The University of Chicago, Toyota Collaborate to Advance Quantum Technologies for Future Mobility and Transportation

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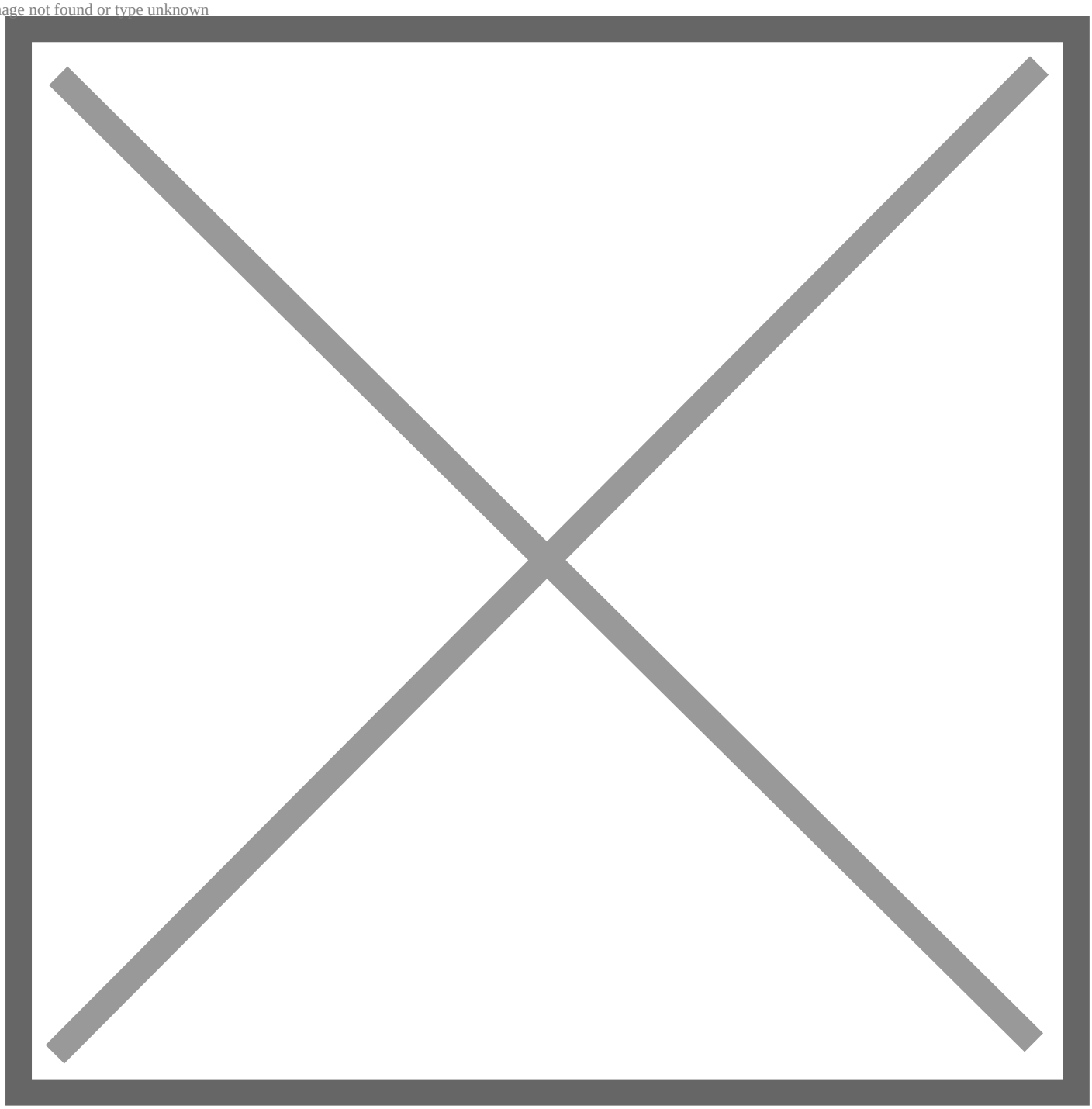

CHICAGO and ANN ARBOR, Mich. (Nov. 3, 2026) – The University of Chicago (UChicago) and Toyota have entered into a multi-year collaborative research agreement to accelerate the development of quantum technologies for future mobility, sustainable transportation and secure vehicle systems.

