QUANTUM FOR ENVIRONMENT

TQT Transformative Quantum Technologies

Sponsored by:

Quantum Valley Ideas Lab

ANGSTROM ENGINEERING

AMBATURE

Territorial Acknowledgement

The University of Waterloo acknowledges that much of our work takes place on the traditional territory of the Neutral, Anishinaabeg and Haudenosaunee peoples. Our main campus is situated on the Haldimand Tract, the land granted to the Six Nations that includes six miles on each side of the Grand River. Our active work toward reconciliation takes place across our campuses through research, learning, teaching, and community building, and is co-ordinated within the Office of Indigenous Relations.

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Goals for Today

Learn about quantum, learn about environmental needs.

Explore opportunities to have impact. Refine your ideas.

Connect with others. Connect with mentors.

Enjoy refreshments and lively conversation!

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Ideation Forum

- Introduction to Quantum for Environment
- Instructions for today
- Connections (20 min)
- Ideation (45 min)
- Re-cap & Presentations
- Closing
- Reception

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Introduction to Quantum for Environment

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Why Quantum for Environment?

- Opportunity to mate the power of quantum with pressing needs in the environment
  - Those working in quantum are looking for environmental targets to be impactful
  - Conversely, those knowledgeable about environmental needs are searching for solutions

The Quantum for Environment Design Challenge unites these communities and seeks to bring new ideas for how quantum may impact the environment.

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Opportunity Space

Underlying quantum effects lead to large efficiency gains

- superconducting materials for lossless power transmission
- improved efficiency of solar conversion, from 18% to 40%
- spintronics for non-volatile memory and improved classical electronics, theoretical gain is a factor of 600
- quantum simulation for new energy-efficient materials
- high-resolution imaging for remote earth observation
- highly-sensitive/selective/precise sensors for pollutants, critical minerals
- quantum algorithms that bring a quantum advantage for important environmental problems
- the list goes on…

