

Vitae

**Jibamitra Ganguly, Professor
Department of Geosciences
University of Arizona, Tucson**

Education

Ph.D., University of Chicago, U.S.A., 1967

Thesis: Reconnaissance Study of the Stabilities of Chloritoid and Staurolite, and Some Equilibria in the System FeO-Al₂O₃-SiO₂-H₂O-O₂.

Professional Appointments

- 1986- Professor, Department of Geosciences, University of Arizona
- 1981-1986: Associate Professor (with tenure), Department of Geosciences, University of Arizona, Tucson, Arizona, U.S.A.
- 1975-1981: Assistant Professor, Department of Geosciences, University of Arizona, Tucson, Arizona, U.S.A.
- 1972-1975: Research Geophysicist, Institute of Geophysics and Planetary Physics, University of California, Los Angeles, U.S.A.
- 1971: Assistant Professor, Department of Chemistry, Birla Institute of Technology and Science, India
- 1969-1970: Officer, Scientists' Pool (Government of India) at the Geology Department, Jadavpur University, India
- 1967-1969: Post-Doctoral Research Staff, Department of Geology and Geophysics, Yale University, U.S.A.
- 1961-1962: Scientific Officer, Metallurgy Division, Atomic Energy Establishment, Government of India.

Major Fields

Petrology - Geochemistry – Mineralogy: Terrestrial and Planetary problems

Fellowship and Membership

Fellow: Mineralogical Society of America (1980 – 1997)

Member: American Geophysical Union

Member: Editorial Review Board, J. Metamorphic Geology (1983 -88)

Member: University Faculty Senate (1990-1991)

Keynote/Plenary Speaker

- Annual Meeting, Italian Mineralogical Society, Padova, Italy, 1989
- Third International Conference on Experimental Petrology, Mineralogy and Geochemistry, Edinburgh, U.K., 1990
- 63rd International Conference of the Meteoritical Society, Johannesburg, 1999
- International Mineralogical Association, Edinburgh, 2002
- Calphad XXXII (International conference on computational thermochemistry), Quebec, 2003
- Goldschmidt Conference (International conference on Geochemistry), Kurashiki, Japan, 2003

Invited Speaker (Symposia, Workshop and Short Courses), 1990 --

- International Symposium on Thermochemistry, University of Uppsala, Sweden, 1990 (sponsor: Swedish Research Council)
- Symposium on Thermodynamic Mixing Properties of Petrologically Important Minerals, Geological Society of America, 1990
- Symposium on Crystal Chemistry, European Union of Geology, 1991
- Summer School on 'Pressure and Temperature Evolution of Orogenic Belts', Italian Council for Research (CNR) and The University of Siena, 1991 (sponsor: Italian Research Council)
- Summer School on 'Radiometric Age Determinations in Orogenic Processes - Potentials and Limits': Italian Council for Research (CNR), 1992 (sponsor: Italian Research Council)
- Summer School on Geochemical Modeling: Italian Research Council and the University of Genova
- Italian Research Council Symposium on Thermodynamics and Crystal Chemistry of Garnets, 1993 (sponsor: Italian Research Council)
- International Mineralogical Association, 1994 (Pisa, Italy): Symposia on (1) Diffusion in Minerals and Rocks (2) Cooling Rates of Terrestrial and Extraterrestrial Rocks and (3) Mineral Chemistry and Geothermobarometry
- International Geological Congress, 1996 (Beijing, China): Symposium on Petrologic geothermometry and Geobarometry
- International Geological Congress, 1996 (Beijing, China), Short course on 'Diffusion Kinetics in Minerals'
- Symposium in the honor of Julian Goldsmith and Robert C. Newton, University of Chicago, 1998 GSA Symposium on Experimental Petrology, 1998

- European Mineralogical Union: Short course on "Solid solutions in silicate and oxide systems of geological importance", Luebeck, Germany, 2001
- European Mineralogical Union: Short course on "Energy Modeling of Minerals", Budapest, Hungary 2002
- Goldschmidt Conference (Geochemical Societies of USA & Europe), 2002
- Workshop on Experimentation and Modeling in Cosmochemistry, 72 nd Annual Meeting of the Meteoritical Society, Nancy, France, 2009

Convenor (1990--)

Symposium on `Energy Modeling of Rock-forming Minerals': VI Biennial Meeting of the European Union of Geology, Strasbourg, March, 1991.

