Dr Pinaki Sar

Professor, Department of Biotechnology, Indian Institute of Technology Kharagpur Phone: +913222283754, Email: Email: psar@bt.iitkgp.ac.in; sarpinaki@yahoo.com Academic website: <u>http://www.iitkgp.ac.in/department/BT/faculty/bt-psar</u> Google scholar profile: <u>https://scholar.google.co.in/citations?hl=en&user=tV8YrpQAAAAJ</u>

Research interest: Microbial Genomics and Metagenomics, Geomicrobiology, Deep Biosphere, Bioremediation, Astrobiology

Current areas of research:

- Deep Life : Microbial life within the deep, hot, terrestrial subsurface
- •Carbon and energy metabolism in extreme and oligotrophic deep subsurface; Acetogenesis
- Isolation and characterization of extremophilic microorganisms from deep terrestrial subsurface
- Microbial biodegradation of plastics and bioremediation of landfill waste
- Microbial ecology of arsenic contaminated soil and groundwater system
- Impact of amines used in carbon capture technology on terrestrial and aquatic microbial communities

Education:

Ph. D in Botany, 1999, Banaras Hindu University, Varanasi, 221005, India
M. Sc. in Botany, 1993. The University of Burdwan, Burdwan, 713104, India.
B. Sc. (Botany Honours) 1991. The University of Burdwan, Burdwan, 713104, India.

Award/Fellowship:

- •Fellow of West Bengal Academy of Science and Technology (2020)
- •Recipient of Open Competitive Seed Challenge Grants (SGBSI) from IIT Kharagpur for setting up genome sequencing (NGS) facility (2016)
- Census of Deep Life (CoDL), Deep Carbon Observatory, USA award on metagenome sequencing (2016)
- Recipient of Rapid Grant for Young Investigator award from Department of Biotechnology, Govt. of India (2007)
- Recipient of Department of Science and Technology BOYSCAST fellowship (2006)
- Recipient of Department of Atomic Energy Young Scientist award, (2003)
- Recipient of Department of Science and Technology Fast Track award (2003)
- Recipient of Dr. K. S. Krishnan Research Associateship from Department of Atomic Energy, Govt. of India (2000)
- Recipient of Senior Research Fellowship (extended) from Council of Scientific and Industrial Research.
- Recipient of Department of Biotechnology, Govt. of India, doctoral research fellowship (1994-1999).
- Recipient of National merit scholarship in B.Sc. (1993)

Positions held :

2018- Continuing Professor, Indian Institute of Technology Kharagpur, India

- 2011-2018 Associate Professor, Indian Institute of Technology, Kharagpur, India
- 2004-2011 Assistant Professor, Indian Institute of Technology, Kharagpur, India
- 2007-2008 BOYSCAST fellow at Rice University, Houston, USA
- 2002-2004 Lecturer, Birla Institute of Technology and Science, Pilani, India

2000-2002 Dr KS Krishnan Research Associate (KSKRA) at Bhabha Atomic Research Centre, Mumbai, India

Membership of reputed agency/professional bodies:

National

- •Association of Microbiologists of India (AMI), Life member
- •Biotech Research Society of India (BRSI), Life member
- •Research Monitoring Committee of Lakes & Waterways Development Authority (LAWDA), Government of J and K

International

- American Society for Microbiology (ASM), Annual member
- •ISME-International Society for Microbial Ecology (ISME), Annual member
- •Deep Carbon Observatory (DCO), member
- European Federation of Biotechnology (EFB), Annual member

Research grants received:

Ongoing:

- 1) Carbon and energy metabolisms of deep life within the granitic basement of Koyna seismogenic zone, Funded by Funded by Ministry of Earth Sciences Govt. of India (2022-2025). Total fund sanctioned: 49,42,000. PI
- 2) An integrated experimental vis-à-vis in-silico approach for system-level understanding of CO₂ fixation abilities of chemoautotrophic microbial communities derived from deep subsurface rocks for their potential application in third generation biorefineries, Funded by Department of Science & Technology (Science & Engineering Research Board), Govt. of India (2022-2025). Total fund sanctioned: 50,22,952. PI
- 3) Understanding landfill microbiome and application for bioremediation of environmental pollutants, Funded by Tata Consultancy Services (**2018-2023**). Total fund sanctioned: 51,11,760. **PI**
- 4) Understanding structure function and evolution of regulatory networks with a special emphasis on human diseases-BIC at department of biotechnology, IIT-Kharagpur, Funded by Department of Biotechnology, Govt. of India (**2022-2027**). Total fund sanctioned: 140,21,164. **Co-PI**
- 5) Sustainable operation of post-combustion capture plants, Funded by Department of Science & Technology (2021-2024). Total fund sanctioned: 105,01,379. Co-PI

Completed:

