RAJU KUMAR

Assistant Professor (Grade – I), IIT Kharagpur, India

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EDUCATION

Ph.D. in Physics (2016-2020)
Department of Physics (Center for Nuclear Technologies), Technical University of Denmark, Denmark

Integrated M.Sc. in Photonics (2011-2016 | CGPA- 9.46/10)
Cochin University of Science and Technology (CUSAT), Cochin, Kerala, India

PROFESSIONAL EXPERIENCE

Assistant Professor, Geology and Geophysics Department, Indian Institute of Technology (IIT) Kharagpur, India (Jan 2026 - present)

- Nuclear Geophysics: nuclear methods, instrumentation, and applications in geophysics
- Machine learning-based processing for gamma-ray spectra for the identification of natural radioisotopes

Postdoctoral Researcher, Radiation Physics Research Group, Department of Physics and Astronomy, University of Ghent, Belgium (May 2025 - present)

- Characterization of high-resolution and spectral radiation detectors for advancing radiation measurement and imaging technologies
- Machine learning-based image processing for the identification of various radiation particles

Early Career Research Affiliate, School of Archaeology, University of Oxford, UK (Nov. 2024-Nov. 2025)
Postdoctoral Researcher, School of Archaeology, University of Oxford, UK (Nov. 2020-Nov. 2024)

- Advanced gamma-ray spectrometry (NaI/Ge probe) techniques for determining naturally occurring radionuclides (K, U, and Th) and environmental dose rates
- Developed techniques for spatially resolved mapping of radiation and K, U, and Th radionuclides using a silicon-based time-pixelated detector
- Developed instrumentation for spatially resolved radiation measurements based on infrared-radiofluorescence (IR-RF) signals from feldspar in sediments and rocks
- Studied feldspar's physical properties and elemental properties using synchrotron X-ray Spectroscopy
- Taught 'Advanced Luminescence Dating Methods' to M.Sc. Archaeological Science students at the University of Oxford. (Role: Ad-hoc Teaching Fellow, 2020-2024)
- Provided support for instrumental upgrades, commissioning, operation, and maintenance
- Led and participated proactively in writing journal papers and giving talks at conferences

Ph.D. Research, Department of Physics, Technical University of Denmark (DTU) (2016-2020)

- Developed analytical methods and instrumentation for quantifying radiation doses in natural minerals
- Established a new radiometric dating method based on the infrared photoluminescence (IRPL) signal in feldspar minerals
- Utilized high-resolution Germanium (HPGe) gamma-ray spectrometry for radiation dosimetry
- Performed SEM, XRD, and XRF analyses on samples such as rocks containing feldspar and quartz
- Assisted B.Sc. (Eng.) students with Engineering Physics and numerical problem-solving at the Technical University of Denmark (Role: Teaching Assistant, Jan.-Dec. 2018)

PUBLICATIONS

- **Kumar, R.,** Frouin, M., & Schwenninger, J-L (2025). *Spatially resolved infrared-radiofluorescence measurements for single-grain feldspar dating*. (**Under review in Radiation Physics and Chemistry**)

- Aouadi, N., Candy, I., Gasmi, N., Peat, D., Schwenninger, J-L, Mekki, H., Belhouchet, L., **Kumar, R.**, et al. (2025). *Occupation of a humid Sahara by Homo sapiens during MIS 5: evidence from a megalake in Southern Tunisia*. (**Under review: Nature Communications**)
- **Kumar, R.,** Wood, D., Frouin, M., Plackett, R., Osborne, C., Hill, M. A., & Schwenninger, J. L. (2026). *Preparing Timepix3 for deployment in low-radioactivity natural settings: an integrated workflow for charged particle detection and imaging*. Journal of Instrumentation, 21(01), C01010.
- Mathieu Duval, Miren delVal, María Jesús, Lee Arnold, Verónica Guilart**, Kumar, R.,** et al (2024*). A new reference block for field gamma spectrometry applications in ESR and luminescence dating.* Ancient TL, 42(2), 3-13.
- Sontag-González, M., **Kumar, R.,** Schwenninger, J. L., Thieme, J., Kreutzer, S., & Frouin, M. (2024). *Synchrotron-based elemental mapping of single grains to investigate variable infrared-radiofluorescence emissions for luminescence dating*. Geochronology, 6, 77–88.
- **Kumar, R.,** Kook, M., & Jain, M. (2022*). Does hole instability cause anomalous fading of luminescence in feldspar?* Journal of Luminescence, 252, 119403.
- **Kumar, R**., Frouin, M., Gazack, J., & Schwenninger, J. L. (2022). *OxGamma: A MATLAB-based application for the analysis of gamma-ray spectra*. Radiation Measurements (Rad. Meas.), 154, 106761.
- Riedesel, S., **Kumar, R.**, Duller, G. A. T., Roberts, H. M., Bell, A. M. T., & Jain, M. (2021). *Site-selective characterisation of electron trapping centres in relation to chemistry, structural state, and mineral phases present in single crystal alkali feldspars*. Journal of Physics D: Applied Physics, 54(38), 385107.
- **Kumar, R.**, et al. (2021). *Sediment dating using infrared photoluminescence*. Quat. Geoch., 62, 101147.
- Menon, S. G., Kunti, A. K., Kulkarni, S. D., **Kumar, R.**, Jain, M., Poelman, D., & Swart, H. C. (2020). *A new microwave approach for the synthesis of green emitting Mn2+-doped ZnAl2O4: A detailed study on its structural and optical properties*. Journal of Luminescence, 226, 117482.
- **Kumar, R.**, et al. (2020). *Site-selective mapping of metastable states using electron-beam induced luminescence microscopy*. Scientific reports, 10(1), 1-14.
- Jain, M., **Kumar, R.**, & Kook, M. (2020). *A novel coupled RPL/OSL system to understand the dynamics of the metastable states*. Scientific reports, 10(1), 1-15.
- **Kumar, R.**, Kook, M., & Jain, M. (2020). *Understanding the metastable states in K-Na aluminosilicates using novel site-selective excitation-emission spectroscopy*. J. Phys. D: Appl. Phys., 53(46), 465301.
- Niyonzima, P., Sawakuchi, A. O., Jain, M., **Kumar, R.**, Mineli, T. D., del Río, I., & Pupim, F. N. (2020). *Radiofluorescence of quartz from rocks and sediments and its correlation with thermoluminescence and optically stimulated luminescence sensitivities*. Ancient TL, 38(1), 11-20.
- Riedesel, S., King, G. E., Prasad, A. K., **Kumar, R.**, Finch, A. A., & Jain, M. (2019). *Optical determination of the width of the band-tail states, and the excited and ground state energies of the principal dosimetric trap in feldspar.* Radiation Measurements, 125, 40-51.
- **Kumar, R.**, Kook, M., Murray, A. S., & Jain, M. (2018). *Towards direct measurement of electrons in metastable states in K-feldspar: Do infrared-photoluminescence and radioluminescence probe the same trap?* Radiation Measurements, Volume 120, 2018, Pages 7-13, ISSN 1350-4487.
- Kook, M., **Kumar, R.**, Murray, A. S., Thomsen, K. J., & Jain, M. (2018). *Instrumentation for the non-destructive optical measurement of trapped electrons in feldspar*. Rad. Meas., 120, 247-252.

