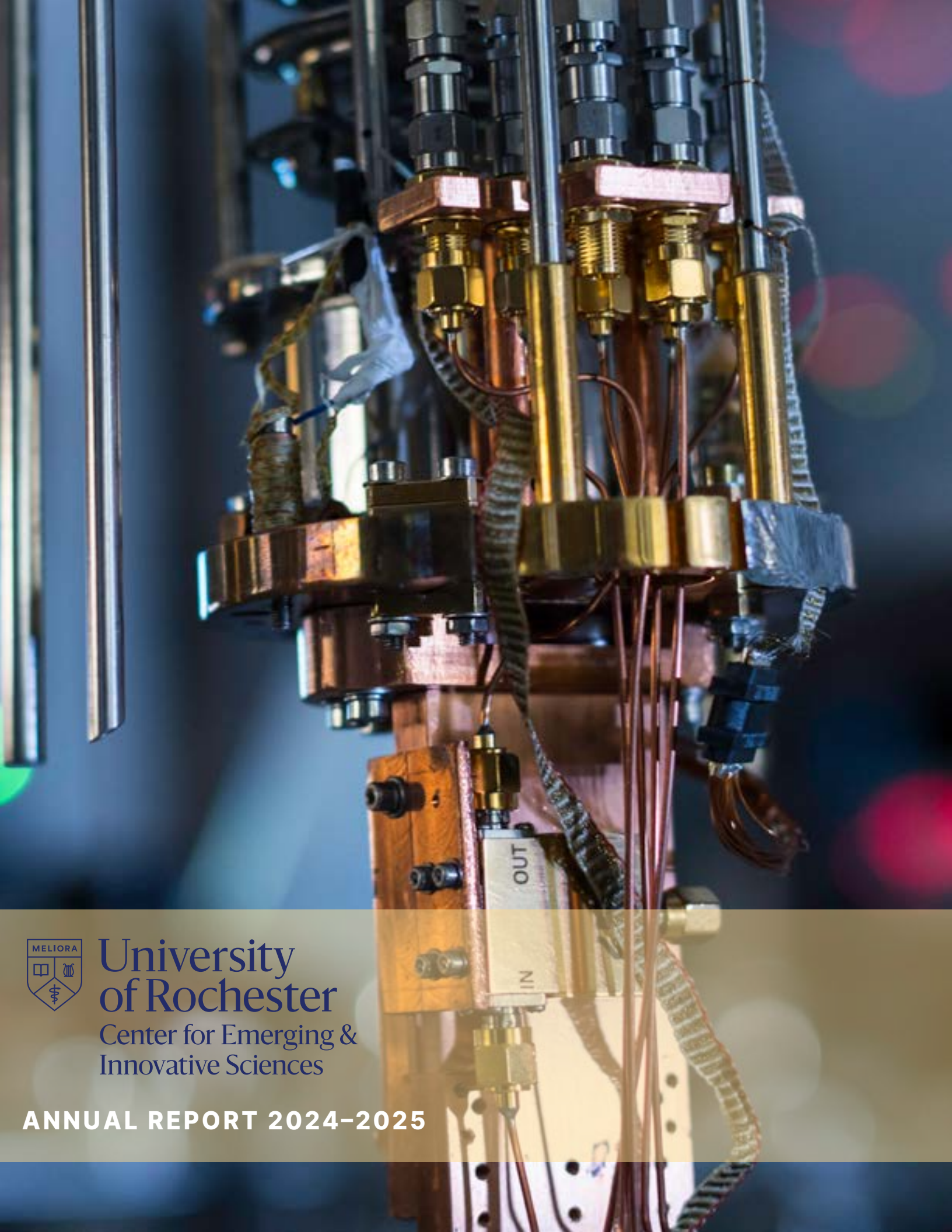


University of Rochester
Center for Emerging & Innovative Sciences

ANNUAL REPORT 2024–2025

CONTENTS

DIRECTOR'S MESSAGE

As I reflect on the past year, I am struck by the momentum building across the Rochester region—and by the growing recognition that our community is not only innovating within established technology sectors, but also helping define what the next decade of innovation in New York State can look like. At CEIS, our mission remains clear: to advance New York's economy by connecting world-leading university research with industry, accelerating new products and companies, and nurturing the ecosystems that create sustained, inclusive growth.

This year marked a major milestone for our Center and for the region. In July 2025, NYSTAR renewed the CEIS Center for Advanced Technology contract for a new 10-year period. This long-term commitment affirms the value of our model - one grounded in trust, collaboration, and measurable outcomes - and it strengthens our ability to invest strategically in emerging opportunities while continuing to serve the enduring needs of Upstate New York's innovation economy.

One of the most exciting demonstrations of CEIS's expanding vision was our co-sponsorship of the inaugural Soundtrax Film Music and Sound Festival held at the UR's Eastman School of Music on October 16–18, 2025. The festival brought together creative artists from music, cinema, games, and other media with creative technologists working in immersive media, AI in music, and next-generation audio and storytelling tools. Soundtrax showcased Rochester as a place where artistry and advanced technology are not separate paths but a shared future.

The festival was a strong and inspiring start, one that reinforced our belief that the creative industries are poised to become a larger and more strategic driver of New York's economy.

At the same time, CEIS continues to deepen its leadership in intelligent imaging, a field where Rochester's legacy and future intersect. Largely through the efforts of CEIS Deputy Director Paul Ballentine and CEIS Strategic Consultant J. Daniel Newman, we are exploring the need and opportunity for a statewide, and ultimately broader, effort to coordinate and accelerate intelligent imaging innovation. This initiative represents a powerful chance to align the University of Rochester's strengths in optics, imaging, computation, and AI with the UR Center of Excellence in Data Science and AI; to engage local academic partners such as RIT's Center for Imaging Sciences; and to collaborate with New York State industry leaders including L3Harris and GE Health. Our goal is to clarify how CEIS and the CoE can best serve this rapidly evolving field, supporting innovation that impacts healthcare, defense, advanced manufacturing, agriculture, environmental stewardship and numerous other fields.

Our commitment to partnership-building remains at the heart of everything we do. We continue to expand research collaborations with long-standing company partners while actively developing new university-industry connections with the many new faculty and new startups across the region. Programs such as our annual University Science & Technology Showcase and other meet-and-greet engagements throughout the year remain essential catalysts for discovery, trust, and shared ambition. These moments of connection are where ideas become realities through collaboration, and where collaborations become economic engines.

Looking forward, CEIS is also planning to leverage University investments in two important new initiatives: the newly funded Center for Extended Reality (CXR), dedicated to research in augmented and virtual reality, including both the enabling technologies and their human, societal, and application-focused dimensions, and the emerging SoundSpace Institute, focused on the intersection of sound, music, and media across entertainment and art (cinema, television, video), games and interactive media, learning and education, and the built environment.

These investments represent an intentional strategy to engage multiple levels of the value chain as economic drivers for New York State. Manufacturing has long been a cornerstone of CEIS's mission and the broader NYSTAR network and it will remain so. But we are also increasingly focused on the creative technology economy: the industries where innovation meets the essentially human activity of imagination and expression. We believe that demonstrating leadership at this intersection will help New York capture a growing share of the global economy, one defined not only by what we manufacture, but also by how we experience, communicate, and create meaning through technology.

I want to express my deepest gratitude to our partners and supporters. Our work would not be possible without the continued commitment of NYSTAR and the State of New York. I am grateful for our dedicated faculty collaborators at the University of Rochester and Rochester Institute of Technology, and for the businesses and entrepreneurs across the region who continually challenge us to help them move faster, think bigger, and innovate more boldly. And I want to recognize the CEIS team—whose professionalism, persistence, and belief in this mission make our impact possible every day.

The year ahead is rich with opportunity. With a renewed 10-year horizon, growing momentum in intelligent imaging, and the successful launch of Soundtrax, alongside new investments in extended reality and SoundSpace, CEIS is positioned to help Rochester and New York State lead in both the technologies we are known for and the emerging creative-innovation domains that will define the next economy.

Thank you for being part of this journey. We look forward to building the next chapter - together.

FINGER LAKES SCIENCE AND TECHNOLOGY SHOWCASE

Winners of the Judith Pipher Outstanding Student Poster Presentation. Martin Sanchez, Paul Ballentine (CEIS), Yamin Zheng (first place), and Quazi Rushnan Islam

The Finger Lakes Science & Technology Showcase took place on April 24, 2025, at the Memorial Art Gallery, serving as a dynamic platform for collaboration and innovation. Researchers from the University of Rochester, Rochester Institute of Technology, and other regional universities presented their work to industry professionals, fellow researchers, and organizations focused on economic development. This year, high school students from Harley also contributed by showcasing their research, fostering a diverse and inclusive environment for idea exchange. The event aimed to inspire discussions that could lead to impactful industry-university partnerships.

The day began with the student-organized Western New York AR/VR Mini Symposium, featuring insightful presentations by Karl M. Guttag, President of KGOn Tech; Mark F. Bocko, Distinguished Professor of Electrical and Computer Engineering at the University of Rochester; and Raffaella Borasi, Director of the Center for Learning in the Digital Age at the University of Rochester. These talks highlighted advancements in AR/VR technology and its applications, setting the stage for meaningful dialogue.

A key feature of the event was the panel discussion on AI and its implications, which brought together leading experts from academia and industry. Panelists included Bernard Brower of L3Harris; Venu Govindaraju, Distinguished Professor and Vice President for Research and Economic Development at SUNY Buffalo; Christopher Kanan, Associate Professor of Computer Science at the University of Rochester and leader of the Hajim School of Engineering and Applied Sciences AI Initiative; and Brendan Mort, Director of the Center for Integrated Research Computing at the University of Rochester. The discussion explored the transformative potential of AI and its role in shaping the future.

Following a networking lunch, representatives from academia and industry had the opportunity to pitch their organizations and research, fostering connections and collaboration. The event concluded with a poster session featuring 30 presentations from the University of Rochester, Rochester Institute of Technology, and Harley School. Attendees engaged with presenters and voted for their favorite posters in the Judith Pipher Outstanding Student Poster Presentation competition. Congratulations to Yamin Zheng, Martin Sanchez, and Quazi Rushnan Islam for their award-winning posters!

The Finger Lakes Science & Technology Showcase exemplified the spirit of innovation and collaboration, bringing together diverse perspectives to drive progress and strengthen connections between academia, industry, and the community.

At right, attendees enjoying lunch before the afternoon sessions.

Clockwise, Sherry Yi-Ting Feng presenting her poster entry, Calibration for Single-Molecule Localization Microscopy, to Rick Plympton of Optimax.

Mark Bocko presenting at the Western New York AR/VR Mini-Symposium.

Wayne Knox participating in the Q&A portion of the program.

Poster Session in the MAG Ballroom.

Bob Naum, Chair of CEIS Advisory Board, in discussion with a poster session attendee.

** All Showcase Photos by Ria Tafani*

THE SOUNDTRAX FILM MUSIC AND SOUND FESTIVAL: *BUILDING ON ROCHESTER'S LEGACY IN IMAGING AND MEDIA INNOVATION*

Rochester, New York, renowned as the imaging capital of the world and the birthplace of modern photography and film, successfully hosted the inaugural Soundtrax Film Music and Sound Festival on October 16–18, 2025. This landmark event celebrated the art, craft, and technology of music and sound in visual media, shining a spotlight on Rochester's historical, cultural, and commercial ties to film, television, gaming, and the music industries while demonstrating the region's growing influence at the intersection of creative excellence and advanced technology.

