Postdoctoral researcher Dr. Monika Devi-Narrative CV

Crystalline imperfections, trapped electrons and radiations—Electron spin resonance and luminescence unveil time's hidden stories

Monika Devi is a postdoctoral researcher at the Environmental Radioactivity and Nuclear Dating Centre at Babeș-Bolyai University (BBU) in Cluj-Napoca, Romania. She completed her bachelor's degree from Himachal Pradesh University, Shimla, India, securing the top rank in her college. She then pursued her master's degree at Panjab University, Chandigarh, India, where she also ranked third in the university. She has taught bachelor's and master's students preparing for entrance exams at Bansal Academy, Chandigarh. She did a summer internship at the Department of Physics & Astrophysics, University of Delhi, New Delhi, where she worked on the measuring the thermal neutron capture cross section of ^{27}Mg using gamma ray spectroscopy and developed her interest in research.

Following her passion for research, she cleared several prestigious national exams in India, including the CSIR-UGC Junior Research Fellowship, Graduate Aptitude Test in Engineering (GATE) and Joint Entrance Screening Test (JEST) in Physics, paving the way for her doctoral studies. She started her doctoral research at the Physical Research Laboratory (PRL), Ahmedabad / Indian Institute of Technology, Gandhinagar, India and focusing on "Multispectral Luminescence Studies: Methodological Developments and Applications". She worked on understanding the luminescence production mechanism of natural mineral potassium feldspar. She explored different spectral regions of potassium feldspar to assess their athermal stability. Her research led to the identification of a new luminescence signal, termed post-violet infrared stimulated luminescence (pVIRSL), which demonstrated stability over geological time periods. The signal was generated from photo-transferred charges during violet stimulation, and these charges can be accessed using IR stimulation. She then developed a single aliquot regenerative dose protocol for pVIRSL (pVIR-SAR), demonstrating its reliability for ages up to 500 ka with improved precision. The pVIR-SAR protocol proved effective for both fine (4–11 μm) and coarse (90–150 μm) grain polymineral samples, demonstrating that mineral separation is not required. Her research proposed the existence of deep traps below the principal trap in feldspars and offered new insights into the luminescence production mechanism of potassium feldspar.

Alongside methodological developments, she worked with samples from various regions in India, including aeolian, fluvial, pottery, and volcanic ash samples from archaeological and geological sites. She has experience in applying various protocols for the dating of quartz and feldspar for burial dating. She also has experience in various models such as central age model, minimum age model and finite mixture model for age estimations for burial luminescence dating.

In her postdoctoral research at PRL, she explored the application of luminescence techniques to estimate exposure times of rock surfaces. The objective of the study was to develop an understanding of the sensitivity of the luminescence depth model to various parameters in the context of the Himalaya and to understand the role of geological factors such as desert varnish and micro fractures inside the rocks, on the accuracy of exposure ages. Her study reported the challenges associated dating old rock (>1 ka) surface exposed samples.

Her past research deepened her interest in crystal defects responsible for luminescence signals in natural minerals. Currently, she is pursuing these interests as a postdoctoral researcher in the European Research Council (ERC) Consolidator Grant-101043356, awarded to Prof. Alida Timar-Gabor, "PROGRESS – Reading provenance from ubiquitous quartz: understanding the changes occurring in its lattice defects in its journey in time and space by physical methods". Her current research investigates quartz luminescence sensitivity as an indicator of sediment provenance. She is utilizing electron spin resonance (ESR) spectroscopy and luminescence to study changes in point defects within quartz crystals over geological time and under various geological conditions, including metamorphism.

She has expertise in instruments such as the Thermoluminescence/Optically Stimulated Luminescence (TL/OSL) Reader, High-Purity Germanium (HPGe) Detector for gamma-ray spectrometry of natural rocks and sediments, ZnS(Ag) alpha counter, NaI(Tl) scintillation detector, X-Ray Diffraction (XRD) for material characterization, and Electron Spin Resonance (ESR) for the study of unpaired defects in crystals.

