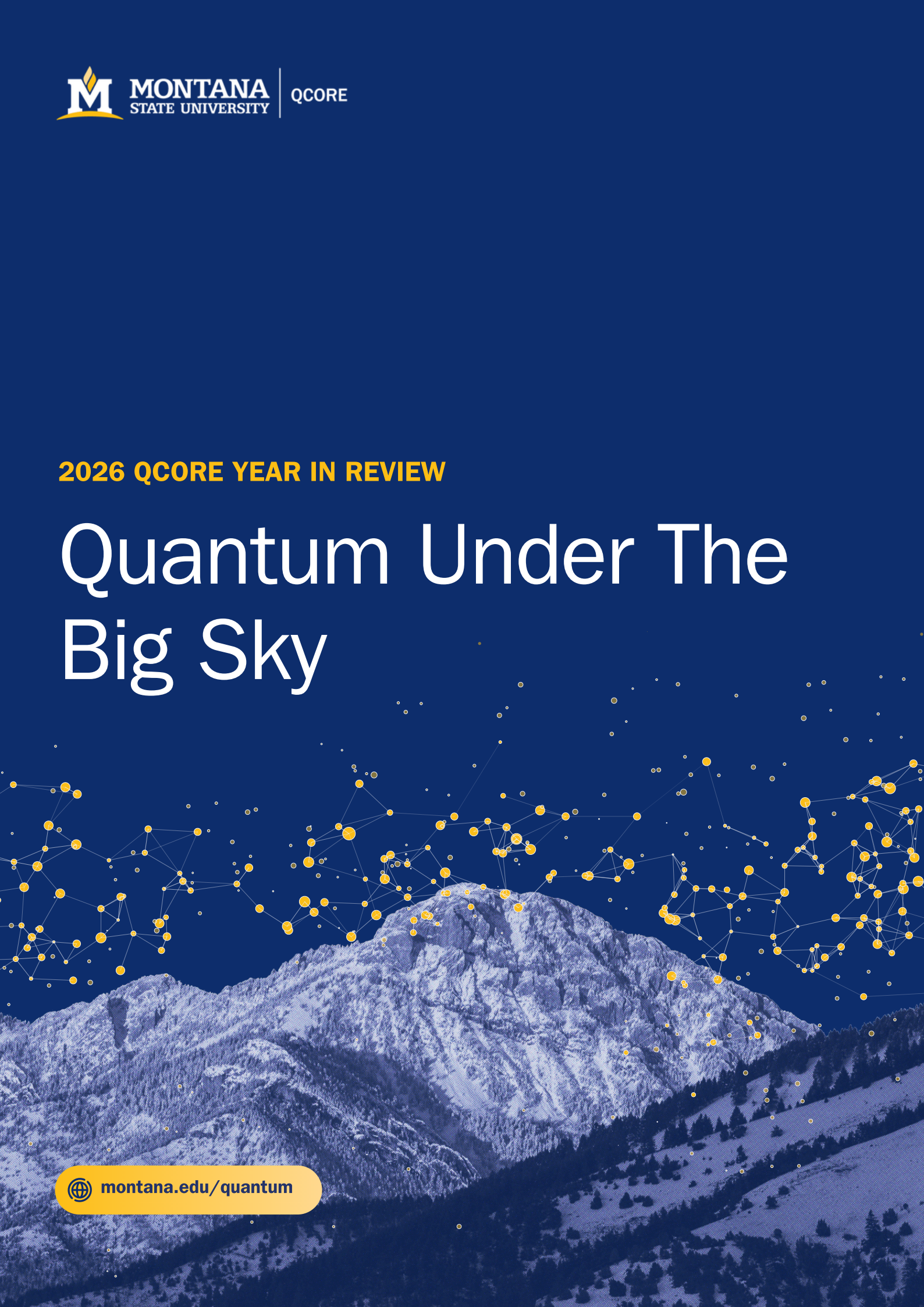


2026 QCORE YEAR IN REVIEW

Quantum Under The Big Sky



 montana.edu/quantum

Executive Statement

Welcome to QCORE!

QCORE at Montana State University is emerging as a knowledge center for research and innovation in quantum systems integration. Quantum technology advancement, including quantum computing and sensing, is poised to dramatically impact our world, allowing for the completion of complex computations that were once thought impossible and for optimizations to be completed in days instead of weeks.

Envisioning a future where these systems work with classical computation is the job of many, working together, building community and fostering collaboration. Now is the time to think about the integration of these new technologies, enabled by interoperability standards, performance measures, and a reliable supply chain. We are thrilled to share the many successes and opportunities for collaboration.



"Montana is well poised to rise with quantum technology advancements." - Dr. Jayne Morrow, QCORE Director

Mission, Purpose, Vision



Mission

QCORE expands access to cutting-edge infrastructure, fosters the translation of quantum and adjacent innovations to societal impact, and develops a quantum workforce.



Purpose

QCORE exists to steward the development of transformative quantum technologies in service to the common good.



Vision

Leading Montana's research, technology development, education, and cross-sector partnerships into a sustainable quantum ecosystem.



