

## ASISH R. BASU

Professor Emeritus, Earth & Environmental Sciences  
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### Education

Calcutta University	Geology, Physics, Mathematics	B.Sc. 1964
Calcutta University	Geology	M.Sc. 1966
University of Chicago	Geophysical Sciences	M.S. 1969
University of California-Davis	Geology	Ph.D. 1975
University of Minnesota	Geochemistry	Research Associate, 1975-1977
U.S. Geological Survey	Geochemistry	Research Scientist, 1977-1978

### Appointments

Professor Emeritus, Earth & Environmental Sciences, University of Texas, Arlington, 2020 – present  
Professor, Earth & Environmental Sciences, University of Texas, Arlington, 2017 - 2020  
Professor and Chair, Earth & Environmental Sciences, University of Texas, Arlington, 2013 - 2017  
Professor of Geological Sciences, University of Rochester, 1987–2012  
Chair, Department of Earth and Environmental Sciences, University of Rochester, 1986 – 1998  
Associate Professor of Geological Sciences, University of Rochester, 1981 – 1987  
Assistant Professor of Geological Sciences, University of Rochester, 1978 – 1981

### Awards and Honors

Fellow, Geological Society of America  
Fellow, American Association for the Advancement of Science  
Scholar Awardee 2005, American Federation of Mineralogical Society  
'Volcan Basu', San Quentin Volcanic Field in Baja California, named in 1995 in recognition of research done on this volcanic field in the 1970's-1980's

### Synergistic Activities

Served as an executive committee member of Volcanology, Geochemistry and Petrology section, American Geophysical Union, 1998-2004

Editorial Board, International Geology Review, 2013- present.

Organized and co-chaired symposia and technical sessions at American Geophysical Union (AGU) Fall Meetings and Geological Society of America (GSA) Annual Meetings

Actively involved in outreach activities throughout my professional career in visiting elementary, middle and high schools and natural history museums, giving public lectures in efforts for the promotion of the understanding of geosciences.

Advisor, International Atomic Energy Agency (IAEA) - Isotope Hydrology Division in studies of groundwater Arsenic contamination in Bangladesh, groundwater potential in Jordan

Co-edited with S.Hart (**A.Basu** and S.Hart) a volume, "Earth Processes: Reading the Isotopic Code". Geophysical Monograph Series, American Geophysical Union, 95, 1996; an extensively used reference on this topic.

## Research Accomplishment

My research has yielded significant insights specifically on problems related to the following:

