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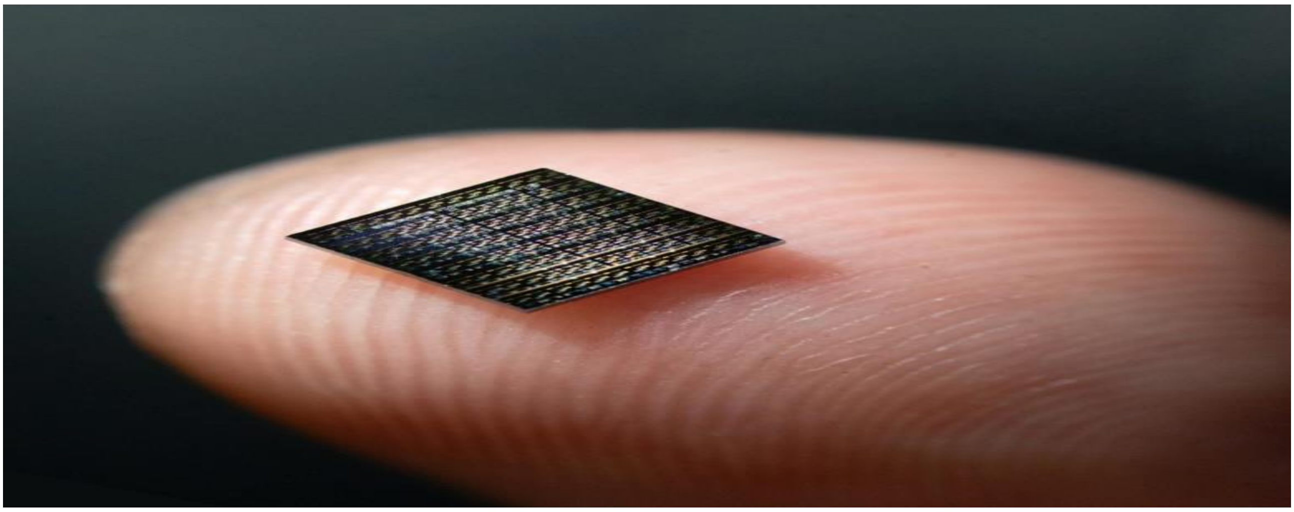
Department of Data Science

Weekly Data Science Bytes

New Artificial Neurons Physically Replicate the Brain



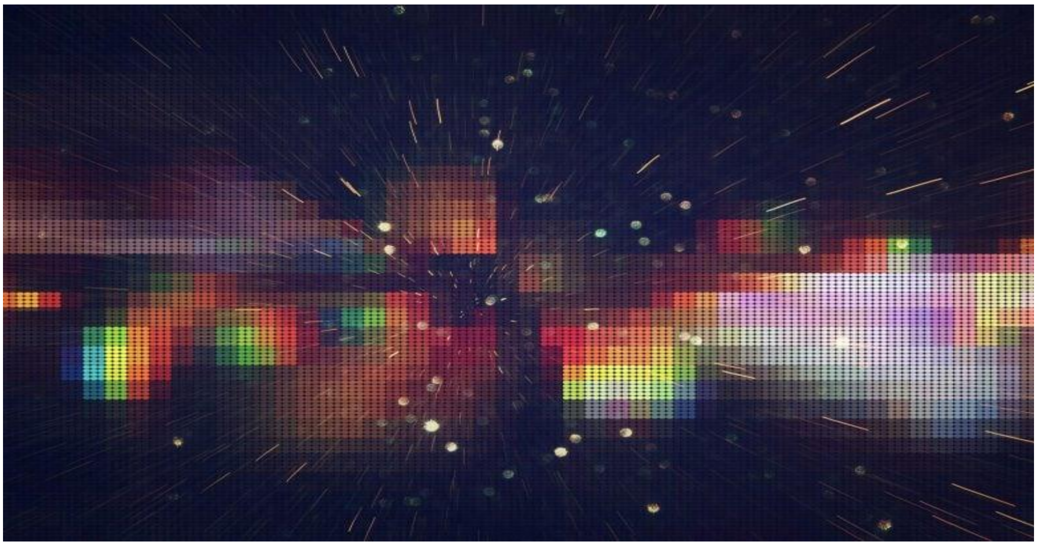
A breakthrough in neuromorphic computing could lower the energy consumption of chips and accelerate progress toward artificial general intelligence (AGI).

