Education and Positions held

I completed my schooling in Cuttack (1973), attended Raveshaw and Khallikote colleges and did my Masters in Applied Geology from University of Roorkee (1977–1980). After graduating from Roorkee, I came to IIT Kharagpur for pursuing Ph.D. under Prof. Asoke Mookherjee on geochemistry and genesis of some metamorphosed massive sulfide deposits. I joined the Department of Geology & Geophysics, IIT Kharagpur as a lecturer in 1988 and since 2003 I've been working as a professor in the same Department. I did short-term research at the university of Bonn (DFG), Ruhr University, Bochum (INSA-DFG) and University of Adelaide. Since 2013, I've been acting as the in-charge of the EPMA-SEM DST-IIT Kharagpur National Facility housed in the Department.

Courses taught

- Ore Geology (GG41005)
- Ore Genesis (GG50007)
- Thermodynamics of Geological systems (GG20002)
- Applied Mineralogy (GG50005)
- Instrumental Methods in Geosciences (EX60023)

Awards and Achievements

- University of Roorkee Gold Medal, 1980
- INSA Young Scientist award, 1986
- DST Young Scientist Research Award, 1987
- IIT Silver Jubilee Research award, 1987
- PRL Award in Earth & Planetary Sciences, 1999 from PRL, Ahmadabad
- National Mineral Award (2005) in Basic Geosciences
- Member, Editorial board of *Current Science* since January 2015

Fellowship/ Affiliations

- Life Fellow, Geological Society of India (2000)
- Life Fellow, Mineralogical Society of India (2005)
- Fellow, Society of Economic Geologists (SEG), USA, (2000)
- Vice-chairman, International Mineralogical Association-Commission on Ore Mineralogy, (IMA-COM)

Sponsored projects as PI

1. Experimental mineralogical studies in some selected portions of the system Cu_2S-Ag_2S-PbS-Sb_2S_3-As_2S_3: ore genetic significance and Industrial applications (CSIR, 1991–1994, *Value*: Rs. 17.20 lakhs)
2. Genesis of greenstone-hosted gold deposits at Hutti and Ajjanahalli with exploration implications (DST, 1999–2002, *Value*: Rs. 46.37 lakhs)
3. Genetic modeling of orogenic gold deposits in the Dharwar Craton: constraints from metamorphism, ore mineralogy and fluid evolution (DST, 2007 – 2010, *Value*: Rs. 33.55 lakhs)
4. Structural, Mineralogical and Geochemical Appraisals of the Pur-Banera Basin, Rajasthan for assessing its uranium potential (BRNS, 2011 – 2016, *Value*: Rs. 34.09 lakhs)
5. EPMA-SEM National Facility for testing (Various Government and Private Agencies, 2013 onwards, *Value*: Rs. 100.00 lakhs).
6. Petrogenesis and Rare Earth Element potential of Kamthai and Amba Dongar carbonatites (SERB, 2016 – till date, *Value*: Rs. 160.20 lakhs)

Recent research interests:

- EPMA monazite dating of greenstones and geochemistry of accessory hydrothermal minerals in relation to gold metallogeny in the Dharwar Craton
- Metamorphic melt-assisted remobilization of massive sulfide deposits (natural and experimental)
- Geochemistry of pyrite and arsenopyrite from metamorphosed and metamorphogenic deposits
- Uranium mineralization and REE metasomatism
- Genesis of REE-Nb-Ta-F mineralization in carbonatites
- Chemical and isotopic compositions of tourmaline and hydrothermal ore formation

Ph.D. guidance: Completed: 8

- K. L. Pruseth: Phase equilibrium study in the system Cu_2S-PbS-Sb_2S_3 (1995)

- D. C. Pal: Evolution of the granite–pegmatite system in the Bastar-Malkangiri Tin Belt, Central India: constraints from granite geochemistry, fluid inclusions and ore mineralogy (2000)

