

Updated Bio-data of Santanu Kumar Bhowmik

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Academic qualifications

Degree	Year	University/Institution	Class/rank
B.Sc. (Geology)	1984-1987	*JU, Kolkata	81% (<i>1st</i>)
M.Sc (Applied Geology)	1987-1990	JU, Kolkata	79% (<i>1st</i>)
Ph.D. (Science)	1991-1994	JU, Kolkata	

*JU: Jadavpur University

Professional qualifications

Institution	Position	Year
Geological Survey of India	Geologist	1994-2000
IIT Kharagapur	Assistant Professor	2000-2004
IIT Kharagapur	Associate Professor	2004-2010
IIT Kharagapur	Professor	2010

Professional experience

Geologist in Geological Survey of India

1. Worked as a Petrologist in the REGIONAL PETROLOGICAL LABORATORY, GSI, Nagpur from May, 1994 to July, 2000. Carried out petrological work on **Dongargarh Volcanics, the Deccan Trap Basalt and on the Granitic Rocks of the Sausar Mobile Belt.**
2. Learnt the techniques of **exploration methods, structural mapping and photogeological and remote sensing interpretation.**
3. Learnt **mapping techniques in high-grade granulite-gneiss terrain** as part of a DST- (Dept of Science & Technology) sponsored training programme in the Sandmata Granulite Belt, Rajasthan, Western India.

Faculty, Department of Geology and Geophysics, IIT, Kharagpur

Teaching Experience (Classroom):

1. Metamorphic Petrology.
2. Igneous Petrology.
3. Mineralogy.
4. Geochemistry.

Teaching Experience (Geological Fieldwork):

Imparts basic training in geological mapping skills to 2nd and 3rd year students in different metamorphic belts of India.

Research experience

Research specialization

Metamorphic Petrology, Igneous Petrology, Geochronology, Precambrian Tectonics

Contribution to research

My research career over the years centered around understanding the geodynamic evolution of the Precambrian high-grade orogenic domains, namely the Eastern Ghats Mobile Belt (EGB), the Central Indian Tectonic zone (CITZ) and the Aravalli-Delhi Mobile Belt (ADMB), using multidisciplinary approaches namely, metamorphic, structural, geochemical and geochronological tools. The dominating themes of my research are the desire (a) to identify and to distinguish monocyclic and polycyclic orogenic domains in these very complex mobile belts, (b) to reconstruct metamorphic P-T-t paths of the different orogenic events, (c) to quantify the P-T-X controls on the mineral stabilities in charnockitic-enderbitic, pelitic and mafic compositional space and finally (d) to constrain the timing of metamorphic and magmatic events using high resolution SHRIMP U-Pb zircon and Th-U-Pb monazite geochronometers. *My work with my students and collaborators led to (a) the discovery of new high-pressure granulite-gneiss domain with a clockwise P-T path in the CITZ, (b) the first documentation of ~1.6 Ga ultra-high temperature granulite metamorphism along a counterclockwise metamorphic P-T path and hot orogenesis at the craton-mobile belt interface, at the southern margin of the CITZ, and (c) the first record of Grenville-aged high-pressure granulite metamorphism along a CW P-T path in the ADMB to name a few.*

Current research interest

The nominee's current research interest lies in (a) *modeling metamorphic transformations and fluid evolution along slab-mantle wedge interfaces from fossil subduction zones* and (b) *application of diffusion kinetics and high precision geochronology to model various planetary processes and also to quantify the T-t history of Indian metamorphic belts.*

Ph.D guidance

Five (Completed), Three (Ongoing)

Research projects executed

1. Geological Survey of India: **2** (Completed)
2. Department of Science & Technology: **5** (Completed)
3. Council of Scientific & Industrial Research: **1** (Completed)
4. DAAD: **1** (Completed)
5. INSA-DFG: **2** (Completed)

6. ISIRD, IIT, Kharagpur: **1** (Completed)
7. DST-AISRF: **1** (Ongoing)
8. ISRO: **1** (Ongoing)

Workshop organised:

1. DST-sponsored **International THERMOCALC WORKSHOP** on " The use of THERMOCALC software in the modelling and interpretation of metamorphic rocks", **IIT, KHARAGPUR, 8-10th January, 2013. (P.I. and Convenor).**

