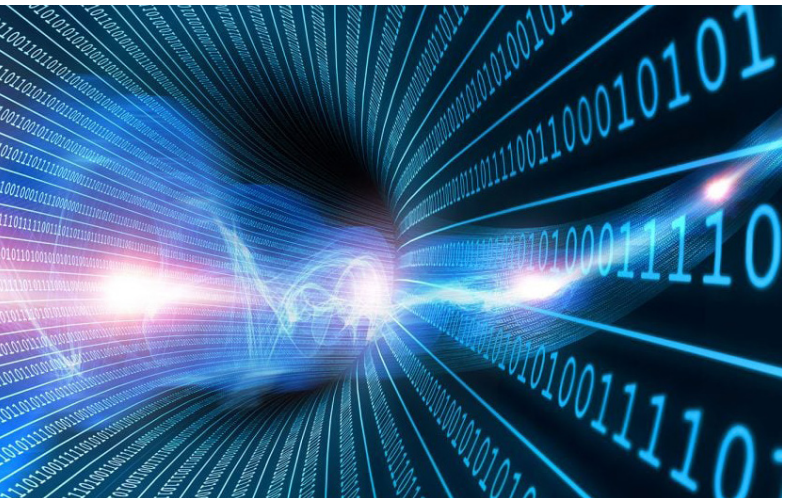
In The News

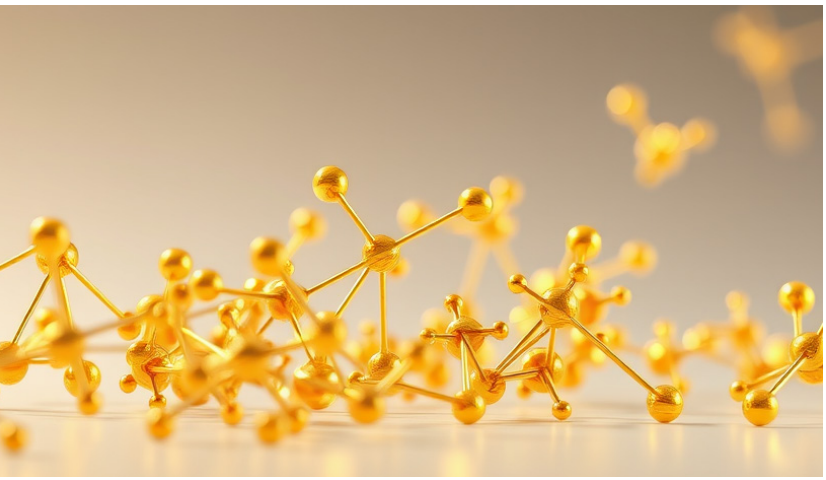
Quantum Internet brought to commercial fiber

Researchers at the University of Pennsylvania have successfully demonstrated the first quantum communication over a live commercial fiber network using a specialized chip called the Q-Chip. This chip can transmit quantum signals while correcting for noise, and routes quantum and classical data together using standard internet protocols. Installed on Verizon's commercial fiber, the system showed high fidelity (over 97%) across a one-kilometer link between two buildings. Quantum particles are fragile—measuring them destroys their state—so traditional network routing can't be used. To solve this, the Q-Chip sends a classical signal just ahead of the quantum signal. This allows routing and error correction without disturbing the quantum data. Like a train engine guiding sealed cargo, the classical signal guides the quantum payload. The chip is silicon-based and mass-producible, enabling future scalability. Unlike lab environments, real-world fiber faces weather, vibrations, and temperature shifts. By observing changes in the classical signal, the chip infers necessary corrections for the quantum data. Though long-distance scaling still requires new technology, this demonstration shows that a quantum internet can work with today's infrastructure—paving the way for secure communication and future quantum computing networks. ◆