- 1) Development and demonstration of integrated instrumentation system for quantitative detection of water contaminants with information database for surveillance of waterborne disease (Co-PI), (**2018-2021**), Funded by: Department of Science and Technology, Govt. of India. Total fund sanctioned: 24,36,000. **PI**
- Microbiology of deep granitic subsurface of Koyna-Warna region, Funded by Ministry of Earth Sciences Govt. of India (2017-2020). Total fund sanctioned: 112,88,000. PI
- Arsenic in food chain: problems and perspectives of local farming communities in India and Bangladesh (2019-2019), Funded by The University of Sheffield of Western Bank, United Kingdom. Total fund sanctioned: 3,64,000. Co-PI
- 4) Exploring the effect arsenic contaminated groundwater on rice paddy soil (RPS) of West Bengal on RPS microbiome, RPS biogeochemical cycles and impact on arsenic (As) accumulation by the rice plants. (2018-2020), Funded by Department of Science and Technology, Govt. of India. Total fund sanctioned: 19,60,000. Mentor
- 5) Arsenic from root to gut (**2018-2019**). Funded by Academy of Medical Sciences, GCRF, Networking Grant Scheme, UK. Total fund sanctioned: 3,57,000. **PI**
- 6) Microbiology of arsenic contaminated groundwater of Bengal delta plain: deciphering the role of subsurface microorganism in As release and prospect for in situ remediation. Funded by Department of Science and Technology, Govt. of India (2016-2019). Total fund sanctioned: 41,25,521, PI
- Geomicrobiology of arsenic contaminated aquifer of Bengal basin: deciphering subsurface microbial communities and their functional role in As mobilization. Funded by IIT Kharagpur, Institute Challenge Grant (SGBSI) (2016-2019). Total fund sanctioned: Rs 100,00,000, PI
- B) Geomicrobiology of the deep subsurface in Koyna-Warna region: Diversity, distribution, and function of microbial communities within granitic-basaltic crustal systems. Funded by Ministry of Earth Sciences Govt. of India (2014-2017). Total fund sanctioned: 22,34,950, PI
- 9) Exploration, testing and supply of safe drinking ground water to school children of Soladahar and Balrampur village, West Medinipur, Funded by IIT Kharagpur (**2014-2015**), Total fund sanctioned: 1,00,000, **Co-PI**
- Exploration of microbial diversity and function in acid mine drainage and mine tailings: An integrated geomicrobiological approach for bioremediation. Funded by Department of Biotechnology, Govt. of India (2013-2016). Total fund sanctioned: 45,98,600, PI
- 11) Assessment of microbial communities and their biodegradation potentials in petroleum hydrocarbon contaminated environments in Assam. Funded by Department of Biotechnology, Govt. of India (2012-2015). Total fund sanctioned: 15,000,00, PI
- 12) Characterization of arsenic oxidizing bacteria from contaminated groundwater and their mechanisms of arsenite oxidation process for potential application in As-detoxification. Funded by Council and Scientific Research (CSIR), Govt. of India (**2011- 2014**). Total fund sanctioned: 27,28,000, **PI**
- Exploration of microbial diversity and microbial role in arsenic mobilization in As-contaminated groundwater of North Eastern states (Arunachal Pradesh and Assam). Funded by Department of Biotechnology, Govt. of India (2011-2014). Total fund sanctioned: 28,26,000, PI
- 14) Assessment of microbial diversity and community structure and their role in arsenic transformation and mobilization in arsenic contaminated groundwater of West Bengal. Funded by Department of Biotechnology, Govt. of India under Rapid Grant for Young Investigators (RGYI) scheme. (2008-2011). Total Fund sanctioned: 29, 15, 000, PI
- 15) Molecular analysis of microbial diversity and catabolic potential in hydrocarbon contaminated sites. Funded by Department of Science and Technology under the BOYSCAST program (2007-2008). PI

- 16) Baseline survey of microbial community structure present in uranium mine area of UCIL, Jaduguda. Funded by Department of Atomic Energy, Govt. India. (2006-2011). Total Fund sanctioned: 52, 22,000, PI
- Microorganism based bioremediation of heavy metals and radionuclides containing wastes: understanding the mechanisms and process development. Funded by CSIR, Govt. of India. (2006-2010). Total Fund Sanctioned: 13,56,000, PI
- 18) Microbial removal of heavy metals and radionuclides from industrial wastes. Funded by Department of Science and Technology under the Fast Track scheme (2004-2007). Total Fund Sanctioned: 7,57,000, PI
- 19) Bioremediation of nuclear wastes: removal of radionuclides/metals and degradation of organic contaminants. Department of Atomic Energy (Young Scientist Award) (2004-2007). Total Fund sanctioned: 10,000,00, PI
- Molecular characterization of microbial strain relevant to bioremediation. IIT Kharagpur (2004-2007), Total Fund Sanctioned: 3,000,000, PI

Publication [Total 99, Total Citation: 3745, h-index: 34 (Google Scholar)]