GRANTS

FCWO travel grant by the University of Ghent for attending the 26th International Workshop on Radiation Imaging Detectors (IWORID 2025) in Slovakia

SBU/BNL Seed grant by National Synchrotron Facility, Brookhaven National Laboratory (BNL) and Stony Brook University (SBU), USA ($44,870, Role: Research Associate)

Travel Grant for attending the Ph.D. open day 2016 at ICFO, Spain

PROFESSIONAL ENGAGEMENT

Invited Talks

- Infrared radiofluorescence (IR-RF) emission in K-feldspar for dating by imaging. Martin Aitken Seminar (2024), University of Oxford, UK
- Infrared Photoluminescence in Feldspar: Pioneering Insights and Dating Potential. Workshop on luminescence dating (Feb. 2024), Physical Research Laboratory (PRL), India
- IR-OSL/PL/RF emissions in feldspar. IR-RF workshop 2022, Giessen University, Germany
- Infrared Photoluminescence (IRPL)- A new luminescence dating technique. Climate and Chronology seminar series 2021. University of Oxford

Peer Reviewer and Editor

Radiation Measurements, Nuclear Science and Techniques, Physics and Chemistry of Minerals, Quaternary Geochronology, Gchron., Journal of Radiological Protection, Qeios, Geochronometria, Ancient TL (Editor)

Conferences Organized

- The 2024 UK Luminescence and ESR dating (UKLum24) conference (September 2024)

Outreach Activities

- Represented DTU at the 12th International Graduate School of Science and Engineering Forum on 'Science with borders' in Germany (May 2018)
- Delivered a webinar to both the public and high school students (Sep. 2021)
- Demonstrated scientific experiments to school students

Software Development

- Developed OxGamma application for gamma-ray spectrum analysis (MATLAB-based application)

AWARDS AND FELLOWSHIPS

Scientific Excellence Award for the best science at a conference in Denmark

Peter Townsend Award for the most innovative idea at a conference in South Africa

Ph.D. Scholarship at DTU, Denmark, for Ph.D. studies

ASPIRE Fellowship for carrying out a thesis/project at IIT Bombay

Research Fellowship for carrying out the Master's Project at IIT Bombay

Research Fellowship for carrying out a summer internship in UCC, Ireland

Summer Research Fellowship for carrying out a summer internship at IIT Madras

Summer Research Scholarship, University of Queensland, Australia

Nalanda Endowment Award (for securing the first rank in the first semester of Int. M.Sc.)

CONFERENCE PRESENTATIONS

- International Workshop on Radiation Imaging Detectors (IWORID 2025), Bratislava, Slovakia (Talk)
- UK Conference on Luminescence and Electron Spin Resonance Dating 2024 (UKLum24), UKLum22 (UK), UKLum19 (Denmark), and UKLum18 (UK). (Talk)
- International Conference on Luminescence and Electron Spin Resonance Dating 2023, Denmark. (Talk)
- Conference for NSLS-II & CFN Joint Users 2022, online (BNL, USA). (Poster)
- Online Luminescence and Electron Spin Resonance Dating (LED) conference, 2021. (Poster)
- International Conference on Solid-State Dosimetry (SSD) 2019, Japan. (Talk)
- Int. Conference on Luminescence and Electron Spin Resonance Dating 2017, South Africa. (Talk)