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ACM TechBrief Warns of Promise and Peril of "Sleeper" Quantum Simulation Technology, Highlighting Multiple Risks

New York, NY, August 2, 2022 – The Association for Computing Machinery's global Technology Policy Council (ACM TPC) has just released "Quantum Computing and Simulation." It is ACM's fourth TechBrief: a series of short technical bulletins by ACM TPC that present scientifically grounded perspectives on the impact of specific technological developments in computing and their applications.

"Quantum Computing and Simulation" underscores how quantum simulation, an offshoot of quantum computing that has received relatively little attention, poses profound societal and individual risks as well as benefits with serious public policy implications. These include that intense media and policymaker focus on the theorized encryption-cracking power of future quantum computers has obscured the imminent viability, and *actual* likely consequences, of quantum simulation technology today.

As the new ACM TechBrief points out, while general-purpose quantum computing is estimated to be at least 10 and perhaps as many as 40 years from being fully available, the lesser-known quantum simulation technology could be widely available within two years with profound possible impacts. ACM TechBrief lead authors Simson L. Garfinkel and Chris J. Hoofnagle note that quantum simulation "has the potential to profoundly affect science, industry, and warfare." The TechBrief also cautions that "privacy and other civil liberties could be adversely affected by technological developments accelerated by quantum simulation."

Quantum Computing and Simulation's key conclusions are:

- Quantum simulation, a less recognized element of the quantum technology revolution, must be planned for thoroughly to realize its tremendous promise.
- Because quantum simulators are likely to be developed far sooner than general-purpose quantum computers, such planning is needed immediately.

- Strategic investment and government oversight and controls will be critical to securing the benefits of quantum simulation while mitigating both its foreseeable and unforeseen risks.

"Despite the vast potential of quantum simulation, both its positive and negative impacts have not yet been adequately addressed by the global computing community or policy leaders," said ACM TPC Chair James Hendler of Rensselaer Polytechnic. "The goal of this TechBrief is to introduce a broad audience to both the promise and peril of quantum simulation so that leaders in science, government, and policy may begin to debate and design parameters within which this technology can develop and be deployed responsibly with maximum benefit and minimum risk. As the world's largest association of computing professionals, ACM is the right organization to frame this important conversation."

ACM's TechBriefs are designed to complement ACM's activities in the policy arena and to inform policymakers, the public, and others about the nature and implications of information technologies. As with other TechBriefs in the ACM series, "Quantum Computing and Simulation" includes an overview of the major policy implications of the technology, key statistics to put the issues in context, a narrative introduction to educate the general public, and key conclusions. Previous ACM TechBriefs focused on climate change, facial recognition, and smart cities. Topics under consideration for future issues include election auditing, AI and trust, encryption security, media disinformation, content filtering, blockchain, accessibility and more.

About the ACM Technology Policy Council

ACM's global Technology Policy Council sets the agenda for global initiatives to address evolving technology policy issues and coordinates the activities of ACM's regional technology policy committees in the US and Europe. It serves as the central convening point for ACM's interactions with government organizations, the computing community, and the public in all matters of public policy related to computing and information technology. The Council's members are drawn from ACM's global membership.

About ACM

ACM, the Association for Computing Machinery, is the world's largest educational and scientific computing society, uniting computing educators, researchers and professionals to inspire dialogue, share resources and address the field's challenges. ACM strengthens the computing profession's collective voice through strong leadership, promotion of the highest standards, and recognition of technical excellence. ACM supports the professional growth of its members by providing opportunities for life-long learning, career development, and professional networking.

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