

## REFERENCES

- Adams, J., Green T.H., Sie S.H., and Ryan C.G. (1996) Trace element partitioning between aqueous fluids, silicate melts and minerals. *Eur. J. Mineral.*, 9, 569-584.
- Affholter, K. (1987) Synthesis and crystal chemistry of lanthanide allanites. PhD dissertation, Virginia Polytechnic Institute and State University, Blacksburg, Virginia, 218 p.
- Ahmad, T., Harris, N., Bickle, M., Chapman, H., Bunbury, J., and Prince, C. (2000) Isotopic constraints on the structural relationships between the Lesser Himalayan Series and High Himalayan Crystalline Series, Garhwal Himalaya. *GSA Bull.*, 112, 467-477.
- Ahmad, T., Mukherjee P.K., and Trivedi, J.R. (1999) Geochemistry of Precambrian mafic magmatic rocks of the Western Himalaya, India: petrogenetic and tectonic implications. *Chemical Geol.*, 160, 103-119.
- Akiba, C., Amma, S., and Ohta, Y. (1973) Arun River region. In Hashimoto S., (Ed.), *Geology of the Nepal Himalayas*. Saikon Publishing Company, pp. 13-31.
- Aleinikoff, J.N., Burton, W.C., Lyttle, P.T., Nelson, A.E., and Southworth, C.S. (2000) U-Pb geochronology of zircon and monazite from Mesoproterozoic granitic gneisses of the northern Blue Ridge, Virginia and Maryland, USA. *Precambrian Res.*, 99, 113-146.
- Anders, E. and Grevesse, N. (1989) Abundances of the elements. *Geochim. Cosmochim. Acta*, 53, 197-214.
- Argles, T.W., Prince, C.I., Foster, G.L., and Vance, D. (1999) New garnets for old? Cautionary tales from young mountain belts. *Earth Planet. Sci. Lett.*, 172, 301-309.
- Arita, K. (1983) Origin of the inverted metamorphism of the Lower Himalaya, central Nepal. *Tectonophysics*, 95, 43-60.
- Attoh, K., Dallmeyer, R.D., and Affaton, P. (1997) Chronology of nappe assembly in the Pan-African Dahomeyide orogen, West Africa: evidence from  $^{40}\text{Ar}/^{39}\text{Ar}$  mineral ages. *Precambrian Res.*, 82, 153-171.
- Auden, M.A. (1937) The structure of the Himalaya in Garhwal. *Rec. Geol. Surv. India*, 71, 407-433.

- Avouac, J.P. and Burov, E.B. (1996) Erosion as a driving mechanism of intracontinental mountain growth. *J. Geophys. Res.*, 101, 17747-17769.
- Azor, A., Simancas, J.F., Exposito, I., Lodeiro, F.G., and Poyatos, D.J.M. (1997) Deformation of garnets in a low-grade shear zone. *J. Str. Geol.*, 19, 1137-1148.
- Baker, D.M., Lillie, R.J., Yeats, R.S., Johnson, G.D., Yousuf, M., and Zamin, A.S.H. (1988) Development of the Himalayan frontal thrust zone: Salt Range, Pakistan. *Geology*, 16, 3-7.
- Bakker, K., Hein, H., Konings, R.J.M., van der Laan, R.R., Matzke, H., and van Vlaanderen, P. (1998) Thermophysical property measurements and ion-implantation studies on CePO<sub>4</sub>. *J. Nucl. Mat.*, 252, 228-234.
- Balasubramaniyam, M.N., Murthy, M.K., Paul, D.K., and Sarkar, A.K. (1978) K-Ar ages of Indian kimberlites. *J. Geol. Soc. India*, 19, 548-585.
- Barbey, P., Brouand, M., Le Fort, P., and Pêcher, A. (1996) Granite-migmatite genetic linked: the example of the Manaslu granite and Tibetan Slab migmatites in central Nepal. *Lithos*, 38, 63-79.
- Barth, A.P., Wooden, J.L., Tosca, R.M., Morrison, J., Dawson, D.L., and Hernly, B.M. (1995) Origin of gneisses in the aureole of the San Gabriel anorthosite complex and implications for the Proterozoic crustal evolution of southern California. *Tectonics*, 14, 736-752.
- Barth S., Oberli F., and Meier, M. (1994a) Th-Pb versus U-Pb isotope systematics in allanite from co-genetic rhyolite and granodiorite: implications for geochronology. *Earth Planet. Sci. Lett.*, 124, 149-159.
- Barth S., Oberli F., and Meier, M. (1994b) Evidence for closed-system behavior of <sup>232</sup>Th-<sup>208</sup>Pb in allanite under hydrothermal conditions: a study of altered rhyolite and granodiorite from the Atesina-Cima d'Asta volcano-plutonic complex (N. Italy). *USGS Circular*, 1107, 21.
- Beaumont, C., Fullsack, P., and Hamilton, J. (1992) Erosional control of active compressional orogens. In McClay., K.R., (Ed.), *Thrust Tectonics*. Chapman and Hall, pp. 1-18.
- Berman, R.G. (1990) Mixing properties of Ca-Mg-Fe-Mn garnets. *Am. Min.*, 75, 328-344.