The festival's story begins in 1921, when a generous donation from George Eastman, founder of Kodak and a visionary philanthropist, enabled the establishment of the University of Rochester's Eastman School of Music. In addition to enriching the quality of life of Rochester through the arts, a key goal was to support the growing silent film industry, which relied on skilled organists to accompany motion pictures. More than a century later, Soundtrax honored this legacy by exploring the transformative role of music and sound in visual storytelling, from historical foundations to today's most forward-looking innovations.

Soundtrax delivered three remarkable days of performances, conversations, and immersive demonstrations that brought together composers, performers, technologists, scholars, and enthusiasts. The main concert performances were splendid and exceptionally well attended, including Terrence Blanchard with the Gateways Festival Orchestra; a stunning performance of *The Red Violin* score with violin soloist YooJin Jang, Eastman School faculty member, and the Eastman Philharmonia with guest conductor Jeff Beal; and the Rochester Philharmonic's sold-out performance of *Harry Potter and the Deathly Hallows, Part 2*. Daytime concerts featuring the music of John Williams and Interstellar with original score organist Roger Sayer were also major highlights for audiences.

Equally energizing was the festival's daytime programming, which showcased the dynamic fusion of art and technology that defines contemporary media. Sessions on immersive media featured compelling presentations and demonstrations from Apple, The Spatialists, and Anderson Music, New York. Conversations on AI in music included an inspiring presentation and demonstration from Yamaha on using AI to make music more accessible for musicians with physical limitations, alongside forward-looking discussions about the future of generative AI and the emergence of collaborative music creation systems that can help composers and musicians quickly and effectively explore and refine their own creative ideas. Sessions on sound for games and the many "meet the composer" events were also well attended, reinforcing Soundtrax's role as a nexus for cross-sector creative exchange.

One of the most memorable moments of the festival was the "Mystique of Stradivarius" session, featuring New York City based violin restoration specialist and dealer Bruno Price discussing the unique properties and history of Stradivarius instruments, paired with YooJin Jang's extraordinary demonstrations of four remarkable (and valuable!) Stradivarius violins brought together for this event. This sense of wonder and discovery was complemented by compelling live immersive multimedia experiences from Apple and Anderson Audio, underscoring the festival's distinctive blend of heritage, performance, and innovation.

A central goal of Soundtrax is to attract major creative and technology leaders to Rochester, while strengthening connections among the region's growing cluster of audio technology and media production companies and our world-class institutions. The success of this inaugural festival affirmed that Rochester is uniquely positioned to lead in music and sound for screen media and interactive experiences and that the creative technology economy represents an increasingly important complement to the advanced manufacturing and imaging strengths that have long defined the region.

I want to extend my heartfelt thanks to everyone who helped to make this vision a reality. I am especially grateful to my creative partner in this venture, Mark Watters, faculty member and Director of the Beal Institute at the Eastman School of Music; to Tracy Armstrong, our event coordinator; to Margaret and Cathy in CEIS for doing a hundred jobs, and to Dresden PR for the outstanding website and promotional work. I also wish to recognize the many people at Eastman, especially Kate Sheeran, Dean of the Eastman School of Music; who embraced this concept early on and committed a huge amount of time and financial resources to this, Kate Schimmer, Associate Dean for Artistic Planning at Eastman; and the dedicated teams in the Concert Office, Communications, Facilities, and Technology at Eastman whose expertise and commitment enabled a truly exceptional event. I am deeply appreciative of President Sarah Mangelsdorf for her early and enthusiastic support, including critical financial assistance when Soundtrax was still just an idea, and of the New York State Division of Tourism through its Market New York grant program for helping to bring this exciting new festival to life.

The inaugural Soundtrax Festival was both a celebration of Rochester's past achievements and a confident investment in the future of contemporary media. The energy, attendance, and artistic and technical excellence of this first year left everyone eager for what comes next, and we look forward to building on this momentum as we shape the next chapter of innovation in music and sound for visual storytelling.

PHOTOS FROM SOUNDTRAX

At left: MUSIC FOR VIDEO GAMES session presented by Andrew Borman, Strong Museum of Play (moderator) and industry panelists Guy Whitmore, Seth Wright, Garry Schyman

Middle: Soundtrax, Rochester's Film Music and Sound Festival, gets air time on Adam Chodak's podcast, Adam Interviews | Soundtrax Co-Director, Mark Watters, fielding audience questions during one of the sessions

Lower left: Co-Directors, Mark Bocko and Mark Watters, welcome audience and participants to Soundtrax

ECONOMIC IMPACT 2024–2025

For the fiscal year July 1, 2024 to June 30, 2025, the total documented dollar value of the economic impact of CEIS supported research and outreach was over $37 million. This self reported data (new and retained jobs, increased sales, cost savings, capital investments and additional funds acquired) from 17 of our partners provides a snapshot of the region's economic successes.

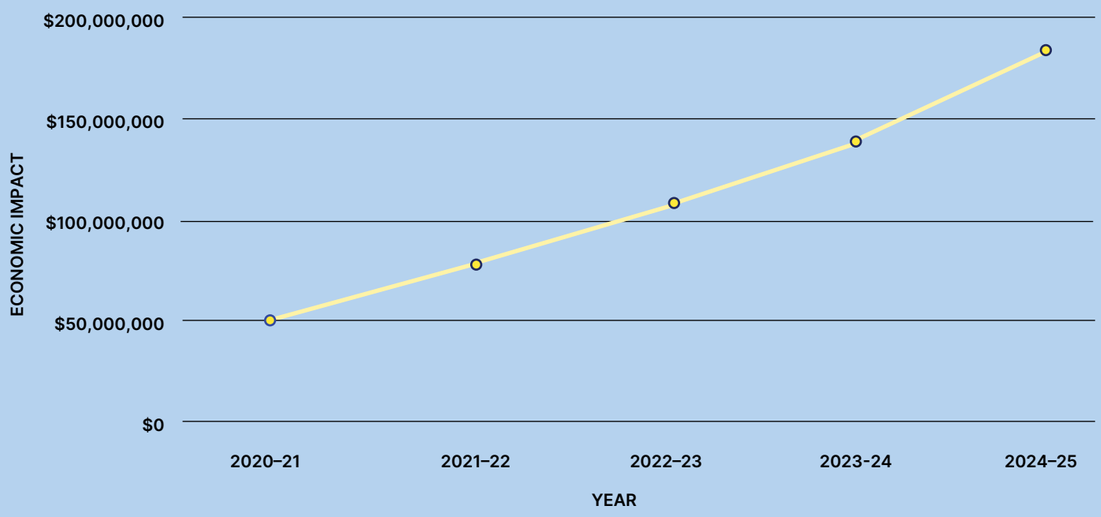
The five-year cumulative economic impact effect of CEIS investments in NYS entities is over $176 million.

A shout out to the AIM Photonics initiative which led the way with nearly $29 million in monetary impacts. And hats off to two UR spin-offs; Clerio Vision with over $2.2 million in non-job impacts and Phlotonics with 5 new jobs and over $2.5 million in non-job impacts reported.

FIVE-YEAR SUMMARY OF ECONOMIC IMPACT

Year	2020–21	2021–22	2022–23	2023–24	2024-25	Total
Increased Revenues	$4,051,507	$3,972,963	$2,317,144	$708,530	$1,094,546	$12,144,690
Cost Savings	$5,143,669	$2,931,593	$2,194,750	$1,834,600	$1,901,800	$14,006,412
Funds Acquired	$37,205,718	$22,700,043	$22,194,899	$23,360,577	$33,992,245	$139,453,482
Capital Improvements	$720,000	$80,000	$925,000	$100,000	$107,500	$1,932,500
Job Value	$2,308,974	$1,234,327	$2,528,410	$1,393,489	$1,182,158	$8,647,358
New Jobs	17	11	31	16	10	85
Retained Jobs	18	9	10	6	8	51
Total Impact	$49,429,868	$30,918,926	$30,160,203	$27,397,196	$38,278,249	$176,184,442
Total Cumulative Impact	**$49,429,868**	**$80,348,794**	**$110,508,997**	**$137,906,193**	**$176,184,442**	**$176,184,442**

TOTAL CUMULATIVE ECONOMIC IMPACT



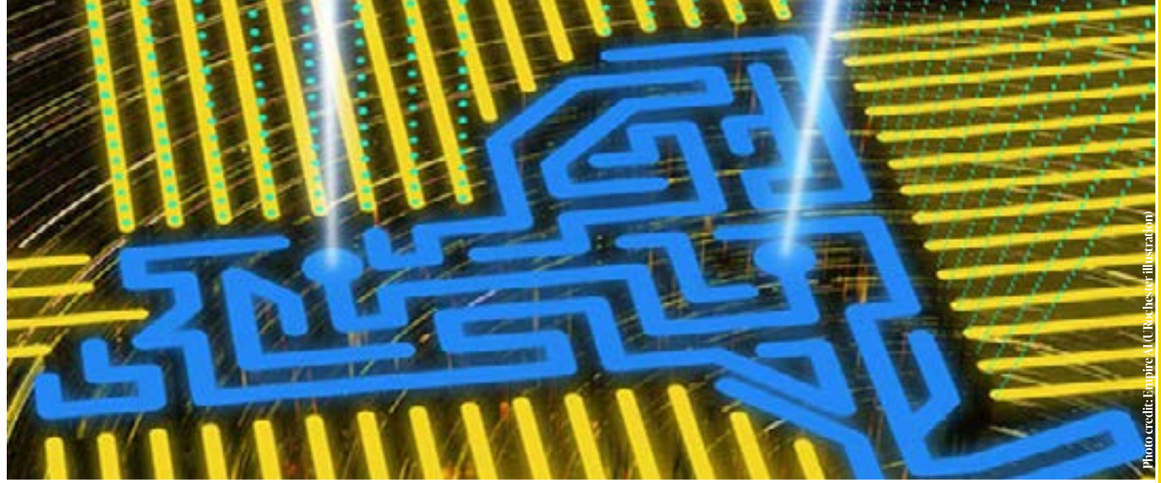
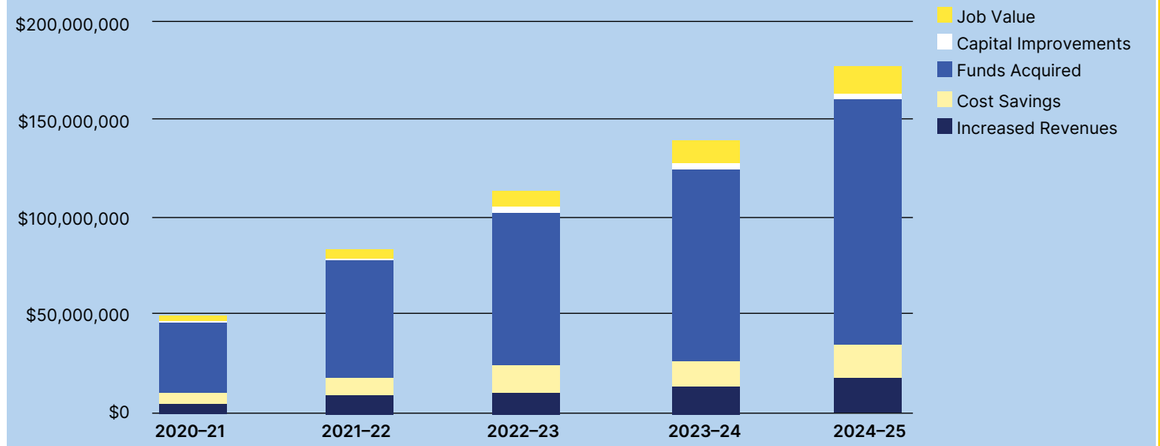