- Symposium on `Diffusion in Rock-forming Minerals': XVI General Meeting, International Mineralogical Association, Pisa, 1994
- Symposium on `The Interpretation of Isotopic Ages in High Grade Rocks': American Geophysical Union, Fall Meeting, San Francisco, 1995.
- Short Course on Diffusion Kinetics in Minerals, International Geological Congress, Beijing, China, 1996
- Thermal history of meteorites, International Meteoritical Soc Meeting, Johannesburg, South Africa, 1999
- International Geological Congress, session on Mantle Mineralogy, Florence, Italy, 2004

Visiting/Guest Professor

- University of Padova and National Research Council (CNR), Italy (Fall, 1992)
- University of Uppsala , Sweden, 1998
- Bayresches Geoinstitut, University of Bayreuth, Germany, 2002

Special Invitations

- Invited Scientist: Council of Scientific and Industrial Research, Govt of India, under the sponsorship of United Nations program on `Transfer of know-how through expatriate Nationals (TOKTEN).
- Chinese Academy of Sciences, 2000

Award

Alexander von Humboldt Research Prize, Germany, 2002

Publications

Books

- Ganguly, J., and S.K. Saxena (1987) MIXTURES AND MINERAL REACTIONS, 291 p., Springer-Verlag
- Ganguly, J. (2008) THERMODYNAMICS IN EARTH AND PLANETARY SCIENCES, 501 p. Springer-Verlag

Edited volumes

- Ganguly, J., editor (1991) DIFFUSION, ATOMIC ORDERING AND MASS TRANSPORT: Selected Topics in Geochemistry, Advances in Physical Geochemistry, vol. 8, 581 p., Springer-Verlag
- Bhattacharya, S. and Ganguly, J. (2001) Proc. Indian Academy of Science (Earth Science), Special Issue on Petrology and Geochemistry

Papers (peer reviewed journals/books)

- Tirone, M., Ganguly, J. (2010) Garnet compositions as recorders of P-T-t history of metamorphic rocks. Gondwana Research (Miyashiro volume), in review
- Ganguly, J. (2010) Cation Diffusion Kinetics in Garnet and Geological Applications. In Zhang, Y. and Cherkia, D. (Ed) Diffusion in Minerals and Melts, Reviews in Mineralogy and Geochemistry, Mineralogical Soc. America, in review.
- Ottonello G., Civalleri B., Ganguly J., Perger W.F., Belmonte D., and Vetuschi Zuccolini M. (2010) Thermo-chemical and Thermo-physical properties of the high pressure phase Anhydrous B ($Mg_{14}Si_5O_{24}$): An ab-initio all-electron investigation. Amer Mineral, in press.
- Martin, A.J., Ganguly, J., DeCelles, P.G. (2009) Metamorphism of greater and lesser Himalayan rocks in the Modi Khola calley, central Nepal. Contrib Mineral Petrol DOI 10.1007/s004-10-009-0434-3
- Zhang, X-Y, Ganguly, J., Ito, M. (2009) Ca-Mg Diffusion in Diopside: tracer and chemical inter-diffusion coefficients. Contrib. Mineral. Petrol. DOI 10.1007/s00410-009-0422-5.
- Tirone, M., Ganguly, J., Morgan, J.P. (2009) Modeling petrological geodynamics in the Earth's mantle. G^3 : Geochemistry, Geophysics, Geosystems 10, 1-28, doi:10.1029/2008GC002168
- Ganguly J, Freed AM, Saxena SK (2009) Density profiles of oceanic slabs and surrounding mantle: Integrated thermodynamic and thermal modeling, and implications for the fate of slabs at the 660 km discontinuity.