- Researchers from the USC Viterbi School of Engineering and the School of Advanced Computing have created artificial neurons that closely mimic the complex electrochemical behavior of real brain cells. Their breakthrough, described in *Nature Electronics*, represents a major step forward in neuromorphic computing. This new approach could dramatically shrink chip size, cut energy use by several orders of magnitude, and bring us closer to achieving artificial general intelligence (AGI).

- Unlike standard digital processors or existing silicon-based neuromorphic chips that only simulate neural activity, these artificial neurons physically reproduce the analog processes of biological neurons. In the same way that neurochemicals trigger brain activity, specific chemicals can now be used to initiate computation in brain-inspired, or neuromorphic, hardware

Source: https://scitechdaily.com/new-artificial-neurons-physically-replicate-the-brain/

Tinier than a Grain of Sand: Physicists Create the World's Smallest Light Pixel



- Smart glasses, or eyewear that can project digital information directly into a user's field of view, are often seen as a cornerstone of future wearable technology. Until now, however, progress has been limited by bulky components and optical constraints that prevent efficient light emission when pixels are reduced to the scale of a single wavelength.
- Researchers at Julius-Maximilians-Universität Würzburg (JMU) have now achieved a major breakthrough toward creating bright, ultra-small displays.

Source: https://scitechdaily.com/tinier-than-a-grain-of-sand-physicists-create-the-worlds-smallest-light-pixel/

'Technology is picking up ghosts underwater': 9,000 mysterious objects spotted off US shores; experts baffled'

- A popular UFO-tracking platform is making waves after recording tens of thousands of mysterious underwater objects off the United States' coastlines. According to Marine Technology News, users of Enigma, a non-partisan organisation that claims to host the "largest queryable historical sighting database for global UFO sightings", have logged more than 9,000 unidentified underwater sightings within 10 miles of US shorelines since August 2025.
- The sightings, categorised as Unidentified Submersible Objects (USOs), refer to any object detected underwater that cannot be immediately identified or explained. Witnesses often describe the USOs as moving at extreme speeds, changing direction with uncanny precision, and even transitioning seamlessly between water and air, a phenomenon experts call transmedium capability.

Source: https://timesofindia.indiatimes.com/world/us/technology-is-picking-up-ghosts-underwater-9000-mysterious-objects-spotted-off-us-shores-experts-baffled/articleshow/125029748.cms

AI and Quantum tech to reshape industries and unlock new growth: World Economic Forum

- As multiple foundational technologies reach maturity simultaneously, a report by the World Economic Forum emphasised a critical shift in how this innovation is evolving. The report mentioned that individual breakthroughs are no longer sufficient. The new frontier of innovation lies in the combination, convergence, and compounding of technologies, a process WEF captures in its 3C Framework.

- The report said, “While technology combination creates capability advantage, convergence translates this advantage into revenue growth by reshaping value chains and opening new market opportunities”. The report identified eight advanced technology domains at the heart of this transformation. These include Artificial Intelligence (AI), Omni Computing, Engineering Biology, Robotics, Advanced Materials, Spatial Intelligence, Quantum Technologies, and Next-Generation Energy.

Source: https://www.financialexpress.com/life/technology-ai-and-quantum-tech-to-reshape-industries-and-unlock-new-growth-world-economic-forum-3868197/

Elon Musk's Grokipedia is a major own goal

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"The goal here is to create an open source, comprehensive collection of all knowledge," Musk posted on X on Tuesday, a day after his xAI company rolled out its first 0.1 version of Grokipedia, an AI-powered online encyclopedia. "Then place copies of that etched in a stable oxide in orbit, the Moon and Mars to preserve it for the future. Foundation." You know, because understandings of what is and isn't true — and about how to capture the whole truth of a given subject — have famously always just been the kind of straightforward, uncomplicated and static thing that's really well-suited to being etched on to something that cannot be changed and launched into space. Er, foundation.