Awards and Honours

National

1. **National Scholar** during the Period 1982-1990.
2. Recipient of **University Gold Medal**, 1987 for standing **1st in the B.Sc.**
3. Awarded the **CSIR Certificate of Merit** for being among the **ten top candidates in the Joint CSIR-UGC Test, 1989.**
4. Recipient of **University Gold Medal**, 1990, for standing **1st in the M.Sc.**
5. **CSIR Research Fellow** during the period Feb' 1991 to May' 1994.
6. **Stood 1st in Geologists' Exam' 1991**, conducted by the **UNION PUBLIC SERVICE COMMISSION, GOVT.OF INDIA.**
7. Recipient of **Sarat Lal Biswas Memorial Medal** from the **Asiatic Society**, Kolkata, 1993.
8. **Stood 1st in the 19th Orientation Course for Geologists**, in Batch 'A' conducted by the **Training Institute, Geological Survey of India.**
9. Recipient of **Prof. Nirmal Nath Chatterjee Memorial Medal** from the **Asiatic Society**, 1996.
10. Recipient of **NATIONAL MINERAL AWARD** in the field of **BASIC GEOSCIENCES** by the Ministry of Mines, Government of India, 1999.

International

1. Recipient of **DAAD Short term Study Visit Fellowship** for Foreign Academicians, 2002.
2. Recipient of **INSA-DFG Short term Study Visit Fellowship**, 2003.

3. Recipient for **INSA-DFG Short term Study Visit Fellowship for the year**, 2008-09.
4. Recipient of **TiGER (The Institute of Geoscience Research) post-doctoral research fellowship, Department of Applied Geology, Curtin University of Technology, Perth, Australia for the year**, 2009.

Academic Assignments Abroad:

1. Visiting Scientist to the University of Bonn, Germany, 2002, 2003.
2. Visiting Scientist to the Ruhr University, Bochum, Germany, 2008-09.
3. Visiting Senior Research Fellow to the Curtin University of Technology, Australia, 2009.
4. Visited Taiwan National University, Taipei, Taiwan, September, 2010 to deliver an invited talk.
5. Visited Florence, Italy, August, 2013 to deliver a talk in the Goldschmidt Conference, 2013.

Existing Research Collaborations:

1. Prof. Somnath Dasgupta, Jamia Milia, New Delhi.
2. Prof. Sumit Chakraborty, Ruhr University, Bochum, Germany
3. Prof. Simon Alexander Wilde, Curtin University, Perth, Australia.
4. Prof. Geoff L. Clarke, University of Sydney.

Reviewer of Journals

International

1. Lithos.
2. Precambrian Research.
3. Gondwana Research.
4. Geological Journal
5. American Journal of Science
6. Geological Society London
6. Journal of Asian Earth Sciences
7. Journal of metamorphic Geology
8. Terra Nova

9. Tectonophysics

National

1. Journal of Earth System Science.
2. Journal of Geological Society of India.

Reviewer of Project

Department of Science and Technology, New Delhi; Ministry of Earth Science, New Delhi.

Examiner of PhD Thesis

Jadavpur University, IISER, Kolkata

Examiner of MPhil Thesis

Curtin University, Perth, Western Australia.

Invited lectures in India/abroad and/or chaired any scientific International conference/symposia:

1. Delivered an *oral presentation* in the International Granulite Conference, 2006 in Brazil.
2. Delivered *invited lecture* in the International AOGS Conference, 2010 in Hyderabad, India.
3. Delivered an *invited lecture* in the Department of Applied Geology, Curtin University, Perth, Australia in May, 2009.
4. Delivered an *invited lecture* in the Department of Geosciences, National Taiwan University in September, 2010.
5. Delivered *a key note* talk in the International Granulites & Granulites 2013 Conference, Hyderabad, India.
6. *Chaired a scientific session* in the Granulites & Granulites 2013 Conference, Hyderabad, India.
7. Delivered *two key note talks* in the DST and AISRF-sponsored International Workshop in Manali, India, 2013
8. Delivered an *oral presentation* in the International Goldschmidt Conference, 2013 in Florence, Italy.