Key Statistics

50

Group Tours



36

Events



15

Seminar Series, 21 Speakers



500+

Seminar Attendees



200+

Open House Attendees



30+

MOUs & NDAs



44

World Quantum Day Kit Applications

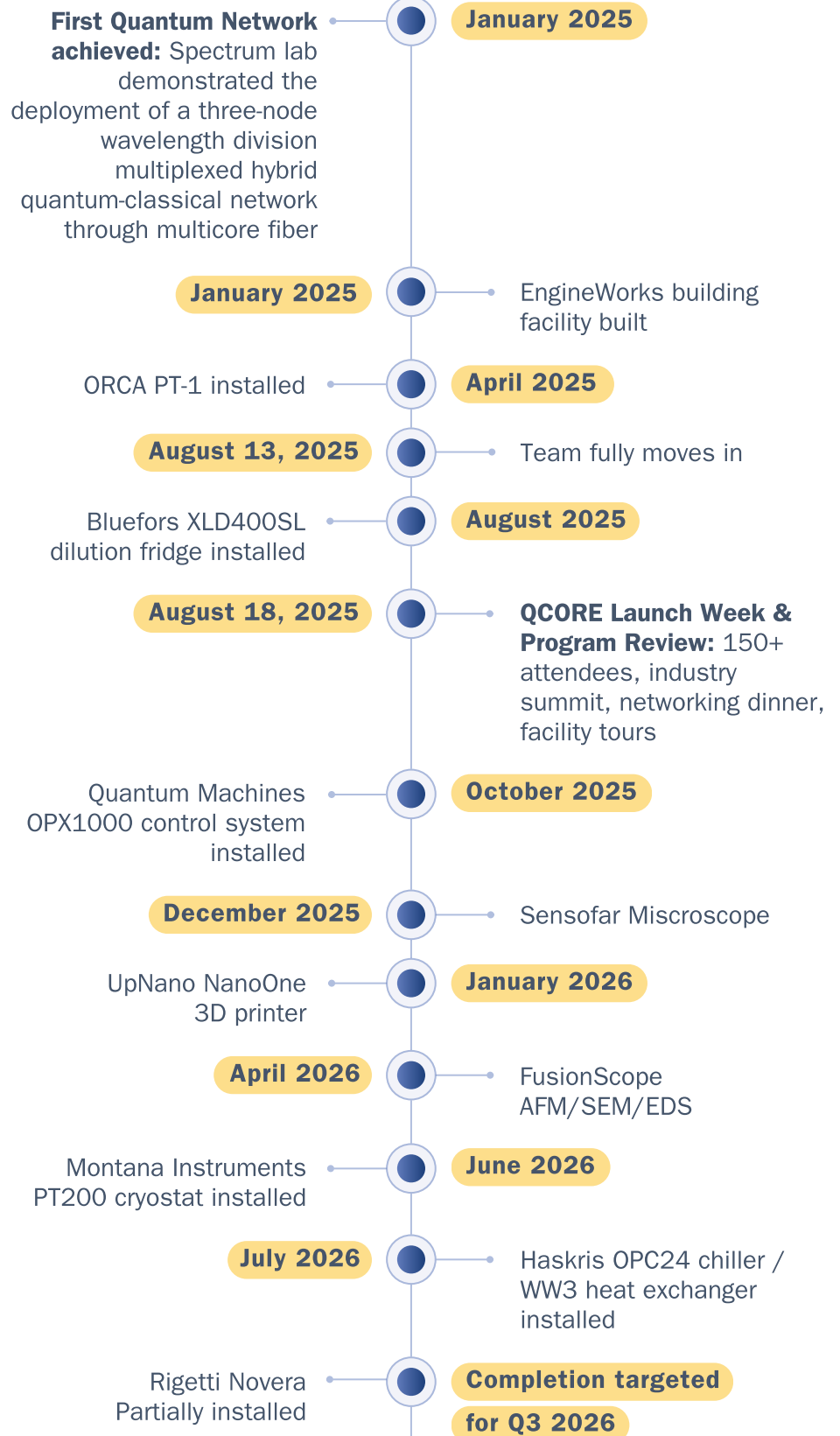


400

Poster Sets Distributed



Timeline of Major Milestones



Launch Week Spotlight

AUGUST 18–22, 2025

A five-day celebration marking QCORE's official launch: a welcome reception and poster session, AFRL content sessions and facility tours, a public industry summit, an advisory board social, and a public open house with an ideathon pitch competition.



New relationships formed across academia, industry, and the local community, including several unplanned connections that led directly to continued engagement

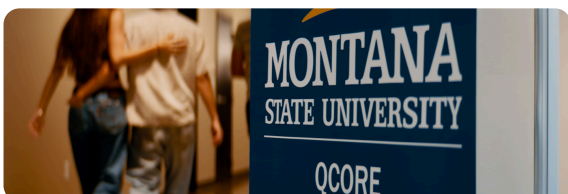


Strong public turnout at the Open House with families and community members engaged throughout the day

Active interest from investors and venture capital groups engaging with QCORE's work



The Industry Summit and poster sessions drove sustained, in-depth conversations and new partnership leads



Meaningful national visibility alongside strong local and regional engagement

Testimonials



"QuEra Computing is proud to be included as a national partner of QCORE, contributing to our efforts in neutral-atom quantum computing. QCORE is positioning Montana not only as a hub for innovation but also as a key contributor to the resilience of U.S. quantum technology development."



"Montana is quickly establishing itself as a new quantum hub, bringing together world-class talent, strong institutional support, and innovative companies. At Qblox, our motto is building quantum together, and QCORE is a perfect example of how collaboration across universities, industry, and government can accelerate progress."



Tommaso Macrì, Senior Director of Business Development, QuEra Computing



Daniel Rodan Legrain, PhD, Quantum Science & Engineering Lead, North America, Qblox

Membership Program Highlights



QCORE's membership model is designed to create a structured, evolving partnership between industry, academia and government stakeholders. Members gain access to an expanding ecosystem of talent, infrastructure, research collaboration and strategic thought leadership.

QCORE membership pillars:



Early access to innovation



Talent pipeline development



Collaborative research opportunities



Research and testing infrastructure and facility access



Ecosystem visibility



Strategic thought leadership

Access QCORE's website

Click Here 

Active Collaborators



Honeywell
Aerospace



Members gain access to core engagement mechanisms designed to establish connection and visibility within the ecosystem:

Access through newsletters, seminars, and curated updates

Participation in events, workshops, and roundtables

Access to facilities and infrastructure

Entry into workforce programs, including internships and student engagement opportunities.

Opportunities for leadership through panels and summits.

Visibility through QCORE's website, events, and communication channels.

Industry & Ecosystem Engagement

In its first year, QCORE moved industry engagement beyond introductions and facility tours to create real opportunities for technical collaboration, workforce development, and research connections. Companies across the quantum and advanced technology ecosystem — including QuEra, Qblox, Vision Net, Enviro AI, Rigetti, ORCA Computing, Bluefors, AdvR, Teledyne FLIR, Quantum Coax, Quantum Machines, Montana Instruments, Honeywell Aerospace, and Qunnect, among others — gained direct access to QCORE researchers, technical capabilities, and infrastructure.