1. Plume Volcanism: Our extensive work on the Siberian, Deccan and the Kerguelen flood volcanic provinces have documented the relationship of highly alkalic volcanism to be in the early and late phases, with respect to the main tholeiitic phase. They were all sourced from a relatively less-depleted, high  $^3\text{He}$  bearing lower mantle. Further, with P. Renne, we showed the Siberian flood basalts had relatively short duration of volcanism at the Permian-Triassic boundary.
2. Permian-Triassic mass extinction: With colleagues M. Petaev and S. Jacobsen at Harvard, we discovered meteorite fragments at the P-T boundary (2003), a discovery that was challenged by several scientists including P. Renne, K. Farley and S. Bowring, who opined that Siberian flood volcanism was the sole cause of P-T extinction. We were still convinced of our meteorite evidence for a bolide impact at the P-T boundary, only recently confirmed by the discovery of an impact crater in northeast Parana Basin, Brazil (Tohver et al., 2012; Geochronological constraints on the age of a Permo-Triassic impact event: U-Pb and  $^{40}\text{Ar}/^{39}\text{Ar}$  results for the 40km Araguainha structure of central Brazil, *Geochimica et Cosmochimica Acta*, 86, 1 June 2012, Pages 214-227). It is interesting in this connection the recently confirmed very short duration of 60k years of the P-T extinction by the MIT group (Burgess et al., PNAS, 2014). Synchrony and causal relations between P-T boundary crises, Siberian flood volcanism and meteoritic impact need further exploration on the basis of our collective work on these issues.
3. With graduate student B. Faggart and M. Tatsumoto, we provided the first convincing evidence of meteorite impact-triggered origin of the Sudbury Igneous Complex using Nd isotopes as tracers of large scale crustal melting (230, 436-439, *Science* 1985).
4. The convincing evidence of submarine groundwater discharge to the ocean and its effect on the marine Sr-isotopic record came from our study in the Bengal Basin with colleagues from Harvard and Rochester (293, 1470-1473, *Science* 2001). This study also accompanied two other major papers on the geochemical study of Arsenic release mechanism, weathering and chemisorption in the Bengal Basin groundwater.
5. Geochemical evidence for Middle-Tertiary volcanism during ridge-trench collision in Western California was documented in two papers with graduate student Cole (258, 793-796, *Science* 1992; *GSA Bulletin* 107, 167-179, 1995).
6. With M. Tatsumoto (1979, 1980), using Nd isotopes in garnet lherzolite and eclogite inclusions in kimberlites, we provided evidence of geochemical heterogeneity in the Earth's mantle that was inherent in the general earth model advocated by D. DePaolo (p110: Fig. 7.11, and p165, *Nd Isotope Geochemistry*, Springer, 1988).
7. Stability of amphiboles in the upper mantle and its possible role in MORB genesis was first documented with Sr isotopic evidence and high K/Rb ratio arguments in both amphiboles and ocean-ridge basalts with V.R. Murthy [v5 (6), p365-368, *Geology* 1977]. Role of amphibole in mantle source of MORB has recently been documented by experimental petrological evidence by D.H. Green (467, 448-451, *Nature* 2010).

### ***Collaborators and Co-editors***

A.A.Anbar, H.Craig, P.G.DeCelles, M.R.Drury, C.J.Ebinger, K.A.Farley, C.N.Garzione, R.B.Georg, P-Y.Gillot, R.T.Gregory, A. N. Halliday, R. Hannigan, S.Hart, B.K.Horton, S.B.Jacobsen, M.I.Petaev, R.J.Poreda, J.Quade, P. R. Renne, M.A.Richards, S.P.Shirey, N. V. Sobolev, R.J.Stern, J. Wakabayashi, A.J.West, M.J.Whitehouse, Q.-Z. Yin, H.Zou, S.Das, P. Chakrabarty, M-L.Bagard.,

### ***Graduate and post-doctoral advisors***

Ph.D.Advisor: Ian D. MacGregor

Post Doctoral Mentors: V. Rama Murthy and M. Tatsumoto

### ***Thesis advisor (Primary) – MS***

E. Rubury, 1980; M. Domenick, 1982; M. Kramer, 1982; S. Silverman, 1984; J. Talpey, 1984; J. Ongley, 1986; J. Snow, 1986; G. Sharp, 1987; W. Lanik, 1989; S. Ghose, 1992; G. Dunn, 1993; F. Teichmann, 1993; K. Weaver, 2000; A. Smith, 2000; A. Ghatak, 2006; N.Ghosh, 2011; S.Darmaoen, 2014; Y.Wang, 2014, Valencia, D,2017, Wright, J. 2018

### ***Thesis advisor (Primary) – PhD***

N. Srimal, 1986 (Florida International University); B. Faggart, 1990 (EPA, Washington DC); M. Sharma, 1992 (Dartmouth); F. Teichmann, 1995 (Vienna, Austria); R.E. Hannigan, 1997 (UMass, Boston); A. Saha-Yannopoulos, 2004 (S and P, New York), R. Chakrabarti, 2006 (IISc Bangalore, India), A. Ghatak, 2010 (IISER Bhopal, India), N. Ghosh, 2015 (Boston University), P. Chakrabarty, 2019 (UT Arlington).

### ***Thesis advisor (Secondary) – PhD***

R. Cole, 1993; Z. Ismat, 2003; C. B. Dowling, 2003, Y. Al-Salam (2019)

### **Publications**

Das, S., **Basu, A.R.**, Origin of Indus ophiolite linked to the mantle transition zone (410-660 km). Geological Society of America , Special Paper ,552 , Chapter 2,I n honor of E.M. Moores , 2021 in press.