- Bhargava, O.N. and Bassi, U.K. (1994) The crystalline thrust sheets of the Himachal Himalaya and the age of amphibolite facies metamorphism. *J. Geol. Soc. India*, 43, 343-352.
- Bhatia S.C., Kumar M.R., and Gupta H.K. (1999) A probabilistic seismic hazard map of India and adjoining regions. *Annali Geofisica*, 42, 1153-1164.
- Bilham, R., Larson, K., Freymueller, J., and Project Idylhim members (1997) GPS measurements of present-day convergence across the Nepal Himalaya. *Nature*, 386, 61-64.
- Bindu, R. S., Yoshida, M., and Santosh, M. (1998) Electron microprobe dating of monazite from the Chittikara Granulite, South India; evidence for polymetamorphic events. *J. Geosc.*, 41, 77-83.
- Bingen, B., Demaiffe, D., and Hertogen, J. (1996) Redistribution of rare earth elements, thorium, and uranium over accessory minerals in the course of amphibolite to granulite facies metamorphism: The role of apatite and monazite in orthogneisses from southwestern Norway. *Geochim. Cosmochim. Acta*, 60, 1341-1354.
- Bird, P. (1978) Initiation of intracontinental subduction in the Himalaya. *J. Geophys. Res.*, 83, 4975-4987.
- Bonini, M., Sokoutis, D., Talkbot, C.J., Boccaletti, M., and Milnes, A.G. (1999) Indenter growth in analogue models of Alpine-type deformation. *Tectonics*, 18, 119-128.
- Bordet, P., Colchen, M., and Le Fort, P. (1975) Recherches géologiques dans l'Himalaya du Népal, région du Nyi-Shang. Centre National de la Recherches Scientifiques, Paris, 138 pp.
- Boyer, S.E. (1992) Geometric evidence from synchronous thrusting in the southern Alberta and northwest Montana thrust belts. In McClay, K.R., (Ed.), Thrust Tectonics. Chapman and Hall, New York, pp. 377-390.
- Braun, I., Montel, J-M., and Nicollet, C. (1998) Electron microprobe dating of monazites from high-grade gneisses and pegmatites of the Kerala Khondalite Belt, southern India. *Chemical Geol.*, 146, 65-85.
- Broska, I., Petřík, I., and Williams, C.T. (2000) Coexisting monazite and allanite in peraluminous granitoids of the Tribec Mountains, Western Carpathians. *Am. Min.*, 85, 22-32.
- Broska, I. and Siman, P. (1998) The breakdown of monazite in the West-Carpathian Veporic orthogneiss and Tatric granites. *Geol. Carpathica*, 49, 161-167.

