YAMUNA PHAL

CONTACT INFORMATION

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ACADEMIC APPOINTMENTS

Colorado School of Mines, Golden, USA
Assistant Professor, Department of Electrical Engineering — *July 2023 – Present*
Affiliate Professor, Quantitative Biosciences & Engineering — *September 2023 – Present*

Colorado Clinical & Translational Sciences Institute (CCTSI), Aurora, USA
Affiliate Member

EDUCATION

University of Illinois Urbana-Champaign (UIUC), Urbana, USA
Ph.D. in Electrical & Computer Engineering (ECE)

California Institute of Technology (Caltech), Pasadena, USA
M.S. in Electrical Engineering (EE)

Indian Institute of Technology (IIT) Roorkee, Roorkee, India
B.Tech. in Electrical Engineering (EE)

ACADEMIC AWARDS & FELLOWSHIPS

Chirality Best Poster Award
William G. Fateley & Coblentz Society Student Awards
Ernest A. Reid Fellowship, UIUC
NYU Tandon School of Engineering Faculty First Look Program
Global Young Scientists Summit
Cadence Women in Technology Program
FACSS SciX Best Poster Award
MIT EECS Rising Stars
Harriett & Robert Perry Fellowship, UIUC
Nadine Barrie Smith Memorial Fellowship, UIUC
Harold L. Olesen Undergraduate Teaching Award, UIUC
List of Teachers Ranked as Excellent, UIUC
James M. Henderson Fellowship, UIUC
NASA Jet Propulsion Laboratory (JPL) Graduate Fellowship
Dr. Jai Krishna & Director's Gold Medals, IIT Roorkee
The President of India, Dr. Shankar Dayal Sharma Gold Medal, IIT Roorkee

INDUSTRY EXPERIENCE

Swedish Institute of Space Physics (IRFU), Uppsala, Sweden

Analog Research Design & EMC Engineer | Radio & Plasma Wave Investigation (RPWI), Jupiter Icy moons Explorer (JUICE) & Solar Orbiter (SO) Missions

Finisar Malaysia Pvt. Ltd., Ipoh, Malaysia

Failure Analysis Engineer, Quality Analysis Department

RESEARCH EXPERIENCE

University of Illinois, Urbana-Champaign, Urbana-Champaign, USA

Graduate Research Assistant, Biomedical Imaging | PI: Dr. Rohit Bhargava, Beckman Institute

Graduate Research Assistant, Remote Sensing & Space Sciences

Johns Hopkins University Applied Physics Laboratory (APL), Laurel, USA

Visiting Researcher | PI: Dr. Larry Paxton, Head Geospace & Earth Science Group

NASA Jet Propulsion Laboratory (JPL), Pasadena, USA

Graduate Fellow | PI: Dr. Karl Rittger, Scientist Water and Carbon Cycles Group

Graduate Research Assistant | PI: Dr. Keith Patterson, Senior Engineer Microdevices Lab

Grants & Funding

NSF Research Partnership for Innovation (RP-PFI)

Role: Principal Investigator | *Mid-Infrared Imager for Analyzing Chiral Drug-Tissue Interactions* — *September 2024 – August 2027*

Funding Agency: NSF

NASA Planetary Instrument Concepts For The Advancement Of Solar System Observations (PICASSO)

Role: Principal Investigator | *Mid-Infrared Rapid Advanced Chiroptical Life-detection Explorer (MIRACLE)* — *November 2024 – October 2027*

Funding Agency: NASA

Patents

Vibrational Circular Dichroism Infrared Spectroscopic Imaging Microscope
U.S. Patent US20220187591A1 [Google Patents Search Link]

Peer-reviewed Publications

Y. Jeong, P-H. Hsieh, **Y. Phal**, R. Bhargava, J. Irudayaraj, Label-Free Monitoring of Coculture System Dynamics: Probing Probiotic and Cancer Cell Interactions via IR Spec. Imaging *June 2024*
Analytical Chemistry, DOI:10.1021/acs.analchem.4c00894 | [Link]