- 1) Sar, P.; H. Bose, and R. P. Sahu, "Understanding the role of deep subsurface granitic rock hosted microorganisms in utilization of diverse electron acceptors and energy sources under anaerobic and high temperature condition" *Frontiers in Microbiology* (Revised, Under Review)
- 2) Saha, A., A. Gupta, and P. Sar, 2023. "Metagenome based analysis of groundwater from arsenic contaminated sites of West Bengal revealed community diversity and their metabolic potential". *Journal of Environmental Science and Health, Part A*, 58(2), 91-106.
- 3) Mandal, S., H. Bose, K. Ramesh, R. P. Sahu, A. Saha, P. Sar, and S. K., Kazy, 2022. "Depth wide distribution and metabolic potential of chemolithoautotrophic microorganisms reactivated from deep continental granitic crust underneath the Deccan Traps at Koyna, India". *Frontiers in Microbiology*, 13, 1018940.
- 4) Lal, R., B. Singh, **P. Sar**, and P. Phale, 2022. "Microbiology in India: status, challenges and scope". *Environmental Microbiology*, 24(6), 2607-2611.
- 5) Bose, H.; A. Saha, R. P. Sahu, A. S. Dey, and **P. Sar,** 2022. "Characterization of the rare microbiome of rice paddy soil from arsenic contaminated hotspot of West Bengal and their interrelation with arsenic and other geochemical parameters". *World Journal of Microbiology and Biotechnology*, 38(10), 171.
- 6) Bose, H.; R. P. Sahu, and P. Sar, 2022. "Impact of arsenic on microbial community structure and their metabolic potential from rice soils of West Bengal, India". *Science of the Total Environment*, 841, 156486.
- 7) Lal, R., B. K. Singh, **P. Sar**, and P. Phale, 2022. "The assessment of microbial ecology: a special emphasis on the Indian scenario". *Environmental Microbiology Reports*, 325-329.
- 8) Sahu, R. P., S. K. Kazy, H. Bose, S. Mandal, A. Dutta, A. Saha, S. Roy, S. D. Gupta, A. Mukherjee, and P. Sar, 2021. "Microbial diversity and function in crystalline basement beneath the Deccan Traps explored in a 3-km borehole at Koyna, western India". *Environmental Microbiology*, 24(6), 2837-2853
- 9) Saha, A., B. Mohapatra, A. Gupta, A. Kar, A. N. Chowdhury, S. K. Kazy, and P. Sar, 2021. "Geomicrobiology of Arsenic (As) Contaminated Groundwater of West Bengal Reveals Microbial Role in Sediment Bound Arsenic Mobilization". Special Publication of Geological Society of India pp. 170-177.
- 10) Pal, S., A. Dutta, J. Sarkar, A. Roy, P. Sar, and S. K. Kazy, 2021. "Exploring the diversity and hydrocarbon bioremediation potential of microbial community in the waste sludge of Duliajan oil field, Assam, India." *Environmental Science and Pollution Research*, 28(36), 50074–50093.
- 11) Mishra, D., B. S. Das, T. Sinha, J. M. Hoque, C. Reynolds, M. Rafiqul Islam, M. Hossain, P. Sar, and M. Menon, 2021. "Living with arsenic in the environment: An examination of current awareness of farmers in the Bengal basin using hybrid feature selection and machine learning." *Environment International*, 153(January), 106529.
- 12) Saha, A., B. Mohapatra, S. K. Kazy and P. Sar, 2021. "Variable response of arsenic contaminated groundwater microbial community to electron acceptor regime revealed by microcosm based highthroughput sequencing approach." *Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering*, 56(7), 804–817.
- 13) Mohapatra, B., A. Saha, A. N. Chowdhury, A. Kar, S. K. Kazy, and **P. Sar**, 2021. "Geochemical, metagenomic, and physiological characterization of the multifaceted interaction between microbiome

of an arsenic contaminated groundwater and aquifer sediment". *Journal of Hazardous Materials*, 412(January), 125099.

- 14) Gupta, A., A. Saha, and P. Sar, 2021. "Thermoplasmata and Nitrososphaeria as dominant archaeal members in acid mine drainage sediment of Malanjkhand Copper Project, India". Archives of Microbiology, 203(4), 1833–1841.
- 15) A. Krishnamoorthy, A. Gupta, P. Sar, and M. K. Maiti, 2021. "Metagenomics of two gnotobiotically grown aromatic rice cultivars reveals genotype-dependent and tissue-specific colonization of endophytic bacterial communities attributing multiple plant growth promoting traits." World Journal of Microbiology and Biotechnology, 37(4), 1–16.
- 16) Gupta, A., A. Dutta, M. K. Panigrahi, and **P. Sar.** 2021. "Geomicrobiology of Mine Tailings from Malanjkhand Copper Project, India". *Geomicrobiology Journal*, *38*(2), 97–114.
- 17) Dey, A. S., H. Bose, B. Mohapatra, and **P. Sar.** 2020. "Biodegradation of Unpretreated Low-Density Polyethylene (LDPE) by *Stenotrophomonas sp.* and *Achromobacter sp.*, Isolated From Waste Dumpsite and Drilling Fluid." *Frontiers in Microbiology*, 11(December), 1–15.
- 18) Sarkar, J., A. Saha, A. Roy, H. Bose, S. Pal, P. Sar, and S. K. Kazy, 2020. "Development of nitrate stimulated hydrocarbon degrading microbial consortia from refinery sludge as potent bioaugmenting agent for enhanced bioremediation of petroleum contaminated waste." World Journal of Microbiology and Biotechnology, 36(10), 1–20.
- 19) Bose, H., A. Dutta, A. Roy, A. Gupta, S. Mukhopadhyay, B. Mohapatra, J. Sarkar, S. Roy, S. K. Kazy, and P. Sar. 2020. "Microbial Diversity of Drilling Fluids from 3000m Deep Koyna Pilot Borehole Provides Insights into the Deep Biosphere of Continental Earth Crust." *Scientific Drilling* 27:1–23.
- 20) Ghosh, S., and P. Sar. 2020. "Microcosm Based Analysis of Arsenic Release Potential of *Bacillus* sp. Strain IIIJ3-1 under Varying Redox Conditions." World Journal of Microbiology and Biotechnology 36(6).
- 21) Ghosh, S., B. Mohapatra, T. Satyanarayana, and P. Sar. 2020. "Molecular and Taxonomic Characterization of Arsenic (As) Transforming *Bacillus* sp. strain IIIJ3–1 Isolated from Ascontaminated Groundwater of Brahmaputra River Basin, India." *BMC Microbiology* 20(1), 1-20.
- 22) Gupta, A., and P. Sar. 2020. "Characterization and Application of an Anaerobic, Iron and Sulfate Reducing Bacterial Culture in Enhanced Bioremediation of Acid Mine Drainage Impacted Soil." *Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering* 55(4):464–82.
- 23) Gupta, A., and P. Sar. 2020. "Role of Cost-Effective Organic Carbon Substrates in Bioremediation of Acid Mine Drainage–Impacted Soil of Malanjkhand Copper Project, India: A Biostimulant for Autochthonous Microbial Populations." *Environmental Science and Pollution Research* 27(22):27407–21.
- 24) Dutta, A., L. M. Peoples, A. Gupta, D. H. Bartlett, and **P. Sar**. 2019. "Exploring the Piezotolerant/Piezophilic Microbial Community and Genomic Basis of Piezotolerance within the Deep Subsurface Deccan Traps." *Extremophiles* 23(4):421–33.
- 25) Ghosh, S., A. Gupta, J. Sarkar, S. Verma, A. Mukherjee, and **P. Sar**. 2019. "Enrichment of Indigenous Arsenate Reducing Anaerobic Bacteria from Arsenic Rich Aquifer Sediment of Brahmaputra River Basin and Their Potential Role in as Mobilization." *Journal of Environmental Science and Health Part A Toxic/Hazardous Substances and Environmental Engineering* 54(7):635–47.
- 26) Mohapatra, B., S. K. Kazy, and P. Sar. 2019. "Comparative Genome Analysis of Arsenic Reducing, Hydrocarbon Metabolizing Groundwater Bacterium Achromobacter sp. KAs 3-5^T Explains Its Competitive Edge for Survival in Aquifer Environment." *Genomics* 111(6):1604–19.
- 27) Dutta, A., P. Sar, J. Sarkar, S. D. Gupta, A. Gupta, H. Bose, A. Mukherjee, and S. Roy. 2019. "Archaeal communities in deep terrestrial subsurface underneath the Deccan traps, India." *Frontiers in microbiology* 10 (2019): 1362.
- 28) Dutta, A., S. Dutta Gupta, A. Gupta, J. Sarkar, S. Roy, A. Mukherjee, and P. Sar. 2018. "Exploration of Deep Terrestrial Subsurface Microbiome in Late Cretaceous Deccan Traps and Underlying Archean Basement, India." *Scientific Reports* 8(1).