Source: https://www.ft.com/content/5ada1835-bdee-4326-adc0-e90a33123588

The quantum revolution will reshape computation, communications and sensing across every industry.
Dr. Basma Al-Buhairan
C4IR Saudi Arabia managing director

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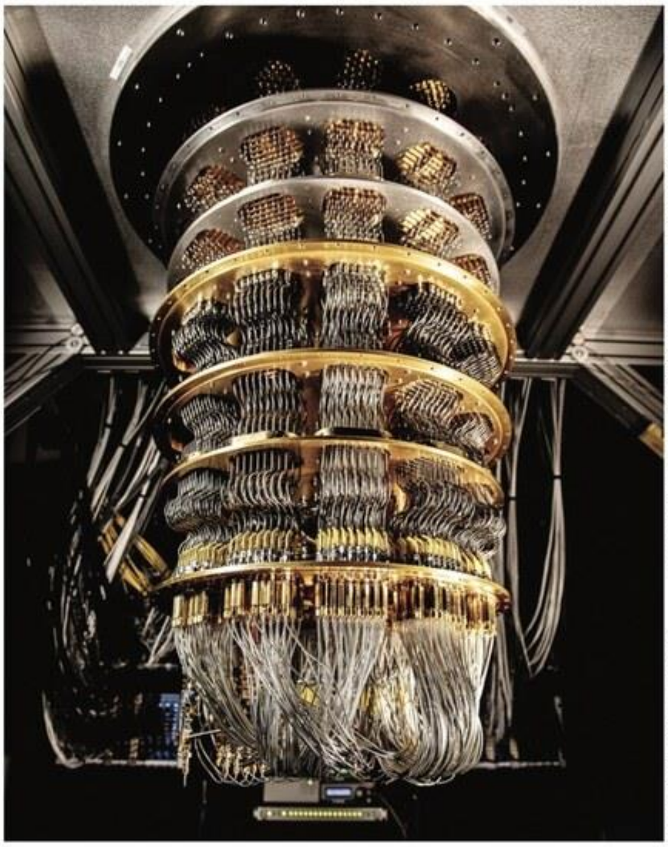
UNESCO

Quantum science's big bang

Long list of fields likely to benefit from 'quantum revolution,' whose transformative influence is likely to reshape computation, communications and sensing



FAST FACTS

- **UNESCO declared 2025 the International Year of Quantum Science and Technology to celebrate a century of quantum breakthroughs.**
- **Microsoft's new topoconductor chip could accelerate quantum computing development from decades to just a few years.**
- **Saudi Arabia's Centre for the Fourth Industrial Revolution is leading quantum research, aligning with Vision 2030.**

Google, bottom, has made strides with Quantum AI, main, but Microsoft's Majorana 1, below left, is hot on its heels. Google's Hartmut Neven, below, expects an error-corrected quantum computer by 2030. AFP/ Google/ Microsoft/ Supplied

Jonathan Gornall London

It is quite possible you haven't noticed that 2025 is the International Year of Quantum Science and Technology — or IYQ, for short. Yet it is something hordes of scientists are very excited about, as is UNESCO, which came up with the idea.

What the UN's science and culture organization has failed to do, however, despite planning events around the world "aimed at increasing public awareness of the importance of quantum science and applications," is explain on its IYQ website exactly what it is.

To be fair, that's not an easy question to answer.

The word "quantum" — Latin for "how much" — is an adjective that finds itself placed in front of a whole range of nouns including "physics," "computers," "mechanics," "engineering," "theory" and many more.

In these contexts, explains James Cruise, head of quantum computing at Cambridge Consultants, the word quantum refers to the smallest possible unit of something.

For instance, quantum physics studies the behavior of matter and energy at extremely small scales, such as atoms and subatomic particles. "We're getting better and better at controlling our world, and what's going on now is we're controlling the very, very tiny," he said.

"We controlled electricity for our electrical and digital revolutions, and mechanical control drove the Industrial Revolution, and now we're controlling the quantum mechanical realm, understanding how these really tiny particles behave to drive a new technological revolution based on that control."

His field is quantum computing, which allows certain problems, such as cracking cryptography, to be solved ridiculously quickly — although "quickly" doesn't really do the process justice.

"We are looking at tackling problems which would take millennia to solve, and being able to do them in days," he said.

One example is the analysis of chemical processes, important in the development of new drugs, "which is very hard to simulate."

