

Dr. Swatantar Kumar

Microbial Biogeochemist

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Ganesh Bazar, Baijnath, Kangra, Himachal Pradesh, India 176125



EDUCATION



- **Doctor of Philosophy (Dr. rer. nat.)** 2014–2018
Friedrich Schiller University, Jena, Germany
Honors: **Max Planck Graduate Research Fellow** (IMPRS-gBGC), **JSMC fellow** (LIFE)
Thesis: **Elucidation of microbial nitrogen cycle in the subsurface- “Key microbial players and processes”**
- **Master of Technology (Biotechnology)** 2009–2011
M.M. University, Ambala, India
Honors: First division with distinction; CGPA 9.36
Thesis: **Biochemical & molecular characterization of sulfate-reducing bacteria from deep-sea sediments of offshore Goa (The Arabian Sea)**
- **Master of Science (Biochemistry)** 2006–2008
Rajasthan University, Jaipur, India
Honors: First division

RESEARCH EXPERIENCE



- **Post Doctorate Research Associate, Ecosystem Science** September 2018–October 2020
Pacific Northwest National Laboratory, Department of Energy, USA
- Project I.** Investigated how microbial and root activity together can modify the chemistry of rhizosphere on a micrometre to millimetre scale, specifically the availability of phosphorous and fresh photosynthate carbon. **Analytical techniques:** Spatial-temporal resolution of porewater orthophosphate availability based on UV-spectrophotometer, root-blotting based non-destructive analysis of phosphatase activity and total protein distribution, stable isotope $^{13}\text{CO}_2$ incubation-based quantification of organic matter rhizodeposition in response to inorganic or organic phosphorous resources (IRMS; data analysis).

Project II. a). Investigated stoichiometric regulation of priming effects in the hyporheic zone sediments (aquatic priming). **b).** Biogeochemistry of pyrogenic and non-pyrolytic terrestrial organic matter input on freshwater river sediments across the United States.

Analytical techniques: Optodes based non-invasive quantification of aerobic respiration activity in batch reactors, ultrahigh-resolution metabolomics utilizing FTICR-MS and NMR on the sediment extracts (sample prep and data analysis).
- **Scientific Assistant, Institute of Biodiversity** June 2017–April 2018
Friedrich Schiller University, Germany

Analytical techniques: Microbial diversity analysis in the groundwater driving nitrogen loss using DNA and RNA sequencing, stable isotope ^{15}N based tracing assays using IRMS-GC, functional genes-based qPCR and RT-qPCR for the chemolithoautotrophic bacterial enrichment and cultures based functional assays

- **Research Scientist – B, Indian Arctic Programme** **July 2013–May 2014**
MoES-National Centre for Polar and Ocean Research, India (erstwhile NCAOR)

Engaged with the India's Arctic research program with thrust on climate change in the circumpolar north. Organized successful scientific expeditions to the Indian Arctic research station, Himadri at the International Arctic Research Base at Ny-Ålesund, Svalbard, Norway.

Assisted Indian scientists for carrying out research in disciplines like Glaciology, Atmospheric sciences and Biological sciences in cooperation with multiple national and international organizations such as Kings Bay AS (Ny-Ålesund), Indian as well as Norwegian Foreign Services, Ministry of Earth Sciences; India and premier Indian research Institutes (IIT's).

- **Project Assistant – II, Biological Oceanography Division** **June 2011–June 2013**
CSIR-National Institute of Oceanography, India

Research focused on microbial sulfur-cycling and its link to the degradation of organic matter in the oxygen minimum zone, off south-west coast of India

Analytical techniques: $^{35}\text{SO}_4^{2-}$ radioactive isotope technique, liquid scintillation counting, hydro-biogeochemistry and anaerobic microbiology. Extensive offshore sampling of sea water and sediments at multiple transects and sample analysis onboard the research vessels.