- 29) Gupta, A., A. Dutta, J. Sarkar, M. K. Panigrahi, and P. Sar. 2018. "Low-Abundance Members of the Firmicutes Facilitate Bioremediation of Soil Impacted by Highly Acidic Mine Drainage from the Malanjkhand Copper Project, India." *Frontiers in Microbiology* 9 (DEC).
- 30) Mohapatra, B. and **P. Sar.** 2018. "Genome Sequencing and Functional Analysis of an Environmental Isolate *Escherichia coli* Cont-1 Revealed Its Genetic Basis of Arsenic-Transformation and Niche Adaptation." *Ecological Genetics and Genomics* 9:34–42.
- 31) Mohapatra, B., P. Sar, S. K. Kazy, M. K. Maiti, and T. Satyanarayana. 2018. "Taxonomy and Physiology of *Pseudoxanthomonas arseniciresistens* sp. nov., an Arsenate and Nitrate-Reducing Novel *Gammaproteobacterium* from Arsenic Contaminated Groundwater, India." *PLoS ONE* 13(3).
- 32) Mohapatra, B., T. Satyanarayana, and P. Sar. 2018. "Molecular and Eco-Physiological Characterization of Arsenic (As)-Transforming Achromobacter sp. KAs 3–5^T from As-Contaminated Groundwater of West Bengal, India." Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering 53(10):915–24.
- 33) Roy, A., A. Dutta, S. Pal, A. Gupta, J. Sarkar, A. Chatterjee, A. Saha, P. Sarkar, P. Sar, and S. K. Kazy. 2018. "Biostimulation and Bioaugmentation of Native Microbial Community Accelerated Bioremediation of Oil Refinery Sludge." *Bioresource Technology* 253:22–32.
- 34) Roy, A., P. Sar, J. Sarkar, A. Dutta, P. Sarkar, A. Gupta, B. Mohapatra, S. Pal, and S. K. Kazy. 2018. "Petroleum Hydrocarbon Rich Oil Refinery Sludge of North-East India Harbours Anaerobic, Fermentative, Sulfate-Reducing, Syntrophic and Methanogenic Microbial Populations." BMC Microbiology 18(1).
- 35) Gupta, A., A. Dutta, J. Sarkar, D. Paul, M. K. Panigrahi, and P. Sar. 2017. "Metagenomic Exploration of Microbial Community in Mine Tailings of Malanjkhand Copper Project, India." *Genomics Data* 12:11–13.
- 36) Mohapatra, B., A. Sarkar, S. Joshi, A. Chatterjee, S. K. Kazy, M. K. Maiti, T. Satyanarayana, and P. Sar. 2017. "An Arsenate-Reducing and Alkane-Metabolizing Novel Bacterium, *Rhizobium arsenicireducens* sp. Nov., Isolated from Arsenic-Rich Groundwater." *Archives of Microbiology* 199(2):191–201.
- 37) Pal, S., A. Kundu, T. D. Banerjee, B. Mohapatra, A. Roy, R. Manna, P. Sar, and S. K. Kazy. 2017. "Genome Analysis of Crude Oil Degrading *Franconibacter pulveris* Strain DJ34 Revealed Its Genetic Basis for Hydrocarbon Degradation and Survival in Oil Contaminated Environment." *Genomics* 109(5–6):374–82.
- 38) Sarkar, P., A. Roy, S. Pal, B. Mohapatra, S. K. Kazy, M. K. Maiti, and P. Sar. 2017. "Enrichment and Characterization of Hydrocarbon-Degrading Bacteria from Petroleum Refinery Waste as Potent Bioaugmentation Agent for in Situ Bioremediation." *Bioresource Technology* 242:15–27.
- 39) Choudhary, S., and **P. Sar.** 2016. "Real-Time PCR Based Analysis of Metal Resistance Genes in Metal Resistant *Pseudomonas aeruginosa* Strain J007." *Journal of Basic Microbiology* 56(7):688–97.
- 40) Islam, E., and P. Sar. 2016. "Diversity, Metal Resistance and Uranium Sequestration Abilities of Bacteria from Uranium Ore Deposit in Deep Earth Stratum." *Ecotoxicology and Environmental Safety* 127:12–21.
- 41) Sarkar, A., D. Paul, S. K. Kazy, and **P. Sar**. 2016. "Molecular Analysis of Microbial Community in Arsenic-Rich Groundwater of Kolsor, West Bengal." *Journal of Environmental Science and Health Part A Toxic/Hazardous Substances and Environmental Engineering* 51(3):229–39.
- 42) Sarkar, J., S. K. Kazy, A. Gupta, A. Dutta, B. Mohapatra, A. Roy, P. Bera, A. Mitra, and P. Sar. 2016. "Biostimulation of Indigenous Microbial Community for Bioremediation of Petroleum Refinery Sludge." *Frontiers in Microbiology* 7(SEP).
- 43) Choudhary, S., and **P. Sar.** 2015. "Interaction of Uranium (VI) with Bacteria: Potential Applications in Bioremediation of U Contaminated Oxic Environments." *Reviews in Environmental Science and Biotechnology* 14(3):347–55.
- 44) Kieft, T. L., T. C. Onstott, L. Ahonen, V. Aloisi, F. S. Colwell, B. Engelen, S. Fendrihan, E. Gaidos, U. Harms, I. Head, J. Kallmeyer, B. Kiel Reese, Lin L. H., P. E. Long, D.P. Moser, H. Mills, P. Sar, D. Schulze-Makuch, H. Stan-Lotter, D. Wagner, P. L. Wang, F. Westall, M. J. Wilkins. 2015. "Workshop to Develop Deep-Life Continental Scientific Drilling Projects." *Scientific Drilling* 19:43–53.