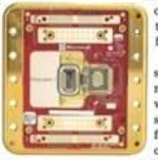
"There are a lot of molecules and a lot of very complicated equations to solve, and at the moment, when we use computers in chemistry, we just can't get accurate simulations, because this would take millennia to do all the necessary calculations.

"But with a quantum computer, you could actually do those simulations really quickly, in a day, or a week."

Earlier this week, Microsoft announced a major breakthrough in quantum computing with the development of a new chip powered by the world's first topoconductor — a material capable of creating a new state of matter that is neither solid, liquid, nor gas.

The company claims this innovation could dramatically accelerate the timeline for building practical quantum computers, reducing it from decades to just a few years.

Unlike traditional quantum computing approaches, Microsoft's topoconductor-based chip enables quantum systems to fit on a single, palm-sized chip, potentially paving the way for more stable and scalable quantum hardware.



But how does quantum computing actually work? For many, the "guru" of all things quantum is Hartmut Neven, vice president of quantum engineering for Google Quantum AI.

In a recent TED Talk, he tried to explain for a lay audience the theory behind quantum computing. It started well enough.

"Today's computers, like a laptop or a server at the Google data center, operate on the binary logic of zeros and ones," he said.

"A quantum computer replaces the binary logic with the laws of quantum physics. That gives it more powerful operations, allowing it to perform certain computations with way fewer steps."

So far, so understandable. But not for long. "So where does this superpower come from? Quantum computing is the first technology that takes seriously the idea that we live in a multiverse. It can be seen as farming out computations to parallel universes.

"The equations of quantum mechanics tell us that at any time, any object, myself, or the world at large, exists in a superposition of many configurations."

Skip over the mysterious "how," then, to Neven's example and the bottom line that quantum computers are on course to be seriously fast at previously impossible computational tasks. He invites the audience to envision a massive filing cabinet with a million drawers. An ordinary computer would have to open on average half a million drawers to find a particular item filed in one of the drawers, "but if you had access to a quantum algorithm, it would only be 1,000 steps to find the item."

Although Neven and Google are leading the field, they have yet to convert the theory of quantum computing into real-life practical applications. But they are well on the way. They have passed the second of six milestones they need to reach, and expect to have built "a large, error-corrected quantum computer by the end of the decade."

The potential of quantum technology to deliver a whole range of potentially transformative applications is being recognized and seized upon around the world — and Saudi Arabia is among the leaders of the pack chasing these golden prizes.

In 2021, in a pioneering collaboration with the World Economic Forum, Saudi Arabia launched the Centre for the Fourth Industrial Revolution, hosted by the King Abdulaziz City for Science and Technology in Riyadh.

In December, C4IR Saudi Arabia published a report that spelled out the potential benefits of quantum technology, highlighted existing progress in the Kingdom and set out a roadmap for a vision of a "quantum economy" which "aligns with the bold goals of Vision 2030, positioning the Kingdom as a global key player in technological innovation and economic diversification."

In her foreword to the report, the center's managing director, Dr. Basma Al-Buhairan, wrote that the Kingdom "stands at the dawn of the quantum revolution — a transformative force that will reshape computation, communications and sensing across every industry."

The report highlighted how quantum technology would "drive innovation across multiple sectors, creating new industries and economic growth" and leading to the development of new products, markets and jobs.

The list of fields in which quantum technology is predicted to have a transformative influence is wide, including energy efficiency, cyber defense, climate modeling, traffic management, machine learning, nanotechnology, cryptography, and the development of new materials and medicines.

Saudi universities are already offering a range of quantum-related programs, ranging from a course in quantum computation and security at Imam Abdulrahman bin Faisal University to a master's in theoretical quantum optics at Jazan University, and quantum-related research is under way at multiple institutions.

The number of quantum-related publications, conferences and journals produced by Saudi universities and research institutes has increased dramatically from just a handful 15 years ago. In 2023 alone there were 100 conferences and more than 180 journal publications in the Kingdom.

Saudi Arabia, as Dr. Al-Buhairan concluded, "is strategically positioned to become a global quantum technology hub" and "aims to harness this technological revolution's potential to foster economic growth, enhance national security, and improve citizens' quality of life."

In a call to arms, she urged "all partners and collaborators to continue this journey with us, exploring quantum technology's vast possibilities and ensuring Saudi Arabia remains at the forefront of this exciting field … to realize the full potential of a quantum-enabled future."