Annex- Career timeline and listed achievements

Personal Information

Family name, First name: **Monika Devi**

Date of birth: 19 September 1994

Researcher unique identifier(s) ORCID 0000-0001-8672-0276

Google Scholar: https://scholar.google.com/citations?user=bavqK1wAAAAJ&hl=en

Research gate: https://www.researchgate.net/profile/Monika-Devi?ev=hdr_xprf

Website: https://sites.google.com/view/drmonikadevi/dr-monika-devi

h-index=3 (since 2020)

Education

2023: Ph.D. in Physics (2018 – 2023), Atomic, Molecular, and Optical Physics Division, Physical Research Laboratory (PRL), Ahmedabad / Indian Institute of Technology, Gandhinagar, India., supervised by Dr. Naveen Chauhan. PhD thesis title: "*Multispectral Luminescence Studies: Methodological Developments and Applications."*

2016: Master's degree in Physics, J.C.D.A.V. College, Dasuya, Panjab University, Chandigarh, India.

2014: Bachelor's degree in Physics, Chemistry, Mathematics, Govt. College Daulatpur Chowk, Himachal Pradesh University, Shimla, India.

Current positions

2024-present: Postdoctoral researcher in European research Council (ERC) Consolidator Grant 101043356, HORIZON EUROPE, *PROGRESS - Reading provenance from ubiquitous quartz: understanding the changes occurring in its lattice defects in its journey in time and space by physical methods*", 2023-2027, awarded to Prof. Alida Timar-Gabor.

Previous positions

- **2023-2024**: Postdoctoral researcher at Atomic, Molecular, and Optical Physics Division, Physical Research Laboratory, Ahmedabad, India. Mentor: Dr. Naveen Chauhan, Topic: Application of luminescence for surface exposure studies.

- **2020- 2023:** Senior Research Fellow, Atomic, Molecular, and Optical Physics Division, Physical Research Laboratory, Ahmedabad, India. Mentor: Dr. Naveen Chauhan.
- **2018-2020:** Junior Research Fellow, Atomic, Molecular, and Optical Physics Division, Physical Research Laboratory, Ahmedabad, India. Mentor: Dr. Naveen Chauhan.
- **June 2020- December 2020:** Teaching assistant of credited coursework on Research Methodology at Physical Research Laboratory, Ahmedabad.
- **February 2017-March 2018**: Instructor, Bansal Academy, Chandigarh, for entrance exams like CSIR-UGC Junior Research Fellowship, Graduate Aptitude Test in Engineering (GATE) in Physics and Joint Entrance Screening Test (JEST) in Physics and Joint Admission Test for Masters (IIT-JAM).
- **April-June 2018:** Junior Research Fellow- Defence Geoinformatics Research Establishment (DGRE) Himparisar, Chandigarh, India. Mentor: Dr. H.S. Negi and Dr. Yogesh C. Nagar.
- **June-July 2016:** Summer Intern-Department of Physics and Astrophysics, University of Delhi, New Delhi, India. Topic: Measurement of cross-section of the radioisotope 27 Mg @ low energy neutron induced reactions. Mentor: Dr. Samit Mandal and Dr. Unnati.

Supervision of graduate students

Co-supervisor of 1 master`s dissertations: Mr. Sachin Joshi and 1 summer intern: Mr. Parth Khanduri.

Memberships of scientific societies

Member of American Geophysical Union (AGU),

Member of European Geosciences Union (EGU).

List of Publications

1. Anil, D., **Devi, M.,** Jha, G., Khan, Z., Mahesh, V., Ajithprasad, P., Chauhan, N. 2024. Deep-rooted Indian Middle Palaeolithic: Terminal Middle Pleistocene lithic assemblage from Retlapalle, Andhra Pradesh, India. PloS one, 19(8), e0302580, https://doi.org/10.1371/journal.pone.0302580
2. **Devi, M.,** Chauhan, N., Singhvi, A.K., 2024. Quaternary Geochronology Post-violet infrared stimulated luminescence (pVIRSL) dating protocol for potassium feldspar. Quat. Geochronol. 79, 101487. https://doi.org/10.1016/j.quageo.2023.101487.
3. Anil, D., **Devi, M.,** Ati, N., C P, M., Khan, Z., Mahesh, V., Ajithprasad, P., Chauhan, N., Pandey, A. and Jha, G., 2023. Diversity of MIS 3 Levallois technology from

Motravulapadu, Andhra Pradesh, India-implications of MIS 3 cultural diversity in South Asia. Frontiers in Earth Science, 11. https://doi.org/10.3389/feart.2023.1302419

4. Anil, D., **Devi, M.,** Blinkhorn, J., Smith, V., Sanghode, S., Mahesh, V., Khan, Z., Ajithprasad, P., Chauhan, N., 2023. Youngest Toba Tuff deposits in the Gundlakamma river basin, Andhra Pradesh, India and their Role in Evaluating Late Pleistocene Behavioural Change in South Asia. Quaternary Research. 1–12. https://doi.org/10.1017/qua.2023.13

5. **Devi, M.,** Chauhan, N., Rajapara, H., Joshi, S., Singhvi, A.K., 2022. Multispectral athermal fading rate measurements of K-feldspar. Radiat. Meas. 156, 106804. https://doi.org/10.1016/j.radmeas.2022.106804.