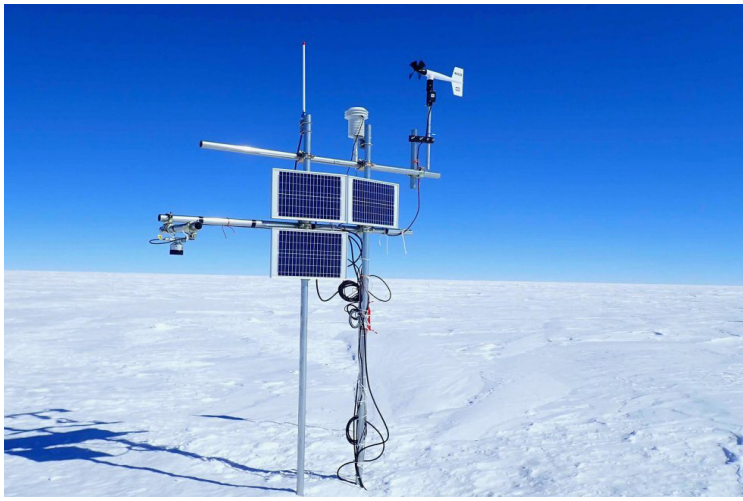
"Gold Quantum Needles" for sharper bio-imaging

Researchers at the University of Tokyo—Shinjiro Takano, Yuya Hamasaki, and Tatsuya Tsukuda—have directly imaged how gold nanoclusters form at the earliest stages of growth. Using unique synthesis conditions and single-crystal X-ray diffraction, they captured structural snapshots of nanoclusters just as they were forming—something rarely achieved. Under these conditions, they discovered a new, unexpected structure: elongated nanoclusters shaped like tiny pencils, composed of triangular and tetrahedral gold atom units. The team named them "gold quantum needles" because electrons within them show quantized behavior—a quantum effect where electrons occupy only specific energy states. These gold quantum needles also interact strongly with near-infrared light, making them promising for sharper biomedical imaging and efficient light-energy conversion. Gold, while often associated with luxury, is a key nanomaterial due to its unusual and tunable properties at very small scales. However, precise control over nanocluster formation has remained a major challenge. "Our goal was to open the black box of how these clusters form," said Tsukuda. The team now aims to refine their synthesis techniques and collaborate on applying these structures in cutting-edge technologies.The findings were published in the Journal of the *American Chemical Society*. ◆



Hidden Climate Driver Heating Antarctica

A new 30-year study has found that East Antarctica's interior is warming faster than its coasts, driven by shifting ocean conditions that transport warm air deep into the continent. Led by Naoyuki Kurita of Nagoya University and published in *Nature Communications*, the research links this rapid warming to changes in the Southern Indian Ocean, where intensified ocean fronts influence atmospheric circulation. Previously considered a climate "blind spot," East Antarctica holds about 70% of the world's freshwater in its ice sheets. Most temperature data came from coastal research stations, leaving the interior poorly monitored. To address this, scientists analyzed records from three unmanned weather stations—Dome Fuji, Relay, and Mizuho—active since the 1990s. These stations showed warming rates of 0.45–0.72°C per decade, faster than the global average. The cause is a new atmospheric "dipole" pattern: low pressure in mid-latitudes and high pressure over Antarctica. This high-pressure zone pulls warm air southward. While coastal stations haven't shown significant warming yet, that could soon change. This discovery suggests that current climate models may underestimate future Antarctic ice loss, with major implications for global sea level rise. ◆



Holograms to Your Phone

Researchers at the University of St Andrews have developed a breakthrough optoelectronic device that could transform holographic technology in areas such as smart devices, gaming, communication, and augmented reality. Published in Light: Science and Applications, the study combines Organic Light-Emitting Diodes (OLEDs) with Holographic Metasurfaces (HMs) to create compact, cost-effective holograms—without the need for bulky lasers. OLEDs, widely used in phone and TV displays, emit light across flat surfaces and integrate easily into small-scale systems. HMs are ultra-thin layers made of nanoscale structures called meta-atoms, engineered to precisely manipulate light. Together, the OLED-HM system can produce detailed holographic images through light interference. The team's key achievement is projecting a full holographic image from a single OLED pixel, a major simplification over traditional displays requiring thousands of pixels. This innovation enables miniaturized, high-resolution holographic systems. "Holographic metasurfaces are among the most versatile tools to control light," said Professor Andrea Di Falco. The research opens the door to next-generation holographic displays, with potential impacts across virtual reality, biophotonics, and optical communication. ◆