- 45) Pal, S., T. D. Banerjee, A. Roy, P. Sar, and S. K. Kazy. 2015. "Genome Sequence of Hydrocarbon-Degrading *Cronobacter* sp. Strain DJ34 Isolated from Crude Oil-Containing Sludge from the Duliajan Oil Fields, Assam, India." *Genome Announcements* 3(6).
- 46) Paul, D., S. K. Kazy, T. D. Banerjee, A. K. Gupta, T. Pal, and P. Sar. 2015. "Arsenic Biotransformation and Release by Bacteria Indigenous to Arsenic Contaminated Groundwater." *Bioresource Technology* 188:14–23.
- 47) Paul, D., S. K. Kazy, A. K. Gupta, T. Pal, and P. Sar. 2015. "Diversity, Metabolic Properties and Arsenic Mobilization Potential of Indigenous Bacteria in Arsenic Contaminated Groundwater of West Bengal, India." *PLoS ONE* 10(3).
- 48) Sarkar, A., P. Sar, and E. Islam. 2015. "Hexavalent Chromium Reduction by *Microbacterium oleivorans* A1: A Possible Mechanism of Chromate -Detoxification and -Bioremediation." *Recent Patents on Biotechnology* 9(2):116–29.
- 49) Dhal, P. K., and P. Sar. 2014. "Microbial Communities in Uranium Mine Tailings and Mine Water Sediment from Jaduguda U Mine, India: A Culture Independent Analysis." *Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering* 49(6):694– 709.
- 50) Islam, E., D. Paul, and **P. Sar**. 2014. "Microbial Diversity in Uranium Deposits from Jaduguda and Bagjata Uranium Mines, India as Revealed by Clone Library and Denaturing Gradient Gel Electrophoresis Analyses." *Geomicrobiology Journal* 31(10):862–74.
- 51) Paul, D., S. Poddar, and **P. Sar**. 2014. "Characterization of Arsenite-Oxidizing Bacteria Isolated from Arsenic-Contaminated Groundwater of West Bengal." *Journal of Environmental Science and Health Part A Toxic/Hazardous Substances and Environmental Engineering* 49(13):1481–92.
- 52) Sarkar, A., S. K. Kazy, and **P. Sar**. 2014. "Studies on Arsenic Transforming Groundwater Bacteria and Their Role in Arsenic Release from Subsurface Sediment." *Environmental Science and Pollution Research* 21(14):8645–62.
- 53) Ghosh, S., and P. Sar. 2013. "Identification and Characterization of Metabolic Properties of Bacterial Populations Recovered from Arsenic Contaminated Ground Water of North East India (Assam)." *Water Research* 47(19):6992–7005.
- 54) Sarkar, A., S. K. Kazy, and **P. Sar.** 2013. "Characterization of Arsenic Resistant Bacteria from Arsenic Rich Groundwater of West Bengal, India." *Ecotoxicology* 22(2):363–76.
- 55) Choudhary, S., E. Islam, S. K. Kazy, and P. Sar. 2012. "Uranium and Other Heavy Metal Resistance and Accumulation in Bacteria Isolated from Uranium Mine Wastes." *Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering* 47(4):622– 37.
- 56) Choudhary, S., and P. Sar. 2011. "Identification and Characterization of Uranium Accumulation Potential of a Uranium Mine Isolated *Pseudomonas* Strain." World Journal of Microbiology and Biotechnology 27(8):1795–1801.
- 57) Choudhary, S., and P. Sar. 2011. "Uranium Biomineralization by a Metal Resistant Pseudomonas aeruginosa Strain Isolated from Contaminated Mine Waste." Journal of Hazardous Materials 186(1):336–43.
- 58) Islam, E., P. K. Dhal, S. K. Kazy, and P. Sar. 2011. "Molecular Analysis of Bacterial Communities in Uranium Ores and Surrounding Soils from Banduhurang Open Cast Uranium Mine, India: A Comparative Study." Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering 46(3):271–80.
- 59) Islam, E., and **P. Sar**. 2011. "Molecular Assessment on Impact of Uranium Ore Contamination in Soil Bacterial Diversity." *International Biodeterioration and Biodegradation* 65(7):1043–51.
- 60) Islam, E., and **P. Sar.** 2011. "Culture-Dependent and -Independent Molecular Analysis of the Bacterial Community within Uranium Ore." *Journal of Basic Microbiology* 51(4):372–84.
- 61) Dhal, P. K., E. Islam, S. K. Kazy, and P. Sar. 2011. "Culture-Independent Molecular Analysis of Bacterial Diversity in Uranium-Ore/-Mine Waste-Contaminated and Non-Contaminated Sites from Uranium Mines." 3 Biotech 1(4):261–72.