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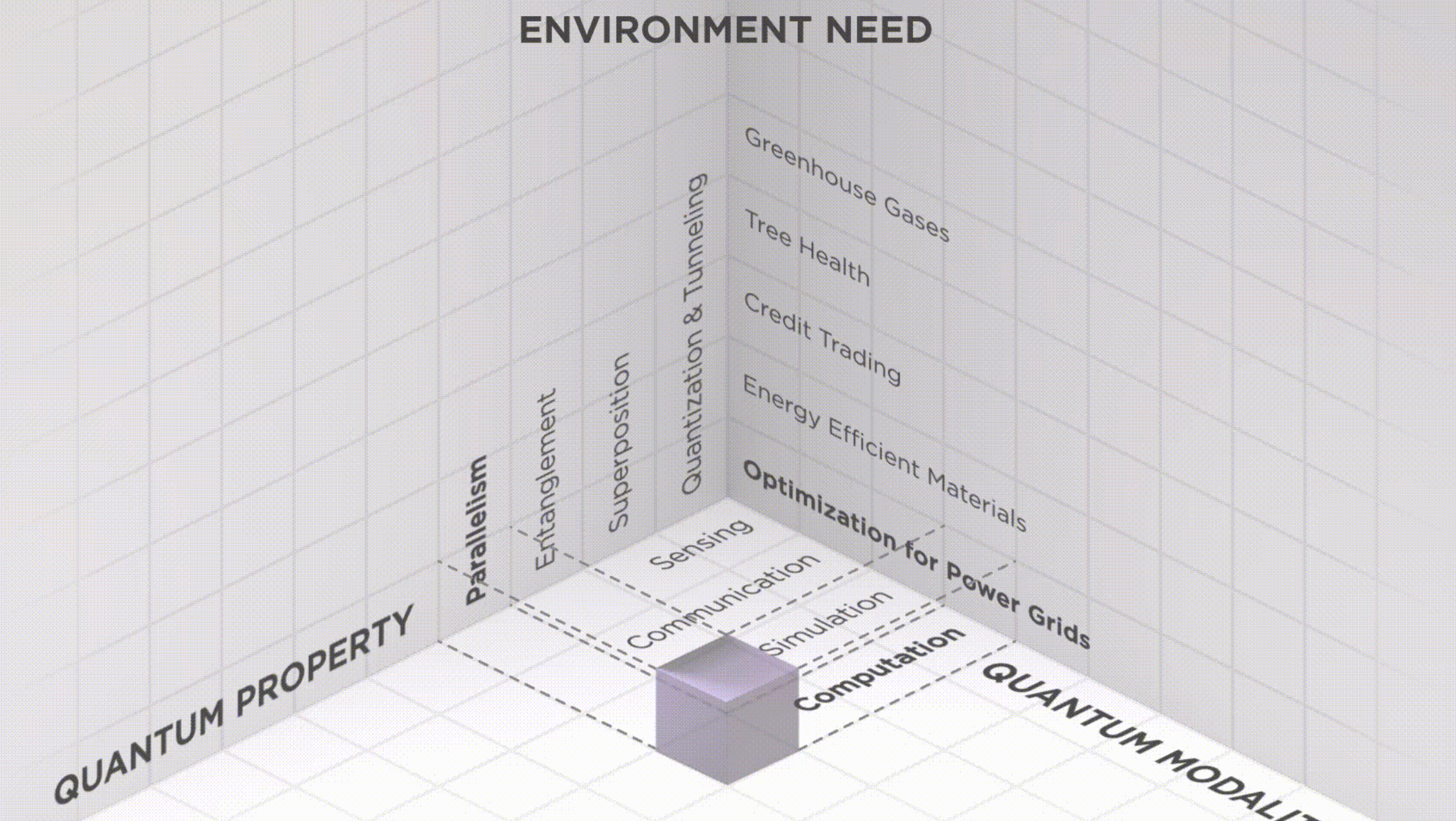
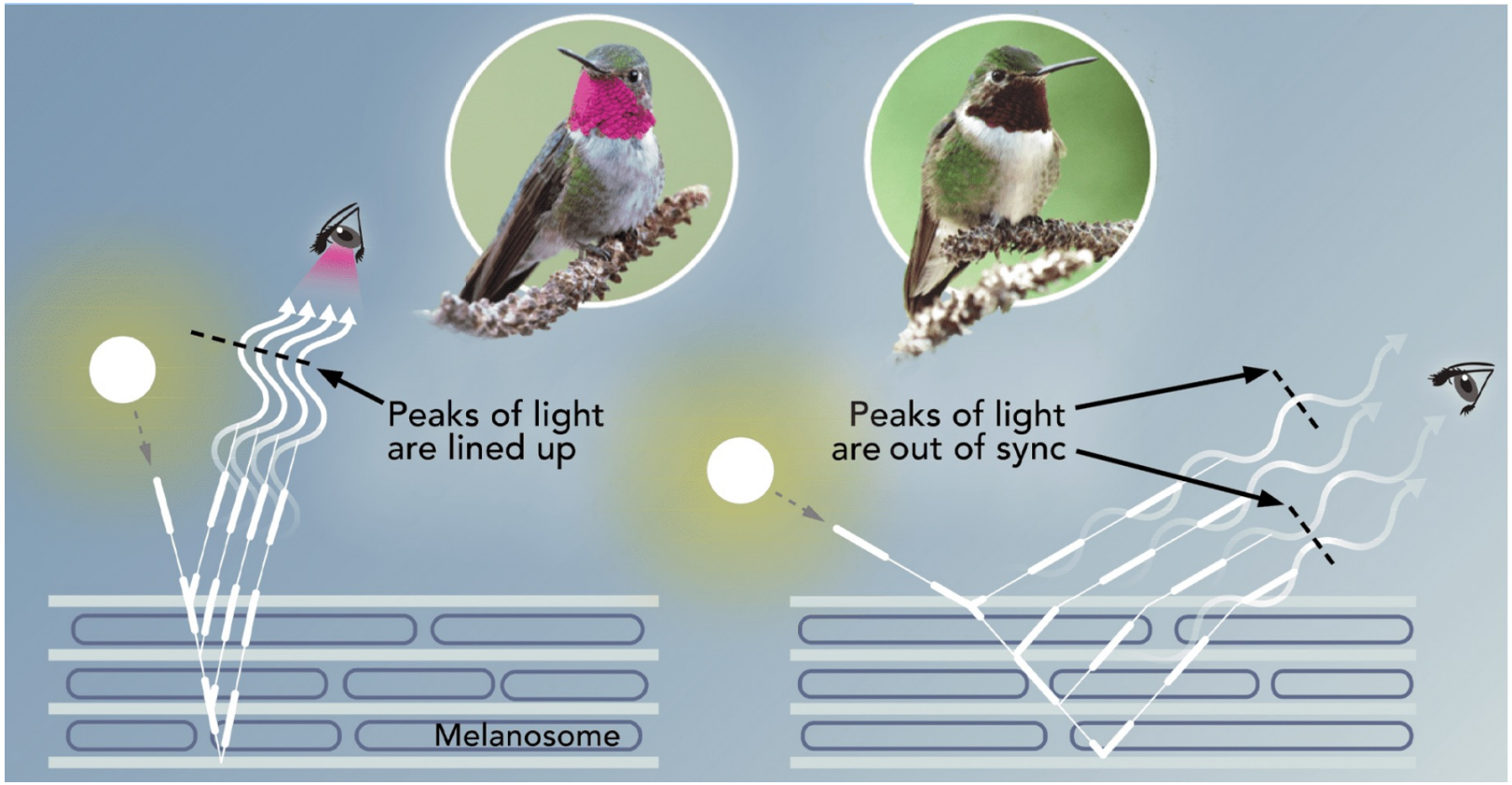