- N. Pal: Genesis of gold mineralization in the Hutti-Maski greenstone belt, eastern Dharwar craton, India: Constraints from metamorphism, ore mineralogy and fluid evolution (2003)

- S. Mahato: Thermo-tectonic evolution of the North Singhbhum mobile belt, Eastern India: evidence from the corridor study in the western part of the belt (2007)

- S. Goon: Mesoproterozoic polyphase metamorphism in the Chotanagpur Gneissic Complex, Eastern India: Evidence from Bero-Saltora and Ranchi-Kolomda areas (2008)

- S. S. Chinnasamy: Greenstone metamorphism, geochemistry, ore mineralogy and fluid evolution of the granitoid-hosted gold mineralization at Jonnagiri, eastern Dharwar craton (2010)

- N. Jehan: Melting experiments in the system PbS-ZnS-FeS-Cu_2S-S: implications to metamorphosed massive sulfide deposits (2015)

- P. Hazarika: Greenstone metamorphism, monazite geochronology and geochemistry of hydrothermal minerals from selected orogenic gold deposits in the eastern Dharwar craton (2016)

  Ongoing: 4

- M. K. Ozha: Uranium mineralization and mobilization of rare earth elements

- B. G. Rao: Experimental sulfide melting studies

- A. K. Patel: Carbonatite-hosted rare earth element mineralization

- S. Patel: Chemical and isotopic compositions of tourmaline and hydrothermal ore formation

Reviewer of Journals

- Economic Geology
- Mineralium Deposita
- Ore Geology Reviews
- Chemical Geology
- Gondwana Research
- Journal of Asian Earth Sciences
- Mineralogy & Petrology
- Lithos
- Journal of Geological Society of India
- Journal of Earth System Science

List of publications:

1. Hazarika P, **Mishra B**, Pruseth KL (2016) Trace element geochemistry of pyrite and arsenopyrite: ore genetic implications for late Archean orogenic gold deposits in southern India, *Mineralogical Magazine* (in press).

2. Mishra B (2016) Metallogeny, *Proceedings of the Indian National Science Academy*, 82, 505–513.

3. Hazarika P, **Mishra B**, Pruseth KL (2016) Scheelite, apatite, calcite and tourmaline compositions from the late Archean Hutti orogenic gold deposit: Implications for analogous two stage ore fluids, *Ore Geology Reviews*, 72, 989 –1003.

4. Ozha MK, **Mishra B**, Hazarika P, Jeyagopal AV, Yadav GS (2016) EPMA monazite geochronology of the basement and supracrustal rocks within the Pur-Banera basin, Rajasthan: Evidence of Columbia breakup in Northwestern India, *Journal of Asian Earth Sciences*, 117, 284 – 303.

5. Ozha MK, **Mishra B**, Jeyagopal AV (2016) Reaction aureoles around uraninites within biotite and plagioclase: evidence of low-temperature sequential fluid alteration and LREE-mobilization from monazite, *Mineralogical Magazine*, 80, 567– 584.

6. Hazarika P, Pruseth KL, **Mishra B** (2015) Neoarchean greenstone metamorphism in the eastern Dharwar Craton, India: constraints from monazite U-Th-Pb_{total} ages and P-T pseudosection calculations. *Journal of Geology*, 123, 429–461.

7. Mishra B (2015) Precambrian metallic mineralization in India In: Mazumder R and Eriksson PG (eds) Precambrian Basins of India: stratigraphic and tectonic context. *Geological Society of London Memoir,* 43, 327–337.

8. Hazarika P, **Mishra B**, Pruseth KL (2015) Diverse tourmaline compositions from orogenic gold deposits in the Hutti-Maski greenstone belt, India: Implications for sources of ore-forming fluids, *Economic Geology*, 110, 337–353.

9. Pruseth KL, **Mishra** B (2014) Magmatic (?) base metal sulfide deposits. In: Krishnamurthy P, Vidyadharan KT, Sawkar RH (eds.) Proceedings of the workshop on magmatic sulfide deposits, *Geological Society of India, special publications*, 2, 226–230.

