



Dr. Navdeep K Dhami

Research Fellow

School of Civil and Mechanical Engineering

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Current Position

Name of Institution	Curtin University
School	Civil and Mechanical Engineering
Address	Kent Street, Bentley, Perth, WA, Australia
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Current position	Research Fellow
Research Area	Self-healing construction materials, Construction Biotechnology, Green materials

Education

Conferral date	Degree/Award	Awarding organisation	Discipline/Field
24/11/2014	Ph.D.	Thapar University, India	Biotechnology
12/11/2005	M.Sc.	Thapar University, India	Biotechnology
20/07/2003	B.Sc.	Punjab University, India	Sciences

PhD thesis: Calcifying Bacteria Mediated Cementation for Improvement of Building Materials

- Investigated the potential of microbes isolated from calcareous soils for production of calcium carbonate biominerals
- Developed multidisciplinary tools of experimental biogeochemistry, mineralogy, crystallography, biofilm and microbial characterisation for understanding the role of bacterial cultures and biofilms in production of carbonate minerals.
- Applied the knowledge of microbial-mineral interactions in natural environments for development of self-healing biocemented construction materials
- Outcome led to 8 publications in high impact journals of applied biotechnology and environmental engineering along with 4 international conference papers

Employment History

Period	Organization	Position
January 2020 - present	Curtin University, Australia	Research Fellow
July 2016 – December 2019	Curtin University, Australia	Lecturer
July 2014 – June 2016	Curtin University, Australia	Research Fellow
August 2007 - May 2009	Lovely Professional University, India	Lecturer
Jan 2006 – Feb2007	Institute of Microbial Technology, India	Research Fellow

Organization: Curtin University, WA, Australia

Position: Research Fellow and Lecturer

Duration: July 2014 – present

Research area and expertise: Construction Biotechnology and Environmental Microbiology

Primary focus:

- Microbial-mineral interactions from micro to macro scales
- Impact of microbial dynamics and environmental conditions on properties of biocemented materials
- Applications of microbes for development of sustainable, self-healing biocemented construction materials

Responsibilities	Achievements
Research	Bio-active materials (BAM) ➤ Contributed seminally in establishment of BAM laboratory at Curtin University ➤ Serving as lab in - charge of BAM since 2014 ➤ Trained 10 PhDs, 9 Master's and 8 undergraduate students in this laboratory ➤ Co-ordinated and organised for research activities of 5 funded projects including 3 ARCs (DP160104731, LP180100132, LP150100475), 1 industry driven project (MRIWA M0545) and 1 international project (DST SPARC 409) in BAM lab since 2016 Publications and impact ➤ 31 research papers in high quality journals of geomicrobiology, geotechnology and civil engineering (81% in Q1 category) ➤ One book chapter and 2 review papers in high impact journals (one chapter in Frontiers in Microbiology 2013 highlighted as highly downloadable chapter of the month) ➤ 8 conference papers with 1 awarded as outstanding paper (at Sustainable Materials and Technologies Conference, Las Vegas, USA 2016) and awarded Howard's medal by American Society of Civil Engineers in 2019 ➤ <i>h</i>-index of 20 at Google Scholar with 1465 citations and 14 at Scopus ➤ Research Gate score of 26.2 with 20,126 reads (solely on my publications) Funding Grants and research income ➤ Lead Chief Investigator: Mineral Research Institute of Western Australia grant 2019-2022 (MRIWA M0545): In situ barrier technology for risk mitigation and extraction optimisation for in-situ recovery operations (Awarded \$450k) in collaboration with mining companies BHP, Orano mining, NewCrest, Mining3 and CSIRO.