ENVIRONMENT NEED
Greenhouse Gases
Tree Health
Credit Trading
Energy Efficient Materials
Optimization for Power Grids
Quantization & Tunneling
Superposition
Entanglement
Parallelism
QUANTUM PROPERTY
Sensing
Communication
Simulation
Computation
QUANTUM MODALITY

Quantum in Nature



Graphic by A.M. Dokter and Jillian Ditner; Broad-tailed Hummingbird photos from Macaulay Library by Ryan Sanderson (left) and Isoo O'Brien (right).

Photo by Steven Kessel.

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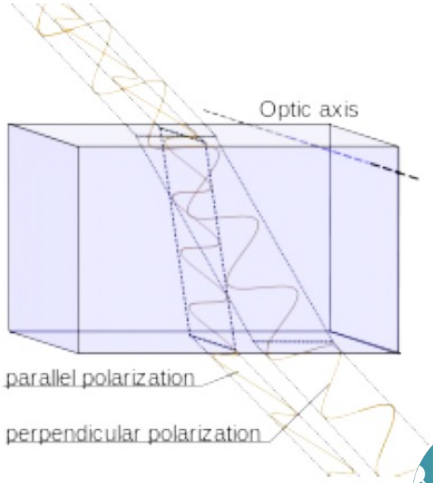
Early Quantum Technology

late 10th century
navigation

Birefringence



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Quantum for Environment Design Challenge

Launched in June 2023, design submissions due February 2024.

Open to all students and post-doctoral fellows at the University of Waterloo. Must apply as a team. Opportunity to receive mentorship.

Awards up to $5,000 CAD.

tqt.uwaterloo.ca/q4e

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Important

All ideas and backgrounds welcome.

Need not be a quantum physicist to participate!

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Instructions for Today

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Ideation Forum

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Connections

1. Contribute your ideas – use mentimeter to add new ideas
2. Connect with others

Walk around and introduce yourself to others and / or find a topic heading of interest at the front of the room and meet with others there.

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Ideation

1. Self-assemble into groups and develop an idea, signal the attention of one of the organizers if you'd like to connect with a mentor
2. Express interest – use mentimeter to vote on ideas of interest

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Re-cap and Presentations

1. Present your ideas and receive a special gift!

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Connections (20 min)

Contribute your ideas –
use mentimeter to add new ideas

Connect with others

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Ideation (45 min)

1. statement of the thesis
2. significance of answer
3. why now
4. resources needed

*Signal the attention of an organizer if you'd like to connect with a mentor.

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Recap & Presentations

1. statement of the thesis
2. significance of answer
3. why now
4. resources needed

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Visit tqt.uwaterloo.ca/q4e

- Request access to Q4E slack
- Register your interest in Q4E
- Connect with mentor(s)

tqt.uwaterloo.ca/q4e

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Important Dates

- Q4Environment Lunch and Learn with GreenHouse: October 24, 2023
- Q4Environment Design Submissions Due: February 2024
- Q4Environment Awards Announced: March 2024

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Thank you – enjoy
the reception!

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