Dr. Donna Strickland
University of Waterloo
2018 NOBEL IN PHYSICS
“Spooky action at a distance.”

Albert Einstein


Results of 1982 Aspect experiment proved the world is Non-Local (Quantum), not Classical.
COMPONENTS OF THE QUANTUM VALLEY ECOSYSTEM

QVI Quantum Valley Investments
RAC Research Acceleration Centre
QVIL Quantum Valley Ideas Lab
IQC Institute for Quantum Computing
QNF Quantum NanoFab
LI Lazaridis Institute for Management of Technology Enterprises
PI Perimeter Institute of Theoretical Physics
Today’s Theoretical Physics is Tomorrow’s Technology
The Stephen Hawking Centre

“Perimeter Institute is now one of the world’s leading centres in theoretical physics, if not the leading centre.”

Stephen Hawking
Perimeter Institute Distinguished Visiting Research Chair (2009-2018)
State-of-the-art teaching, laboratory, clean room and fabrication facilities right at the centre of the University of Waterloo campus

“The Institute for Quantum Computing (IQC) in Waterloo, Canada,...is currently the largest centre for quantum information worldwide.”

UK National Quantum Technologies Programme: UK Quantum Technology Landscape 2016 Report
Investing in the future

QUANTUM VALLEY INVESTMENTS

QUANTUM TECHNOLOGY COMMERCIALIZATION FUND

FOUNDED IN:
2013

ESTABLISHED BY:
Mike Lazaridis and Doug Fregin
to provide funding, expertise
and support to researchers for
the commercialization of Quantum
Science based Technologies

CENTRE FOR QVI’S COMMERCIALIZATION EFFORTS:
90,000 sq ft
state-of-the-art research facility
Ideas Lab brings together world-class, focused research teams and state-of-the-art infrastructure to develop new quantum technologies and applications. Our mission is to accelerate the commercialization of advances in quantum research.
IN THE MEDIA

Lazaridis [and Fregin] led recruitment and development at three research organizations: the Perimeter Institute for Theoretical Physics, the Institute for Quantum Computing, and the Waterloo Institute for Nanotechnology. Those efforts have attracted prominent physicists and made Canada an outsize force in the field which the U.S. and China typically dominate.”

Bloomberg – February 2018
# The Early Mover Advantage

## World Ranking for Quantum Science and Technologies

<table>
<thead>
<tr>
<th></th>
<th>World ranking based on spend$^5$</th>
<th>World ranking based on publications$^6$</th>
<th>World ranking based on patent applications$^7$</th>
<th>Total Ranking</th>
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</tr>
</tbody>
</table>

UK Government Office for Science Quantum Technologies Report
QUANTUM TECHNOLOGIES TIMELINE

ESTIMATE AS TO WHEN NEW QUANTUM TECHNOLOGIES WILL START TO BECOME COMMERCIALY AVAILABLE

NOW
- QUANTUM SENSORS
- QUANTUM/QUANTUM-SAFE ENCRYPTION

5-10 years
- QUANTUM SIMULATORS
- QUANTUM MATERIALS

>10 years
- GENERAL PURPOSE QUANTUM COMPUTERS
- KILLER APPS

*Disclaimer: based on estimates provided by researchers.
Quantum computing will break today’s public key encryption standards.
Quantum computers will be able to instantly break the encryption of sensitive data protected by today’s strongest security, warns the head of IBM Research.

“Anyone that wants to make sure that their data is protected for longer than 10 years should move to alternate forms of encryption now.”

Arvind Krishna, Director of IBM Research
PATHWAYS TO QUANTUM SAFETY

AGILE MIGRATION TECHNOLOGIES

QUANTUM-SAFE CRYPTOGRAPHY

Source: ISARA
THE WALL STREET JOURNAL.

“In the past five years, scientists have made major progress on [the Quantum Computing] balancing act. In response, investment has surged, with projects under way at Google, Microsoft, IBM and Intel Corp., and interest from potential customers has followed.”

The Wall Street Journal – October 2017

GOV.UK

“In order to secure the UK lead in this area, and make sure that UK companies take a significant share of this large future sector, we must act now with a focus more than ever on working across the spectrum of industry, academia and government to achieve innovation.”

Sir Peter Knight – April 2018

“The Economist – March 2017

“After a century stuck in textbooks, mind-bending quantum effects are about to power mainstream innovation.”
The second quantum revolution will impact all technologies and industries.

- Quantum Sensing and Measurement
- Quantum Computing, Storage, and Communications
- Quantum Precision Timing
- Quantum Thermodynamics
- Securing our Communications and Data
- New Quantum Materials
- Quantum Simulation
- Quantum Imaging

... and much more