- 62) Choudhary, S., and **P. Sar.** 2009. "Characterization of a Metal Resistant *Pseudomonas* sp. Isolated from Uranium Mine for Its Potential in Heavy Metal (Ni²⁺, Co²⁺, Cu²⁺, and Cd²⁺) Sequestration." *Bioresource Technology* 100(9):2482–92.
- 63) Kazy, S. K., S. F. D'Souza, and **P. Sar.** 2009. "Uranium and Thorium Sequestration by a *Pseudomonas* sp.: Mechanism and Chemical Characterization." *Journal of Hazardous Materials* 163(1):65–72.
- 64) Kazy, S. K., **P. Sar,** and S. F. D'Souza. 2008. "Studies on Uranium Removal by the Extracellular Polysaccharide of a *Pseudomonas aeruginosa* Strain." *Bioremediation Journal* 12(2):47–57.
- 65) Sar, P., P. K. Dhal, E. Islam, and S. K. Kazy. 2007. *Molecular Assessment of Microbial Diversity and Community Structure at Uranium Mines of Jaduguda, India*. Advanced Materials Research Vols. 20-21.
- 66) D'Souza, S. F., **P. Sar,** S. K. Kazy, and B. S. Kubal. 2006. "Uranium Sorption by *Pseudomonas* Biomass Immobilized in Radiation Polymerized Polyacrylamide Bio-Beads." *Journal of Environmental Science and Health - Part A Toxic/Hazardous Substances and Environmental Engineering* 41(3):487–500.
- 67) Kazy, S. K., S. K. Das, and **P. Sar.** 2006. "Lanthanum Biosorption by a *Pseudomonas* sp.: Equilibrium Studies and Chemical Characterization." *Journal of Industrial Microbiology and Biotechnology* 33(9):773–83.
- 68) Sar, P., S. K. Kazy, and S. F. D'Souza. 2004. "Radionuclide Remediation Using a Bacterial Biosorbent." *International Biodeterioration and Biodegradation* 54(2–3):193–202.
- 69) Kazy, S. K., **P. Sar,** S. P. Singh, A. K. Sen, and S. F. D'Souza. 2002. "Extracellular Polysaccharides of a Copper-Sensitive and a Copper-Resistant *Pseudomonas aeruginosa* Strain: Synthesis, Chemical Nature and Copper Binding." *World Journal of Microbiology and Biotechnology* 18(6):583–88.
- 70) Sar, P., and S. F. D'Souza. 2002. "Biosorption of Thorium (IV) by a Pseudomonas Biomass." Biotechnology Letters 24(3):239–43.
- 71) Sar, P., and S. F. D'Souza. 2001. "Biosorptive Uranium Uptake by a *Pseudomonas* strain: Characterization and Equilibrium Studies." *Journal of Chemical Technology and Biotechnology* 76(12):1286–94.
- 72) Sar, P., S. K. Kazy, and S. P. Singh. 2001. "Intracellular Nickel Accumulation by *Pseudomonas* aeruginosa and Its Chemical Nature." *Letters in Applied Microbiology* 32(4):257–61.
- 73) Kazy, S. K., P. Sar, R. K. Asthana, and S. P. Singh. 1999. "Copper Uptake and Its Compartmentalization in *Pseudomonas aeruginosa* Strains: Chemical Nature of Cellular Metal." *World Journal of Microbiology and Biotechnology* 15(5):599–605.
- 74) Sar, P., S. K. Kazy, R. K. Asthana, and S. P. Singh. 1999. "Metal Adsorption and Desorption by Lyophilized *Pseudomonas aeruginosa.*" *International Biodeterioration and Biodegradation* 44(2– 3):101–10.
- 75) Sar, P., S. K. Kazy, R. K. Asthana, and S. P. Singh. 1998. "Nickel Uptake by *Pseudomonas aeruginosa*: Role of Modifying Factors." *Current Microbiology* 37(5):306–11.