- Ganguly J, Ito M, Zhang, X-Y (2007) Cr diffusion in orthopyroxene: experimental determination, ^{53}Mn - ^{53}Cr thermochronology, and planetary applications. *Geochim et Cosmochim Acta* 71, 3915-3925.
- McCallum I.S., Domeneghetti, M.C., Schwratz, J.F., Mullen, E.K., Zema, M., Camara, F., McCammon, C., Ganguly, J. (2006) Cooling history of lunar Mg-suite gabbro-norite 76255, toctolite 76535 and stillwater pyroxenite SC-936: The record in exsolution and ordering in pyroxenes. *Geochim Cosmochim Acta.* 70, 6068-6078.
- Ganguly, J., and Frost, D.L (2006) Stability of Anhydrous phase B: Experimental studies and implications for phase relations in subducting slab and the X-discontinuity in the mantle. *J. Geophys Research* (in press)
- Ito, M., and Ganguly, J. (2005) Diffusion kinetics of Cr in olivine and ^{53}Mn - ^{53}Cr thermochronology of early solar system objects. *Geochim Cosmochim Acta*, 70, 799-806
- Stimpfl, M., Ganguly, J. and Molin, G.M. (2005) Fe^{2+} -Mg order-disorder in orthopyroxenes: Experimental studies and applications to cooling rates of rocks. *Contrib Mineral Petrol* 150, 319-334
- Ganguly, J. (2005) Adiabatic decompression and melting of mantle rocks. *Geophys. Research Letters*,
- Ito, M. and Ganguly, J. (2004) Potassium diffusion in melilites: Experimental studies and constraints on the thermal history and size of planetesimals hosting CAIs. *Meteoritics & Planetary Sciences*, 39.
- Tirone, M., Ganguly, J., Dohmen, R., Langenhorst, F., Hervig, R. (2004) Experimental studies and applications. *Geochim Cosmochim Acta*, (accepted)
- Dasgupta, S., Ganguly, J., Neogi, S. (2004) Inverted metamorphic sequence in Sikkim Himalayas: crystallization history, *P-T* gradient, and implications. *J. Metamorphic Geol.* 22, 395-412
- Ducea, M.N., Ganguly, J., Rosenberg, E.J., Patchett, P.J., Cheng, W.J. and Isachsen, C. (2003) Sm-Nd Dating of Spatially Controlled Domains of Garnet Single Crystals: A New Method of High Temperature Thermochronology. *Earth Planet Sci Let.*, 213, 31-42.
- Liermann, H-P. and Ganguly, J. (2003) Fe^{2+} -Mg fractionation between orthopyroxene and spinel: experimental calibration in the system $\text{FeO-MgO-Al}_2\text{O}_3\text{-SiO}_2$, and applications, *Contrib. Mineral. Petrol.* 145, 217-227.
- Ganguly, J. (2003) Diffusion kinetics in minerals: principles and applications to tectono-metamorphic processes. In Gramaciori, C. (ed) *Energy modeling of minerals*, European Mineralogical Union, *Notes in Mineralogy*, 4, 271- 309.
- Liermann, H-P. and Ganguly, J. (2002) Diffusion kinetics of Fe^{2+} and Mg in aluminous spinel: experimental determination and applications. *Geochim. Cosmochim. Acta*, 66,