Photo credit: Empire AI (Use is for illustration)

FIVE-YEAR ECONOMIC IMPACT



CAT PROGRAM FINANCIAL INFORMATION

July 1, 2024 – June 30, 2025

FUNDING FROM NYSTAR	
Personnel Related Research and Center Management	**$538,014**
Non-Personnel Related Research and Center Management	**$300,270**
Total NYSTAR Contribution	**$838,284**
OTHER SOURCES OF FUNDS—Cash from Companies	
Personnel Related	**$120,177**
Non-Personnel Related	**$280,441**
Total Other Sources	**$400,618**

COMPANIES REPORTING ECONOMIC IMPACT IN 2023–24 FROM CEIS INTERACTIONS

AIM Photonics NNMI
Aktiwave, LLC
AlchLight, LLC
ALLVAR
Clerio Vision, Inc.
Corning Incorporated
Eigenlabs, LLC
Kitware, Inc.
L3Harris Technologies
LighTopTech Corporation
Millennium Engineering/
Millennium Machinery
Optimax Systems, Inc.
Phlotonics, Inc.
POSPEA, LLC
QuidelOrtho
SiMPore, Inc.
Visual Dx

OTHER CEIS INITIATIVES

INTELLIGENT IMAGING INITIATIVE

Artificial intelligence is reshaping our lives in profound ways, no more so than in imaging technologies. AI is changing how images are captured, generated, processed, analyzed, and transformed into actionable data. From healthcare and defense to advanced manufacturing, agriculture, transportation and retail, intelligent imaging is rapidly becoming a part of the foundational infrastructure for modern innovation. In healthcare for example, AI is enabling quicker more accurate identification of illness in radiology images, bringing quality radiology to remote and underserved areas. In the defense sector, intelligent imaging is used to enhance surveillance and guide autonomous systems. The opportunity is expansive, and Rochester and New York State are well positioned to lead because of our unmatched combination of imaging heritage, world-class research capacity, and strong industry presence.

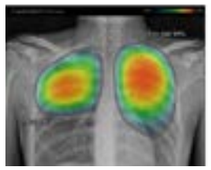
Building on this foundation, CEIS and the University of Rochester's Center of Excellence in Data Science and AI continue to advance an initiative aimed at strengthening Rochester's and New York's leadership in intelligent imaging. Our work is coordinated with key academic and industry partners, including RIT's Chester F. Carlson Center for Imaging Science and major New York State companies with deep expertise in imaging and system-level solutions across multiple sectors.

In 2025, intelligent imaging was a featured theme of the CEIS/CoE annual University Science & Technology Showcase. A panel of local academic and industry experts highlighted both the scale of the opportunity and the strong need for a coordinated strategy that aligns research, workforce development, and industry engagement across the region and the state. This conversation confirmed what we have heard consistently: intelligent imaging is not only a technology frontier, but also a strategic economic opportunity for New York.

CEIS is now taking a deliberate, structured approach to planning how best to support this emerging field. We continue to survey companies across New York State and beyond to assess needs, concerns, and priorities. Early feedback indicates strong industry interest in several areas: robust information exchange and convening; workforce development and up-skilling; targeted support for small businesses; technical assistance and collaborative access to knowledgeable faculty; and, over time, the potential need for shared technical and computing resources and pre-competitive research. CEIS is continuing these conversations to refine a clear, responsive roadmap that matches the pace of the field with the practical requirements of sustainable, high-impact ecosystem-building.

This careful strategy reflects CEIS's track record of helping the region step confidently into major technology transitions. A decade ago, CEIS played an early role in bringing attention from the federal manufacturing innovation ecosystem to the Finger Lakes region - support that contributed to the formation of AIM Photonics. Today, the Rochester-based test, assembly, and packaging (TAP) facility remains an important economic engine for the region and a key contributor to New York's leadership in microelectronics. We see intelligent imaging as a similarly significant opportunity - one that complements manufacturing by strengthening another critical segment of the innovation value chain.

The CEIS/CoE/RIT intelligent imaging initiative supports an integrated systems view that spans components, detectors, computational hardware, complex platforms, and advanced algorithms. This is not a shift away from our optics, photonics and imaging focus but an expansion of our economic reach, pairing New York's strength in building world-class technology with growing leadership in information-rich, knowledge-driven systems that convert imaging into insight, capability, and societal benefit. By advancing this initiative thoughtfully and in close partnership with industry and academia, CEIS aims to help Rochester and New York State become a recognized hub for intelligent imaging innovation, talent, and long-term economic growth.

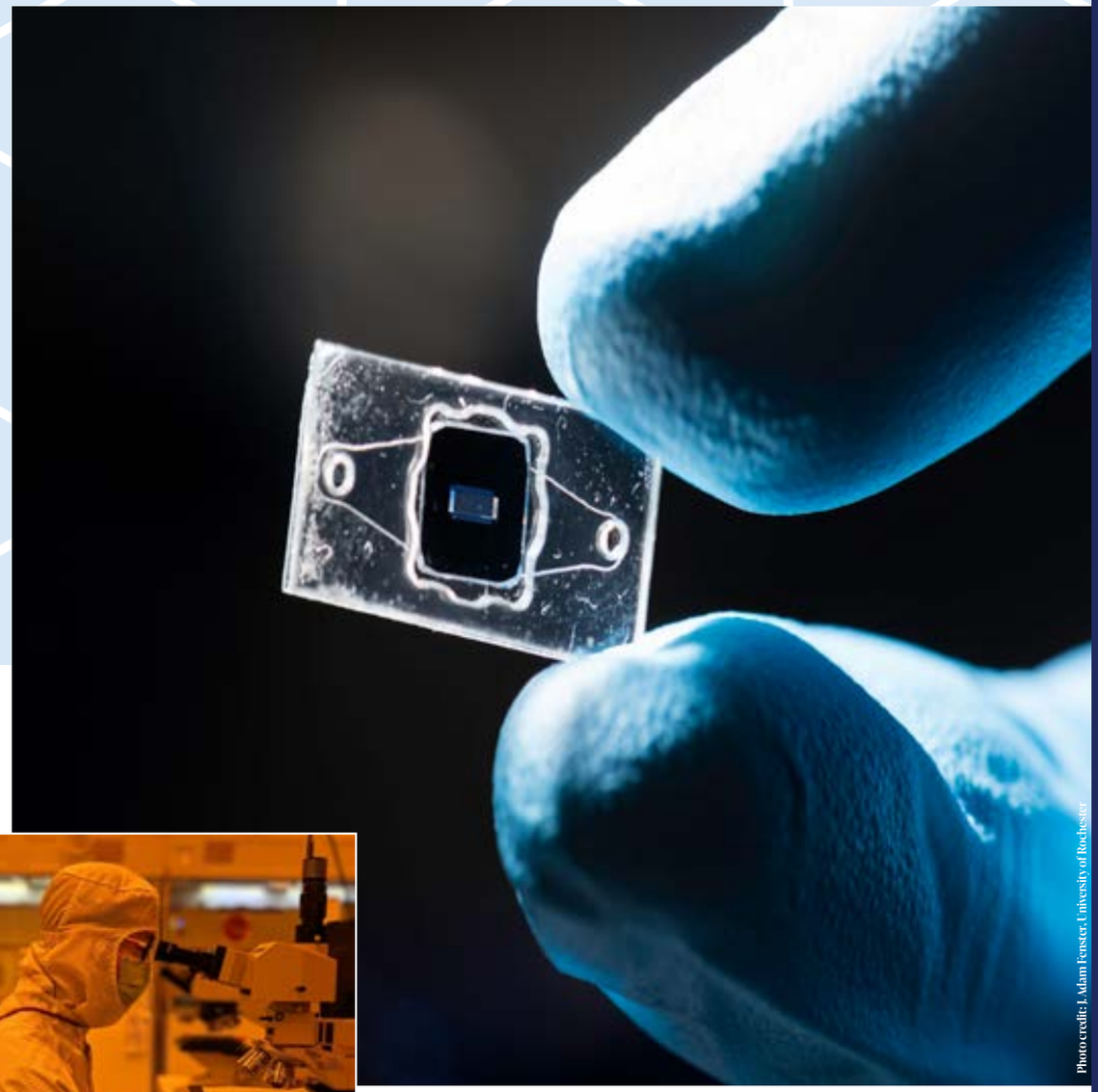




DR. CANAVESI JOINS CEIS ADVISORY BOARD

We are very pleased at CEIS to welcome Dr. Cristina Canavesi to our Advisory Board. Dr. Canavesi earned her PhD from the University of Rochester's Institute of Optics and an MBA from the Simon Business School. She is the Co-Founder and President of LightTopTech Corporation in Rochester, a manufacturer of innovative optical instruments for noninvasive imaging in both medical and industrial applications. LightTopTech has been a valued corporate partner on multiple CEIS projects, helping translate advanced research into real-world solutions and creating meaningful economic and innovation impact for our region. We are delighted that Dr. Canavesi is joining the Board and bringing both her technical depth and business leadership to CEIS as we continue to advance our mission through transformative university-industry collaboration.

PROJECT ABSTRACTS



A modular μSiM (m-μSiM) tissue chip platform, used to model vascular barrier tissues containing an easy-access open well for cell culture (McGrath Lab).

Jaime Cardenas' PhD student accessing UR clean room.

2025–26 PROJECT ABSTRACTS

Research in support of high-manufacturing of custom ophthalmic devices
Wayne H. Knox
University of Rochester
Clerio Vision, Inc.

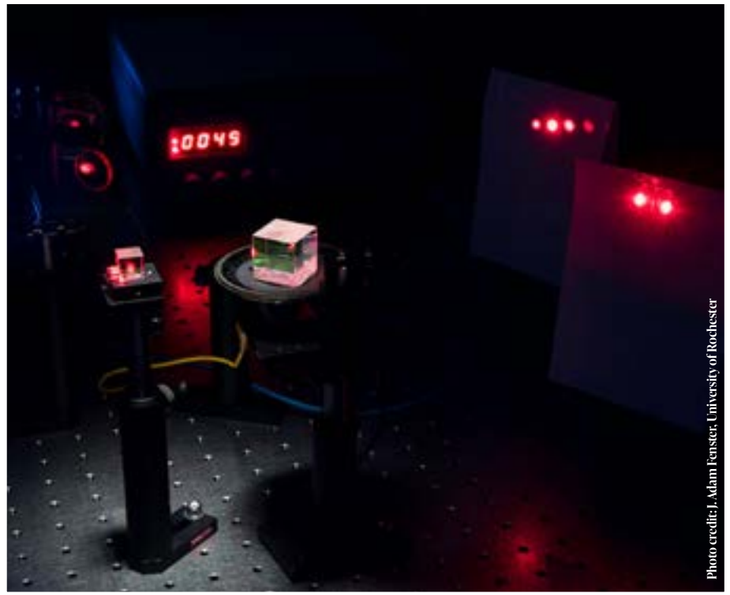
Research is proposed in topics that are highly relevant to the optimization of manufacturing processes for various types of customized vision devices. We propose to use our new 3D fluorescence imaging technique for optimization of LIRIC writing patterns in contact lenses and intraocular lenses. We propose to study and optimize the photothermal components of LIRIC writing in dry and wet hydrogels, and to provide characterizations of new materials designed to enhance photothermal components. Further, we propose to develop a new beamline at LLE to write larger and more complex high-speed devices with our new 1 kHz high power line-focusing methodology.