Book chapters

- Merchant, M., T. Kahali, D. Kumawat, M. Mande, and P. Sar, 2024. "Understanding the structure and function of landfill microbiome through genomics". In: Das, S. (ed) *Microbial Diversity in the Genomic Era: Functional Diversity and Community Analysis*, 2nd edition. Elsevier, Netherlands. (In Press)
- 2) Kazy, S. K., R. P. Sahu, S. Mukhopadhyay, H. Bose, S. Mandal and P. Sar, 2021. "Microbial Life in Deep Terrestrial Continental Crust". In *Extreme Environments*, pp. 263-291. CRC Press, USA.
- 3) Gupta, A., and P. Sar. 2020. "Treatment Options for Acid Mine Drainage: Remedial Achievements Through Microbial-Mediated Processes." In: Shah M., Banerjee A. (eds) Combined Application of Physico-Chemical & Microbiological Processes for Industrial Effluent Treatment Plant, pp 145-185, Springer, Singapore.
- 4) Ghosh, S., M. Mukherjee, and **P. Sar**. 2020. "Impact of Arsenic on Structural and Functional Composition of Dominant Bacterial Populations Associated with Various Natural Ecosystems." In

Environmental Pollution, Biodiversity, and Sustainable Development, pp.115-146. Apple Academic Press, USA.

- 5) Sarkar, J., A. Roy, **P. Sar**, and S. K. Kazy. 2020. "Accelerated bioremediation of petroleum refinery sludge through biostimulation and bioaugmentation of native microbiome." In *Emerging Technologies in Environmental Bioremediation*, pp. 23-65. Elsevier, Netherlands.
- 6) Gupta, A., J. Sarkar., and **P. Sar**. 2019. "Understanding the Structure and Function of Extreme Microbiome Through Genomics: Scope and Challenges." In *Microbial Diversity in the Genomic Era*, pp. 581-610. Elsevier, Netherlands
- 7) Sar, P., A. Dutta, H. Bose, S. Mandal, and S. K. Kazy. 2019. "Deep Biosphere: Microbiome of the Deep Terrestrial Subsurface." In *Microbial Diversity in Ecosystem Sustainability and Biotechnological Applications*, pp. 225-265. Springer, Singapore.
- 8) Sar, P., B. Mohapatra, S. Ghosh, D. Paul, A. Sarkar, and S. K. Kazy. 2017. Geomicrobiology of Arsenic-Contaminated Groundwater of Bengal Delta Plain. In *Handbook of Metal-Microbe Interactions and Bioremediation*. CRC Press, USA.
- 9) Sar, P., D. Paul, A. Sarkar, R. Bharadwaj, and S. K. Kazy. 2015. Microbiology of Arsenic-Contaminated Groundwater. In *Microbiology for Minerals, Metals, Materials and the Environment*, pp.477-525. CRC Press, USA.
- 10) Sar, P., S. K. Kazy, D. Paul, and A. Sarkar. 2013. Metal Bioremediation by Thermophilic Microorganisms. In: Satyanarayana T., Littlechild J., Kawarabayasi Y. (eds) *Thermophilic Microbes in Environmental and Industrial Biotechnology*, pp. 171-201. Springer, Dordrecht.
- 11) Sar, P., and E. Islam. 2012. "Metagenomic approaches in microbial bioremediation of metals and radionuclides." In *Microorganisms in Environmental Management*, pp. 525-546. Springer, Dordrecht, 2012.

Other publications

- Sahu, R. P., S. Mandal, S. Sarkar, D. Mukherjee, S. K. Kazy, and P. Sar, 2023. "Unlocking the mystery of deep biosphere hosted by the Archaean granitic crust underneath the Deccan Traps, Koyna, India". In *EGU General Assembly 2023*, Vienna, Austria, EGU23-14992.
- 2) Sahu, R. P., P. Sar, S. Mandal, S. K. Kazy, and H. Bose, 2022, December. "Diversity and functionality of deep life within the Archean granitic crust underneath the Deccan traps, India". In AGU Fall Meeting Abstracts, Vol. 2022, pp. B25C-1580.
- 3) Mohapatra, B., H. Bose, A. Saha, and **P. Sar**. 2020. "Arsenic toxicity amelioration in rice soils by plant beneficial microbes." *Oryza-An International Journal on Rice*. 57. 70-78.
- Mohapatra, B. and P. Sar. 2020. "Geomicrobiology & Microbial Biotechnology." https://biotechkiosk.com
- 5) Sar, P., S. K. Kazy, R. Sahu, H. Bose, S. Mandal, A. Dutta, B. Mohapatra, I. G. Roy, and S. Roy. 2019. "Exploring deep life underneath the crystalline granitic crust at Koyna, India through 3000-meter-deep Koyna pilot borehole." In *Geophysical Research Abstracts*, vol. 21. 2019.
- 6) Dutta, A., A. Gupta, and P. Sar. 2018. "Comparative Analysis of Microbial Diversity and Possibilities of Dispersal of Microbial Cells across Different Subterranean Systems of Deccan Traps." EGUGA 3836.
- 7) Mohapatra, B., A. Dutta, A. Gupta, S. K. Kazy, and P. Sar. 2017. "Genome Sequencing Reveals the Potential of an Indigenous Arsenotrophic Bacterium; *Achromobacter* Sp. KAs 3-5 for Sub-Surface Arsenic Mobilization and Strategies for Bioremediation." *Canadian Journal of Biotechnology* 1(Special):271.
- Sarkar, A., and P. Sar. 2015. "Horizontal Gene Transfer of ArsGenes: A Possible Source of Arsenic Dissemination in Subsurface Environment." *Journal of Environmental Research And Development* 9:803–12.
- 9) Roy, A., S. Pal, S. K. Kazy, P. Sarkar, P. Sar, and A. K. Ghoshal. 2014. "Characterization of culturable bacterial communities in petroleum hydrocarbon contaminated sludge of oil refineries and oil exploration sites." *Journal of Environmental Research and Development* 8, no. 3 (2014): 451.