Moores, E.M., N. Simmons, **Basu,A.R.**, Gregory,R.T., The Indian Ocean, its supra subduction history and implications for ophiolites. Geological Society of America, Special paper 552, Ch.1,I n honor of E. M. Moores, 2021 in press.

**Basu, A.R.**, Saha-Yannopoulos , A., Chakrabarty, P., A precise geochemical volcano-stratigraphy of the Deccan Traps, Lithos , v. 376-377, 105754, 2020

**Basu,A.R.**, Chakrabarty, P., Szymanowsky, D., Ibanez-Mejia, M., Schoene, B., Ghosh, N., Georg, R.B., Widespread silicic and alkaline magmatism synchronous with the Deccan Traps flood basalts, India, Earth & Planetary Science Letters,552, 116616 ,2020

Das,S., **Basu, A.R.**, Mukherjee, B., Marcantonio, M., Sen, K., Bhattacharya,S., Gregory,R.T. , Origin of Indus ophiolite -hosted ophicarbonates veins: Isotopic evidence of mixing between seawater and continental crust-derived fluid during Neo-Tethys closure. Chemical Geology,551,119772

Kibria,M.G., Das,S., Hu, Q.H., **Basu, A.R.**, Mandal, S., Thermal maturity evaluation using Raman spectroscopy for oil shale samples of USA: Comparisons with vitrinite reflectance and pyrolysis methods. Petroleum Science 17, 567-581,17,567-581, 2019

Das, S., **Basu, A.R.**, Evidence of majoritic garnet from the mantle transition zone in the Alpe Arami garnet peridotite. *International Geology Review*, doi:10.1080/00206814.17003223.2019.

Das, S., **Basu, A.R.**, Mukherjee, B., 2017, In situ peridotitic diamond in Indus Ophiolite sourced from hydrocarbon fluids in mantle transition zone. *Geology*, August 2017; v. 45; no. 8; p. 755–758.

Ghosh, N., **Basu, A.R.**, Bhargava, O.N., Shukla, U.K., Ghatak, A., Garziona, C.N. and Ahluwalia, A.D., 2015, Catastrophic environmental transition at the Permian-Triassic Neo-Tethyan margin of Gondwanaland: Geochemical, isotopic and sedimentological evidence in the Spiti Valley, India, *Gondwana Research*, 34(2016) 324-345, doi:10.1016/j.gr.2015.04.006

Bagard, Marie-Laure, West, Joshua A., Newman, Karla, **Basu, Asish R.** Lithium isotope fractionation in the Ganges-Brahmaputra floodplain and groundwater systems and implications for groundwater impact on seawater isotopic composition. *Earth and Planetary Science Letters*. <http://dx.doi.org/10.1016/j.epsl.2015.08.036>. (Journal Article Published, 2015).

Das, Souvik, Mukherjee, B.K., **Basu, A.R.**, and Sen Jr., K., 2015, Peridotitic minerals of the Nidar Ophiolite in the NW Himalaya: sourced from the depth of the mantle transition zone and above. In: Mukherjee, S., Carosi, R., van der Beek, P. A., Mukherjee, B. K. & Robinson, D. M. (eds) *Tectonics of the Himalaya*. Geological Society, London, Special Publications, 412, <http://doi.org/10.1144/SP412.12>. (Journal Article, Published, 2015)

Ghosh, N., **Basu, A.R.**, Bhargava, O.N., Shukla, U.K., Ghatak, A., Garziona, C.N. and Ahluwalia, A.D., 2015, Catastrophic environmental transition at the Permian-Triassic Neo-Tethyan margin of Gondwanaland: Geochemical, isotopic and sedimentological evidence in the Spiti Valley, India, *Gondwana Research*, doi:10.1016/j.gr.2015.04.006. (Journal Article Published 2015)