TEACHING EXPERIENCE



- **Assistant Professor, Academic and Exam Coordinator,** **January 2022–Current**
Department of Biotechnology Engineering and Food Technology, Chandigarh University, India

PUBLICATIONS IN PREPARATION/SUBMISSION



- **Kumar S., Cleary D.M., Lin V., Huggett N.L., McGrady M. and Moran J. Elucidating distribution of microbial- and root-derived phosphatase activities in the rhizosphere depending upon availability of organic/inorganic form of P and allocation of C as root exudates.** *in preparation -available upon request.*
- **Kumar S., Garayburu-Caruso V., Renteria L., Wells J.R., Danczak R.E., Chu R.K., Tolic N., Hoyt D.W., Kim Y.M., Burnet M.C., Wietsma T.W., Mcfarland D.P., Scheibe T.D., Stegen J. and Graham E. Investigating stoichiometric regulation of priming effects in the hyporheic zone.** *in preparation -available upon request.*
- **Kumar S., Garayburu-Caruso V., Myers-Pigg A., Sengupta A., Kaufman M.H., Renteria L., Joshua T.M., Danczak R.E., Chu R.K., Hoyt D.W., Kim Y.M., Burnet M.C., Scheibe T.D., Stegen J. and Graham E. Response of organic matter mineralization and microbial activity in typical freshwater aquatic sediments following the addition of leaf derived pyrogenic and non-pyrogenic organic matter.** *in preparation -available upon request.*
- **SamKamaleson A., Fernandes C.E.G., Gonsalves M.J.B.D., Kumar S., Lokabharathi P.A. Total suspended matter drives sulfate-reducing activity in the near shore and offshore waters during upwelling in the Arabian Sea.** *in preparation -available upon request.*

KEY PUBLICATIONS



- Kumar S., Herrmann M., Thamdrup B., Schwab V.F., Geesink P., Trumbore S., Totsche K-U., Küsel K. (2017) **Nitrogen loss from pristine carbonate-rock aquifers of the Hainich Critical Zone Exploratory (Germany) is primarily driven by chemolithoautotrophic anammox processes.** *Front. Microbiol.* doi:10.3389/fmicb.2017.01951
- Kumar S., Herrmann M., Düver A., Hilke I., Frosch T., Totsche K-U., Küsel K. (2018) **Thiosulfate- and hydrogen-driven autotrophic denitrification by a microbial consortium enriched from groundwater of an oligotrophic limestone aquifer.** *FEMS Microbiol. Ecol.* doi:10.1093/femsec/fiy141
- Knelman J.E., Schmidt S.K., Garayburu-Caruso V.A., Kumar S., Graham E.B. (2019) **Multiple, compounding disturbances in a forest ecosystem: Fire increase susceptibility of soil edaphic properties, Bacterial Community structure, and function to change with extreme precipitation event.** *Soil Systems.* 3(2), 40; doi:10.3390/soilsystems3020040
- Geesink P., Tyc O., Küsel K., Taubert M., van de Velde C., Kumar S., Garbeva P. (2018) **Growth promotion and Inhibition induced by interactions of groundwater bacteria.** *FEMS Microbiol. Ecol.* 94-11; doi: 10.1093/femsec/fiy164
- SamKamaleson A., Gonsalves M.J.B.D., Kumar S., Lokabharathi P.A. (2019) **Spatio-temporal variations in sulfur-oxidizing and sulfate-reducing bacterial activities during upwelling, off south-west coast of India.** *Oceanologia* 427-444, doi: 10.1016/j.oceano.2019.03.00
- Garayburu-Caruso V., Danczak R.E., Stegen J., Renteria L., McCall M., Goldman A.E., Chu R.K., Toyoda J., Resch T.C., Joshua T.M., Wells J., Fansler S., Kumar S. and Graham E. (2020) **Using community science to reveal the global chemogeography of river metabolomes.** *Metabolites*; doi: 10.3390/metabo10120518
- Alan Rod K., Patel K.F., Kumar S., Cantando E., Leng W., Kukkadapu R.K., Qafoku O., Bowden M., Kaplan D.I. and Kemner K.M. (2020) **Dispersible colloid facilitated release of organic carbon from two contrasting riparian sediments.** *Frontiers in Water.* doi: 10.3389/frwa.2020.560707
- Blohm A., Kumar S., Knebl A., Herrmann M., Kusel K., Popp J., and Frosch T. (2021) **Activity and electron donor preference of two denitrifying bacterial strains identified by Raman Gas Spectroscopy.** *Analytical and Bioanalytical Chemistry*, doi: 10.1007/s00216-021-03541-y
- Gupta, M., Kumar, S., Mishra, R. K., Srivastava, V., & Dwivedi, V. (2023). **Assessing the mitigation of Pb toxicity by the synergistic application of Oxalic acid and salicylic acid on maize plants for a duration of 15, 30 and 45 days.** *Afr.J.Bio.Sc.* 6(9) (2024) ISSN: 2663-2187 <https://doi.org/10.33472/AFJBS.6.9.2024.3987-4003>
- Gupta, M., Dwivedi, V., Kumar, S., Patel, A., Niazi, P., & Yadav, V. K. (2024). **Lead toxicity in plants: mechanistic insights into toxicity, physiological responses of plants and mitigation strategies.** *Plant Signaling & Behavior*, 19(1), doi:10.1080/15592324.2024.2365576
- Gupta, M., Kumar, S., Dwivedi, V., Gupta, D. G., Ali, D., Alarifi, S., ... Yadav, V. K. (2024). **Selective synergistic effects of oxalic acid and salicylic acid in enhancing amino acid levels and alleviating lead stress in Zea mays L.** *Plant Signaling & Behavior*, 19(1), doi:10.1080/15592324.2024.2400451