Development of a quantum imaging system
Qiang Lin
University of Rochester
POSPEA, LLC

To develop a quantum imaging system based upon chip-scale integrated ultra-broadband and ultra-bright quantum photon sources, with special focus on fabrication and manufacturing of fully integrated chip-scale quantum photon emitter chips.

Optical photons to single-flux quanta transducers for quantum detection and computing applications
Roman Sobolewski
University of Rochester
SEEQC, Inc.

The project is devoted to development of the next-generation single-photon smart counters and transducers, based on Superconducting Nanostripe Single-Photon Detectors (SNSPDs) integrated with Josephson-junction–based, single flux quantum (SFQ) circuits. The aim is to provide readout, tuning, and control of these digitally assisted counters with performance characteristics far surpassing traditional, analogue-type photon detectors. We will target high-value applications in optical quantum information networks and quantum computing applications, including high data rate photon number-resolving and quantum-key distribution schemes. We will also pursue interfacing of optics with digital superconductor electronics, by designing ultrafast transducers for converting flying qubits (photons) to single flux quanta.



Ultrafast metrology research conducted in Dr. Qiang Lin's Lab.

Towards Enabling Digital Superconducting Quantum Control
Selçuk Köse
University of Rochester
SEEQC, Inc.

We aim to develop cryogenic current drivers using Suzuki stack circuits to enable bistable operation of Josephson Digital Phase Detectors (JDPDs)—a new class of superconducting devices for digital qubit readout. Replacing analog microwave methods, JDPDs offer scalable, low-power readout via phase-controlled switching. The designed drivers will deliver precise excitation currents to induce the required double-well potential. To validate performance, test chips will be fabricated and measured at cryogenic temperatures. This work advances digital, cryo-compatible quantum-classical interfaces and supports the development of scalable quantum computing architectures.

2024–25 PROJECT ABSTRACTS

Shear Plate Interferometry for Refractive Index and Thermal Defocus Determination
James Zavislan
University of Rochester
ALLVAR

The goal of this project is to demonstrate that interferometry is a fast and economical method for certifying index of refraction in infrared lens materials. To achieve this goal, the index of refraction measurement concept must be matured by applying the proven technology to the infrared wavelengths and operational temperatures of interest. Then the total combined uncertainty of the apparatus and measurement method must be determined to ensure that a lens material's refractive index can be certified to 0.001. The present study will determine the various uncertainty contributions to the refractive index measurement and use uncertainty calculations and measurements to explore the solution trade space for each subsystem function. A system will be assembled to measure Type A uncertainty at a single wavelength and temperature.

A Tool for the Assessment of the Toxicity and Permeability of Drugs to the Human Outer Blood Retinal Barrier
James McGrath
University of Rochester
Bausch + Lomb

The loss of outer-blood-retinal-barrier (OBRB) function is a hallmark of prevalent retinal diseases including age-related macular degeneration and diabetic retinopathy. Because drugs targeting retinal diseases must penetrate the OBRB to reach the cells of the retina, pre-clinical models of the human OBRB are needed for ophthalmic drug development. Additionally, a number of commonly prescribed drugs exhibit retinal toxicity with chronic use. The fact that these drugs received FDA approval without safety concerns speaks to need for pre-clinical assays of retinal toxicity. We will address these unmet needs by creating and validating a model of the human OBRB 'on-a-chip'.

OCT-based Contact Lens Conformance (OCT-CLC)
Susana Marcos
University of Rochester
Bausch + Lomb

Building on our recent publication (Rodriguez et al, Cont. Lens Ant Eye 2025) study on how contact lenses adapt to the eye using OCT imaging, this project aims to better understand how soft contact lenses change shape when worn. Using high-resolution swept-source optical coherence tomography, we will image lenses on artificial eye models and preliminary in volunteers to measure how their curvature conforms to the cornea and sclera. Comparison of the nominal lens shape and the shape on eye, and relating it to tear film and eye curvature, will allow improved understanding of the effective lens shape and improved design and comfort for everyday users.

Research in support of high-manufacturing of custom ophthalmic devices
Wayne H. Knox
University of Rochester
Clerio Vision, Inc.

Research is proposed in three areas that could improve Clerio Vision's manufacturing processes. Using new advanced laser techniques, we will write 1D and 2D structures at high speeds using high energy low repetition rate lasers, and we will use newly developed phase profile writing to write multiple layers simultaneously. Furthermore, we will investigate new material processing conditions such as never-hydrated materials and new doping methods to increase photochemical stability and determine the thermal limits of damage and mechanical properties of various materials after LIRIC writing. Also proposed is a new method to write surface nanostructures for novel vision devices.

Validation of Spatial Light Modulator-Based Simulation of Optical Designs for Choroidal Biomarker Assessment
Susana Marcos
University of Rochester
CooperVision

Visual Simulations of lens design for myopia control allow non-invasive testing of vision without putting them on eye. Combining spatial light modulation lens mapping of lenses with OCT imaging we will be able to combine functional testing and structural monitoring on the same optical axis, ensuring direct spatial correspondence between the imposed optics, retinal image quality, and tissue response. This combined system creates a closed-loop platform for the rapid evaluation of different lens designs, and eventually an evidence-based optimization of contact lens designs for myopia control.

Analytical Model of a Dual-Ring Photonic-Integrated Tunable Laser
Drew Maywar
Rochester Institute of Technology
Eigenlabs, LLC

Eigenlabs, a small business founded in 2023, seeks to leverage photonic-integrated tunable lasers to explore new markets and economic opportunities. This project endeavors to deliver the deep understanding and design insight that would come from an analytical model encompassing the entire laser resonator.

Advanced UV Instrumentation for Space
Zoran Ninkov
Rochester Institute of Technology
Eoptic, LLC

Develop an instrument simulation model for a space-based UV telescope, including optical effects and sensor sampling and noise. Apply the model to radiometric scenes to be provided by Eoptic and quantify expected performance metrics.

Poolside: An Automated Poolside Chemical Balancing Machine with a Novel Liquid Injection System
Daniel Phinney
University of Rochester
Hydrologic Systems, LLC

We are modifying our pool chemical balancing machine to make it interface with high pressure pool water circulation lines, such that it injects pool chemicals into these lines and is no longer situated poolside. We have IP, a provisional patent, and are working towards a utility patent for a novel method of using a sort of fluid pressure lock that temporarily blocks fluid flow in an offshoot of a pressurized line using solenoids. These solenoids block the flow, vent the pressure and residual fluid in the blocked section of pipe, and then restore flow to flush a bolus of chemical into the mainline through a pipe barb that is coaxial with flow. As such, we are modifying the existing system's hardware and software to support this new layout.

Poolside: An Automated Poolside Chemical Balancing Machine
Daniel Phinney
University of Rochester
Hydrologic Systems, LLC

This project aims to complete the integration of system hardware, firmware, the connection of the dispenser unit to the internet (via 4G LTE), and the creation of a backend server and client facing app.

Radio Audio via Surface Excitation
Michael Heilemann
University of Rochester
L3Harris Technologies | Communication Systems

We propose to explore the potential for surface excitation technology to enhance the performance and improve the durability of personal communication devices manufactured by L3Harris. New advances in flat-panel loudspeaker design will be leveraged to develop prototype radios that radiate and/or capture sound via surface vibrations. A point of emphasis will be the extent to which the existing sections of the radio can be used as the active surface, or if new form-factors are required to suit the new excitation methods.

Power generation from waste heat using a novel supercritical fluid Stirling engine
Eldred Chimowitz
University of Rochester
Millennium Engineering / Millennium Machinery

Thermal pollution represents a vast, largely untapped energy source due to its low temperature (<100 C). We propose investigating the use of a novel Stirling engine design using high pressure supercritical carbon dioxide as the engine's working fluid as a method to convert thermal energy into electrical energy. Our Thermodynamic calculations show the concept has significant potential for providing significant return of energy from a widely available unexploited resource.

X-Ray and UV Optics for Light-Source and Astronomical Applications
Zoran Ninkov
Rochester Institute of Technology
Optimax Systems, Inc.

This project's experimental goal is to develop digital micromirror devices (DMDs) that can be used as object-selection "slit generators" in the next generation of far ultraviolet (FUV) multi-object spectrometers (MOS). This work supports Optimax's strategic plan on entering the space instrumentation market.

Design and Optimization of an Integrated Optical Coupling Assembly for Photonic Biosensor Deployment
Benjamin Miller
University of Rochester
Phlotonics, Inc.

Phlotonics, Inc., an early-stage photonic biosensing company based in Rochester, is collaborating with Dr. Benjamin Miller to develop and optimize an Optical coupling assembly to facilitate use of Phlotonics' integrated photonic sensors in continuous monitoring applications. This project will leverage the experience of a UR optical engineering undergraduate student, who will develop, assemble, and test fixtures for combining optical input/output elements and sample delivery for platform functionality. The optical element is a key module of Phlotonics' technology and its integration and deployment into different products is a critical need.

Suited up for the clean room in the Laboratory for Laser Energetics at University of Rochester.

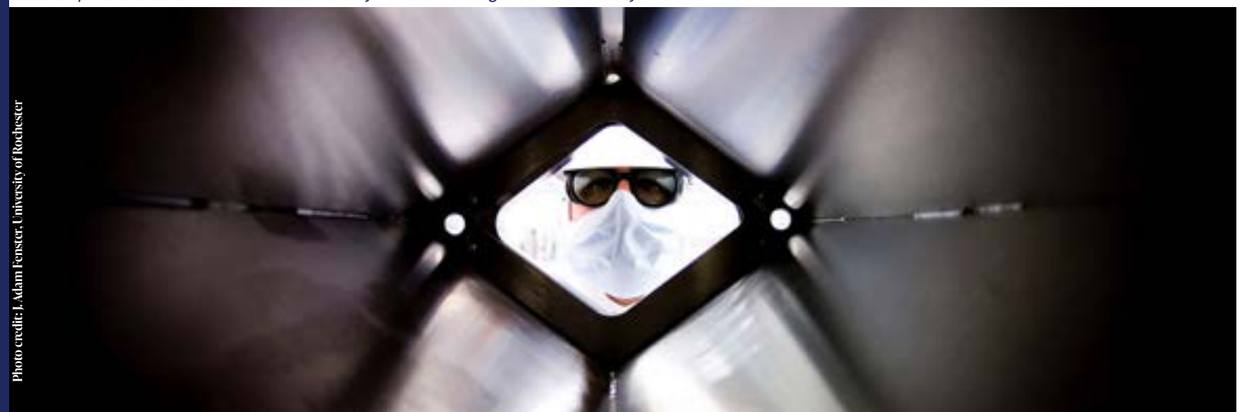


Photo credit: J. Adam Fenster, University of Rochester

2024–25 PROJECT ABSTRACTS

Development of a laminoplasty single-screw implant device
Greg Gdowski
University of Rochester
Portico Health

The patent application for the laminoplasty implant device (US202303381b5A1) was recently approved, providing a description of its design and intended use. A functional prototype has been fabricated using readily available 3D printing materials and successfully evaluated within a simulated cervical spine model. The objective is to advance the implant's development using more durable materials suitable for evaluation in human cadaver studies. This phase will enable Portico Health to gather voice-of-customer feedback from orthopedic spine surgeons. The work will be conducted collaboratively by the University of Rochester Center for Medical Technology and Innovation (CMTI) and Portico Health. The PI will engage colleagues with medical device manufacturing experience to facilitate prototyping (John Longuil).