- 10) Choudhary, S., and P. Sar. 2011. "Reverse Transcriptase-Real Time PCR Analysis of Heavy Metal Stress Response in a Uranium Resistant *Pseudomonas aeruginosa* Strain Isolated from Jaduguda Uranium Mine." In *Proceedings of DAE-BRNS life sciences symposium 2011 on advances in molecular and cell biology of stress response*.
- 11) Singh, A., P. Sar, and G. N. Bennett. 2009. "Isolation and Characterization of Benzene Degrading Bacteria from Gasoline Contaminated Water." Pp. 424–27 in *Technical Proceedings of the 2009 NSTI Nanotechnology Conference and Expo, NSTI-Nanotech 2009.* Vol. 2.
- 12) Singh, A., P. Sar, and G. N. Bennet. 2009. "Isolation and characterization of benzene degrading bacteria from gasoline contaminated water". *Clean Technology*, 15, pp.286-289.
- 13) Sar, P., and S. F. D Souza. 2002. "Radionuclide biosorption by bacterial biomass." *BARC NEWSLETTER* (2002): 135-144.
- 14) **Sar, P.**, S. F. D'Souza, S. K. Kazy, and S. P. Singh. 2001. "Radionuclide and heavy metal biosorption by Pseudomonas biomass." In *Proceedings of the tenth national symposium on environment*.

RESEARCH SUPERVISION

Doctoral: 12 completed, Continuing 7

- **1. Sangeta Chowdhary (2010)**; Thesis title: Uranium and other heavy metal resistance and accumulation in a *Pseudomonas aeruginosa* strain: Potential in bioremediation (**Completed**).
- 2. Ekramul Islam (2011); Thesis title: Molecular analysis of microbial diversity in uranium mines and indigenous bacterial interaction with uranium (Completed).
- **3. Paltu Kumar Dhal (2012)**; Thesis title: Baseline survey of microbial community structure present at uranium mine sites of UCIL, Jaduguda (**Completed**).
- 4. Angana Sarkar (2015); Thesis title: Microbiology of arsenic contaminated groundwater: identification of major bacterial and characterization of their role in arsenic transformation (Completed).
- 5. Dhiraj Paul (2015); Thesis title: Molecular assessment of microbial diversity in arsenic contaminated groundwater of West Bengal, India (Completed).
- 6. Soma Ghosh (2018) Thesis title: Characterization of bacterial communities in arsenic contaminated groundwater of Brahmaputra River basin (Completed).
- 7. Poulomi Sarkar (2019) Thesis title: Analysis of petroleum refinery waste microbial community and evaluation of its hydrocarbon bioremediation potential (Completed).
- 8. Jayeeta Sarkar (2019) Thesis title: Metagenomic insights into the microbial community composition and function of petroleum refinery waste and scope for its bioremediation (Completed).
- 9. Avishek Dutta (2019) Thesis title: Geomicrobiology of deep subsurface granitic-basaltic environment of Deccan Traps at Koyna-Warna region, India (Completed).
- 10.Balaram Mohapatra (2019) Thesis title: Characterization of arsenic transforming from arsenic contaminated groundwater of West Bengal: Eco-genomic perspective of arsenic mobilization (Completed).
- 11. Abhishek Gupta (2020) Thesis title: Exploring the microbial ecology of acid mine drainage of Malanjkhand copper project, India, and scope for its bioremediation (Completed).
- 12. Anumeha Saha (2023); Geomicrobiology of arsenic contaminated groundwater of West Bengal: spatiotemporal variation and key biogeochemical factors driving As release in water (Completed).
- 13. **Rajendra P Sahu (continuing);** Exploration of deep granitic microbiome in Late Cretaceous Deccan traps and underlying Archean basement, India.
- 14. Mitali Merchant (continuing); Exploration of landfill microbiome and their bioremediation potential.
- 15. Shuchisloka Chakraborty (continuing); Effect of nitrogen cycles in Arsenic contaminated paddy soil
- 16.Swatilekha Sarkar (continuing): Characterization of thermotolerant, acetogenic bacteria from deep subsurface

17. **Debarshi Mukherjee (continuing):** Carbon dioxide (CO₂) utilization and conversion to organic compounds by endolithic microorganisms at elevated temperature and CO₂

18. Roopmalya Basu (continuing)

19.Sumit Rez (continuing)

MS

1. Sourav Mukhopadhayay (2022) Thesis title: Characterization of poly-extremotolerant bacteria from deep subsurface crust of the late cretaceous deccan traps (Completed)

M Tech.

Over 25 students have completed their M Tech thesis under my supervision

Pinaki Sar