10. Pruseth KL, Jehan N, Sahu P, and **Mishra B** (2014) The possibility of a ZnS-rich sulfide melt at 600°C: Evidence from Rajpura-Dariba deposit, India supported by laboratory melting experiment. *Ore Geology Reviews*, 60, 50–59.

11. Hazarika P, **Mishra B**, Sakthi Chinnasamy SS, Bernhardt HJ (2013) Multi-stage growths and invisible gold distribution in pyrite from the Kundarkocha sediment-hosted gold deposit, eastern India. *Ore Geology Reviews*, 55, 134–145.

12. Hazarika P, Upadhyay D, **Mishra B** (2013) Contrasting geochronological evolution of the Rajpura-Dariba and Rampura- Agucha metamorphosed Zn-Pb deposit, Aravalli-Delhi Belt, India. *Journal of Asian Earth Sciences*, 73, 429–439.

13. Chinnasamy SS and **Mishra B** (2013) Greenstone metamorphism, hydrothermal alteration and gold mineralization in the genetic context of the granodiorite-hosted gold deposit at Jonnagiri, eastern Dharwar Craton, India. *Economic Geology*, 108, 1015–1036.

14. **Mishra B**, Deb M (2012) Mineral Deposits in India. *Proc. Ind. Natn. Sci. Acad*., 78, 423−430.

15. Pal DC, Sarkar S, **Mishra B**, Sarangi AK (2011) Chemical and sulfur isotope compositions of pyrite in the Jaduguda U (–Cu–Fe) deposit, Singhbhum shear zone, eastern India: Implications for sulfide mineralization. *Journal of Earth System Science*, 120, 475–488.

16. Sarkar A, Chakraborty PP, **Mishra B**, Bera MK, Sanyal P, Paul S (2010) Mesoproterozoic sulfidic ocean, delayed oxygenation and evolution of early life: sulfur isotope clues from Indian Proterozoic basins. *Geological Magazine*, 147, 206–218.

17. Mishra B (2010) Metamorphism and hydrothermal fluid evolution in relation to gold metallogeny, Dharwar Craton, southern India In: Deb M and Goldfarb RJ (eds) Gold metallogeny in India and beyond, Narosa, New Delhi, pp.154–167.

18. Sakthi Saravanan C, **Mishra B**, Jairam MS (2009) P–T conditions of mineralization in the Jonnagiri granitoid-hosted gold deposit, eastern Dharwar Craton, southern India: Constraints from fluid inclusions and chlorite thermometry. *Ore Geology Reviews*, 36, 333–349.

19. Sakthi Saravanan C, **Mishra B** (2009) Uniformity in sulfur isotope composition in the orogenic gold deposits from the Dharwar Craton, southern India. *Mineralium Deposita*, 44, 597−605.

20. **Mishra B**, Bernhardt HJ (2009) Metamorphism, graphite crystallinity and sulfide anatexis of the Rampura-Agucha massive sulfide deposit, northwestern India. *Mineralium Deposita*, 44, 183−204.

21. Mishra B (2009) Economic mineralizations. *Ore Geology Reviews*, 36, 363−364.

22. **Mishra B**, Pal N (2008) Metamorphism, fluid flux and fluid evolution relative to gold mineralization in the Hutti-Maski Greenstone Belt, Eastern Dharwar Craton, India. *Economic Geology*, 103, 801−827.

23. Maji A K, Goon S, Bhattacharya A, **Mishra B**, Mahato S, Bernhardt HJ (2008). Proterozoic polyphase metamorphism in the Chotanagpur Gneissic Complex (India), and implication for trans-continental Gondwanaland correlation, *Precambrian Research*, 162, 385–402.

24. Mahato S, Goon S, Bhattacharya A, **Mishra B**, Bernhardt HJ (2008). Thermo-tectonic evolution of the North Singhbhum Mobile Belt; A view from the western part of the belt. *Precambrian Research*, 162, 102–127.