- Ganguly, J., Hensen, B.J. and Cheng, W. (2001) Reaction texture and Fe-Mg zoning in granulite garnet from Soestrene island, Antarctica: Modeling and constraint on the time scale of Pan-African tectono-metamorphic event. *Proc. Indian Acad. Sci*, 110, 305-312.
- Ganguly, J. (2001) Thermodynamic modeling of solid solutions, In Geiger, C. (ed.) *Solid solutions in silicate and oxide systems of geological importance*, European Mineralogical Union, *Notes in Mineralogy*, 3, 37-69 (chapter 3).
- Liermann, H-P., and Ganguly, J. (2001) Compositional properties of coexisting orthopyroxene and spinel in some Antarctic diogenites: Implications for thermal history. *Meteoritics & Planetary Science*, 36, 155 – 166.
- Ganguly, J., and Tirone, M. (2001) Relationship between cooling rate and cooling age of a mineral: Theory and applications to meteorites. *Meteoritics and Planetary Science*, 36, 167 – 176.
- Ganguly, J., Dasgupta, S., Cheng, W. and Neogi, S. (2000) Exhumation history of a section of the Sikkim Himalayas, India: records in the metamorphic mineral equilibria and compositional zoning in garnet. *Earth & Planet Sci Lett*, 183, 471 – 486.
- Ganguly, J. and Stimpfl, M. (2000) Low temperature cooling history of orthopyroxenes from two stony-iron meteorites: implications for metal-silicate mixing and parent body. *Geochim Cosmochim Acta*, 64, 1291 – 1297.
- Ganguly, J. and Tirone, M. (1999) Diffusion closure temperature and age of a mineral with arbitrary extent of diffusion: Theoretical formulation and applications, *Earth & Planet Science Letters*, 170, 131-140.
- Stimpfl, M., Ganguly, J. and Molin G. (1999) Fe²⁺-Mg order-disorder in orthopyroxene: Equilibrium fractionation between the octahedral sites and thermodynamic analysis, *Contrib. Mineral. Petrol.*, 136, 297-309.
- Ganguly, J., Tirone, M., and Hervig, R. (1998) Diffusion kinetics and closure temperature of Sm and Nd in garnet. *Science*, 281, 805-807.
- Ganguly, J., Cheng, W. and Chakraborty, S. (1998) Cation diffusion in aluminosilicate garnets: experimental determination in pyroxene-almandine diffusion couples. *Contrib. Mineral Petrol*, 131, - 180.
- Ganguly, J., Cheng, W. and Tirone, M. (1996) Thermodynamics of aluminosilicate garnet solid solution: new experimental data, an optimized model, and thermometric applications. *Contrib. Mineral. Petrol.*, 126, 137-151.
- Ganguly, J., Chakraborty, S., Sharp, T. and Rumble, D. III (1996) Constraint on the time scale of biotite grade metamorphism during Acadian orogeny from a natural garnet-garnet diffusion couple. *American Mineralogist*, 81, 1208-1216.
- Ganguly, J. and Domeneghetti, M. C. (1996) Cation ordering of orthopyroxenes from the

Skaergaard intrusion: Quantitative constraints on the subsolidus cooling rates and permeabilities, *Contributions to Mineralogy & Petrology*, 122, 359-367.

- Ganguly, J. and Bose, K. (1995) Experimental and theoretical studies of the stabilities of talc, antigorite and phase A at high pressures with applications to subduction processes. *Earth & Planetary Science Letters*, 136, 109-122.
- Ganguly, J., Singh, R.N. and D. V. Ramana (1995) Thermal perturbation during charnockitization and granulite facies metamorphism in southern India. *Journal of Metamorphic Geology*, 13, 1-12.
- Bose, K., and Ganguly, J. (1995) Quartz-coesite transition revisited: reversed experimental determination at 500-1200 °C and retrieved thermochemical parameters. *American Mineralogist* 80, 231-238.
- Ganguly, J., Yang, H., and Ghose, S. (1994) Thermal history of mesosiderites: Quantitative constraints from compositional zoning and Fe-Mg ordering in orthopyroxenes. *Geochimica et Cosmochimica Acta*, 58, 2711-2723
- Ruzicka, A., Boynton, B., and Ganguly, J. (1994) Olivine coronas, metamorphism and the thermal history of Morristown and emery mesosiderites: *Geochimica et Cosmochimica Acta*, 58, 2725-2741.
- Ganguly, J., and Cheng, W. (1994) Some aspects of multicomponent excess free energy models with subregular binaries, *Geochimica et Cosmochimica Acta*, 58, 3763-3767.
- Ganguly, J., and Tazzoli, V. (1994) Fe-Mg interdiffusion in orthopyroxene: Retrieval from the data on intracrystalline exchange reaction: *American Mineralogist*, 79, 930-937.
- Bose, K., and Ganguly, J. 1994, Thermogravimetric study of the dehydration kinetics of Talc: *American Mineralogist*, 79, 692-699.
- Chakraborty, S., and Ganguly, J. (1994) A method to constrain thermodynamic mixing properties and diffusion data in multicomponent solutions, In Y. Limoge and G. Martin, eds. *Reactive Formation of Phases at Interfaces and Diffusion Processes*, Tans. Tech. Publishers, 279-284 pp.
- Ganguly, J., Cheng, W., and O'Neill, H. StC. (1993) Syntheses, volume and structural changes of garnets in the pyrope-grossular join: implications for stability and mixing properties. *American Mineralogist*, 78, 583 - 593.
- Chakraborty, S., and Ganguly, J. (1992) Cation diffusion in aluminosilicate garnets: Experimental determination in spessartine-almandine diffusion couples, evaluation of effective binary diffusion coefficients, and applications. *Contributions to Mineralogy & Petrology* 111, 74 - 86.
- Chakraborty, S., and Ganguly, J. (1991) Chapter in book: Compositional zoning and cation diffusion in garnet, in J. Ganguly, ed., `Diffusion, Atomic Ordering and Mass