Design and fabrication of on-chip lithium niobate microresonator devices
Qiang Lin
University of Rochester
POSPEA, LLC

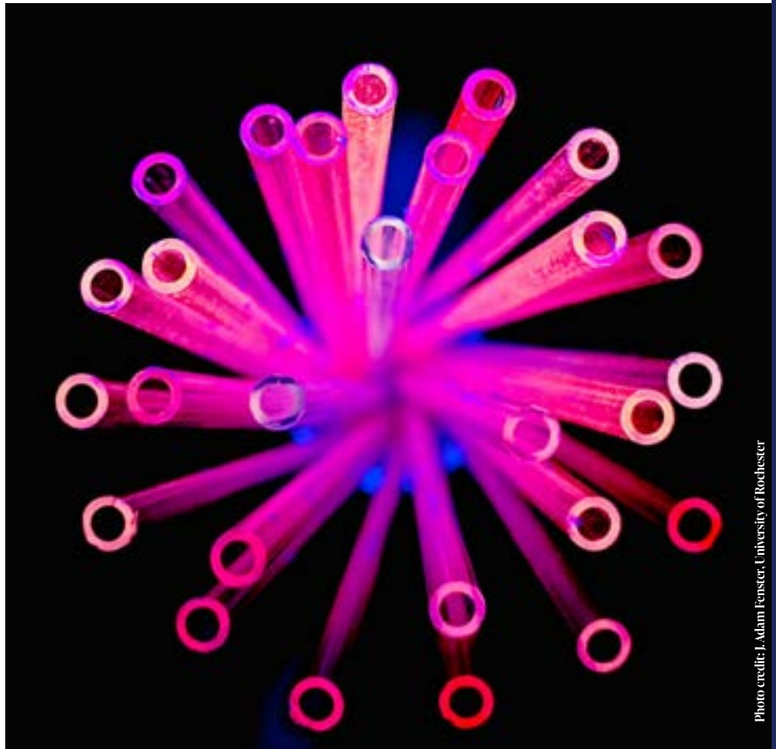
To design, fabricate, and characterize high-quality integrated photonic devices on thin-film lithium niobate platform, with a special focus on wafer-scale fabrication and manufacturing process. We have successfully improved the fabrication quality in the previous year of effort. We will continue along this line and focus on wafer-scale manufacturing.

Development of Protective Surface on Solid Patterned Nickel for Low Energy Cold Storage of Permanent Record Archives
Santosh K Kurinec
Rochester Institute of Technology
Stamper Technology, Inc.

This proposed research aims at developing and characterizing protective coatings on patterned nickel films obtained by maskless lithography and electroforming. Using a direct write lithography system, such as a maskless aligner, human readable archival records can be reduced and eventually recorded onto nickel films that can inherently last for thousands of years without degradation and withstand high fluctuation in temperature and humidity storage environments. This inert metal format would negate the need to strict adherence of NARA 1571 Environmental Storage standards for moisture barriers and HVAC regulation of humidity and temperature, saving thousands of dollars per month in cold storage costs for a business and billions for the archival industry.

CFD Investigations of Latex Mixing in a Stirred Reactor
David Foster
University of Rochester
Xerox Corporation

The goal of this project is to use CFD simulations to better understand an industrial mixing process that Xerox currently utilizes. CFD can play a key role here in that it is able to investigate potential avenues that are impractical or even impossible in a practical sense. Examples of this are changing temperatures, mixing RPM beyond equipment limits, removing mixing impellers, and incorporating baffles in the tank.



"The Hues of Quantum Rhapsody" - Farwa Awan (Macroscopic image shows Ag+ doped CdSe semiconductor nanoplatelets fluorescing under a UV lamp.)

Photo credit: J. Adam Fenster, University of Rochester

CORPORATE PARTNERS

Photo credit: Phlotonics, Inc.

Results of an 18-month collaboration with ARMI | BioFabUSA, University of Rochester, and RIT aims to enable continuous, label-free monitoring during stem-cell-derived beta-islet manufacturing.

Phlotonics, Inc. exhibiting at the 2025 Innovation Summit presented by FuzeHub in partnership with Empire State Development's Division of Science, Technology & Innovation (NYSTAR) in Rochester, NY. Mickey Bryan, Co-Founder and CEO of Phlotonics, Inc. pictured with event attendee.

ADVANCED GROWING RESOURCES, INC.
www.agrsensors.com

At AGR®, we see the invisible® by bringing revolutionary optical sensing technology to the palm of your hand. We aim to remove guesswork from visual inspection with our proprietary optical scanning platform—Spectre®. AGR® is focused on the analysis of light frequencies, or "colors," that span beyond what the human eye can see to bring lab-grade material identification to the field. Spectroscopy, or frequency analysis, is only our first step toward changing the way everyday users harness the power of emerging optical technology.

AKTIWAVE, LLC
www.aktiwave.com

Aktiwave, LLC is dedicated to providing customized optical components and consulting services in optical technologies. Our beam shapers and coronagraphs have been used in a large variety of applications such as astronomy and laser engineering. We have experience in a wide range of domains such as: Optical system design and modeling/Optical pulse diagnostic for ultrafast and telecommunication systems/Spatial and temporal shaping/ Intellectual property analysis.

ALCHLIGHT
www.alchlight.com

AlchLight, based in Rochester NY, is the leading developer and distributor of advanced and proprietary laser-fabricated materials. Acclaimed by the NY Times as "optical alchemy", they use femtosecond laser processing to etch proprietary nanostructures on materials. Their procedure doesn't coat the materials, instead it changes the intrinsic properties of the materials. Their topographies can change the color of titanium to blue, make silicon attract water, or even make water bounce off of brass.

ALLVAR ALLOYS
https://allvaralloys.com/

ALLVAR was founded in 2014 and manufactures revolutionary metal alloys. These alloys' unique negative thermal expansion helps compensate and eliminate the detrimental effects thermal expansion has in a variety of applications. Negative thermal expansion alloys can be used to athermalize optic designs, reduce thermal stress in assemblies, maintain a constant force load, and maintain thermal stability. Currently, we are able to offer our Negative Expansion Alloys in Bar (up to 2.25" round) and tube (up to 3.00" OD) depending on wall thickness. We also offer thermal compensating washers and spacers to maintain constant pre-loads to control the margin of safety of bolted joints.

BAUSCH AND LOMB
www.bausch.com

Bausch and Lomb offer one of the world's most comprehensive portfolios of eye health products. B+L markets five broad categories of products: contact lenses, lens care, pharmaceuticals, cataract and vitreoretinal surgery, and refractive surgery.

BYK-GARDNER USA (ACQUIRED IMAGINANT, INC.)
www.byk-instruments.com/en/2023-06-imaginant

ALTANA has acquired the business of Imaginant Inc., a U.S. company that develops and manufactures test and measurement instruments based on ultrasound. With this acquisition, the specialty chemicals group has strategically expanded its BYK division and entered the growth market of the semiconductor industry. Imaginant is based in New York State and will be integrated into BYK-Gardner.

CARESTREAM
www.carestream.com

Carestream is a dynamic, global company with more than 100 years of leadership. In today's rapidly changing global healthcare environment, where the mandate to provide better outcomes has never been greater, we add value by delivering personalized, affordable and practical options to help our customers advance. Medical providers large and small, from clinics and single hospitals to large networks and even entire countries, are upgrading their radiology and IT systems using our latest solutions.

CLERIO VISION, INC.
www.cleriovision.com

Clerio Vision is developing a novel vision correction procedure based on technology licensed from the University of Rochester. Instead of changing the shape of the cornea, as current LASIK-based approaches do, the LIRIC approach proposes to use a femtosecond laser to change the refractive index of the cornea with small pulses to “write” a corrective prescription onto the cornea non-invasively. Because this approach does not thin the cornea, it can be repeated as needed to correct vision changes over a person’s lifetime. LIRIC is being commercialized by some of the original architects of the world’s first LASIK systems.

COOPERVISION
https://coopervision.com/

CooperVision designs and manufactures innovative, high quality contact lenses to meet a remarkably wide range of wearer needs. We conduct extensive ongoing research and development in optical science. And we collaborate closely with eye care professionals, who help us identify the evolving needs of contact lens wearers around the world.

CORNING, INC.
www.corning.com

Corning, Inc. is a diversified technology company that develops breakthrough technologies that significantly improve people’s lives. Corning pursues innovation and focuses on high-impact growth opportunities in the telecommunications, flat panel display, environmental, life sciences, and semiconductor industries.

DINAMICOR
www.dinamicor.com

DinamicOR is medical equipment manufacturer, whose mission is to standardize operating room organization with an ergonomic and intuitive Workflow Management System – improving the efficiency and reproducibility of surgical processes which will enable perioperative staff to focus on providing thoughtful patient care.

EIGENLABS, LLC
www.eigenlabsllc.com

Eigenlabs, LLC is a research and development firm experienced in the mathematical modeling, prototyping, and system integration of lasers, integrated-photonics, free-space optics, and signal-processing solutions for communication and sensing applications. We provide our clients with a deep physical understanding of fundamental principles, informing and guiding design considerations early in the engineering development cycle leading to effective technology transitions and stronger solutions for the end customer.

EOPTIC
www.eoptic.com

Eoptic tailors solutions to your specific measurement and analysis needs, from concept through manufacturing. We offer advanced electrical, optical and mechanical systems, leveraging our diverse experience with complex imaging and metrology techniques.

HYDROLOGIC SYSTEMS, LLC
https://hydrologicpools.com

Hydrologic Systems, LLC make industrial-grade water treatment techniques available to small-scale water treatment operations, including pool water treatment. Hydrologic Systems, LLC seeks to combine industrial-grade machine control and remote monitoring and to borrow technologies from other industries to reduce waste streams and energy use.

KITWARE, INC.
www.kitware.com

Kitware, Inc. is a leader in the creation and support of open-source software and state of the art technology. By fostering extended, collaborative communities, Kitware is able to provide flexible, cost-effective visualization, computer vision, medical imaging, data publishing, and quality software process solutions to a variety of academic and government institutions and private corporations worldwide.

L3HARRIS TECHNOLOGIES
www.l3harris.com

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers’ mission-critical needs. We provide advanced defense and commercial technologies across air, land, sea, space and cyber domains. We bring speed, innovation and flawless execution together with our commitment to make the world safer and more secure.

L&C ORTHOPEDIC & INNOVATION (LCOI)
www.lcorthopedicsinnovation.com

L&C Orthopedics & Innovation was founded in 2016 with a focus in bio-mechanical analysis of individuals in the orthopedics and sports performance world. Our goal is to use automated software to guide rehabilitation, prevent injuries, and improve sports performance to benefit individuals and clinics.

