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Quantum Computing 2025 — Is it Turning the Corner?

By John Russell

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It's time to stop doubting quantum information technology.

Are we there yet? No. Not by a long shot. But the progress on a number of key challenges, the sheer number of organizations fighting to succeed (and make a buck), the no-turning-back public investment, and nasty international rivalry are all good guarantors.

It feels like quantum computing is turning an important corner, maybe not the corner leading to the home stretch, but likely the corner beyond the turning back point. We now have quantum computers able to perform tasks beyond the reach of classical systems. Google's latest break-through benchmark demonstrated that. These aren't error corrected machines yet, but progress in error correction is one of 2024's highlights.

Quantum pioneer John Preskill recently suggested we change our mindset and language and stop talking about NISQ (noisy intermediate scale quantum) versus FASQ (fault-tolerant application scale quantum) systems and start talking about Mega/Gigaquop (million/billion quantum operations) systems – basically systems able to do some levels of productive "work."

John Preskill, Caltech

That feels right. We're rapidly developing the features (hardware and software) that will make Mega/Gigaquop possible. We're entering the next phase of quantum computing development. Not the end game but a significant change, let's call it the middle game, where winning hardware and software strategies will emerge and lesser ones will fade.

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- NSF Congratulates Recipients of National Medal of Science and National Medal of Technology and Innovation Awards
- IonQ to Participate in CES 2025, Joining the Event's First-Ever Quantum Track
- SEMI Report: 18 New Semiconductor Fabs to Start