- Chief Investigator: Australian Research Council Linkage grant 2019-2022 (ARC LP180100132): Field scale biocementation in remediation and self-healing (**Awarded \$442k**) in collaboration with Prof Abhijit Mukherjee, Mr Ky Cao, Dr Didar Singh Cheema, Asst Prof Hendrik Jonkers, Prof Sudhakara Reddy, A/Prof Shruti Sharma and Mr Mridul Goyal
- Foreign investigator DST-SPARC grant 2019-2022 (with Prof Ramakrishna Sen from Indian Institute of Technology, Kharagpur): Sustainable cement through emulation of biogeochemical processes of nature: translation to field scale: **Awarded (\$170k)**

Prizes and Awards

- 2017 Marie Curie Post-Doctoral Fellowship grant: Microbially activated self-healing accretionary materials. **Awarded \$311k** but declined due to on-going projects at Curtin University.
- 2020 Best research paper award based on citations at Thapar University
- 2019 Thomas Howard medal from American Society of Civil engineers for outstanding research paper presented at Sustainable Materials and Technology Conference 2016
- 2010 Department of Science and Technology, India PhD Scholarship Award

Keynote lectures and invited talks

- 2021 Goldschmidt virtual conference (4-9 July): Potential and challenges of biominerals for applications in construction and mining industry
- 2020 Indo - Australia SPARC workshop, Indian Institute of Technology, Kharagpur, India (4-5 January): Microbial mineralization: From understanding to engineering
- 2020 Microbial Biotechnology in Construction Materials and Geotechnical Engineering, China (6-7 November): Evaluation of potential bio-stimulation for landslide mitigation by native urease microbes
- 2019 Center for bio-mediated and bio-inspired Geotechnics, Arizona State University, USA (25 October): Applications of biominerals for sustainable construction materials
- 2018 Goldschmidt Annual conference, Boston, USA (12-17 August): Beach rocks in natural and *in vitro* biomineralization conditions
- 2018 Tech Talk, Mineral Research Institute of Western Australia, Australia (27 October): Self-healing Biocement: From crack healing to metal immobilisation
- 2017 Aberystwyth University, Wales, UK (26 September): Microbially based accretionary materials for low energy construction materials
- 2016 Australian Society of Microbiology, Annual Scientific Meeting, Perth, Australia (3-6 July): Microbial community dynamics and carbonate precipitation during biostimulation and bioaugmentation
- 2016 Fourth international conference on Sustainable Construction Materials and Technologies, Las Vegas, USA: Sustainable road bases with microbial carbonate precipitation
- 2014 International conference on rammed earth construction, University of Western Australia, Australia (10-13 Feb 2015)
- 2012 World Congress on Biotechnology, Hyderabad, India (13 September): Role of urease and carbonic anhydrase in microbial carbonate precipitation

Global partnerships

- Developed strong collaborations with University of California Davis, Arizona State University, USA; Aberystwyth University, UK; University of Toronto, Canada; Indian Institute of Technology, Kharagpur, Kanpur, Madras, Guwahati
- Secured visiting fellow position at University of Toronto in 2017

Social Media release:

- <https://news.curtin.edu.au/podcasts/sustainable-buildings/>

	Commercial outcomes of research ➤ Developed patent on “A novel biocement additive and method of application” in 2021 as the first inventor along with Prof Abhijit Mukherjee which is undergoing submission (Provisional patent lodged in September 2021). ➤ ConBiocrete industry obtained the license for our Biocementation technology in September 2021
Teaching	PhD completed (with present affiliations, as communicated) 1. Hannah Porter, Development of sustainable materials with bio-activation (2019), <i>Now Lecturer, Southern Queensland University, Australia</i> 2. Asha Latha Ramachandran (2021), <i>Now Low Carbon Construction Author, One Click LCA, Finland, Europe</i> Current PhD supervisions 1. Evaluation of subsurface barrier technology for risk mitigation and extraction optimisation for in-situ recovery operations (2021): Godfrey Mawire 2. Biocement barriers for in-situ recovery operations in different physical conditions (2021): Pelin Polat (September 2021) 3. Microbial metabolism and biocement formation in extreme cementitious environments (2017- till date): Sakshi Tiwari 4. Self-healing in concrete utilising Biocement (2018 – till date): Nimrat Pal Kaur 5. Biocementation in mitigation of riverbank erosion (2018 – till date): Anant Aishwarya Dubey 6. Bioprocess analysis and understanding of Microbially induced calcium carbonate precipitation (2018 – till date): Raja Murugan 7. Nano – reinforcements and surface modification on bacterial adhesion (2018 – till date): Shivani Gour 8. Improvement of recycled aggregates for sustainable construction (2018 – till date) Masters, undergraduate and Hons thesis already completed 1. Effect of bacterial cell state on efficacy of biocementation: Sonali Patel (<i>Lab technician at Giants medical foundation, Australia</i>) 2. Microbial community dynamics and mineralisation in natural and lab simulated beach rock formations: Pelin Polat (<i>Applied for PhD with me in 2021</i>) 3. Carbonate biomineralization and heavy metal remediation by calcifying fungi isolated from karstic caves: Marie E Christelle Quirin (<i>Senior lab technician at Linear Clinical Research, Australia</i>) 4. Bacterial community dynamics and biocement formation during stimulation and augmentation: Walaa Alsubhi (<i>Lab supervisor in Saudi Arabia</i>) 5. Influence of cell metabolism on properties of biominerals: Ratish Ramyad Permala (<i>PhD candidate in Biomedical Sciences, Curtin</i>) 6. Gene expressions during microbial carbonate precipitation: Kawen Jandu (Hons) 7. Impact of Biocement on durability of road bases: Raj Ruparelia (<i>Graduate engineer at Main Roads, Western Australia</i>) 8. Effect of Biocement on erosion mitigation: Jack Hooper - Lewis (<i>Geotechnical engineer at AngloGold Ashanti, Australia</i>) 9. Effect of biocement on recycled aggregates: Jasmine Man (<i>Graduate engineer at Downer, Australia</i>) 10. Self – healing geopolymer concrete for sustainable constructions: Robert Evans (<i>Geotechnical engineer in Perth, Australia</i>) 11. Impact of fibre reinforcement on sand: Richard Cass (<i>Geotechnical engineer in Perth, Australia</i>)

	Teaching in undergrad and post graduate courses at Curtin University ➤ <u>Post graduate course designed:</u> ❖ Biotechnology in Civil Engineering STEN 6005: Interdisciplinary unit developed in consultancy with mining and construction industry Australia, colleagues from Arizona State University, USA ➤ <u>Delivered lectures in</u> ❖ Civil engineering practices, quality and legislation (CSEN4003) ❖ Civil engineering project and cost management (CSEN3000) ❖ Integrated design and cost management (CSEN4002) ❖ Structural analysis of indeterminate structures (STEN2006) ❖ Environmental Aquatic chemistry (CHEM5007) ❖ Applied and environmental microbiology (MICB2000) ❖ Technology of Brewing and Winemaking (Food1000) ✓ Received excellent feedback and teaching eVALUation in all the units and HDRs available in PREP 2021 report
Engagement	School committees 1. Deputy Chair Gender Equity Committee, CME - 2. Member: HDR attraction committee, CME Cross disciplinary collaborations Actively developed strong research collaborations within the university across disciplines of engineering and science Societal contributions <u>Served as Female STEM ambassador</u> ➤ Participated in various programmes organised by Tech trails, Athena Swan and Rotary club, WA for educating primary and high school kids especially females for STEM careers ➤ STEMinst talks at Kewdale Primary School (2018), Butler College in WA (2021) and motivational story in ATHENA Swan (2020) available on social media at: https://www.youtube.com/watch?v=SrdugDTWpKM https://steminists.weebly.com/stem-ambassador-project.html https://about.curtin.edu.au/values-vision-strategy/diversity-equity/athena-swian/stemm-stars/ Global partnerships with academia and industry ➤ Developed partnerships with 4 Indian institutes of technology, India (Kanpur, Kharagpur, Madras, Guwahati); Arizona State University and University of California Davis, USA; University of Toronto, Canada; Aberystwyth University, UK; Delft University, Netherlands leading to joint research projects and supervisions ➤ Established strong connections with Australian industry including BHP, NewCrest and Orano leading to one industry funded project grant. Editorial committees and services 1. Guest editor for Frontiers in Biosciences (IF > 2.74) 2. Member Australian Society for Microbiology 3. Member International Society for Microbial Ecology 4. Regular reviewer for Scientific Reports, Construction and Building materials, PLOS One 5. PhD thesis reviewer for RMIT, Melbourne, Australia and Cardiff University, UK