Nestell, G., Nestell, M., Elwood, B., Wardlaw, B., **Basu, A.R.**, Ghosh, N., Lan, L.T.P., Rowe, H., Hunt, A., Tomkin, J., Ratcliffe, K., 2015, High influx of carbon in walls of agglutinated foraminifers during the Permian-Triassic transition in global oceans, *International Geology Review*, Vol.57 (4), 411-427, doi:10.1080/00206814.2015.1010610. (Journal Article Published 2015)

Çiftçi E., Lermi A., Ghosh N. And **Basu A.R.**, 2014, *Carbonate-Hosted Gallium-Bearing Lead-Zinc Deposits Of Tauride Belt (Turkey): Genetic Implications*. *Acta Geologica Sinica*, 88: 147. Doi: 10.1111/1755–6724.12369\_2.

A. Ghatak, **A. R. Basu** and J. Wakabayashi, Implications of Franciscan Complex graywacke geochemistry for sediment transport, provenance determination, burial-exposure duration, and fluid exchange with co-subducted metabasites, *Tectonics*, v32, 1-13, 2013.

A.Ghatak and **A.R. Basu**, Isotopic and trace element geochemistry of alkalic-mafic-ultramafic- carbonatitic complexes and flood basalts in NE India: Origin in a heterogeneous Kerguelen plume, *Geochimica et Cosmochimica Acta*. v115, 46-720, 2013.

J. Nie, B.K.Horton, J.E.Saylor, A.Mora, M.Mange, C.N.Garziona, **A.R.Basu**, C.J.Moreno, V.Caballero and M.Para, Integrated provenance analysis of a convergent retroarc foreland system: U-Pb ages, heavy minerals, Nd isotopes, and sandstone compositions of the middle Magdalena Valley basin, Northern Andes,

Colombia, *Earth-Science Reviews*, v110, 111-126, 2012.

L.N.Palasse, R.L.M.Vissers, H.Paulssen, **A.R.Basu** and M.R.Drury. Microstructural and seismic properties of the upper mantle underneath a rifted continental terrane (Baja California): An example of sub-crustal mechanical asthenosphere, *Earth and Planetary Science Letters*, v345-348, 60-70, 2012.

R. Chakrabarti, **A. R. Basu**, and A. Ghatak, Chemical Geodynamics of Western Anatolia, *International Geology Review*, 1-22, 2011.

Chakrabarti, R., **Basu, A. R.**, Bandyopadhyay, P. K., and Zou, H., Age and Origin of the Chilka Anorthosites, Eastern Ghats, India: Implications for Massif Anorthosite Petrogenesis and Break-up of Rodinia, in: J. S. Ray et al., (eds), *Topics in Igneous Petrology*, Springer Science, p. 355 - 382, 2011.

A. Ghatak, **A. R. Basu**, and J. Wakabayashi, Elemental Mobility in Subduction Metamorphism: Insight from metamorphic rocks of the Franciscan Complex and the Feather River ultramafic belt, California, *International Geology Review*, iFirst article, 1-32, 2011.

A Ghatak and **A. R. Basu**, Vestiges of the Kerguelen plume in the Sylhet Traps, Northeastern India, *Earth and Planetary Science Letters*, v308(1-2),52-64, 2011.

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J. Wakabayashi, A. Ghatak, and **A. R. Basu**, Supra-subduction zone ophiolite generation, emplacement, and initiation of subduction: A perspective from geochemistry, metamorphism, geochronology, and regional geology, *Bulletin Geological Society of America*, v 122, no9/10, 1548-1568, 2010.

R. Hannigan, M. E. Brookfield, and **A. R. Basu**, A detailed  $^{87}\text{Sr}/^{86}\text{Sr}$  isotopic curve for the mid-Cincinnatian (Upper Katian-Lower Hirnantian, Upper Ordovician), NE North American Shelf (Ontario, Canada) transition to the Hirnantian glaciation, *Chemical Geology*, v 277, 336-344, 2010.

