

Prakash Gautam
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Experimental physicist with extensive experience in conception and design set-up, customization and calibration of instruments, and performing academic research experiments. Performed in-depth analysis and research to develop a world-class light scattering setup for conducting cutting-edge experiments in the light scattering world.

Education

Ph.D. Physics - **Kansas State University**, Manhattan, KS Anticipated: April 2022
Advisor: Uni. Dist. Prof. Christopher M. Sorensen

M.S. Physics - **Tribhuvan University**, Kathmandu, Nepal April 2015

Key Accomplishments

- 5 years of independent and collaborative research resulting in 3-first author peer-reviewed papers with two in progress. Attended and gave presentations at many national and international conferences.
- Successfully designed and built a novel wide range (0.32° to 177.6°), multi-angle light scattering setup, and concomitant analysis method, published in reputed journal “Review of Scientific Instruments” <https://aip.scitation.org/doi/full/10.1063/5.0068318>. Receive recognition for novel setup from U. Memphis Dept. of Engineering researcher who plans to visit my lab to learn more about the setup.
- Studied the optical properties of particles of arbitrary size (nano to microns), shape, and complex refractive index.
- Became a confident independent researcher following 5 years as a lead researcher in the group.

Research Experiences

Graduate Research Assistant *Aug 2017- Present*
Kansas State University, Department of Physics

- Work as a GRA in the NSF Funded Project “Experimental studies of light scattering, focused on backscattering and linear depolarization ratio by particles (aerosols) of arbitrary size, shape and complex refractive index” throughout the whole angular range.
- Perform light scattering study of different irregular-shaped particles viz. Silica (SiO_2), Molybdenum disulfide (MoS_2), Aluminum dioxide (Al_2O_3), Arizona road dust particles, graphene, polystyrene latex sphere (PSL) particles.
- Perform light scattering studies from a highly absorptive, non-fractal hematite ($\alpha\text{-Fe}_2\text{O}_3$), aggregates, yielded two notable results: I). An extended Guinier regime indicating bimodal size distribution of the particles, consistent with the size distribution seen in the optical

pictures and II) An enhancement in the backscattering due to multiple scattering between the grains within the aggregates, non-fractal nature of the particles (USAXS results), resulted in a paper.

- Successfully demonstrate equivalency between the size inferred by scattering to the size measured by commercially available aerosol measuring instruments viz. aerodynamic particle sizer (APS), scanning mobility particle sizer (SMPS), consistent with the size shown in TEM, SEM, resulted in a paper.
- Perform light scattering studies of soot particles generated by a lab-made (self-designed) pre-mixed burner and a commercially available soot generator.
- Participate in a dynamic light scattering project that investigates the kinetics of the colloidal sol-to-gel transition by combining small static light scattering (SASLS), dynamic light scattering (DLS) techniques, and transmissivity measurement.
- Mentored undergraduate students for 2 years, provide instruction on instrument use, data collection methods, preparing slides for PowerPoint presentations, manuscript writing.

Areas of Expertise

- Optical design and development, calibration and testing, data analysis and interpretation, and mechanical design.
- Expert in Optical and Laser system alignment.
- In situ aerosol measuring instruments APS, SMPS, optical particle counters.
- Static light scattering, dynamic light scattering, TEM, SEM.
- Aerosol optical properties, aerosol particle characterization.

Training and Courses

- Basic training on the operation of different instruments/machines in the Physics Machine Shop at KSU.
- Formal writing (Manuscript/Grant writing) training from English Language Program (ELP), KSU.
- Training on sample preparation for Transmission Electron Microscope (TEM) and Scanning electron microscope (SEM) and their operation.

Honors & Awards (Selected)

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| • KSU College of Art and Science Travel Award/NSF grants | 2019 |
| • KSU College of Art and Science Travel Award/NSF grants | 2018 |
| • Research grant provided by University Grant Commission, Tribhuvan University | 2015 |
| • Merit-based Mahatma Gandhi Scholarship provided by the Government of India | 2006 |

Software Skills

MS Excel, MS Word, PowerPoint, Mathematica, Python, Origin, AIM software, Image J

Peer-Reviewed Publications

Journals

Published

- **Prakash Gautam**, Christopher M. Sorensen. “A wide range (0.32 to 177.6), multi-angle light scattering setup and concomitant analysis method”, review of scientific instruments, 2021”. <https://aip.scitation.org/doi/full/10.1063/5.0068318>
- **Prakash Gautam**, JB Maughan, CM Sorensen “A Light –Scattering Study of Highly Absorptive, Non-fractal, Hematite Aggregates”. Journal of Quantitative Spectroscopy and Radiative Transfer, 2020. <https://doi.org/10.1016/j.jqsrt.2020.106919>
- **Prakash Gautam**, Christopher M. Sorensen. “A Light-Scattering Study of highly refractive, irregularly shaped MoS₂ particles”. Journal of Quantitative Spectroscopy and Radiative Transfer, 2019. <https://doi.org/10.1016/j.jqsrt.2019.106757>
- Kanchan P. Adhikari, Narayan Ghimire, **Prakash Gautam**, Tirtha Adhikari. “First Data on Quality Control Test done in Diagnostic X-ray facility at Major Public Hospitals in Kathmandu Valley, Nepal”. World Congress on Medical Physics and Biomedical Engineering, June 7-12, 2015. https://doi.org/10.1007/978-3-319-19387-8_168

In Preparation

- **Prakash Gautam** and CM Sorensen, “Light backscattering and depolarization ratio measurements from different non-spherical airborne as well as commercially available dust particles”.
- **Prakash Gautam**, JB Maughan, and CM Sorensen, “A new approach to describe the light scattering phase function from any arbitrary size, shape and complex refractive index”.

National and International Conference Presentations (Selected)

- **Prakash Gautam**, J. B. Maughan, C. M. Sorensen. “Design of a multi-angle light scattering setup covering the whole scattering angle range (0.32° to 177.6°) and interpretation of light scattering data under Q-space analysis”, Oral presentation (online). (July. 2021, Electromagnetic Light Scattering conference).
- **Prakash Gautam**, C. M. Sorensen, “Design of a Multi-Angle Light Scattering Setup and Interpretation of data by two methods: Θ -space and Q-space analysis”, Oral presentation at American Association for Aerosol Research 39th Annual Conference. (Online, October 2021).
- **Prakash Gautam**, J. B. Maughan, and C. M. Sorensen, “Light backscattering from post-flame, non-homogenous, cooled soot particles”, Oral presentation (Online) at American Association for Aerosol Research 38th Annual conference, North Carolina, (Oct. 2020).

- **Prakash Gautam**, Justin B. Maughan, and Christopher M. Sorensen, “Q-space analysis of experimentally observed light scattering by hematite and molybdenum disulfide particles”, Electromagnetic Light Scattering Conference, 2020 accepted.
- **Prakash Gautam**, J. B. Maughan, and C. M. Sorensen, “The Light-Scattering Study of Highly Absorptive Hematite Aggregates” Poster presentation at American Association for Aerosol Research 37th Annual Conference, Portland, Oregon (Oct. 2019).
- **Prakash Gautam**, Annual Condensed Matter Seminar 2018- 2021

Leadership and Outreach (Selected)

- Secretary, Nepalese Student Association at KSU 2020 – present
- A panelist on Prospects of Nepali Students Enrolling in US Universities. 2019
- Sports Co-Ordinator, Nepalese Student Association at KSU 2016-2017