This engagement took shape through recurring opportunities for industry and external partners to connect with the broader MSU and QCORE ecosystem, including:

- QCORE Seminar Series and outside speakers
- Technical workshops and exchanges
- Industry networking and researcher connections
- Facility tours and demonstrations
- Partner and federal delegations
- Workforce development and hands-on training
- Exploration of sponsored research and collaborative projects

This engagement grew into meaningful participation — connecting companies with researchers and talent, embedding industry in workforce development, and building pathways toward sustained research collaboration.

DARPA Visit — October 2025

QCORE welcomed DARPA leaders for a two-day visit on quantum and photonic systems integration, including tours of Montana Instruments, AdvR, and Teledyne FLIR and a joint industry workshop. The visit showcased QCORE's ability to connect Montana's tech companies with federal agencies around shared research priorities.

FBI Emerging Technologies Summit — May 2026

QCORE co-hosted a summit with the FBI, bringing together government, industry, and academic leaders to explore quantum technology's implications for national security. The event positioned QCORE as a trusted convener at the intersection of quantum innovation and national security.

QCORE Cold Camp — August 2026

QCORE partnered with Honeywell, Montana Instruments, and Gallatin College to launch Montana's first hands-on cryogenics training program for 10 participants. Scholarships from Quantum Strategix, Boston Cryogenics, and Gallatin College expanded access, linking industry partnership to workforce development.

QCORE Cold Camp: Building Montana's Cryogenic Workforce

\$1,095

Tuition with scholarships available for up to two students.

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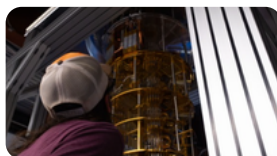
Boston Cryogenics

GALLATIN COLLEGE
MONTANA STATE UNIVERSITY

QUANTUM STRATEGIX

MONTANA INSTRUMENTS
COLD SCIENCE MADE SIMPLE

Honeywell Aerospace

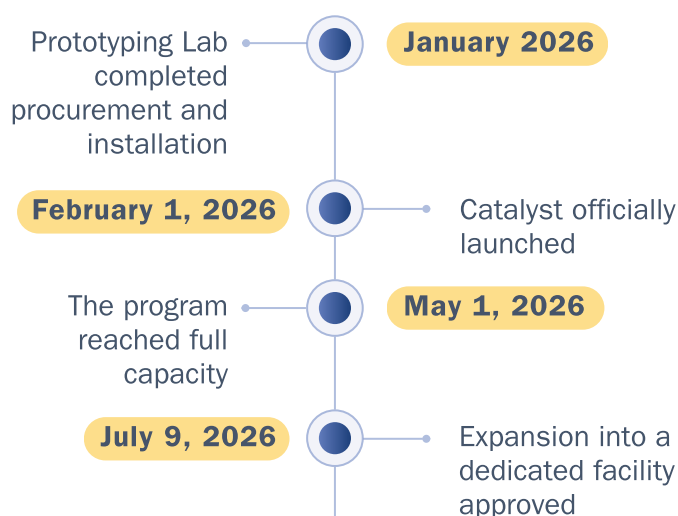


QCORE launched Montana's first Cold Camp, a hands-on training program designed to build foundational skills in cryogenic systems and prepare participants for careers supporting quantum and other advanced technologies. All 10 participants successfully completed the five-day training, gaining practical experience with cryogenic equipment, temperature sensors, sample mounting, system maintenance, and troubleshooting.

The inaugural cohort was made possible through strong industry and education partnerships. Quantum Strategix and Boston Cryogenics sponsored five full scholarships, while Gallatin College provided two additional full scholarships, helping remove financial barriers and expand access to the program. QCORE, Honeywell Aerospace, Montana Instruments, and Gallatin College came together to deliver an industry-connected training experience and strengthen Montana's technical workforce.

Catalyst Incubator From Launch to Growth

Catalyst experienced rapid growth throughout its first year, with demand exceeding expectations only months after launch. What began as an incubation program quickly evolved into a comprehensive platform that combines business development, technical resources, workspace, and access to Montana's growing quantum innovation ecosystem. Reaching capacity within the first operating cycle highlighted both the strength of the model and the increasing need for commercialization support among quantum and advanced-technology startups.



Expanding the Incubator

Catalyst's rapid growth has positioned the program for its next phase of development. The approved expansion into a dedicated facility will provide additional workspace, programming, and technical capacity, enabling Catalyst to support more companies and deliver deeper commercialization services for quantum, quantum-adjacent, and other advanced-technology startups as they progress from early concepts to viable commercial ventures.

Primary Contributors:



Magali Eaton, Director of Innovation and Ventures



Taylor Heinecke, Assistant Director of Business Incubation

Partner & Government Engagement

Throughout the year, QCORE strengthened relationships across industry, government, research, and international communities through a range of visits, technical engagements, facility tours, and collaborative discussions.



These engagements provided opportunities to showcase QCORE's research capabilities, facilities, and emerging quantum technologies while connecting researchers, industry leaders, government representatives, and international partners. Discussions explored opportunities across research and technical collaboration, technology development and commercialization, workforce development, and the broader role of quantum technologies in economic development.

Engagement with federal and government organizations further supported alignment around research priorities, emerging technologies, workforce needs, and potential applications of quantum technologies. QCORE also welcomed international delegations and representatives from across Europe and Asia, expanding connections between Montana's growing quantum ecosystem and the global quantum community.

Together, these interactions helped position QCORE as a point of connection between research, industry, government, and the broader quantum ecosystem—creating opportunities to share expertise, develop relationships, and build pathways for future collaboration.