- Brown, R.L. and Nazarchuk, J.H. (1993) Annapurna detachment fault in the Greater Himalaya of central Nepal. In Treloar, P.J., and Searle, M.P., (Eds.), *Himalayan Tectonics*. Geological Society Special Publication, 74, pp. 461-473.
- Brozovic, N. and Burbank, D.W. (2000) Dynamic fluvial systems and gravel progradation in the Himalayan foreland. *GSA Bull.*, 112, 394-412.
- Brunel, M. and Kienast, J.R. (1986) Etude pétro-structurale des chevauchements ductiles himalayens sur la transversale de l'Everest-Makalu (Nepal oriental). *Can. J. Earth Sci.*, 23, 1117-1137.
- Buda, G. and Nagy, G. (1995) Some REE-bearing accessory minerals in two types of Variscan granitoids, Hungary. *Geol. Carpathica*, 46, 161-167.
- Burbank, D.W., Verges, J., Mufioz, J.A., and Bentham, P. (1992) Coeval hindward and forward-imbricating thrusting in the south central Pyrenees, Spain: timing and rates of shortening and deposition. *GSA Bull.*, 104, 3-17.
- Burchfiel, C.B., Zhiliang C., Hodges K.V., Yuping L., Royden L.H., Changrong D., and Jiene X. (1992) The South Tibetan Detachment System, Himalayan orogen: extension contemporaneous with and parallel to shortening in a collisional mountain belt. *USGS Special Paper*, 269, 1-40.
- Burchfiel, C.B. and Royden L.H. (1985) North-South extension within the convergent Himalayan region. *Geology*, 13, 679-682.
- Burg, J.P., Brunel, M., Gapais, D., Chen G.M., and Liu, G.H. (1984) Deformation of leucogranites of the crystalline Main Central Sheet in southern Tibet (China). *J. Str. Geol.*, 6, 535-542.
- Burg, J.P. and Chen G.M. (1984) Tectonics and structural zonation of southern Tibet, China. *Nature*, 311, 219-223.
- Burt, D.M. (1989) Compositional and phase relations among rare earth element minerals. Lipin, B.R., and McKay, G.A., (Eds.), *Geochemistry and mineralogy of rare earth elements*. Mineralogical Society of America Reviews in Mineralogy, 21, pp. 259-307.
- Campbell, F.A. and Ethier V.G. (1984) Composition of allanite in the footwall of the Sullivan Orebody, British Columbia. *Can. Mineral.*, 22, 507-511.

- Carosi, R., Lombardo, B., Musumeci, G., and Pertusati, P.C. (1999a) Geology of the Higher Himalayan Crystallines in Khumbu Himal (eastern Nepal). *J. Asian Earth Sci.*, 17, 785-803.
- Carosi, R., Musumeci, G., and Pertusati, P.C. (1999b) Extensional tectonics in the higher Himalayan crystallines of Khumbu Himal, Eastern Nepal. In Macfarlane, A., Sorkhabai, R.B., and Quade, J. (Eds.), *Himalaya and Tibet: Mountain roots to mountain tops. GSA Special Paper*, 328, pp. 211-223.
- Carosi, R., Lombardo, B., Molli, G., Musumeci, G., and Pertusati, P.C. (1998) The South Tibetan Detachment System in the Rongbuk valley, Everest region. Deformation and geological implications. *J. Asian Earth Sci.*, 16, 299-311.
- Carosi, R., Musumeci, G., and Pertusati, P.C. (1996) Southward extensional tectonics and dike emplacement in the High Himalayan Crystallines of Khumbu Himal, eastern Nepal. In 11<sup>th</sup> Himalaya-Karakorum-Tibet Workshop, Abstract Volume, Flagstaff, Arizona, p. 28.
- Carson, C.J., Powell, R., Wilson, C.L.J., and Dirks, P.H.G.M. (1997) Partial melting during tectonic exhumation of a granulite terrane: an example from the Larsemann Hills, East Antarctica. *J. Metamorph. Geol.*, 15, 105-126.
- Catlos, E.J., Sorensen, S.S., and Harrison, T.M. (2000) Th-Pb ion-microprobe dating of allanite. *Am. Min.*, 85, 633-648.
- Catlos, E.J., Harrison, T.M., Grove, M., Kohn, M.J., and Upreti, B.N. (1999) Evidence for Pliocene Activity across the Main Central Thrust Shear Zone, central Nepal. In: American Geophysical Union, Fall Meeting Abstracts.
- Chakraborty, S. and Ganguly, J. (1991) Compositional zoning and cation diffusion in garnets. In Ganguly, J. (Ed.), *Diffusion, atomic ordering and mass transport*. Springer-Verlag Press, pp. 120-175.
- Chamberlain, C.P., Zeitler, P.K., Barnett, D.E., Winslow, D., Poulson, S.R., Leahy, T., and Hammer, J.E. (1995) Active hydrothermal systems during the recent uplift of the Nanga-Parbat, Pakistan Himalaya. *J. Geophys. Res.*, 100, 439-453.
- Chen, Z., Burchfiel, B.C., Liu, Y., King, R.W., Royden, L.H., Tang, W., Wang, E., Zhao, J., and Zhang, X. (2000) Global Positioning System measurements from eastern Tibet and their implications for India/Eurasia intercontinental deformation. *J. Geophys. Res.*, 105, 16215-16277.
- Chesner, C.A. and Ettlinger, A.D. (1989) Composition of volcanic allanite from the Toba Tuffs, Sumatra, Indonesia. *Am. Min.*, 74, 750-758.