9. Delivered an *invited lecture* in the DST-sponsored brainstorming workshop on Geosciences Title: Evolution of the Indian Lithosphere and the Appearance and Diversification of Life” in the Jadavpur University in January, 2014.
10. Delivered an *invited lecture* in the National Conference on “Making of the Indian Continent”, held in the Presidency University, Kolkata, in November, 2014.
11. Delivered *invited lectures* in the GSI Training Institute, Hyderabad in November, 2015.
12. Delivered an *invited lecture* in the Regional Level Brain Storming Session for IGC-2020, held in GSI, Shillong in January, 2016.
13. Delivered an *invited lecture* on the Proceedings of the International Workshop with co-host and neighbouring countries on “Vision for Fusion” in Ministry of Earth Sciences, New Delhi on 29-30 March, as part of selecting geological field traverse in the Nagaland Ophiolite Complex for the 36th IGC-2020..

Updated List of Publications

Publications in Referred Journals

- (1) Sengupta, P., Dasgupta, S., Bhattacharya, P.K., Fukuoka, M., Chakraborti, S. & **Bhowmick, S.**, (1990). Petrotectonic imprints in the sapphirine granulites from Anantagiri, Eastern Ghats mobile belt, India. *Journal of Petrology*, 31, 971-996.
- (2) **Bhowmik, S. K.**, Dasgupta, S., Hoernes, S. & Bhattacharya, P.K. (1995). Extremely high-temperature calcareous granulites from the Eastern Ghats, India : Evidence for isobaric cooling, fluid buffering, and terminal channelized fluid flow. *European Journal of Mineralogy*, 7, 689-703.
- (3) **Bhowmik, S.K.** (1997). Multiple episodes of tectonothermal processes in the Eastern Ghats granulite belt. *Proc. Indian Acad. Sci. (Earth Planet Sci.)*, 106, 131-146.
- (4) **Bhowmik, S.K.**, Pal, T., Roy, A. & Chatterjee, K. K. (1997). Penecontemporaneous deformation structures in relation to diagenesis of carbonate hosted manganese ores: An example from polydeformed and metamorphosed Sausar belt. *Indian Minerals*, 51 (No.1&2), 149-164.

- (5) **Bhowmik, S.K.**, Pal, T., Roy, A. & Pant, N. C. (1999). Evidence for Pre-Grenvillian high-pressure granulite metamorphism from the northern margin of the Sausar mobile belt in Central India. *Journal of the Geological Society of India*, 53, 385-399.
- (6) **Bhowmik, S.K.** (2000). Ultrapotassic rocks along late ductile shear zones from the Eastern Ghats belt, India, and its significance. *Gondwana Research*, 3, 55-63.
- (7) Kano, T., Yoshida, M., Wada, H., Satish-Kumar, M., Roy, A., Bandhopadhyay, B.K., Khan, A.S., Pal, T., Huin, A.K., **Bhowmik, S.K.**, Chattopadhyay, A. (2001). Field studies in the Sakoli and Sausar belts of the Central Indian Tectonic Zone, 1999-2000. *Journal of Geosciences*, 44, 17-39.
- (8) Roy, A., Hanuma Prasad, M., **Bhowmik, S.K.** (2001). Recognition of Pre-Grenvillian and Grenvillian Tectonothermal Events in the Central Indian Tectonic Zones: Implications on Rodinian Crustal Assembly. *Gondwana Research*, 4, 755-757.
- (9) **Bhowmik, S.K.** & Roy, A. (2003). Garnetiferous metabasites from the Sausar Mobile Belt: Petrology, P-T path and implications for the tectonothermal evolution of the Central Indian Tectonic Zone. *Journal of Petrology*, 44, 387-420.
- (10) **Bhowmik, S.K.** & Spiering, B. (2004). Constraining the prograde and retrograde P-T paths of granulites using decomposition of initially zoned garnets: An example from the Central Indian Tectonic Zone. *Contributions to Mineralogy and Petrology*, 147, 581-603.
- (11) **Bhowmik, S.K.**, Basu Sarbadhikari, A., Spiering, B & Raith, M.M. (2005). Mesoproterozoic Reworking of Palaeoproterozoic Ultrahigh Temperature Granulites in the Central Indian Tectonic Zone and its Implications. *Journal of Petrology*, 46, 1085-1119.
- (12) **Bhowmik, S.K.** (2006). Ultra high temperature metamorphism and its significance in the Central Indian Tectonic Zone. *Lithos*, 92, 484-505.
- (13) Saha, L., **Bhowmik, S.K.**, Fukuoka, M., Dasgupta, S. (2008). Contrasting episodes of regional granulite facies metamorphism in enclaves and host gneisses from the Aravalli-Delhi Mobile Belt, NW India. *Journal of Petrology*, 49, 107-128.
- (14) Basu Sarbadhikari, A. & **Bhowmik, S. K.** (2008). Constraining the metamorphic evolution of a cryptic hot Mesoproterozoic orogen in the Central Indian Tectonic Zone,