25. **Mishra B**, Saravanan CS, Bhattacharya A, Goon S, Mahato S, Bernhardt HJ (2007) Implications of super dense carbonic and hypersaline fluid inclusions in granites from the Ranchi area, Chottanagpur Gneissic Complex, Eastern India. *Gondwana Research*, 11, 504–515.

26. Pal DC, **Mishra B**, Bernhardt HJ (2007) Ore Mineralogy and geochemistry of pegmatite-hosted Sn-, Ta–Nb-, and Zr–Hf-bearing minerals from the southeastern part of the Bastar-Malkangiri pegmatite belt, Central India. *Ore Geology Reviews*, 30, 30–55.

27. Pal DC, Panigrahi MK, **Mishra B** (2007) Contrasting Fluid Inclusion characteristics of staniferous and non-staniferous Pegmatites of southeast Bastar, Central India. *Journal of Asian Earth Sciences*, 28, 306–319.

28. **Mishra B**, Upadhyay D, Bernhardt HJ (2006) Metamorphism of the host and associated rocks at the Rajpura-Dariba massive sulfide deposit, Northwestern India. *Journal of Asian Earth* Sciences, 26, 2006, 21–37.

29. Mishra B (2005) World Skarn Deposits: Skarns of the Indian Subcontinent: p. 1-2 and 1 Table, in electronic folder "3 India" in electronic folder "Meinert" in CD-ROM supplementary appendix to: Meinert, L.D., Dipple, G. M., and Nicolescu, S., 2005, World Skarn Deposits: in Hedenquist, J.W., Thompson, J.F.H., Goldfarb, R.J., Richards, J.P., eds., Economic Geology 100th Anniversary Volume, Society of Economic Geologists, p. 299–336.

30. **Mishra B**, Pal N, Basu Sarbadhikari A (2005) Fluid inclusion characteristics of the Uti gold deposit, Hutti-Maski greenstone belt, southern India. *Ore Geology Reviews*, 26, 1–16.

31. Mishra B (2004) Rampura-Agucha zinc-lead deposit. *Gondwana Research*, 7, 1255–1257.

32. Pal N, **Mishra B** (2004) Epigenetic nature of the BIF-hosted gold mineralization at Ajjanahalli, southern India: Evidence from ore petrography and fluid inclusion studies: Reply. *Gondwana Research*, 7, 632–635.

33. **Mishra B**, Pal N, Ghosh S (2003) Fluid evolution of the Mosabani and Rakha copper deposits, Singhbhum district, Jharkhand: evidence from fluid inclusion studies in mineralized quartz vein. *Journal of Geological Society of India*, 61, 51–60.

34. Pal N and **Mishra B** (2003) Epigenetic nature of the BIF-hosted gold mineralization at Ajjanahalli, southern India: evidence from ore petrography and fluid inclusion studies. *Gondwana Research,* 6, 531–540.

35. Pal N, **Mishra B** (2002) Alteration geochemistry and fluid inclusion characteristics in relation to formation of greenstone- hosted gold deposit at Hutti, eastern Dharwar Craton, India. *Mineralium Deposita*, 37,722–736.

36. Pruseth KL, **Mishra B**, Bernhardt HJ (2001) The minerals boulangerite, falkmanite and Cu- free meneghinite: synthesis, new powder diffraction data and stability relations. *European Journal of Mineralogy*, 13, 411–419.

37. Pal N, Pal DC, **Mishra B**, Meyer FM (2001) Geochemistry of the Palim granite, Bastar tin province, Central India*. Mineralogy and Petrology*, 72, 281–304 (IF = 1.35).

38. Mishra B (2000) Evolution of the Rajpura-Dariba polymetallic sulfide deposit: constraints from sulfide-sulfosalt phase equilibria and fluid inclusion studies: in Crustal evolution and Metallogeny in the northwestern Indian shield. (ed. By Deb, M), Narosa Publisher, New Delhi, pp. 347–370.