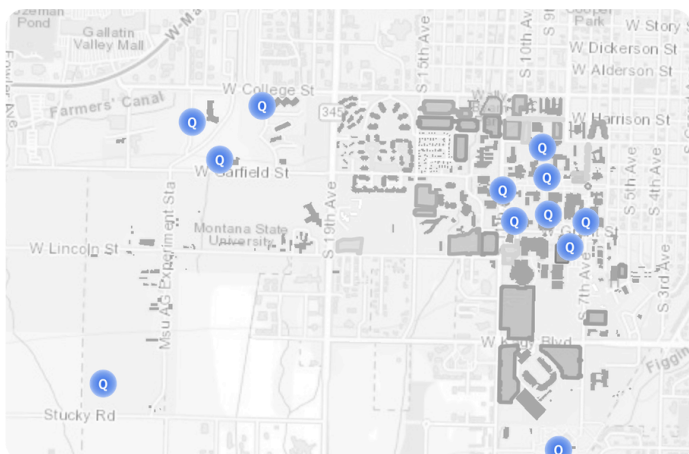
“

“I have been thoroughly impressed with how QCORE came together over the past few years using Air Force funding. I was truly honored and humbled to give the keynote at the ribbon cutting — I'm excited to see QCORE establish itself as a leader in the US academic quantum ecosystem in the coming years.”



Michael Hayduk, Associate Director at the Air Force Research Lab Information & Spectrum Warfare Directorate

QCORE Across Montana State University's Campus



QCORE's quantum testbed extends well beyond EngineWorks, creating a distributed research network across Montana State University. On MSU Innovation Campus, this includes QCORE, Spectrum Lab, and the Applied Research Laboratory (ARL); it extends to MSU Bart Farm and labs in Physics, Chemistry, Engineering, the Montana Microfabrication Facility (MMF), and University Information Technology (UIT). Together, these sites offer complementary capabilities in quantum systems, photonics, materials, and sensing — connecting researchers, students, and industry partners in a shared research ecosystem.

Sampling of Published Papers

[Click Here](#) 

To view and download the papers

Taylor, S.; Chipps, J.

"Optics and Photonics: The Gateway to Quantum Education." Optical Technology Center Annual Conference

OCTOBER 2025

Ayala, D., & Francis, J.

"A parametrized Pontryagin–Thom theorem"
arXiv:2512.10274 [math.AT]

PUBLISHED 2026

Wolfe, O.; Dugre, J.; Kirkland, G.; Mohan, R. K.

"Modal filtering of stimulated photon echoes in rare earth ion doped crystals utilizing orbital angular momentum phase matching."

Journal of Luminescence, 293.

PUBLISHED 2026

Chipps, J. and Iversen, M.

"Quantum to All through Community Outreach Events and Summer Camps."

National Science Teaching Association (NSTA) annual conference.

APRIL 2026

Yager, R.

"Bridging the Gap In Quantum Education from Beginner to Advanced Resources."

National Council on Undergraduate Research (NCUR) annual conference.

APRIL 2026

May, B.

"Epitaxial Nitrides: A Toolbox for Development of New Materials,"

Northwest Regional American Chemical Society.

JUNE 2026

Grumstrup, E.

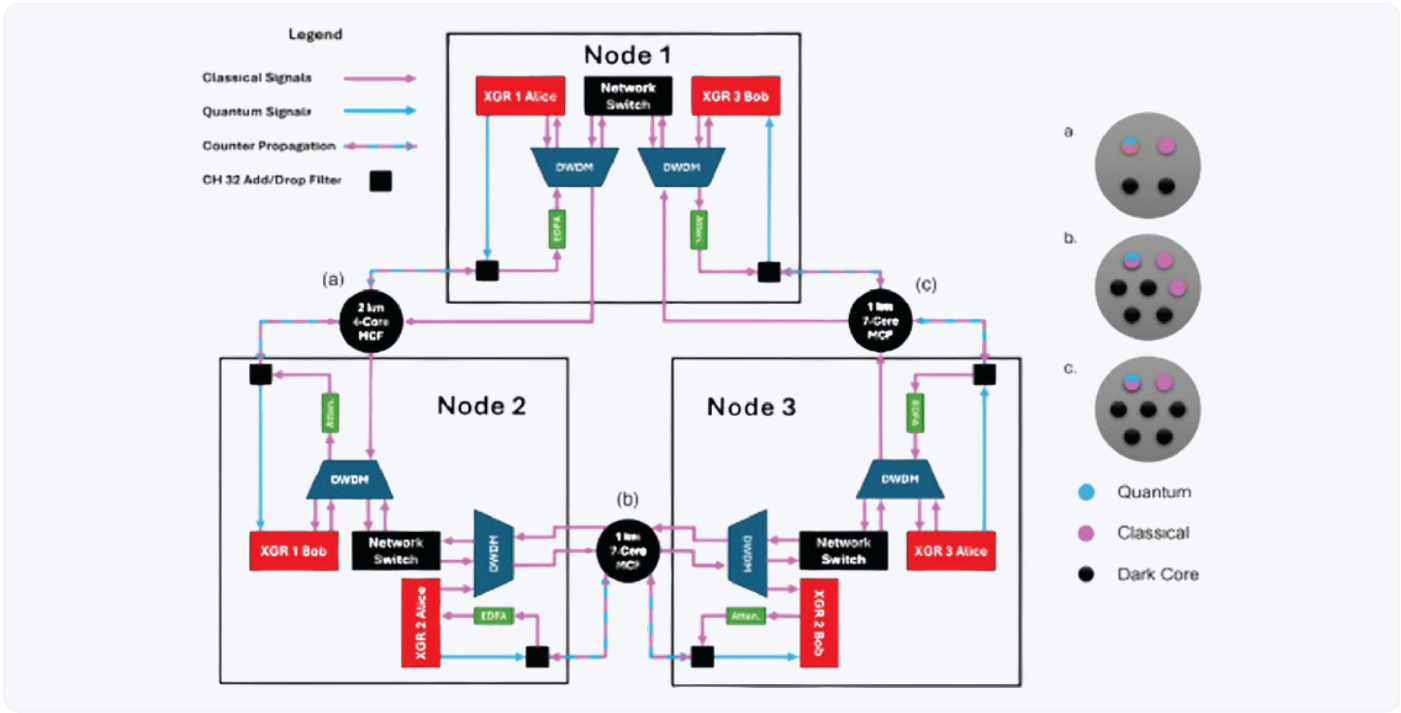
"Single particle spectroscopy of emerging functional nanomaterials,"

Northwest Regional American Chemical Society

JUNE 2026

Research Spotlight

Deployment of a Three-node Wavelength Division Multiplexed Hybrid Quantum-Classical Network Through Multicore Fiber



Description

Classical communication networks enable global connectivity, while quantum technologies such as quantum key distribution (QKD) are being advanced to add new layers of security. In January 2025, Spectrum Lab researchers demonstrated a three-node wavelength division multiplexed hybrid quantum-classical network through multicore fiber, allowing quantum and classical signals to share the same physical infrastructure.