- using P-T pseudosection modeling of mafic intrusions and host reworked granulites. *Precambrian Research*, 162, 128–149.
- (15) **Bhowmik, S.K.**, Saha, L., Dasgupta, S. & Fukuoka, M. (2009). Metamorphic phase relations in orthopyroxene-bearing granitoids: Implication for high-pressure metamorphism and prograde melting in the continental crust. *Journal of Metamorphic Geology*, 27, 295-315.
- (16) Goswami, S., **Bhowmik, S.K.** & Dasgupta, S. (2009). Petrology of a non-classical Barrovian inverted metamorphic sequence from the western Arunachal Himalaya, India. *Journal of Asian Earth Sciences*, 36, 390-406.
- (17) **Bhowmik, S.K.**, Bernhardt, H-J., Dasgupta, S. (2010). Grenvillian age high pressure upper amphibolite-granulite metamorphism in the Aravalli-Delhi Mobile Belt, Northwestern India: New Evidence from monazite Chemical Age and its Implication. *Precambrian Research*, 178, 168-184.
- (18) Bhandari, A., Pant, N.C., **Bhowmik, S.K.**, Goswami, S. (2011). ~1.6 Ga Ultrahigh-temperature granulite metamorphism in the Central Indian Tectonic Zone: Insights from metamorphic phase relations and monazite chemical ages. *Geological Journal*, 46, 198-216.
- (19) **Bhowmik, S.K.**, Wilde, S.A., Bhandari, A. (2011). Zircon U-Pb/Lu-Hf and Monazite Chemical Dating of the Tirodi Biotite Gneiss: Implication for Latest Paleoproterozoic to Early Mesoproterozoic Orogenesis in the Central Indian Tectonic Zone. *Geological Journal*, 46, 574-596.
- (20) Mahapatra, S.N., Pant, N.C., **Bhowmik, S.K.**, Tripathi, A.K., Nanda, J.K. (2012). Archaean granulite facies metamorphism at the Singhbhum craton-Eastern Ghats Mobile Belt interface: Implication for the Ur Supercontinent Assembly. *Geological Journal*, 47, 312-333.
- (21) **Bhowmik, S.K.** & Dasgupta, S. (2012). Tectonothermal evolution of the Banded Gneissic Complex in Central Rajasthan, NW India: Present status and correlation. *Journal of Asian Earth Sciences*, 49, 339-348.
- (22) **Bhowmik, S.K.**, Wilde, S.A., Bhandari, A., Pal, T., Pant, N. C. (2012). Growth of the Greater Indian Landmass and its Assembly in Rodinia: Geochronological evidence from the Central Indian Tectonic Zone. *Gondwana Research*, 22, 54-72.