Transport: Selected Topics in Geochemistry, *Advances in Physical Geochemistry*, 8, p. 120-175.

- Ganguly, J., and S.K. Saxena (1989) Theoretical predictions of volatile bearing phases and volatile resources in some carbonaceous chondrites, Faughnan, B. and Maryniak, G. ed. *Space Manufacturing 7: Space Resources to Improve Life on Earth*, Proc. 9th Princeton/AIAA/SSI Conference, 97-108, Amer. Inst. Aeronautics and astronautics, Washington.
- Dandekar, D.P., Ganguly, J and Bose, K.(1989) Compressions of Ta₁₀W, Kennertium W-2, and BeO to 4.5 GPa. Proc 12th AIRAPT Conf. on High Pressure Sciences and Technology.
- Ganguly, J., R. Bhattacharya and S. Chakraborty, (1988) Convolution effects in the determination of compositional profile and diffusion coefficient by step scans in microprobe: *American Mineralogist*, 73, p. 901-909.
- Lee, H.Y., and Ganguly, J. (1988) Equilibrium compositions of coexisting garnet and orthopyroxene: Reversed experimental determinations in the system FeO-MgO-Al₂O₃-SiO₂, and applications: *Journal of Petrology*, 29, 93-113.
- Ganguly, J., Dandekar, D.P. and Bose, K. (1987) Static compression of SiC-Al to 45 Kbars: Proc.19th International SAMPE (Society of Advances of Material and Process Engineering) Technical Conference, 19, 665-673.
- Ganguly, J., and J. Ruiz (1987) Time-temperature relation of mineral isochrons: A thermodynamic- model, and illustrative application for Rb-Sr system: *Earth & Planetary Science Letters*, 81, 338-348.
- Ganguly, J., and P.K. Battacharya (1987) Chapter in book: Xenoliths in Proterozoic kimberlites from southern India Petrology and geophysical implications, in P.H. Nixon, ed., 'Mantle Xenoliths' (Wiley), p. 249-265.
- Ganguly, J. (1986) Disorder energy versus disorder in minerals: A phenomenological relation and application to orthopyroxene: *Journal of Physics and Chemistry of Solids*, 47, p. 417-420
- Loomis, T.P., Ganguly, J. and S.C. Elphick (1985) Experimental determination of cation diffusivities in aluminosilicate garnets: II. Multicomponent simulation and tracer diffusion coefficients, *Contributions to Mineralogy & Petrology*, 90, p. 45-51
- Elphick, S.C., J. Ganguly, and T.P. Loomis (1985) Experimental determination of cation diffusivities in aluminosilicate garnets: I. Experimental methods and interdiffusion data, *Contributions to Mineralogy & Petrology*, 90, 36-44.
- Ganguly, J. and S.K. Saxena (1984) Mixing properties of aluminosilicate garnet solid solution: Constraints from natural and experimental data, and applications to geothermobarometry: *Amer. Mineralogist*, 69, 88-97.

