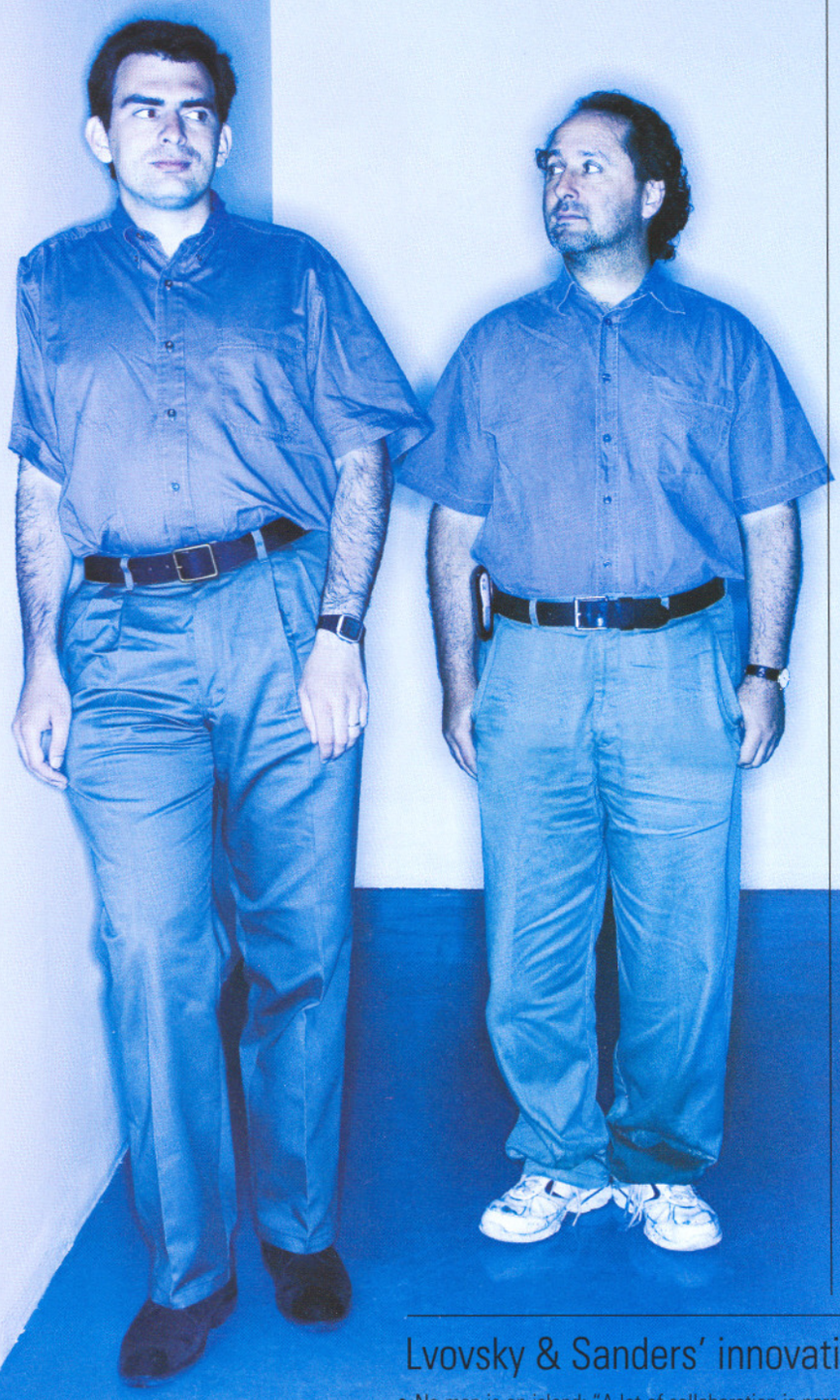
Quantum progress, bit by bit

Alex Lvovsky, group leader, **Barry Sanders**, director,
Institute for Quantum Information Science, University of Calgary



Alex Lvovsky, left, and **Barry Sanders**.

Alex Lvovsky points to what he calls a "Nobel Prize" lab, a box-filled room in the basement of the University of Calgary. "When we come up with the idea that gets us the Nobel Prize, we'll start building it," he says with laughter. Although he's joking, it could become a reality; Lvovsky and this lab are part of a worldwide scientific race that could produce the computing equivalent of the atomic bomb.

The race is to create a quantum computer, a fundamental change in the way computers operate, with atom-sized transistors. With a PhD in physics, Lvovsky is focusing on using photons, particles of light, to act as the computer's digital information. A quantum computer's power, in theory, should be able to crack any modern security code in the world.

"As soon as one is able to build a quantum computer...one would be able to get all the money in all the banks, or to discover all military secrets of all countries," Lvovsky says. Quantum technology, because of the way it sends information, would also be its own security system. Any attempt to hack into a quantum computer would be immediately detected and the requested information would be rendered useless to thieves. Therefore, it's imperative that the "bad guys" aren't the first to build this technology.

The university is up to the challenge. "Everyone wants to work in a place that's exciting and that they think is going to keep getting better," says Barry Sanders, director of the university's Institute for Quantum Information Science.

Lvovsky expects to have the first high-speed quantum communication network in Canada up and running within five years. For him, it's not possible to overstate the importance of this research. "The only way to prevent destruction by means of quantum information is to develop quantum information technology," he says.

— Reagen Sulewski

Lvovsky & Sanders' innovation insights

- No man is an island: "A lot of collaboration is paramount in this field. Without sharing, there is no way we can succeed." *— Alex Lvovsky*
- Be prepared to travel: "For any scientist, wherever they are, the rule is you have to travel a lot, because you have to learn from different people and learn from different experiences. Just from being one place in your life you cannot learn too many things." — Alex Lvovsky
- Have realistic goals: "A place that over-promises [results] is destined for failure." *— Barry Sanders*