- (23) **Bhowmik, S.K.**, Chattopadhyay, A., Gupta, S., Dasgupta, S. (2012). Proterozoic tectonics: An Indian perspective. *Proceedings of the Indian National Science Academy*, 78, 385-391.
- (24) Borinski, S.A., Hoppe, U., Chakraborty, S., Ganguly, J., **Bhowmik, S.K.** (2012). Multicomponent diffusion in garnets I: General theoretical considerations and experimental data for Fe-Mg systems. *Contributions to Mineralogy & Petrology*, 164, 571-586.
- (25) **Bhowmik, S.K.** & Chakraborty, S. (2013). Constraining the Thermal History of an Ultra-Hot Orogen from Metamorphic Reaction History and Garnet-Orthopyroxene Diffusion Modelling Studies. *Mineralogical Magazine*, 77(5) 700.
- (26) **Bhowmik, S.K.**, Wilde, S. A., Bhandari, A., Basu Sarbadhikari, A. (2014). Zoned Monazite and Zircon as Monitors for the Thermal History of Granulite Terranes: An Example from the Central Indian Tectonic Zone. *Journal of Petrology*, 55, 585-621.
- (27) Ao, A. and **Bhowmik, S.K.** (2014). Cold subduction of the Neotethys: The metamorphic record from finely banded lawsonite and epidote blueschists and associated metabasalts of the Nagaland Ophiolite Complex, India. *Journal of Metamorphic Geology*, 32, 829-860.
- (28) Goswami-Banerjee, S., **Bhowmik, S.K.**, Dasgupta, S. and Pant, N.C. (2014). Burial of thermally perturbed Lesser Himalayan midcrust: Evidence from a detailed petrochemistry and P-T estimation of western Arunachal Himalaya, India. *Lithos*, 208-209, 298–311.
- (29) **Bhowmik, S.K.** and Ao, A. (2016). Subduction Initiation in the Neo-Tethys: Constraints from Counterclockwise P-T Paths in Amphibolite Rocks of the Nagaland Ophiolite Complex, India. *Journal of Metamorphic Geology*, 34, 17–44.
- (30) Clarke, G.L., **Bhowmik, S.K.**, Ireland, T.R., Aitchison, J.C., Chapman, S. L. and Kent, L. (2016). Inverted Oligo-Miocene metamorphism in the Lesser Himalaya Sequence, Arunachal Pradesh, India; age and grade relationships. *Journal of Metamorphic Geology* (In Press).
- (31) Jain, A.K. and **Bhowmik, S.K.** (2016). Tectonics and Evolution of the Trans-Himalayan Mountains and Nagaland Ophiolite Belt. *Proceedings of the Indian National Science Academy*, 82 No. 3 July Spl Issue.

- (32) Saha, D., **Bhowmik, S.K.**, Bose, S. and Sajeev, K. (2016). Proterozoic Tectonics and Trans-Indian Mobile Belts: A Status Report. *Proceedings of the Indian National Science Academy*, 82 No. 3 July Spl Issue.

Publications in proceedings of seminars/conferences

- (1) **Bhowmik, S.K.** & Dasgupta, S. (2004). Tectonometamorphic evolution of boudin-type granulites in the Central Indian Tectonic Zone and in the Aravalli Delhi Mobile Belt: A synthesis and future perspectives. Geological Survey of India Special Publication. Number 84, 227-246.
- (2) **Bhowmik, S.K.**, Pal, T., Pant, N. C. & Shome, S. (2000). Implication of Ramakona cordierite gneiss in the crustal evolution of Sausar mobile belt in Central India. Proceedings Volume of the International Seminar on “Precambrian Crust in Eastern and Central India. IGCP-368, Bhubaneshwar, 1998, 131-150.
- (3) **Bhowmik, S. K.**, Pal, T., Roy, A. & Padhi, R.N. (1996). Contrasting mineral paragenesis of metamorphosed Mn-deposits from Satak-Beldongri-Lohdongri mines of Satak belt, Nagpur District, Maharashtra, India. Mineral and Groundwater Resources of Vidarbha Symp. Vol., 1996, 101-109.

Abstracts in proceedings of seminars/conferences

- (1) **Bhowmik, S.K. (2013)**. Thermal history of the Proterozoic granulites from northwestern, central, eastern and northeastern India: implication for the growth of the Greater Indian landmass. Granulites & Granulites 2013, Hyderabad, 16–20 January, 2013, Abstracts.
- (2) **Bhowmik, S.K.** , Sarbadhikari, A.B. and Wilde, S. (2006). 1.6 Ga Metamorphic Re-heating and Subsequent Compression of UHT Granulites from the Central Indian Tectonic Zone. International conference with program and abstracts on the granulites and granulites. Brasilia, Brazil, page 16.