B.A. Sargent, W.J. Forrest, C. Tayrien, M.K. McClure, A. Li, **A.R. Basu**, P. Manoj, D.M. Watson, C.J. Bohac, E. Furlan, K.H. Kim, J.D. Green, and G.C. Sloan, Silica in Protoplanetary Disks, *The Astrophysical Journal*, v 690, 1193-1207, 2009.

R. Chakrabarti, **A.R. Basu**, A.P. Santo, D. Tedesco, and O. Vaselli, Isotopic and geochemical evidence for a heterogeneous mantle plume origin of the Virunga volcanics, Western rift, East African Rift system, *Chemical Geology*, v 259, 273-289, 2009.

R. B. Georg, A. J. West, **A. R. Basu**, and A. N. Halliday, Silicon fluxes and isotope composition of direct groundwater discharge into the Bay of Bengal and the effect on the global ocean silicon isotope budget, *Earth and Planetary Science Letters*, v 283, 67-74, 2009.

R. Chakrabarti, K. W. W. Sims, **A.R.Basu**, M. Reagan, and J. Durieux, Timescales of magmatic processes and eruption ages of the Nyiragongo volcanics from  $^{238}\text{U}$ - $^{230}\text{Th}$ - $^{226}\text{Ra}$ - $^{210}\text{Pb}$  disequilibria, *Earth and Planetary Science Letters*, 288, 149-157, 2009.

**A. R. Basu**, P. K. Bandyopadhyay, R. Chakrabarti and H. Zou, Large 3.4Ga Algoma-type BIF in the Eastern Indian Craton, *Geochimica et Cosmochimica acta*, v 72(12S), A59, 2010.

S.B. Shirey, B.S. Kamber, M.J. Whitehouse, P.A. Mueller and **A.R. Basu**, A Review of the isotopic evidence for mantle and crustal processes in the Hadean and Archean: Implications for the onset of plate tectonic subduction, Special Paper, Geological Society of America, v 440, 1-29, 2008.

R. Chakrabarti, **A. R. Basu**, and D. K. Paul, Nd-Hf-Sr-Pb and trace element geochemistry of Proterozoic lamproites from southern India: Subducted komatiite in the source, Chemical Geology, v 236, 291-302, 2007.

R. Chakrabarti, P. A. Abanda, R. E. Hannigan, and **A. R. Basu**, Effects of diagenesis on the Nd-isotopic composition of black shales from the 420 Ma Utica Shale Magnafacies, Chemical Geology, v244, 221-231, 2007.

R.Chakrabarti, **A.R.Basu**, and A. Chakrabarti, Trace Element and Nd-isotopic Evidence for Sediment Sources in the Mid-Proterozoic Vindhyan Basin, Central India, Precambrian Research, v 159 ( 3), 260-274, 2007.

R. Chakrabarti, and **A. R. Basu**, Trace Element and Isotopic Evidence for Archean Basement in the Lonar Crater Impact Breccia, Deccan Volcanic Province, Earth and Planetary Science Letters, v247, 197-211, 2006.

R. Chakrabarti, **A. R. Basu**, and A.Ghatak, Reply To: Comments on "Trace Element and Isotopic Evidence for Archean Basement in the Lonar Crater Impact Breccia, Deccan Volcanic Province" by Ramananda Chakrabarti and Asish R. Basu, Earth and Planetary Science Letters, v250, 669-670, 2006.

C.Garzioni, M.J.Ikari, and **A.R.Basu**, Sources of Oligocene to Pliocene sedimentary rocks in the Linxia basin in northeastern Tibet from Nd isotopes: Implications for tectonic forcing of climate, Bulletin Geological Society of America, v117, 9/10, 1156-1166, 2005.

A. Saha, **A.R. Basu**, J.Wakabayashi and G.L. Wortman, Geochemical evidence for subducted infant arc in Franciscan high-grade tectonic blocks, Bulletin Geological Society of America, v117, 9/10, 1318-1335, 2005.

