pollution monitoring. For example, tinyML-equipped drones in India help identify diseased plants, and in Brazil, farmers use it to diagnose coffee diseases. Despite its limited scope, tinyML is gaining popularity due to its affordability, privacy benefits, and adaptability, with researchers fostering its development through workshops and open-source resources. As the technology matures, researchers and institutions worldwide are fostering its development through workshops and open-source resources. TinyML is becoming a powerful tool for tackling pressing challenges in underserved regions and beyond, proving that sometimes, smaller solutions can have a big impact.

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3. Microsoft Says It Has Created a New State of Matter to Power Quantum Computers

By Cade Metz

Microsoft has announced the creation of a new state of matter in its efforts to build a more stable and powerful quantum computer. Their scientists claim to have developed a "topological qubit," a breakthrough that could significantly advance quantum computing by making it more reliable and efficient. Unlike traditional qubits, which are highly fragile and prone to errors, Microsoft's approach integrates semiconductors with superconductors, enabling a more robust quantum state when cooled to extremely low temperatures. While some experts remain skeptical about whether Microsoft has truly achieved this milestone, the research, published in *Nature*, marks a major step in the global race to harness quantum technology. If successful, this innovation could revolutionize fields such as artificial intelligence, medicine, and cryptography, potentially reshaping the technological landscape.

This article was previously published in *The New York Times* on February 19, 2025.

Read the full article here

4. Comic Relief

By Avraneel Paul

Struggling with stage fright during a crucial research presentation, Avraneel Paul took an unconventional approach to overcoming his fear—performing at an open mic stand-up comedy event. Seeking to build confidence, he sought advice from a seasoned comedian, who emphasized three key strategies: observing skilled speakers, crafting and refining a script, and relentless practice. Applying these lessons to his scientific presentations, Paul gradually transformed his delivery, turning data into engaging narratives. His newfound confidence not only improved his public speaking but also reshaped how he approached his research, emphasizing storytelling as a vital tool in science communication. Now a

postdoctoral fellow and Toastmasters chapter president, he shares these insights to help fellow researchers convey their findings more effectively.

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5. Trump 2.0: an assault on science anywhere is an assault on science everywhere

Since the start of his second term, President Donald Trump has launched a broad assault on science, cutting billions in research funding, restricting studies on critical social and health issues, and dismantling key scientific agencies. Federal institutions like the NIH, CDC, and EPA face mass layoffs and suspended operations, while international commitments, including climate initiatives and global health funding, have been drastically reduced. The administration's decision to withdraw from the WHO and freeze aid programs has left millions without essential services, including HIV treatment and reproductive healthcare. Additionally, policies targeting diversity, equity, and inclusion threaten academic freedom and decades of progress in research. These actions not only hinder U.S. scientific leadership but also weaken global efforts to tackle urgent challenges. In response, the international research community is urged to stand in solidarity with affected scientists and advocate for the protection of scientific integrity and collaboration.

This article was previously published in *Nature Editorial* on February 25, 2025.

Read the full article here

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