39. **Mishra B**, Pal DC, Panigrahi MK (1999) Fluid evolution in quartz- vein hosted tungsten mineralization at Chhendapathar, Bankura district, WB. *Proc. Ind. Acad. Sci. (Earth & Planetary Sciences)*, 108, 23–31.

40. Pruseth KL, **Mishra B**, Bernhardt HJ (1999) An experimental study on cubanite irreversibility: implications on natural chalcopyrite-cubanite intergrowths. *European Journal of Mineralogy*, 11, 471–476.

41. **Mishra B**, Panigrahi MK (1999) Fluid evolution in the Kolar Gold Field: Evidence from fluid inclusion studies. *Mineralium Deposita*, 34, 173–181.

42. Pruseth KL, **Mishra B**, Bernhardt HJ (1998) Solid solubility in synthetic zinkenite, robinsonite and meneghinite in the Cu_2S-PbS-Sb_2S_3 system. *Canadian Mineralogist*, 36, 207–213.

43. Pal DC, Panigrahi MK, **Mishra B** (1998) Fluid inclusion characteristics of tin-bearing pegmatites of Malkangiri district, Orissa. *Journal of Geological Society of India*, 51, 685–696.

44. Pruseth KL, **Mishra B**, Bernhardt HJ (1997) Phase relations in the Cu_2S-PbS-Sb_2S_3 system: an experimental appraisal and application to natural polymetallic sulfide ores. *Economic Geology*, 92, 720–732.

45. **Mishra B**, Pruseth KL (1994) Phase equilibrium studies in the system Cu_2S - PbS - Sb_2S_3: non-stoichiometry in the sulfosalts and isothermal variation in sulfur fugacity. *Contributions to Mineralogy and Petrology*, 118, 92–98.

46. Pruseth KL, **Mishra B** (1993) Variation in Forbidden energy gap on the PbS – $\alpha AgSbS_2$ quasi-binary join. *Indian Journal of Earth Science*, 20, 96–103.

47. **Mishra B**, Mookherjee A (1991) Tetrahedrite mineral chemistry and metal zoning: A thermodynamic assessment from the Rajpura-Dariba polymetallic deposit, India, *Economic Geology*, 86, 1529–1538.

48. **Mishra B**, Pruseth KL, Sarkar S (1991) A Diffuse reflectance study of synthetic acanthite, stibnite and bournonite. *Journal of Geological Society of India*, 37, 7–12.

49. **Mishra B**, Panigrahi MK (1990) Fe-Zn mixing energetics of the Iss phase in the system Cu -Fe -Zn -S. *Contribution to Mineralogy and Petrology*, 105, 562–568.

50. Panigrahi MK, **Mishra B**, Mookherjee A (1990) Ore mineralogy and fluid inclusion characteristics of different ore associations from Malanjkhand copper deposit MP (India). *Journal of Geological Society of India*, 37, 239–256.

51. **Mishra B**, Mookherjee A (1988) Geothermometry based on fractionation of Mn and Cd between coexisting sphalerite and galena from some carbonate-hosted sulfide deposits in India. *Mineralium Deposita*, 23,179–185.

52. **Mishra B**, Mookherjee A (1986) Analytical formulation of phase equilibria in two observed sulfide-sulfosalt assemblages in Rajpura-Dariba polymetallic deposit. *Economic Geology*, 81,627–639.

53. Mookherjee A, **Mishra B** (1984) `Derived' and observed sulfosalt - sulfide phase assemblages compared - a case study from Rajpura-Dariba, India. *Mineralium Deposita*, 19,112 – 117.

54. Mookherjee A, Mozgova N, Golovanova TI, **Mishra B** (1984) Rare minerals from Rajpura-Dariba, Rajasthan VI : Thalcusite, its geochemical significance. *Neues. Jahrb. Miner. Monatsch*., H10, 444–454.

55. Mookherjee A and **Mishra B** (1983) On the reaction-rim texture tetrahedrite + galena = bournonite + chalcopyrite. *Journal of Geological Society of India*, 24,588 – 593.