The network achieved 1.16 Tbps of total transmission and a secret key rate of approximately 7.4 kbps across several kilometers of multicore fiber. The demonstration is unique in that quantum and classical channels share the same wavelength band, while the network configuration remains independent of the classical communications modulation format.

Primary Contributors:

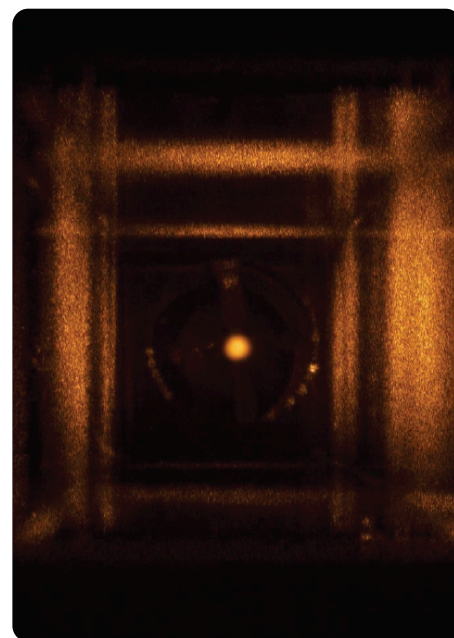
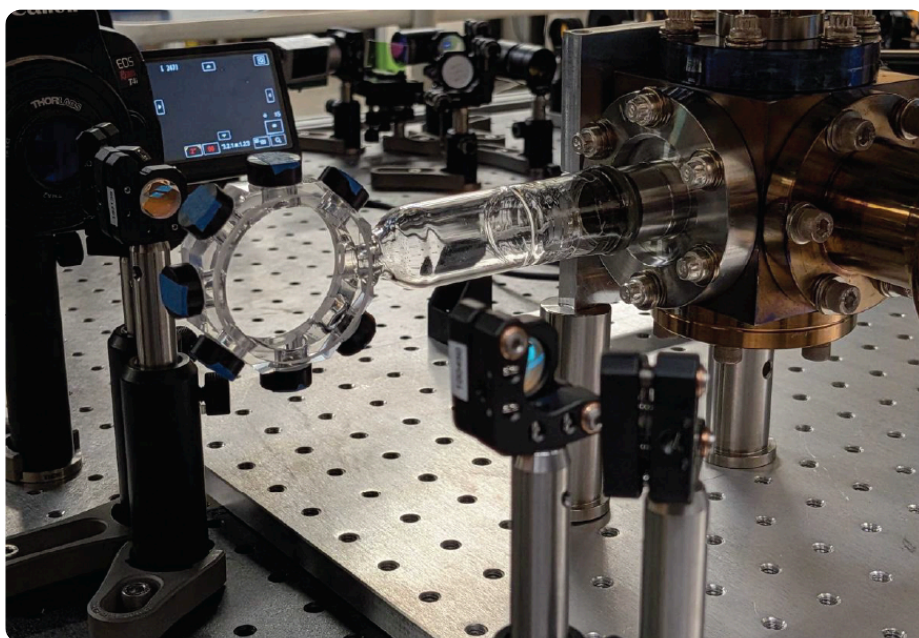
-  **Joshua Dugre,**
Researcher, Spectrum Lab
-  **Samuel Fritsch,**
Research Associate, Spectrum Lab
-  **Krishna Rupavatharam,**
Director, Spectrum Lab

[Click Here](#) 

To view and download the paper

Research Spotlight

Quantum Sensing with Neutral Atom Traps in Cavities



Description

This project comprises two experiments using rubidium atoms trapped inside optical cavities, where mirrors strengthen atom-light interactions. The first supports quantum networking, using high-numerical-aperture cavities to enable information exchange between individual atoms and photons. The second is a trapped-atom interferometer designed to measure gravity by splitting and recombining an atom's wavefunction along two paths.

Both apparatuses are under construction. Their vacuum chambers have been baked to ultra-high vacuum, and laser systems have successfully cooled and trapped rubidium atoms. The next step is to build optical cavities around the chambers, advancing the quantum networking and quantum sensing goals of each project.

Primary Contributors:



Matt Jaffe: Principal Investigator, Assistant Professor of Physics

Graduate Student Researchers: **Josh Oliver, Daniel Podos**

Undergraduate Researchers: **Zade Little, Bridger McGimpsey**

[Click Here](#) 

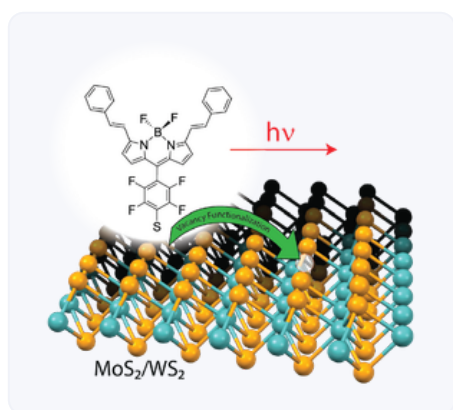
To go to Jaffe Lab's page

Research Spotlight

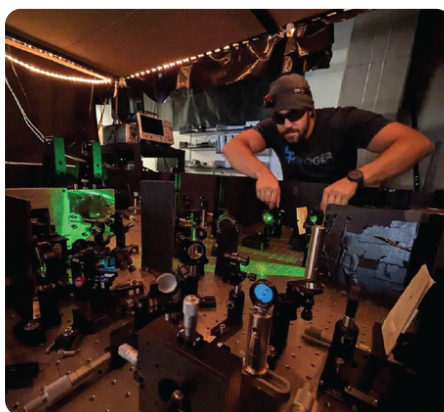
Quantum Emitters

Description

Researchers in the Grumstrup and Lemon labs are developing nanoscale “quantum emitters” for quantum communications and photonic computing. To create bright, reliable sources of indistinguishable single photons, the teams are functionalizing atomically thin semiconductors with molecules that act as light emitters. This hybrid platform combines semiconductor physics with the tunability of synthetic chemistry, offering a path toward color-tunable quantum emitters tailored at the single-atom level to specific computing or networking platforms.