Y. Phal, Quantum cascade laser-based mid-infrared spectroscopic imaging systems with polarization capabilities *August 2023*
Doctoral Dissertation, University of Illinois at Urbana-Champaign

K. Yeh, .. **Y. Phal**, .. R. Bhargava, Infrared spectroscopic laser scanning confocal microscopy for whole-slide chemical imaging
Nature Communications, DOI:10.1038/s41467-023-40740-w | [Link]

P-H. Hsieh, **Y. Phal**, K. V. Prasanth, R. Bhargava, Cell Phase Identification in a Three-Dimensional Engineered Tumor Model by Infrared Spectroscopic Imaging
Analytical Chemistry, DOI:10.1021/acs.analchem.2c04554 | [Link]

Y. Phal, L. Pfister, P.S. Carney, R. Bhargava, Resolution Limit in IR Chemical Imaging
Journal of Physical Chemistry C, DOI:10.1021/acs.jpcc.2c00740 | [Link]
Featured, Cover Image

L. Lux^{+}, **Y. Phal**$^{+}$, P-H. Hsieh, R. Bhargava, Parametric Approach to Determine Pixel-Wise Limit of Detection in Infrared Imaging
Invited Paper for Special Issue, Applied Spectroscopy, DOI:10.1177/00037028211050961 | [Link]
$^{+}$ *Equal Contributions*

Y. Phal, K. Yeh, R. Bhargava, Chirality Mapping in Microscopy Format
Optics and Photonics News | [Link]

Y. Phal, K. Yeh, R. Bhargava, Design Considerations for DFIR Microscopy Systems
Focal Point Review, Applied Spectroscopy, DOI:10.1177/00037028211013372 | [Link]
Featured, Cover Image [Laser Focus World]

Y. Phal, K. Yeh, R. Bhargava, Concurrent Vibrational Circular Dichroism Measurements with Infrared Spectroscopic Imaging
Analytical Chemistry, DOI:10.1021/acs.analchem.0c00323| [Link]
Featured, Cover Image [Drug Target Review] [Photonics]

P. Joshi, **Y. Phal**, L. Waldrop, Quantification of the Vertical Transport and Escape of Atomic H in the Terrestrial Upper Atmosphere
Journal of Geophysical Research: Space Physics, DOI:10.1029/2019JA027057 | [Link]

Book Chapter

R-J. Ho, **Y. Phal**, L. Lux, R. Bhargava, Infrared Spectroscopy and Imaging Using QCLs
Molecular and Laser Spectroscopy: Advances and Applications, Volume 3,
DOI: 10.1016/B978-0-323-91249-5.00012-0

Conference Proceedings

Y. Phal, K. Yeh, R. Bhargava, Discrete Frequency Infrared VCD Spectroscopy *&* Imaging *April 2021*
2021 OSA Biophotonics Congress: Optics in the Life Sciences, ISBN: 978-1-943580-85-9

Y. Phal, K. Yeh, R. Bhargava, Polarimetric Infrared Spectroscopic Imaging Using QCL
Proc. SPIE 11252, Advanced Chemical Microscopy for Life Science and Translational Medicine, 1125210, DOI: 10.1117/12.2544392

Y. Phal *et al.*, Use of Fiber Optic Interconnects for Signal Integrity
2016 ESA Workshop on Aerospace EMC, pp. 1-3. IEEE, DOI: 10.1109/AeroEMC.2016.7504561

J. Soucek, **Y. Phal** *et al.*, EMC Aspects of Turbulence Heating Observer (THOR) S/C
2016 ESA Workshop on Aerospace EMC, pp. 1-3. IEEE, DOI: 10.1109/AeroEMC.2016.7504544

Conference Presentations

Y. Phal, Exoplanet Exploration Using Mid-Infrared Technology *November 2023*
Lightning Talk, Outer Planets Analysis Group (OPAG) Meeting

R. Bhargava, K. Yeh, S. Kenkel, **Y. Phal**, K. Falahkheirkhah, Uncovering New Utility in IR Spectroscopic Imaging by Pushing the Limits of Accuracy, Speed, and Resolution
SPIE Photonics West 2023: Optical Biopsy – Toward Real-Time Spectroscopic Imaging and Diagnosis