- (3) Roy, A., Hanuma Prasad, M., **Bhowmik, S.K.** (2001). Recognition of Pre-Grenvillian and Grenvillian Tectonothermal Events in the Central Indian Tectonic Zones: Implications on Rodinian Crustal Assembly. *Gondwana Research*, 4, 755-757.
- (4) **Bhowmik, S.K.**, Pal, T. & Roy, A. (1998). Reworking of older granulites during Sausar orogeny: An evidence from the northern margin of Sausar mobile belt in Central India. *The Indian Mineralogist*, 32 (No.1), 19-20.
- (5) **Bhowmik, S.K.**, Wilde, S.A., Bhandari, A. and Pant, N.C. (2010). Transition from Accretionary to Collisional orogenesis in the Central Indian Tectonic Zone: Linking Columbia with Rodinia Supercontinent Assembly. 7th Annual Meeting of the Asia Oceania Geosciences Society and Geosciences World Community Exhibition. 5 to 9 July, 2010 Hyderabad International Convention Centre, India. Conference on “Metamorphism and orogenesis from the Archean to the present, with particular reference to the evolution of Asia and its Gondwanan heritage”, SE01-A003 (AOGS10-Abs-134).
- (6) Bhandari, A., **Bhowmik, S.K.**, Wilde, S.A. and Pant, N.C. (2010). Inherited Monazites and Zircons in ~1.6 Ga Ultrahigh-Temperature Granulites from the Southern Margin of the Central Indian Tectonic Zone: Implication for Sedimentary Provenance and Central Indian Orogenesis. . 7th Annual Meeting of the Asia Oceania Geosciences Society and Geosciences World Community Exhibition. 5 to 9 July, 2010 Hyderabad International Convention Centre, India. Conference on “Metamorphism and orogenesis from the Archean to the present, with particular reference to the evolution of Asia and its Gondwanan heritage”, SE01-A004 (AOGS10-Abs-136).
- (7) Goswami, S., **Bhowmik, S.K.**, Dasgupta, S. and Pant, N.C. (2010). Pre-Barrovian Thermal Perturbation in the Lesser Himalayan Sequence Mid-crust of Western Arunachal, India: Implication for the Origin of Himalayan Inverted Thermal Gradient. 7th Annual Meeting of the Asia Oceania Geosciences Society and Geosciences World Community Exhibition. 5 to 9 July, 2010 Hyderabad International Convention Centre, India. Conference on “Metamorphism and orogenesis from the Archean to the present, with particular reference to the evolution of Asia and its Gondwanan heritage”, SE01-A011 (AOGS10-Abs-489).

- (8) **Bhowmik, S.K.** and Chakraborty, S. (2013). Constraining the Thermal History of an Ultra-Hot Orogen from Metamorphic Reaction History and Garnet-Orthopyroxene Diffusion Modelling Studies. *Mineralogical Magazine*, 77(5) 700.
- (9) Roeder, T., Aitchison, J., Stojanovic, D., Agarwal, A., Ao, A., **Bhowmik, S.** (2013). Detrital zircon geochronology overlying the Naga Hills ophiolite. AGU Fall Meeting Abstracts 1, 2421.
- (10) Clarke, G.L., **Bhowmik, S.K.**, Aitchison, J.C., Ireland, T.R. (2014). Disjunctive Grade Variation from Greenschist to Granulite Facies, Siyom Valley, Eastern Arunachal Pradesh, India. AGU Fall Meeting Abstracts T13D-04.
- (11) Aitchison, J.C., Clarke, G.L., Ireland, T.R., Baxter, A.T., **Bhowmik S.K.**, Ao, A., Hussain, F., Richard, J. (2014). Abor volcanics: Magmatic 'breadcrumbs' on the trail of the Kerguelen mantle plume? AGU Fall Meeting Abstracts T21B-4604.
- (12) Roeder, T., Aitchison, J.C., Clarke, G.L., Ireland, T.R., Ao, A., **Bhowmik S.K.**, (2014). Using Zircon Geochronology to Unravel the History of the Naga Hills Ophiolite. AGU Fall Meeting Abstracts T21B-4603.

Manuscript under review/preparation

- (1) **Bhowmik, S.K.** & Chakraborty, S. (2016). Sequential kinetic modelling: a new tool decodes pulsed tectonic patterns in early hot orogens of Earth. *Earth and Planetary Science Letters* (Under Review).