Hybrid molecule-2D semiconductor architecture. The molecules are tethered to the surface and act as single-photon (quantum) emitters for applications in photonics and quantum networking.



Tagert Mueller, PhD student in the Grumstrup group, aligns a laser microscope for characterization of quantum emitters.



Logan Mikesell, PhD student in the Lemon lab, displays a solution of molecular emitters, designed to couple chemically and energetically to the 2D semiconductor MoS₂.

Primary Contributors:



Professor Christopher Lemon, Department of Chemistry and Biochemistry



Professor Erik Grumstrup, Department of Chemistry and Biochemistry, Materials Science and Engineering Program

Logan Mikesell, Graduate Student in the Lemon Lab

Tagert Mueller, Graduate Student in the Grumstrup Lab

[Click Here](#)

To view the lab webpage

[Click Here](#)

To view the project page

Research Spotlight

Enhanced Quantum Measurement of the Position of Levitated Objects with Light

Description

Researchers are exploring how quantum physics extends to larger, visible objects using levitated lenses and mirrors controlled with light. In an initial experiment, a levitated glass lens improved motion-detection sensitivity by nearly five times. Building on this result, the team is constructing a Levitated Mirror Interferometer to investigate quantum noise, light-mirror correlations, and quantum measurement in a milligram-scale object.

Primary Contributors:



Professor Brian D'Urso,
Department of Physics

Sophia Balderrama, Graduate student in the D'Urso lab

Michael Testagrossa,
Graduate student in the D'Urso lab

Student Highlights

Student employees

Murray Stebbins, BS, Mechanical Engineering

Lucy Tourville, BS, Biomedical/medical Engineering

Tyler Stumpf, BS, Mechanical Engineering

Rebekah Yager, MS, Computer science

Emily Moss, BS, Computer Science



Student Spotlight

Undergraduate Researcher → Graduate Research Assistant

“Working at QCORE has given me the opportunity to gain practical experience in quantum computing research and become more confident working independently. I've learned how to communicate my work to people with different technical backgrounds, and it has changed how I think about quantum computing—helping me focus on where quantum methods can provide meaningful advantages.”

Rebekah started with QCORE as an intern with the Education and Workforce Development team, helping to translate quantum concepts into everyday language. Today, her research focuses on hybrid quantum-classical neural networks using ORCA Computing's photonic quantum systems, while also exploring post-quantum cryptographic security. In recognition of these contributions, Rey received the Founders Day Student Award and continues at QCORE as a Graduate Research Assistant.

Education & Workforce Development

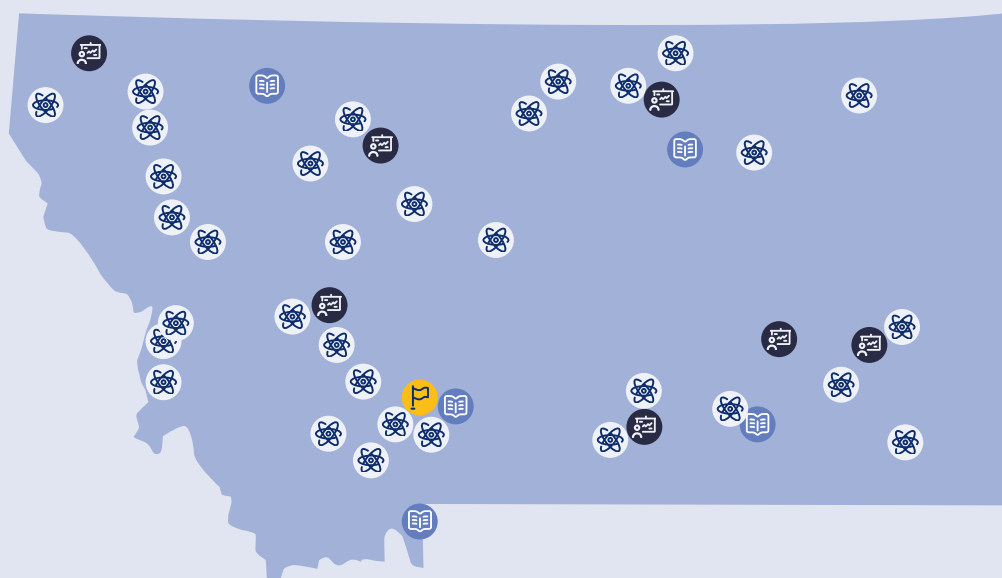
Our K-12 group has had an exciting year, with activities around the state and nation as we support everyone from elementary students to future science teachers to MSU graduate students who are practicing science communications alongside STEM skills. Quantum can be a little bit harder to explain than, say, dinosaurs or comets, but we find that Montanans overall are fascinated – and proud– to learn about the quantum research happening literally in our backyard. In particular, we find that students, teachers, and counselors are energized by the wide range of careers that will be in, and enabled by, quantum. Watch for our team at career fairs, workshops, and events around Montana!