A. Saha, **A. R. Basu**, S.B. Jacobsen, R.J. Poreda, Q.-Z. Yin, and G.M. Yogodzinski, Slab devolatilization and Os and Pb mobility in the mantle wedge of the Kamchatka arc, Earth and Planetary Science Letters, v236, 182-194, 2005.

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A.Saha, **A.R.Basu**, C.N.Garzioni, P.K.Bandyopadhyay, and A. Chakrabarti, Geochemical and petrological evidence for subduction-accretion processes in the Archean Eastern Indian Craton, Earth and Planetary Science Letters, 220,91-106, 2004.

A.Saha, **A.R.Basu**, C.N.Garzioni, P.K.Bandyopadhyay, and A. Chakrabarti, Geochemical and petrological evidence for subduction-accretion processes in the Archean Eastern Indian Craton, Earth and Planetary Science Letters, 220,91-106, 2004.

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Pradeep K. Aggarwal, Asish R. Basu, and Kshitij M. Kulkarni, Comment on "Arsenic Mobility and Groundwater Extraction in Bangladesh" (I), *Science*, 300: 584 (in Technical Comments). 2003.

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Dowling, C.B., Poreda, R.J., **Basu, A.R.**, Peters, S.L. and Aggarwal, P.K., Geochemical study of arsenic release mechanisms in the Bengal Basin groundwater. *Water Resources Research*, 38, no. 9(9), 2002.

**A.R.Basu**, S.B. Jacobsen, R.J. Poreda, C.B. Dowling and P.K. Aggarwal, Groundwater Flow in the Ganges Delta, Reply to Comments by C.F. Harvey, *Science*, v296,1563A, 2002.

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Hannigan, R.E., **Basu, A.R.** and Teichmann, F., Mantle reservoir geochemistry from statistical analysis of ICP-MS trace element data of equatorial Mid-Atlantic MORB glasses. *Chemical Geology*, 175(3-4): 397-428, 2001.

**Basu, A.R.** and Premo, W.R., U-Pb age of the Diana Complex and Adirondack granulite petrogenesis. *Recent researches in petrology and geochemistry*, 110(4): 385-395, 2001.

P.K. Aggarwal, **A.R. Basu**, R.J. Poreda, K.M. Kulkarni and others, Isotope Hydrology of Ground Water in Bangladesh, International Atomic Energy Agency Technical Collaboration Project Report: BGD/8/016, Vienna, 61p, 2000 (Work performed under IAEA Project BGD-8-016).

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Teichmann, F. and **Basu, A.R.**, Nd-Sr isotopic trace element study of rocks and fluids from the Continental Deep Drilling Project (KTB), Germany. *Geologische Rundschau*, 85: 162-171, 1996.

**Basu, A.R.**, Sharma, M. and Premo, W.R., U-Pb age of an older metamorphic group mica schist: earliest terrain of the eastern Indian craton. In, *Recent Researches in Geology and Geophysics of the Precambrian* (A.K. Saha, ed.), Hindustan Publishing Corporation: 93-102, 1996.

**Basu, A.R.** and Hart, S., eds., *Earth Processes: Reading the Isotopic Code*. Geophysical Monograph Series 95, 1996.

**Basu, A.R.** and Faggart, B.E., Temporal Variation in the Hawaiian Mantle Plume: The Lanai Anomaly, The Molokai Fracture Zone and a Seawater-altered Lithospheric Component in Hawaiian Volcanism, In,

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Sharma, M., **Basu, A.R.** and Nesterenko, G.V., Temporal Sr-, Nd- and Pb- isotopic variations in the Siberian Flood Basalts: Implications for the Plume-source characteristics. *Earth Planet. Sci. Lett.*, 113: 365-381, 1992,

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M. Sharma, **A. R. Basu**, R. B. Cole and P. G. DeCelles, Basalt-rhyolite volcanism by MORB-continental crust interaction: Nd, Sr - isotopic and geochemical evidence from southern San Joaquin Basin, California, *Contributions to Mineralogy and Petrology*, v109, 159-172, 1991.

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