- Clinkenbeard, J.P. and Walawender, M.J. (1989) Mineralogy of the La Posta Pluton: Implications for the origin of zoned plutons in the eastern Peninsular Ranges batholith, southern and Baja California. *Am. Min.*, 74, 1258-1269.
- Cocherie, A., Legendre, O., Peucat, J.J., and Kouamelan, A.N. (1998) Geochronology of polygenetic monazites constrained by in situ electron microprobe Th-U-total lead determination: implications for lead behaviour in monazite. *Geochim. Cosmochim. Acta*, 62, 2475-2497.
- Colchen, M., Le Fort, P., and Pêcher, A. (1980) Annapurna-Manaslu-Ganesh Himal, Centre National de la Recherches Scientifiques, Paris, 136pp.
- Coleman, M.E. (1998) U-Pb constraints on Oligocene-Miocene deformation and anatexis within the central Himalaya, Marsyandi Valley, Nepal. *Am. J. Sci.*, 298, 553-571.
- Coleman, M.E. and Hodges, K.V. (1998) Contrasting Oligocene and Miocene thermal histories from the hanging wall and footwall of the South Tibetan detachment in the central Nepal Himalaya from  $^{40}\text{Ar}/^{39}\text{Ar}$  thermochronology, Marsyandi Valley, central Nepal. *Tectonics*, 17, 726-740.
- Coleman, M.E. (1996a) Orogen-parallel and orogen-perpendicular extension in the central Nepalese Himalayas. *GSA Bull.*, 108, 1594-1607.
- Coleman, M.E. (1996b) The tectonic evolution of the central Himalaya, Marsyandi Valley, Nepal. Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts, 220 p.
- Compston, W. (1999) Geological age by instrumental analysis: the 29th Hallimond Lecture. *Min. Mag.*, 63, 297-311.
- Copeland, P., Le Fort, P., Henry, P., Rai, S.M., Foster, D., Parrish, R.R., Pecher, A., Stuwe, K., Upreti, B.N., and Raza, A. (in press) Neogene tectonothermal development of the Himalayan thrust system in the Kathmandu region, Nepal. *GSA Bull.*
- Copeland, P. (1997) The when and where of the growth of the Himalaya and the Tibetan Plateau. In Ruddiman, W.F., (Ed.), Tectonic uplift and climate change. Plenum Press, pp. 19-40.
- Copeland, P., Harrison, T.M., Hodges, K.V., Maru ejol, P., Le Fort, P., and P echer, A. (1991) An early Pliocene thermal disturbance of the Main Central Thrust, Central Nepal: Implications for Himalayan Tectonics. *J. Geophys. Res.*, 96, 8475-8500.