6. Anil, D., Chauhan, N., Ajithprasad, P., **Devi, M.,** Mahesh, V., Khan, Z., 2022. An Early Presence of Modern Human or Convergent Evolution? A 247 ka Middle Palaeolithic Assemblage from Andhra Pradesh, India. J. Archaeol. Sci. Reports 45, 103565. https://doi.org/10.1016/j.jasrep.2022.103565.

Conference Proceedings

7. Unnati, Devi, M., Kumari, N., Kumar, S., Mandal, S., 2016. Measurement of cross-section of the radioisotope 27 Mg @ low energy neutron induced reactions. Proceedings of the DAE-BRNS Symp. on Nucl. Phys. 61.

Published Abstracts

8. **Devi M.,** Khanduri P., Chauhan N., Advancements and Challenges in Luminescence Rock Surface Exposure Dating: A Case Study from the Himalayas.

9. **Devi M.,** Chauhan N., TL and OSL trap correlation studies to understand the luminescence mechanism in feldspar, Ancient TL, Vol. 39, No. S, 2021 – Special Issue - LED2021 Abstracts

Presentations at national and international conferences

1. **Devi M.,** Khanduri P., Chauhan N., Advancements and Challenges in Luminescence Rock Surface Exposure Dating: A Case Study from the Himalayas, American Geophysical Union-2024, Washington, D.C., United States, 9-13 December, 2024. *(Online-Oral)*
2. **Devi M.,** Singhal M., Khanduri P., Chauhan N., Singhvi A.K., Application of Post-violet IR Single Aliquot Regenerative (pVIR-SAR) Dose Protocol for Polymineral Fine- and Coarse- grain Samples, NWLDW-2024, Desert Research Institute, Reno, NV, June 11-14, 2024. *(Online-Oral)*
3. **Devi M.,** Singhal M., Khanduri P., Chauhan N., Singhvi A.K., Application of Post-violet IR Single Aliquot Regenerative (pVIR-SAR) Dose Protocol for Polymineral Fine- and Coarse- grain Samples, 5th Workshop on Luminescence Dating and

Applications-2024, Physical Research Laboratory, Ahmedabad, February 21-23, 2024. (Oral)

4. **Devi M.,** Khanduri P., Chauhan N., Luminescence Rock Surface Exposure Studies in Ladakh, International Conference on Recent Trends in Science and Engineering-2024, Department of Physics, GOVT. V.Y.T. PG. Autonomous college, Durg, Chhattisgarh in association with Physics Department, IIT Bhilai, February 8-10, 2024. *(Online-Oral)*
5. **Devi M.,** Chauhan N., Singhvi A.K., Applicability of Post Violet-Infrared Single Aliquot Regenerative (pVIR-SAR) Dose Protocol for Different Types of Samples using Potassium Feldspars, 4th Workshop on Luminescence Dating and Applications-2023, Indian Institute of Science Education and Research, Kolkata, February 1-3, 2023. (Oral)
6. **Devi M.,** Chauhan N., Singhvi A.K., Post Violet-Infrared Stimulated Luminescence (pVIRSL) Dating using Potassium Feldspar, 6th Asia Pacific Luminescence and ESR dating (APLED-2022), September 26-28, 2022. *(Online-Oral)*
7. **Devi M.,** Chauhan N., Singhvi A.K., New Developments in Probing Non-fading traps in K-Feldspar using Multispectral Studies: Implications to Luminescence Dating, National Conference on Luminescence and its Applications (NCLA-2021), December 9-11, 2021. *(Online-Oral)*
8. **Devi M.,** Chauhan N., Singhvi A.K., TL and OSL trap correlation studies to understand the luminescence mechanism in feldspar, 16th International Luminescence and Electron Spin Resonance Dating Conference (LED-2021), September 13-17, 2021. *(Online-Oral)*
9. **Devi M.,** Basics of Luminescence and its Applications in Geology, National Seminar on Geoarchaeology, Department of Geology and Environmental Science, Christ College, Irinjalakuda, Thrissur, Kerala, January 29, 2020. ***(Invited Talk)***