Suzi Taylor

Lead, K-12 Education and Workforce Development

QCORE Across Montana



-  Career Fair
-  Quantum Kit
-  QCORE tour
-  Teacher PD

➔ **Aaniiih Nakoda Workforce EXPO**
communities: Harlem, Turner, Havre, Hays/Lodgepole, Dodson, Chinook, Box Elder, Rocky Boy

➔ **Blackfeet Workforce EXPO:** Browning Middle School and High School, Heart Butte High School, De La Salle

➔ **Belgrade** (Career Fair, CTE Night, Science Bowl tour)

➔ **Choteau** (Quantum Kids)

➔ **Hardin (STEM Night) - 200+ attendees, 30 student volunteers, marketed to:** Crow Agency, Hardin Intermediate, Hardin KRC, Hardin Middle, Hardin Primary, Huntley, Lodge Grass, Pretty Eagle, Shepherd, St. Labre, and Wyola.

➔ **Billings** (Trades for Teens)

➔ **West Yellowstone** (Career Fair)

➔ **Geyser, Harlem, Miles City, Turner** (QCaMP teacher participants)

Key Statistics

Career fairs attended:



GC-360

900 Students

31 Teachers

07 Schools

Chief Joseph, Sacajawea, Belgrade Middle and High School, Bozeman High, Mount Ellis Academy (HS), Billings Career Center (HS), Home Schoolers

**Gallatin College
Belgrade CTE Night,
Belgrade Career Fair**

~935 Students



Billings Trades for Teens

**Aaniiih Nakoda
Workforce EXPO**

522 Students

20 Teachers

08 Schools



**Blackfeet
Workforce EXPO**

699 Students

20 Teachers

04 Schools

Educational resources:



44

World Quantum Day Kit applications



28

Intro to Quantum kits distributed via Montana After School Alliance



~400

"I Am Quantum" poster sets distributed

[Click Here](#)

Learn about our work

Programs:



QuantumKids

second session ran in 2025–2026; applying for NSF funding to scale nationally; Choteau Quantum Kids group visited QCORE May 13, 2026.



World Quantum Day Kits

Intro to Quantum kits for grades 4–8; 44 applications (42 MT, 1 AZ, 1 CO) as of June 15, 2026 close date; plan to ship up to 5 nationally.



QCAMP

Second year hosted with Sandia National Labs, June 22–26, 2026; 5 teachers from Geyser, Harlem, Miles City, and Turner, MT.



Pre-service Teacher Badge

9 total students completed to date; expert review and national offering planned for fall; next cohort will run in Spring 2027.

Seminar Series

16 Seminars**21** Speakers.

Open House

200+ Attendees

List of Seminar Series

JULY 17, 2025	SEPTEMBER 17TH, 2025
Brelon May, "Epitaxial Nitrides: Bringing Squares and Triangles Together"	Nathan Gemelke, Industry Seminar: Nathan Gemelke
OCTOBER 23, 2025	OCTOBER 29, 2025
David Ayala, "Topological Quantum Computing"	Martin Mosquera, "Electric Structure of Rydberg Atoms"
Matt Jaffe, "Atoms in Cavities for Quantum Information and Precision Sensing"	Anja Kunze, "Magnetic Nanoparticles as Nano-Quantum Sensors in Neurobiology"
OCTOBER 31ST, 2025	NOVEMBER 11, 2025
Gordon "Corky" Brittan, "Metaphysics and Method"	Brian D'Urso, "Quantum Limits of Position Detection in Levitated Optomechanics"
	Andrew Lingley, "Microfabrication: The Invisible Industry"
NOVEMBER 19, 2025	DECEMBER 8TH, 2025
Parvider Kaur Gill, "3D-Printed Optics and Photonic Wire Bonds for Scalable Quantum Integration"	Pierce (John) Fix, "Bandgap Engineering of 2D Semiconductors for Quantum and Optoelectronic Technologies"
Trent Jackson, "Fun With FSO's - Practical Considerations for Airborne Free Space Optical Link Design"	
FEBRUARY 25TH, 2026	MARCH 4TH, 2026
Sam Gunningham, "An Introduction to Quantum Topology"	Magali Eaton, "Quantum Innovation: Translating Research Into Impact"
MARCH 11TH, 2026	APRIL 1ST, 2026
Erik Grumstrup, "Single Particle Spectroscopy of Emerging Functional Nanomaterials"	Mark Craig, "'Classical' Computing - How Silicon Scaling Reached 2nm"
APRIL 8TH, 2026	APRIL 15TH 2026
Josh Aller, "Quantum Enabling Waveguide-Based Components in Bozeman, MT"	Josh Doherty, "Low-Noise Cryogenic Systems for Quantum"
APRIL 22ND, 2026	APRIL 29TH, 2026
Suzi Taylor and Craig Ogilvie, "Shaping the Future of Quantum Education"	Prasanta Bandyopadhyay, "A Third Variety of Emergence in Life and Consciousness: Beyond the Weak-Strong Dichotomy"

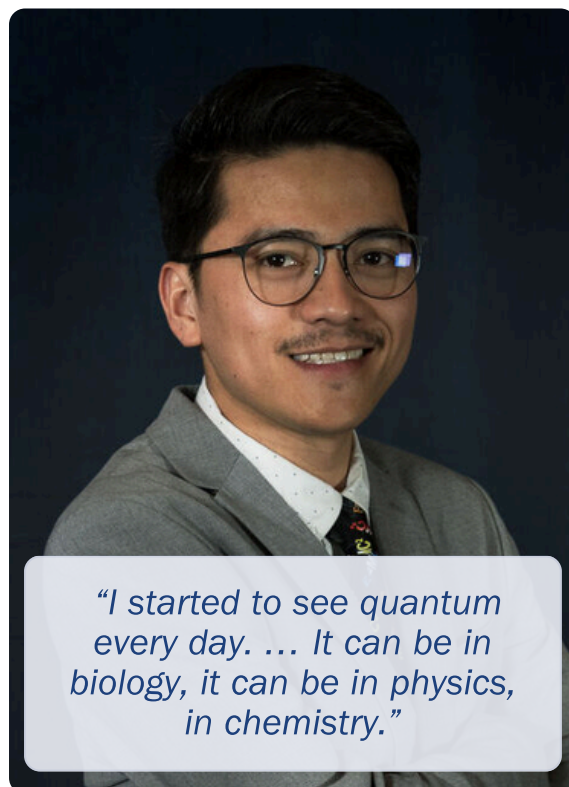
Teacher Story

When Vryann Sison, a science teacher at Hardin High School, first received a World Quantum Day activity kit from QCORE, quantum science was unfamiliar territory.