- Ganguly, J. (1982) Thermodynamics of the oxygen isotope fractionation involving plagioclase: Earth and Planetary Science Letters, 61, 123-126
- Ganguly, J. (1982) Chapter in Book: Fe²⁺- Mg order-disorder in ferromagnesian silicates: Thermodynamics, kinetics and geological applications, in S. K. Saxena ed., 'Advances in Physical Geochemistry': vol. 2, p. 58-99.
- Lane, D.L. and Ganguly, J. (1980) Al₂O₃ solubility in orthopyroxene in the system MgO - Al₂O₃- SiO₂: A re-evaluation and mantle geotherm: Journal of Geophysical Research, 85, 6963-6972
- Ganguly, J. and S. Ghose (1979) Aluminous orthopyroxene: order-disorder of aluminum, thermodynamic properties, and petrological implications: Contributions to Mineralogy and Petrology, 69, 375-385
- Ganguly, J. (1979) Garnet and clinopyroxene Solid Solutions, and geothermometry based on Fe-Mg distribution coefficient: Geochimica et Cosmochimica Acta, 1979, 43, 1021-1029
- Ganguly, J. (1978) Chapter in Book: Compositional variables and chemical equilibrium in metamorphism: in, S. K. Saxena and S. Bhattacharji, ed., "Energetics of geological process", p. 250-284, Springer-Verlag.
- Ganguly, J. and G.C. Kennedy (1977) Solubility of potassium in Fe-S liquid, silicate-K-(Fe- S)liquid equilibria, and their planetary implications, Earth and Planetary Science Letters, 35, 411-420.
- Ganguly, J. (1976) The energetics of natural garnet solid solution II: Mixing of the calcium silicate end members: Contributions to Mineralogy & Petrology, 55, 81-90.
- Ganguly, J. and G.C. Kennedy (1974) The energetics of natural garnet solid solution. I: Mixing of the aluminosilicate end members: Contributions to Mineralogy & Petrology, 48, 137-148.
- Ganguly, J. and G.C. Kennedy (1974) Phase diagram of propargyl alcohol, Journal of Physics & Chemistry of Solids, 35, 605
- Ganguly, J. and G.C. Kennedy (1973) The melting temperature of uranium under high pressures, Journal of Physics & Chemistry of Solids, p. 2272-2274.
- Akella, J., Ganguly, J., R. Grover, and G.C. Kennedy (1973) Melting of lead and zinc to 60 kilobars: Journal of Physics and Chemistry of Solids, 34, 631-636.
- Ganguly, J. (1973) Activity-composition relation of jadeite in omphacite pyroxene: Theoretical deductions, Earth & Planetary Science Letters, 19, 145-153
- Ganguly, J. (1972) Staurolite stability and related parageneses: Theory, experiments, and applications Journal of Petrology, 13, 335-365
- Ganguly, J. (1969) Chloritoid stability and related parageneses: Theory, experiments, and

applications: American Journal of Science, 267, 910-944

- Ganguly, J. and R.C. Newton (1968) Thermal stability of chloritoid at high pressure and relatively high oxygen fugacities: Journal of Petrology, 9, 444-466
- Ganguly, J. (1968) Analysis of the stabilities of chloritoid and staurolite and some equilibria in the system FeO - Al₂O₃ - SiO₂ - H₂O - O₂ . American Journal of Science, 266, 277-298
- Ganguly, J. (1961) Studies on the deformation of the granite body, north of Udaipur City, Central Rajasthan, and the development of plagioclase twins: Quarterly Journal of Geological Mining & Metallurgical Society of India, 3, 189-193.

Book Reviews

- Ganguly, J. (1993) Introduction to the Earth's Interior by J. Poirier (Cambridge University Press), Geochimica et Cosmochimica Acta,
- Ganguly, J. (1995) Equations of State of Solids by O. Anderson (Oxford University Press), Geochimica et Cosmochimica Acta, 59, 4323 -4326
- Ganguly, J. (1999) Principles of Geochemistry by G. Ottonello (Columbia University Press) Geochimica et Cosmochimica Acta, 63, 2475 – 2476.
- Ganguly, J. (2000) Kinetics in Earth Sciences by A. Lasaga (Princeton University), Geological Magazine.
- Ganguly, J. (2009) Minerals, Inclusions and Volcanic Processes (Mineralogical Society of America), Meteoritics and Planetary Sciences