LIGHTOPTECH CORPORATION
www.lightoptech.com

LighTopTech Corporation is a women-owned optical technology company founded in 2013 and based in Rochester, NY. Our goal is to build innovative optical instruments to improve noninvasive imaging in medical and manufacturing fields.

MILLENNIUM MACHINERY
www.millenniummachinery.com

Millennium Machinery serves as a machine tool distributor, representing several retailers including Mitsubishi, System 3R, Ebbco, and more. Millennium still specializes in EDM machines but has grown to include high-quality laser, press brake, sinker, waterjet, milling, and grinding machines as well. We also have an in-house fixture machine shop dedicated to building work-holding fixtures.

OPTIMAX SYSTEMS, INC.
www.optimaxsi.com

Founded in 1991, Optimax continues to enhance its unique capabilities for fast, reliable delivery of precision optics with superior quality and service enabling customer success and employee prosperity. Our know-how, innovation and speed enable quicker production of precision optics to meet emerging market needs. Some of the most sophisticated programs in the world trust Optimax to produce the most complex optics reliably.

OPTIPRO SYSTEMS, LLC
www.optipro.com

OptiPro was founded on one revolutionary, yet simple, concept: optical fabricators deserve more. In the past 30 years, since we introduced the first affordable CNC machine designed specifically for the optics industry, we have consistently built a culture that cares— a culture of employees who live and breathe by our strong OptiPro values and a culture of best-in-breed customers who are collectively on a relentless pursuit of process efficiencies, design improvements, capability enhancements, and marketplace superiority.

CORPORATE PARTNERS

OVITZ
www.o-vitz.com

Ovitz Corporation is an exciting medical device company specializing in developing, manufacturing and marketing novel and portable ophthalmic equipment and accessories that facilitate the delivery of ophthalmic care in eye doctors' and primary care physicians' offices, and in schools, rural areas and developing nations.

PARVERIO, INC.
www.parverio.com

Parverio was founded to address the rising containment known as microplastics. With our revolutionary technology, we aim to bring microplastic testing and awareness to concerned individuals everywhere.

PFIZER, INC.
www.pfizer.com

Pfizer is an American multinational pharmaceutical and biotechnology corporation in relentless pursuit of breakthroughs that change patients' lives. We innovate every day to make the world a healthier place. It was Charles Pfizer's vision at the beginning and it holds true today.

PHLOTONICS, INC.
www.phlotonics.com

Phlotonics created technology that integrates photonic sensors with microphysiological systems for research and drug development. With their novel sensor and laser system design, users can focus on data, not instrument setup, maintenance, and calibration.

POSPEA, LLC
www.pospea.com/

POSPEA is dedicated to developing narrow linewidth, broadband tuning lasers and aims to fill the need of LiDAR and 3D display that used on robotics and self-driving cars. POSPEA aims to deliver a game-changing laser with unmatched tuning speed and broad range. Their mission is to change the way the laser market works.

POWER2PEER, INC.
https://power2peer.com/

Power2Peer is leading the charge to a greener future. Their team of experts developed a platform that makes it easier than ever for solar and other renewable energy sources to take hold of the market. By enhancing returns on capital investments in renewable energy while simultaneously reducing energy costs for consumers who opt into the clean energy marketplace, Power2Peer is providing a market-oriented solution to the looming climate crisis.

QUIDELORTHO
www.quidelortho.com

QuidelOrtho stands at the forefront of testing, tracking, and disease analysis of health conditions ranging from HIV and hepatitis C to flu, strep and COVID-19. For decades, our precision and accuracy have guided clinicians and lab technicians in the moments that matter most. We envision a world where individuals, families and communities have the insight and clarity to spot trends sooner, respond quicker and confidently chart their course to better health.

RAM PHOTONICS, LLC
www.ramphotonics.com

RAM Photonics, LLC was founded in 2009 for the express purpose of transitioning high-risk technology into commercial hardware. The company portfolio includes specialty optical and optoelectronic systems for defense, commercial, and industrial applications, including advanced signal processing, high-power laser, and instrumentation systems.

SEEQC, INC.
https://seeqc.com

As a spinout from Hypres, the world leader in commercial superconductive electronics solutions, SEEQC's technology and fabrication capabilities are proven and patented. The company is one of the first companies to have built a superconductor multi-layer commercial chip foundry and through this experience has the infrastructure in place for design, testing and manufacturing of quantum-ready superconductors.

SIMPORE, INC.
www.simpore.com

SiMPore designs and produces membranes and membrane-enabled products based on its unique patent-pending platform technology - the NanoBarrier™ ultrathin nanoporous silicon membrane. The NanoBarrier™ membrane is the world's first membrane to offer both tunable nanometer-scale thickness and pore size. We are developing products that take advantage of these one-of-a-kind features, including filters for separating and concentrating biological molecules and nanoparticles, cell culture substrates for growing cells, and electron microscopy grids for preparing and imaging samples at the nanoscale.

STAMPER TECHNOLOGY, INC.
https://stampertech.com

Stamper Technology works with executives of archival foundations to archive knowledge of Earth permanently for future generations. We have archived a 30 million page library on the Moon as well as ancient texts for the Buddhists and the Argentina government. We preserve legacies forever in a nano-format that can easily be stored, carried, or even worn. Everyone has a story and collectively those stories make history and comprise a legacy for humanity.

SUNDENSITY, INC.
www.sundensity.net

SunDensity, Inc. produces photonic smart coatings (PSC) for solar power producers aspiring to reduce the cost of energy. Their nano-optical coating improves PV efficiency by downshifting UV rays for greater power output from solar modules, thus lowering overall power costs and accelerating solar energy adoption into the next generation of clean power.

VISUALDX
www.visualdx.com

VisualDx is the leader in clinical decision support, used in over 1,500 hospitals and institutions and over 50% of the U.S. medical schools. Trusted by physicians and nurses all over the world, VisualDx is utilized across several professional specialties. Quickly build a differential to evaluate the possibilities, compare variations, and improve diagnostic accuracy at the point of care.

XEROX CORPORATION
www.xerox.com/en-us

Xerox Corporation, founded in Rochester, NY in 1906, is known for industry-leading technologies, expertise, innovations and global reach that allows the company to deliver exceptional solutions to their customers. Xerox sells printers, digital document products and services in more than 160 countries. Xerox was the pioneer of the photocopier market, beginning with the introduction of the Xerox 914 in 1959, so much so that the word xerox is commonly used as a synonym for photocopy.

FACULTY RESEARCHERS

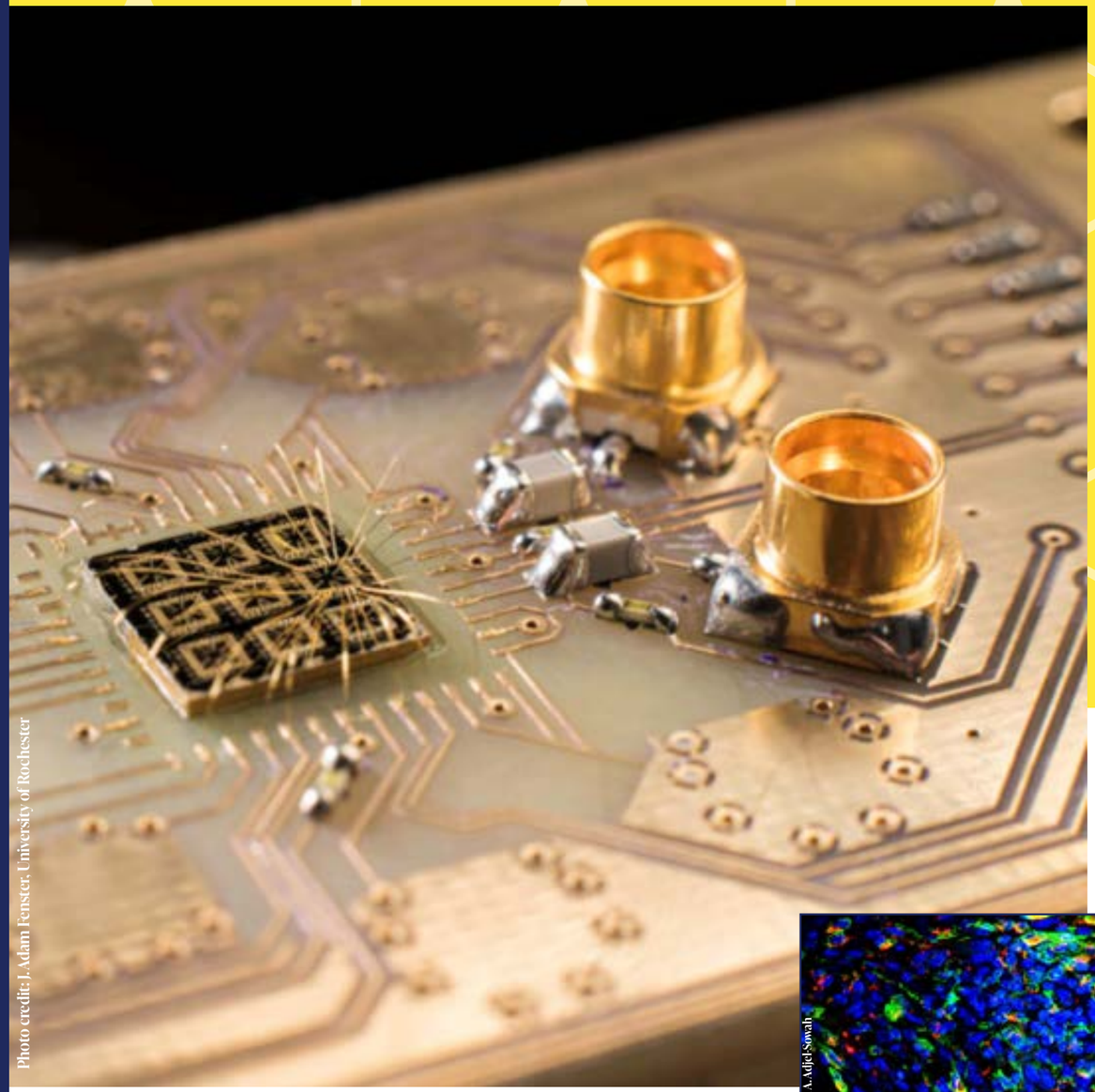


Photo credit: J. Adam Fenster, University of Rochester

Thin aluminum wires connect the surface of a quantum processor semiconductor chip to pads on a circuit board.

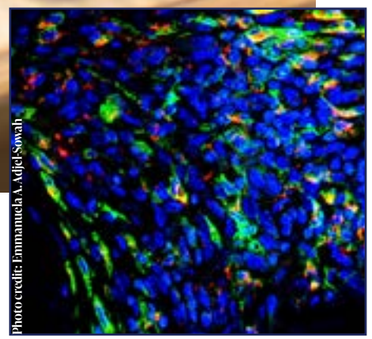


Photo credit: Emmanuela A. Ujah-Sowah

Using nanoparticles for precision drug delivery to heal tendons Loiselle & Benoit UR Labs.