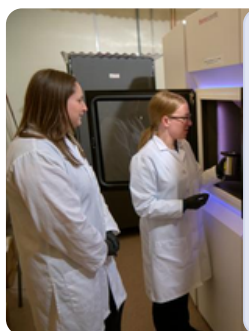
“My background is in biology, so I didn’t have any idea what those quantum things are,” he joked.

Since then, Vryann has immersed himself in quantum education. He attended QCORE’s 2025 Quantum Summer Academy, presented his experience teaching quantum at the STEM Summer Institute, completed a 3-credit graduate course in Quantum Mechanics for teachers, and served on a workforce development panel during QCORE’s Launch Week.

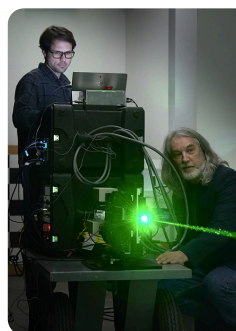
Vryann returned to STEM Summer Institute in 2026 to help fellow educators “confidently facilitate quantum learning experiences that spark curiosity, deepen understanding, and make advanced concepts approachable for all learners.”



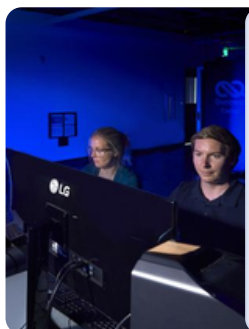
Higher Education



Cryo bootcamp co-sponsored by Gallatin College, Honeywell Aerospace and Montana Instruments



Qbits student organization launched, approximately a dozen active student members



Quantum information course with 20 students enrolled



Quantum hardware course approved for Spring 2027

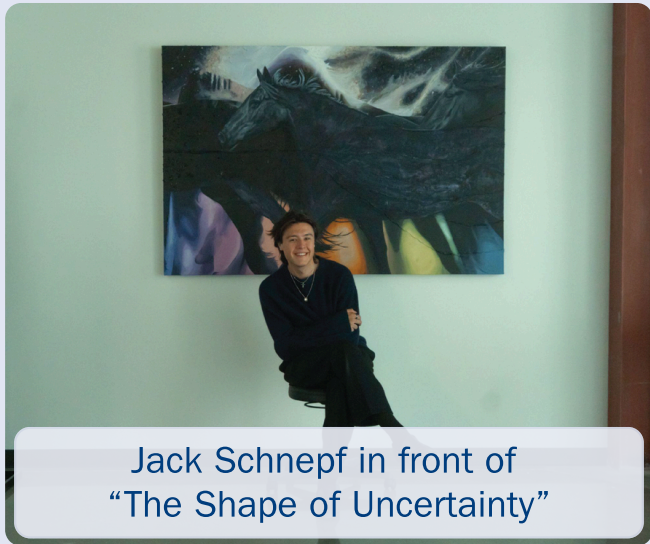
Artist Residency

03 Gallery Shows

01 Speakers.

500+ people contributed to the work.

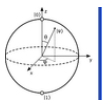
This past year, QCORE established and hosted its first Artist-in-Residence. Through conversations and interactions with physicists, student Artist-in-Residence Jack Schnepf created paintings that translated quantum mechanics through his own perspective, broadening public understanding and engagement. "The Shape of Uncertainty" and "Into the Storm" gave visitors a way to grasp these abstract concepts, and even visualize them, through paintings grounded in a sense of Montana. Bringing an interdisciplinary perspective into a traditionally scientific space has helped expand the reach of QCORE's research to audiences that technical communication alone can't.



Statement from Jack Schnepf

"Being able to work with the team at QCORE as a student has helped inspire me both within and outside of my artistic practice. From the patience and intelligence of the researchers helping me understand quantum mechanics, to the mindset of the leadership team expanding my worldview on the power and impact my art can have, to every visitor who came by QCORE, interacting and engaging with the work I made, my time here has really shaped where my career will go moving forward."

QCORE Press & Coverage



Quantum Computing Report
by GQI



"Quantum research is at the forefront of today's technological advancements and supports hundreds of Montana jobs... This quantum research facility at MSU will help our students learn critical skills for the workforce and helps contribute to America's position as a global leader in technology."



U.S. Sen. Steve Daines



"We congratulate MSU on this exciting milestone and look forward to supporting Montana's vibrant quantum computing ecosystem... Rigetti is proud to support QCORE, and we look forward to growing Montana's quantum capabilities together."

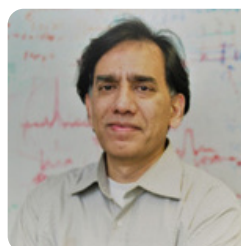


Dr. Subodh Kulkarni, CEO,
Rigetti Computing

LEADERSHIP TEAM

**Jayne Morrow**

Chief Executive Officer

**Krishna Rupavatharam**Chief Technology Officer,
Director, Spectrum Lab**Benjamin Losby**

Chief Operating Officer

NEW TEAM MEMBER

**Kala Radovich**Director, Strategic
Partnerships**Lee Spangler**Associate Vice President of
Research and Economic
Development**Michael Veselik**Assistant vice president
for research

NEW TEAM MEMBER

**Suzi Taylor**K-12 Education and
Workforce Development Lead**Tom Rust**Senior Researcher,
Cryogenics Laboratory**Kayleen Meixner**Program Management and
Fiscal Management

NEW TEAM MEMBER

**Craig Ogilvie**Graduate Education
Coordinator**Brelon May**Senior Researcher,
Materials Science

NEW TEAM MEMBER

**Jack Schnepf**

Executive Administrator

[Click Here](#)To meet more members
of our faculty and staff

As QCORE looks forward to stand up as a center, we look to a future in which industry, academia, and government come together with a common purpose to realize the power of quantum systems while supporting our communities of impact.

Join US

[Click Here](#)

Contact Information



qcore@montana.edu



406-994-1508