SCIENTIFIC OUTREACH (selected)



- Kumar S., Herrmann M., Lange P., Totsche K.U., Thamdrup B., Trumbore S., Küsel K. (2016). **Diversity and distribution of anammox bacteria and denitrifiers in pristine limestone aquifers**. Annual Conference of the Association for General and Applied Microbiology (VAAM), Marburg, Germany.
- Kumar S., Herrmann M., Schwab V.F., Lange P., Totsche K.U., Thamdrup B., Trumbore S., Küsel K. (2016). **Contribution of anammox versus denitrification to nitrate removal in pristine aquifers**. 16th International Symposium on Microbial Ecology - ISME 2016 Conference, Montreal, Canada.
- Kumar S., Herrmann M., Düver A., Hilke I., Frosch T., Trumbore S., Totsche K.U., Küsel K. (2017). **Thiosulfate- and hydrogen-driven autotrophic denitrification by a model consortium enriched from groundwater of an oligotrophic limestone aquifer**. ICoN5 Conference, Vienna, Austria.
- Kumar S., Garaburu-Caruso V., Reneteria L., Wells J.R., Danczak R., Chu R.K., Tolic N., Hoyt D.W., Mcfarland D.P., Scheibe T.D.S., Stegen J., Graham E. (2019). **Investigating stoichiometric regulation of priming effects in the hyporheic zone**. AGU Conference, San Francisco, U.S.A.

SCIENTIFIC ACHIEVEMENTS



- Patent Published. Title of Innovation: **BIOGROFE – Biotechnology Global Research Opportunities For Engineers**, 2024, Patent application no. 202411089369
- Reviewer for Scientific Reports; Nature research Journal, Soil Biology and Biochemistry, Biogeosciences and FEMS Microbial Ecology
- Invited talk “Biogeochemical processes in the pristine groundwater ecosystem” at Soil and Water Research Institute, Ceske Budejovice, Czech Republic
- Organising member of 6th International conference on Microbial Communication, **MiCom 2017** in Germany
- **Scientific cruise** participation for 40 days to study upwelling phenomenon in the near-shore and offshore waters during upwelling in the west coast of the Arabian Sea

RESEARCH COLLABORATIONS



- Susan Trumbore and Ines Hilke, Max Planck Institute for Biogeochemistry, Jena, Germany
- Kirsten Kusel and Martina Herrmann, Friedrich Schiller University Jena, Germany
- James Stegen, Emily Graham and James Moran, Pacific Northwest National Laboratory, U.S.A.
- Bo Thamdrup, the University of Southern Denmark, Denmark
- Torsten Frosch, Leibniz Institute of Photonic Technology, Germany
- Valérie F. Schwab, Friedrich Schiller University Jena, Germany
- Kai-Uwe Totsche, Friedrich Schiller University Jena, Germany

REFERENCE



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