Y. Phal, K. Yeh, R. Bhargava, QCL-Based VCD Imaging for Biological Applications
Chiroptical Spectroscopy CD 2022 [Poster]

Y. Phal, K. Yeh, R. Bhargava, Vibrational Circular Dichroism Spectroscopy *&* Imaging
Chirality 2022 [Poster] | ***Poster Award Winner***

R-J. Ho, **Y. Phal**, R. Bhargava, Understanding Polarization Effects On Absorption Spectra Measured Using A Quantum Cascade Laser-Based Spectrometer
International Symposium on Molecular Spectroscopy 2022

Y. Phal, K. Yeh, R. Bhargava, VCD Imaging: New Tool to Examine Biological Materials
FACSS SciX 2021 [Poster] | ***Poster Award Winner***

Y. Phal, R. Bhargava, R-J. Ho, K. Yeh, Vibrational Circular Dichroism Measurements Using IR Microscopes: Opportunities and Challenges
FACSS SciX 2021: Structure Elucidation of Chiral and Biological Molecules

L. Lux, **Y. Phal**, P-H. Hsieh, R. Bhargava, Parametric Approach to Determine Pixel-Wise Limit of Detection in Infrared Imaging
FACSS SciX 2021 [Poster]

Y. Phal, K. Yeh, R. Bhargava, Mid-IR Laser-Based Polarimetric Imaging for Polymeric and Biological Applications
SPIE Photonics West 2021: Advanced Chemical Microscopy for Life Science and Translational Medicine

R. Bhargava, S. Kenkel, **Y. Phal**, K. Yeh, Pushing the Limits of Spatial and Temporal Capability of Infrared Spectroscopic Imaging: a Theory-Based Approach
SPIE Photonics West 2021: Advanced Chemical Microscopy for Life Science and Translational Medicine

K. Yeh, **Y. Phal**, R. Bhargava, Infrared Chemical Imaging with Scanning Quantum Cascade Laser Microscopy Systems
SPIE Photonics West 2021: Advanced Chemical Microscopy for Life Science and Translational Medicine

R. Bhargava, K. Yeh, **Y. Phal**, S. Kenkel, Next generation infrared spectroscopy for micro and nanoscale chemical imaging
SPIE Defense & Commercial Sensing 2020: Advanced Sensing & Imaging

R. Bhargava, K. Yeh, **Y. Phal**, S. Kenkel, Infrared Spectroscopic Imaging with QCLs
Pittcon Conference 2020

Y. Phal, K. Yeh, R. Bhargava, Polarimetric Infrared Spectroscopic Imaging Using QCLs
SPIE Photonics West 2020: Advanced Chemical Microscopy for Life Science and Translational Medicine

K. Yeh, **Y. Phal**, R. Bhargava, Design of QCL Microscopes for IR Chemical Imaging
SPIE Photonics West 2020: Advanced Chemical Microscopy for Life Science and Translational Medicine

Teaching Experience

Colorado School of Mines, Golden, USA

Instructor, EENG-598 Digital Imaging — *Fall 2024*

Instructor, EENG-411 Digital Signal Processing — *Spring 2024*

Guest Lecturer, PHGN-480 & PHGN-581 Laser Physics — *October 2023*
Spectral Line Profiles & Measurements Using Interferometric Design

University of Illinois, Urbana-Champaign, Urbana-Champaign, USA
Harold L. Olesen Undergraduate Teaching Award & Ernest A. Reid Fellowship

Guest Lecturer, BIOE-570 Seminar Series
Seeing things in a different light

Guest Lecturer, BIOE-507 Advanced Bioinstrumentation
Design & Development of Infrared Spectroscopic Imaging Systems [Virtual]

Graduate Teaching Assistant, ECE 445 Senior Design Project Lab

Award Winning Projects: [Link]

