The Promise of Quantum Computing
By Intel CEO Brian Krzanich

Today I wanted to share some thoughts on a technology that I am incredibly excited about, and our plans to invest and partner in the development of this technology. As you all know, Intel has a legacy of leadership in defining the future, rooted in Moore's Law.

Fifty years ago, when Gordon Moore first published his famous paper, postulating that the number of transistors on a chip would double every year (later amending to every two years), nobody thought we'd *ever* be putting more than 8 billion of them on a single piece of silicon. This would have been unimaginable in 1965, and yet, 50 years later, we at Intel do this every day.

For many of us, it's hard to imagine computing that is exponentially advanced beyond the power that drives today's data centers, PCs and other devices. And yet, the pace of innovation and change continues to accelerate. Tomorrow's computing technologies will perform orders of magnitude beyond even the most powerful supercomputer that exists today.

Quantum computing is one of the more promising areas of long-term research we've been exploring in our labs, with some of the smartest engineers in the world. We believe it has the potential to augment the capabilities of tomorrow's high performance computers.

Researchers have looked at the prospects of quantum computing for more than 30 years. Incredibly smart academics around the world are all working on various aspects of quantum computing. Governments, academics and a small number of technology companies are collaborating on ways to make it work.

Why Quantum Computing and Why Now?

Quantum computing is promising, but there are significant challenges to overcome. It is a subatomic scenario that requires suspending conventional wisdom around basic physics, where an electron can actually be two places at once, spinning clockwise and counterclockwise at the same time.

This ambiguity is both promising and enormously complex.... and of course, an incredibly exciting challenge to anyone who loves physics, like me. How do we connect thousands of quantum bits, or qubits, together? How can we control them? How can we reliably fabricate, connect and control many more qubits? Even measuring qubit signals is going to require an entirely new class of low temperature electronics that don't exist today.

Solving big problems is what we do at Intel, and it's what gets me excited. This is a not just an Intel problem, it is a challenge that the whole industry is coming together around. It will take significant resources and our best engineering minds -- and it will not be easy.

Despite significant progress, quantum computing will take at least a dozen years to fulfill. That's why practical and theoretical research is needed now, and why we will work with industry partners. It is also why we are announcing that we are entering a long-term collaboration with the Delft University of Technology (TU Delft) and TNO, the Dutch Organisation for Applied Research. TU Delft has been working on the science behind quantum computing for many years and has great vision into the challenges around interconnects in particular.

Intel can help advance progress in this field through our leading manufacturing, electronics and architectural expertise. We can help with scaling this technology.

Why am I so confident? Because this is what we do best. This research is on the cutting edge of silicon, architecture and software. Intel's entire history has been built on driving innovations in the very leading edge of all three of these.

I'm excited about the role that Intel's greatest minds and expertise can play in shaping this impactful technology, and I hope you are too. Quantum computing holds the promise of solving complex problems that are practically insurmountable today, changing the world for the better. That's a technology I think we'll all be incredibly proud to play a part in developing.