The collaboration bridges foundational quantum science at UChicago with Toyota's industrial expertise to explore applications across quantum sensing, secure communications and novel materials discovery. These applications could include new technology for vehicles to better sense their environments; ways to protect vehicle data transmissions; and new materials for energy storage systems.

The initiative will launch with five collaborative research projects, drawing heavily on the faculty and resources of UChicago's Pritzker School of Molecular Engineering (UChicago PME). Over the course of the agreement, the parties aspire to build a joint research portfolio supported by annual funding of up to $1 million from Toyota.

The collaboration initially focuses on five key areas:

- Communication;
- Sensing;
- Materials discovery;
- Theoretical modeling and prediction; and
- Electronic properties.

"By pairing academic discovery with industrial insights, we can accelerate the timeline for bringing quantum technologies out of the lab and into real-world transportation systems," said David Awschalom, Director of the Chicago Quantum Institute, the Liew Family Professor of Molecular Engineering at UChicago PME, and the lead researcher on the initiative. "This collaboration with Toyota offers extraordinary opportunities to push the boundaries of research in science and engineering."

The initiative is also intended to build the future quantum workforce by embedding UChicago PME students into projects that bridge academic research and industry needs.

"Toyota's collaboration with the University of Chicago brings together world-leading expertise in quantum sensing, optics, biology, and computing to accelerate breakthroughs that can shape the future of mobility," said Jeff Makarewicz, Group Vice President, Advanced Research & Technical Resources, Toyota. "Through the UChicago, Toyota gains access to fundamental discoveries, advanced talent and new computational approaches to solve complex engineering challenges. In turn, Toyota offers UChicago the opportunity to translate cutting-edge research into tangible societal impact."

Translating quantum science to the road

Scientists and engineers believe quantum technologies could redefine future mobility systems and help support infrastructure by bypassing the physical limitations of classical technology.

The research under this initiative takes a long-term approach to foundational challenges in transportation, including:

- **Extremely precise sensing:** Quantum sensors can measure environmental changes with unprecedented accuracy in laboratory environments. Researchers will investigate translating this technology to potentially improve vehicle capabilities beyond what is possible with current sensor systems.
- **Secure communications:** Researchers will investigate methods to convey and help protect data transmission between vehicles, roadside infrastructure, and regional data and control centers.
- **Material discovery:** Using computational techniques based on quantum simulations, the teams aim to explore novel materials for the design of quantum sensors, transceivers and data links.

“The goal is to address deep technical questions that could help shape the analysis of energy storage systems over a 20-year horizon,” said Giulia Galli, the Liew Family Professor of Molecular Engineering at UChicago PME and a leader on the theory science team on the initiative. “Through advanced computational modeling, we can predict and design materials with novel electronic properties for quantum sensing, helping detailed monitoring of energy storage systems.”

Investing in the next generation

The first phase of the research initiative will fund up to eight UChicago graduate students across both theoretical and experimental labs, giving them direct exposure to industrial research challenges as advanced mobility systems are designed from the ground up.

“What makes this collaboration uniquely impactful is its direct investment in our students and postdoctoral researchers. Virtually all this funding will embed next-generation quantum scientists into collaborative, high-impact research from day one,” Awschalom said. “Working alongside Toyota engineers gives our students a rare opportunity to see how fundamental quantum mechanics can be scaled to solve massive, real-world transportation and energy challenges.”

A joint steering committee composed of representatives from UChicago and the Toyota Research Institute of North America will provide overall coordination for the initial projects. UChicago is currently hosting two researchers from Toyota as visiting scientists in the Awschalom and Galli labs.