GOVIND AGRAWAL

James C. Wyant Professor of Optics, Professor of Physics, and Distinguished Scientist at the Laboratory for Laser Energetics, University of Rochester

Education PhD, Indian Institute of Technology, Physics, 1974; MS, Indian Institute of Technology, Physics, 1971; BS University of Lucknow, Physics and Statistics, 1969

Research Interests Quantum electronics, Nonlinear photonics, Fiber-optic communications

Recent Research Projects Transmission of optical pulses, Semiconductor lasers,Nonlinear fiber optics, Optical communications

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Education PhD, University of Rochester, Physics, 1984; MS, University of Rochester, Physics and Astronomy, 1980; BS, Colgate University, Physics and Astronomy, 1978

Research Interests Multimedia signal processing, Imaging microelectronics, Wireless sensors

Recent Research Projects Digital audio watermarking and steganography, Image sensors with built-in image compression, Digital CMOS image sensor read-out circuits

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Mercer Brugler Distinguished Teaching Professor, Professor of Optics, and Director of the Institute of Optics, University of Rochester

Education PhD, University of Rochester, Optics, 1987; BS, Gordon College, Physics, 1979

Research Interests Optical polarization and metrology, Optoelectronic modeling Integrated optoelectronics

Recent Research Projects Adaptive Nulling for Steep Aspheres using a Holographic Reference Surface, Focusing and coherence properties of polarization vortex beams, Stress-engineered optical elements, Polarization properties of nanostructures, Waveguide mode resonances in SOI waveguides

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JAIME CARDENAS

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Education PhD, Optical Science and Engineering, University of Alabama in Huntsville, 2005; BS, Physics, Monterrey Institute of Technology, 1998

Research Interests Photonic packaging, 2D materials, Integrated photonics, Nonlinear photonics, On-chip quantum photonics

Recent Research Projects Integrated optical frequency detection and weak value amplification, Fiber-to-chip fusion splicing for low-loss photonic packaging, Carrier envelope offset detection via simultaneous supercontinuum and second-harmonic generation in a silicon nitride waveguide, A reconfigurable nanophotonics platform for sub-millisecond, deep brain neural stimulation

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SCOTT CARNEY

Professor of Optics, The Institute of Optics, University of Rochester

Education PhD, University of Rochester, Physics, 1999; B.S, University of Illinois Urbana-Champaign, Engineering Physics, 1994

Research Interests Computed imaging, Spectroscopy, Coherence Theory

Recent Research Projects Light scattering by plasmonic disks and holes arrays: different or the same? Metal-Dielectric-Enhanced Upconversion: Going “Meso”, Clustering diffused-particle method for simulating electromagnetic fields among large ensembles of electromagnetically polarizable particles.

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Education PhD, University of Rochester, Electrical Engineering; MS, University of Rochester, Electrical Engineering; BS, University of Rochester, Chemical Engineering

Research Interests Diagnostic ultrasound imaging, Therapeutic applications of ultrasound, Low frequency underwater sound fields

Recent Research Projects Mechanisms for wound healing with ultrasound, Ultrasound technologies for tissue engineering, Effects of underwater sound on biological tissues

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Emeritus Professor of Chemical Engineering

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Research Interests Critical Phenomena, Supercritical Fluids, Percolation, Computer Simulation

Recent Research Projects Supercritical Waste Heat Recovery Processes for Power Generation, Complex Network Theory Applied to Power Distribution Systems

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Research Interests Mechanical behavior of novel materials, Diffusion-bonded high-temperature alloys, Polymers used in human tissue simulations

Recent Research Projects The TEAK Project: Students as Teachers, Terrain characterization using modified RANSAC analysis of human gait data, Minimum constraint design analysis and modification of a biaxial tensile test fixture for hyperelastic materials

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DAVID FOSTER

Professor of Chemical Engineering (instructional)

Education P PhD, University of Rochester, 1999

Research Interests Principles of transport phenomena, Creation of nanoparticle coatings for enhanced capture of flowing cells in microtubes, Computational fluid dynamics

Recent Research Projects CFD Investigations of Latex Mixing in a Stirred Reactor

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THOMAS GABORSKI

Professor of Biomedical Engineering, Rochester Institute of Technology

Education PhD, University of Rochester, Biomedical Engineering, 2008; MS, University of Rochester, Biomedical Engineering, 2004; BS, Cornell University, Biological and Environmental Engineering, 2002

Research Interests Nanomaterials and membrane fabrication, Microfluidics, separations, and device design, Cellular biophysics, Quantitative fluorescence imaging

Recent Research Projects Cellular co-culture screening assays

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PAUL FUNKENBUSCH

Associate Dean for Education and New Initiatives, Professor of Mechanical Engineering and of Materials Science, University of Rochester

Education PhD, Michigan Technological University, Metallurgical Engineering, 1984; BS, Michigan Technological University, Metallurgical Engineering, 1979

Research Interests Relationships among microstructure, properties, and processing of materials

Recent Research Projects Refining and validating a model to characterize shape changes due to LIRIC writing on cornea, Optical probing for freeform optics metrology

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GREG T. GDOWSKI

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Education PhD, Boston University, Biomedical Engineering, 1996; MS, Boston University, Biomedical Engineering, 1988; BS, Boston University, Biomedical Engineering, 1985

Research Interests Vestibulo-collic reflexes (VCR), Neural mechanisms underlying postural control, Vestibulo-spinal (VS) pathways

Recent Research Projects A testing platform to evaluate thermal profiles of balloon catheter-based bipolar radiofrequency ablation devices in the treatment of resistant hypertension, Photodynamic antimicrobial polymers for infection control

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CHUNLEI GUO

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Education PhD, University of Connecticut, Physics, 1999; BS, Changchun Institute of Optics and Fine Mechanics, Physics, 1994

Research Interests Femtosecond laser-matter interactions at high intensities

Recent Research Projects Superwicking cooling devices for computer CPU and microelectronics

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Education PhD, Massachusetts Institute of Technology, Electrical Engineering and Computer Science, 2000; MS, Massachusetts Institute of Technology, Electrical Engineering and Computer Science, 1997; BS, Cornell University, Electrical Engineering, 1995

Research Interests Multimedia communication, Wireless sensor networks, RFID systems, Cloud computing, Heterogeneous networking

Recent Research Projects Support for distributed computing and network management in mobile ad hoc networks, Developing RFID systems for inventory management, Designing a QoS-aware protocol architecture to support real-time multimedia data transmission, Optimizing video-based sensor networks

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MICHAEL HEILEMANN

Assistant Professor of Electrical and Computer Engineering, University of Rochester

Education PhD, University of Rochester, Electrical Engineering, 2018; MS, University of Rochester, Electrical Engineering, 2015; BS, Canisius College, Physics, 2013

Research Interests Structural acoustics and vibration, Loudspeaker design, Audio signal processing perception, Spatial audio

Recent Research Projects Measures of vibrational localization on point-driven flat-panel loudspeakers, The evolution and design of flat-panel loudspeakers for audio reproduction, Near-field object-based audio rendering on flat-panel displays

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KARL HIRSCHMAN

Professor of Microelectronic Engineering and Director of Semiconductor and Microsystems Fabrication Laboratory, Rochester Institute of Technology

Education PhD, University of Rochester, Electrical and Computer Engineering, 2000; MS, Rochester Institute of Technology, Electrical Engineering, 1992; BS, Rochester Institute of Technology, Microelectronic Engineering, 1990

Research Interests Silicon device integration on nontraditional substrates, Metal-oxide semiconductors for thin-film electronics, Silicon-based optoelectronics

Recent Research Projects MicroLED display technology development, Development and characterization of high-performance transistors on glass, Development of bipolar and MOS high-power microwave transistors

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Research Interests Extracellular matrix, Fibronectin

Recent Research Projects Extracellular matrix protein, fibronectin and wound repair, Tissue engineering, Therapy for tissue regeneration in chronic wounds

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Education PhD, University of Rochester, Electrical and Computer Engineering, 2004; MS, University of Rochester, Electrical and Computer Engineering, 2001; BS, University of Novi Sad, Electrical Engineering and Computer Science, 1999

Research Interests A/D conversion, CMOS analog circuits, Low power circuit architectures, Image sensors

Recent Research Projects Compressive beamforming for portable ultrasound, Developing and investigating focal plane compression techniques where majority of multiplication computations required by the compression are rendered unnecessary

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KRYSTEL HUXLIN

James V. Aquavella, MD, Professor and Director of Research in the Department of Ophthalmology, Professor of Neuroscience, of Brain and Cognitive Sciences, of Optics, and in the Center for Visual Science, University of Rochester

Education PhD, University of Sydney, Neuroscience, 1994; BS (Med), University of Sydney, Neuroscience, 1991

Research Interests Optics of the eye, Femtosecond laser micro-machining in cornea and lens, Visual perception and psychophysics, Biomedical imaging

Recent Research Projects Biological Impact of LIRIC in the cornea, Femtosecond laser micromachining, Effect of corneal wound healing on physiological optics of the eye, Perceptual learning with a damaged visual system

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www.urmc.rochester.edu/eye-institute/research/labs/huxlin-lab.cfm

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Education PhD, University of Rochester, Optics, 1984; BS, University of Rochester, Optics, 1979

Research Interests Ultrafast laser physics and prototyping, Femtosecond micromachining and applications in vision science, dispersion micromanagement in holey and photonic crystal fibers, Ultra-short pulse lasers, Novel fiber components based on fiber tapering, Dispersion compensation devices High nonlinearity fiber devices, Ultrafast mid-infrared sources, Dispersion—limits, measurements, compensation schemes, Biomedical optics

Recent Research Projects Multiphoton LIRIC: modeling, scaling, and material modification studies, Femtosecond micromachining of ophthalmic polymers

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Research Interests Hardware security, Analysis and design of high performance/low power integrated circuits, On-chip reconfigurable DC-DC converters, 3-D integration

Recent Research Projects Exploration of Shared Memory Related Security Challenges in Mobile Computing Platforms, Modeling the Memory-Compute Gap in Large-scale Superconductive Systems, Cryogenic Hybrid Systems Integration Across Multiple Temperature Zones, Atomically Precise Graphene Nanoribbon-based Transistors: Materials, Devices, Circuits, and Systems, Highly-Efficient All-to-All Coupled Ising Machines • DISCoVER: Design and Integration of Superconducting Computation for Ventures beyond Exascale Realization

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Education PhD, Mechanical Engineering, University of Michigan, 1996; BS, Mechanical Engineering, University of Delaware, 1990; BS, Textile Science, Apparel Design, 1983

Research Interests Role of gender, obesity, ethnicity, activities, and meniscal injuries in the development of osteoarthritis, Using models based on medical imaging techniques such as micro-computed tomography and magnetic resonance

Recent Research Projects Refining and validating a model to characterize shape changes due to LIRIC writing on cornea, Biomechanical modeling of the human cornea, Characterizing growth of the knee joint, Finite element models of the knee meniscus, Knee flexion mechanics, Modeling vision correction with LIRIC writing modalities, MR imaging of musculoskeletal joints and bone properties, Understanding the risks for knee osteoarthritis

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Research Interests Magnetic Tunnelling and Phase Change Memory Devices, Silicon CMOS/MEMS, Photovoltaics, Nonvolatile Memory

Recent Research Projects A Comparative Study of n- and p-Channel FeFETs with Ferroelectric HZO Gate Dielectric, Introducing gallium in silicon and thin film polysilicon using self-assembled monolayer doping, Degradation Analysis of an Operating PV Module on a Farm Sanctuary

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Research Interests Fundamental physics of novel nonlinear optical, quantum optical, and optomechanical phenomena in micro-/nanoscopic photonic structures, Chip-scale photonic signal processing in both classical and quantum regimes