- ☐ ***The Lextech Senior Design Best Engineered Project Award:*** Prosthetic Control Board
  Caleb Albers *(Engineering Lead, Pliancy)* & Daniel Lee *(Systems Engineer, Texas Instr.)*
- ☐ ***Area Award for Courage:*** Cell Phone Transmission Detector
  Anish Bhattacharya *(Recipient of NSF GRFP, M.S./PhD., University of Pennsylvania)*, Anthony Schroeder & Shandilya Pachgade *(Machine Learning Engineer, Bloomberg)*
- ☐ ***Area Award for Recreation & Entertainment:*** RC Boat Power & Signal Level Indicator
  Sanchit Anand, Vaibhav Mittal & Sho Harisawa
- ☐ ***Area Award for Research:*** Autonomous Motorized Mount for PATHS Sensor
  Brandon Bogue, Marvin Hernandez & Quoc Pham

Selected Notable Projects:

- ☐ Noninvasive PoC Anemia Detection Mythri Anumula *(Electrical Engineer, Borrego Solar Systems)* & Jeremy DeJournett *(Chief Technology Officer, Ideal Medical Technologies)*
- ☐ Conductive Fabric Gesture-Control Sleeve
  Guneev Lamba *(Associate, HGGC)*, Mrunmayi Deshmukh *(GPU Firmware Engineer, NVIDIA)* & Stephanie Wang

Graduate Teaching Assistant, ECE 468 Optical Remote Sensing

- Designed and organized laboratory experiments for the class. Introduced and implemented a ***LIDAR section*** that used Garmin sensor for depth estimation and 3D mapping of the room.

California Institute of Technology

Graduate Teaching Assistant, ACM 100A Introductory Methods of Applied Mathematics

- Conducted recitation sessions for topics such as Complex Analysis & Ordinary Differential Equations

Graduate Teaching Assistant, CH 1A-B General Chemistry

- Graded exams and assignments for an undergraduate Chemistry course

Professional Service & Outreach

SURF Professional Development Seminar, Mines | Speaker, *July 2024*
Visualizing Data: Crafting Compelling Graphics for Journal Publications
2024 Student Award Nominations Committee, Coblentz Society *April 2024*
Editorial Board Member, Technology in Cancer Research & Treatment *October 2023 – Present*
IEEE Kickoff Event, CO Mines | Speaker, *Undergraduate Research* *September 2023*
SPARK, UIUC | Panelist, *Research Statement* *June 2023*
Scientific Reviewer, Physica Scripta, 2D Materials, Journal of Biological Chemistry, Optics and Lasers in Engineering, Journal of Optics, Applied Optics, Reuleaux UG Mines *June 2023 – Present*
Scientific Reviewer, Analytical Chemistry, Macromolecules, Biosensors *June 2019 – Present*
Career Center 2023, UIUC | Panelist, *Success Story Panel* *April 2023*
International Career Festival 2023, UIUC | Panelist, *Alumni Panel* *March 2023*
researcHStart 2022, UIUC | Summer Workshop, *Light+Electronics* *July-August 2022*
2022 Undergraduate Research Symposium, UIUC | Judge *April 2022*
ECE Pulse Conference 2022, UIUC | Panelist, *Women in Academia* *February 2022*
2021 Optics and Photonics News: Image Contest | Honorable Mention [Link] *December 2021*
Graduate College Image of Research, UIUC | Semifinalist, *Bonds of Strength* [Link] *March 2021*
Engineering Career Services, UIUC | Panelist, *Ask Me Anything: Graduate School* *February 2019*
Seminars & Talks Series, IIT Indore | Invited Speaker, *Space Electronics* *January 2015*
Career in Engineering, Girijabai Sail Inst. of Tech. | Invited Speaker, *Emerging Tech.* *Sept. 2014*

Colorado School of Mines

Undergrad Research Symposium Judge, Mines *Spring 2024*
Colorado Engineering Council Mines Committee, Mines *Spring 2024*
AWC TT Hiring Committee, Department of Electrical Engineering *Fall 2023*
Electrical Engineering Representative, Mines Graduate Council *Fall 2023*
Graduate Committee, Department of Electrical Engineering *Fall 2023*

Thesis Committee Member
☐ Anna Titova, Doctoral Committee, Electrical Engineering *Fall 2024*
☐ Patrick Barringer, Master Committee **[Committee Chair]**, Electrical Engineering *Spring 2024*