Recent Research Projects Perfect soliton crystals on demand, Athermal lithium niobate microresonator, Shallow-etched thin-film lithium niobate waveguides for highly efficient second-harmonic generation, Silicon carbide zipper photonic crystal optomechanical cavities

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Research Interests Computer vision, Machine learning, Social media, Data mining, Human computer interaction, Biomedical informatics, Mobile and pervasive computing, Computational photography, Ubiquitous and mobile computing

Recent Research Projects Fine-grained user profiling from multiple social multimedia platforms, Wine recommendation for grocery shoppers

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Education PhD, University of Rochester, Optics, 1997; MS, University of Rochester, Optics 1992; BS, University of Illinois at Urbana–Champaign, Engineering Physics, 1991

Research Interests Large-mode area fibers, High-efficiency high-power fiber lasers and amplifiers, High-power ultrafast fiber lasers, Fiber lasers at exotics wavelengths, Brightness improvement of high-power semiconductor lasers, Power scaling/beam combining of fiber and semiconductor lasers

Recent Research Projects Review of ultrafast fiber oscillators based on Mamyshev and dissipative soliton resonance mechanisms, Observations of spatial coherence collapse in high-power, broad-area lasers using fiber-assisted self-heterodyning

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Education PhD, University of Delaware, Applied Mathematics, 2009; MS, University of Delaware, Applied Mathematics, 2006; BS, University of New Hampshire, Mathematics, 2003

Research Interests Physical systems and industrial problems pertaining to flows of biological and complex fluids, Modeling, Ordinary and partial differential equations, Scientific computing

Recent Research Projects Improved mathematical modeling and computer simulation of contact lens dynamics, Effect of contact lens distortion on exchange of tears, Model for suction pressure under a contact lens

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Education PhD, University of Salamanca, Physics, 1996; MS, University of Salamanca, Physics, 1992; BS, University of Salamanca

Research Interests Visual optics, Ocular imaging

Recent Research Projects Functional integration of eye tissues and refractive eye development mechanisms and pathways, Vision with spatial light modulator simulating multifocal contact lenses in an adaptive optics system, Simulating outcomes of cataract surgery: important advances in ophthalmology

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Education PhD, Optical Engineering, University of Rochester, 2000; MS, Optical Engineering, University of Rochester, 1997; BS, Optical Engineering/BA, Religion, University of Rochester, 1993

Research Interests Fiber-optic communication systems, Optical and photonic components, Optical phenomena and physical processes

Recent Research Projects Image processing for optical weld-joint failure protection, Avionic fiber-optic networks, Improved RF-signal propagation over fiber, Terabit-per-second fiber-optic system, Metamaterial distributed feedback lasers, All-optical data-wavelength converters, All-optical digital gates, Optical-domain RF spectrum analyzer, Nonlinear dynamics of polarization rotation, Time transformation, Adiabatic wavelength conversion, Self-phase modulation, Four-wave mixing

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Education PhD, Division of Health Sciences and Technology, Harvard/MIT, 1998; MS, Massachusetts Institute of Technology, Mechanical Engineering, 1994; BS, Arizona State University, Mechanical Engineering, 1991

Research Interests Nanoparticle and molecular separations, Nanotechnology, MEMS and micro fabrication, Cell culture technologies, Biological tissue models, Small format hemodialysis, Biosensors, Electrokinectic devices

Recent Research Projects Interaction of nanoparticles with cells and protein mixtures, Ultrathin silicon-based nanomembranes for filtration of molecules and nanoparticles, Ultrathin silicon-based nanomembranes for biological co-cultures

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Education PhD, University of Rochester, Electrical and Computer Engineering, 2002; MS, University of Rochester, Electrical and Computer Engineering, 1998; BS, University of Rochester, Electrical and Computer Engineering, 1996

Research Interests Use of motion-tracking techniques to enhance the contrast of ultrasound images, Acoustic radiation force impulse (ARFI), Magnetically induces vibration of brachytherapy seeds

Recent Research Projects Development of novel, clinically applicable ultrasound imaging techniques, Acoustic radiation force imaging techniques, Spatially modulated ultrasound radiation (SMURF) imaging, Single tracking location (STL), Shear wave elastography imaging (SWEI)

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Education PhD, Stanford University, Organic Chemistry, 1994; BS, Chemistry/BA, Mathematics, German, Miami University, 1988

Research Interests Biomedical nanotechnology, Combinatorial chemistry, Biophysical methods, Biosensors

Recent Research Projects Control of biomolecular interactions through the synthesis of new small-molecule probes and the observation of biomolecular interactions through the development of novel optical sensing technologies, In the area of control The AIR flu chip: A multiplex optical biosensor of influenza serology

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Research Interests Novel 2-D CMOS detector arrays, Fundamental limitations of visible and IR arrays, Miniaturized multispectral systems

Recent Research Projects Development of quantum dot coated detector arrays, Development of novel two-dimensional detector arrays, Development of image processing techniques for optimal analysis of such two-dimensional astronomical image data

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Education M.S, Rochester Institute of Technology, Mixed-Signal ASIC; B.S, Rochester Institute of Technology, Microprocessor Design

Research Interests Application-specific Integrated Circuits, High Speed communication Interfaces, Low-cost/high-reliability Electronics, Embedded Microprocessor, High-speed Digital, Mixed Signal, High-power PCBAs

Recent Research Projects An automated poolside chemical balancing machine, An automated poolside chemical balancing machine with a novel liquid injection system

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Education PhD, Electrical Engineering, Biomedical Concentration, Massachusetts Institute of Technology, 1981; MS, Electrical Engineering, Massachusetts Institute of Technology, 1978; BS, SUNY at Buffalo, 1976

Research Interests Medical imaging, Image processing, Novel scanning techniques, Fundamentals of wave propagation with signal and image processing techniques

Recent Research Projects Techniques and methods for Gabor-domain optical coherence elastography, The blue noise mask, The development of sonoelastography, The development of crawling waves, Tissue biomechanics and the microchannel flow model, The H-scan for identification of scatterers, The reverberant shear wave fields, The needle pulse, OCT elastography, Enhanced resolution, Advanced 3D-4D analytics, The new view of tissue scattering

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Research Interests Silicon photonics, Quantum optics

Recent Research Projects Integrated quantum photonics for photon-ion entanglement, System, device and method for aligning and attaching optical fibers, High extinction ratio microring modulator, Highly-confined, low-loss visible photonics using foundry-fabricated silicon nitride circuits

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Research Interests Optical metrology, Optical instrumentations, Adaptive and active optics, Segmented large-scale optics alignment and testing, Pulse compression, ultrafast laser systems and applications, Optical system design and performance evaluation

Recent Research Projects Femtosecond laser-based fabrication of photonic waveguides toward wavelength lasers, Development and investigation of an integrated laser-based optics polishing and manufacturing technology, Laser polishing for additive manufacturing

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Education PhD, University of Arizona, Optical Science, 1990; MA, University of Arizona, Optical Science, 1987; Diplôme Grandes Ecoles, Institut d'Optique (France), 1984

Research Interests Optical system design for imaging and non-imaging optics, Physics-based modeling, Image quality assessment

Recent Research Projects Techniques and methods for Gabor-domain optical coherence elastography, Gabor-domain optical coherence microscopy for detection of defects in manufacturing, Optical coherence tomography for quantification of contact lens properties

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Research Interests Theoretical and application-oriented research topics covering several aspects within the fields of ergonomics, biomechanics, work physiology, safety, and rehabilitation

Recent Research Projects Lumbar time-varying muscle synergies in trunk flexion and bending movements at different velocities, A systematic review of fall risk factors in stroke survivors toward improved assessment platforms and protocols, Abstract TP61: Can a single motion sensor identify lower limb movement alterations among stroke survivors?

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Research Interests Real-time computer vision, Multimedia systems, Medical imaging

Recent Research Projects Global surveillance augmentation for deep learning, Real-time systems for object tracking and activity recognition, Algorithms and systems for robust scene categorization and object classification in consumer photographs, Document processing algorithms for thresholding, compression, and rendering in high-speed scanners, Digital image processing and computer vision

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Education ScD, Polish Academy of Sciences, Physics, 1992; PhD, Polish Academy of Sciences, Physics, 1983; MS, Warsaw Technical University, 1975

Research Interests Ultrafast optoelectronics, Quantum optoelectronic and spintronic devices, Ballistic transport in electronic nanodevices, Quantum communication and information

Recent Research Projects Quantum key distribution using polarized infrared single photons for practical quantum cryptography and deep-space optical communications, Subpicosecond electro- and magneto–optic characterization of electronic, optoelectronic, and spintronic materials and systems, Smart sensor for classical and quantum data links

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Education PhD, Boston University, Electrical Engineering, 2008; BS, Boston University, Electrical Engineering, 2001

Research Interests Light-matter interaction at the nanoscale, Quantum optics, nano-photonics and condensed matter physics

Recent Research Projects Solid-state and photonic approaches to quantum science

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Education PhD, University of Padova (Italy), Information Engineering, 2012; MSc, University of Padova (Italy), Computer Engineering, 2008; BSc, University of Padova (Italy), Computer Engineering, 2005

Research Interests Wireless communication and networking, Mobile cloud computing, Smart and connected health care solutions, Stochastic modeling and optimization, Design of novel techniques to facilitate the development and diffusion of smart and connected health care solutions

Recent Research Projects Design and optimization of large ad-hoc networks

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HUI WU

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Education PhD, Electrical Engineering, California Institute of Technology, 2003; MS, Microelectronics, Tsinghua University, Beijing, 1998; BS, Tsinghua University, Beijing, 1998

Research Interests Wireless sensors for smart health care, Spintronic and nanoelectric integrated circuits, On-chip interconnect and power distribution for high performance microprocessors, Silicon photonics, optical interconnect and electronic-photonic integrated circuits, High-performance clock generation and distribution, High-speed and ultra-wideband integrated circuits, High-speed passive devices and on-chip interconnect

Recent Research Projects Optical phased array for adaptive free-space optical imaging, Free-space optical interconnect for future microprocessors, Transmission-line based shared-medium on-chip electrical interconnect, Ultrafast pulse generation, filtering and modulation, Ultrafast pulse shaping for Omega laser system, Injection-locked clocking, High-speed silicon photodetectors in standard CMOS, Ultra-wideband (UWB) impulse radios, CMOS-compatible on-chip transmission lines, Integrated microwave passive devices

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CEIS PROGRAM ASSISTANTS

The CEIS team welcomes our recently hired undergraduate students who add invaluable skills to our operation. The Program Assistants provide market analysis, data collection and data analysis, assist in planning and supporting events, and help curate our social media content. We could not do all we do without you, Abylay and Lem!

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CEIS ADVISORY BOARD

The advisory board and CEIS leadership meet and discuss strategies to expand new technologies and enhance the connection between academic research and corporate product development. The entire CEIS team would like to acknowledge and thank the advisory board for their leadership, expertise, and forward-focused ideas.

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New York has hundreds of optics, photonics, and imaging companies clustered into active regional collaborations. These regions are home to abundant organizations and companies that can deliver complete R&D, engineering, and manufacturing capabilities, providing entrepreneurial vision combined with next-edge research. This map shows the entities—from public and private universities to corporations and governmental agencies—involved in the New York Photonics initiative.

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Cover image: Integrated Nanosystems Center (URnano) Dilution Device

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