- Copeland, P., Parrish, R.R., and Harrison, T.M. (1988) Identification of inherited radiogenic Pb in monazite and its implications for U-Pb systematics. *Nature*, 333, 760-763.
- Crowley, J.L. and Ghent, E.D. (1999) An electron microprobe study of the U-Th-Pb systematics of metamorphosed monazite: the role of Pb diffusion versus overgrowth and recrystallization. *Chemical Geol.*, 157, 285-302.
- Curewitz D. and Karson J.A. (1997) Structural settings of hydrothermal outflow: Fracture permeability maintained by fault propagation and interaction. *J. Volcan. Geotherm. Res.*, 79, 149-168.
- Davidson, C., Grujic, D.E., Hollister, L.S., and Schmid, S. M. (1997) Metamorphic reactions related to decompression and synkinematic intrusion of leucogranite, High Himalayan Crystallines, Bhutan. *J. Metamorph. Geol.*, 15, 593-612.
- Davis, D., Suppe, J., and Dahlen, F.A. (1983) Mechanics of fold-and-thrust belts and accretionary wedges. *J. Geophys. Res.*, 88, 1153-1172.
- Davis, D.W., Schandl, E.S., and Wasteneys, H.A. (1994) U-Pb dating of minerals in alteration halos of Superior Province massive sulfide deposits: syngensis versus metamorphism. *Contrib. Mineral. Petrol.*, 115, 427-437.
- Dawes, R.L. and Evans, B.W. (1991) Mineralogy and geothermobarometry of magmatic epidote-bearing dikes, Front Range, Colorado. *GSA Bull.*, 103, 1017-1031.
- DeCelles, P.G., Gehrels, G.E., Quade, J., LaReau, B., and Spurlin, M. (2000) Tectonic implications of U-Pb zircon ages of the Himalayan orogenic belt in Nepal. *Science*, 288, 497-499.
- Deer, W.A., Howie, R.A., and Zussman, J. (1993) An Introduction to the Rock-Forming Minerals, 2nd edition. Longman Scientific and Technical Press, 696 pp.
- DeMets, C., Gordon, R.G., Argus, D.F., and Stein, S. (1990) Current plate motions, *Geophys. J. Internat.*, 101, 425-478.
- Derry, L.A. and France-Lanord, C. (1996) Neogene Himalayan weathering history and river  $^{87}\text{Sr}/^{86}\text{Sr}$ : impact on the marine Sr record. *Earth Planet. Sci. Lett.*, 142, 59-74.
- Dewey, J.F. (1988) Extensional collapse of orogens. *Tectonics*, 7:1123-1139.

- Dèzes, P.J., Vannay, J.-C., Steck, A., Bussy, F., and Cosca, M. (1999) Synorogenic extension: Quantitative constraints on the age and displacement of the Zaskar Shear Zone (northwest Himalaya). *GSA Bull.*, 111, 364-374.
- Dickenson, M.P. and Hewitt, D. (1986) A garnet-chlorite geothermometer. In Geological Society of America, 1986 annual meeting San Antonio, TX, *Abstracts with Programs*, 18, p. 584.
- Dollase, W.A. and Newman, B. (1984) Statistically most probable stoichiometric formulae. *Am. Min.*, 69, 553-556.
- Dollase, W.A. (1971) Refinement of the crystal structure of epidote, allanite, and hancockite. *Am. Min.*, 56, 447-464.
- Drake, M.J. and Weill, D.F. (1972) New rare earth element standards for electron microprobe analysis. *Chemical Geol.*, 10, 179-181.
- Druguet, E. and Hutton, D.H.W. (1998) Syntectonic anatexis and magmatism in a mid-crustal transpressional shear zone: an example from the Hercynian rocks of the eastern Pyrenees. *J. Str. Geol.*, 20, 905-916.
- Duppert, L., Dissler, E., Dore, F., Gresselin, F., and Gall, J.K. (1990) Cadomian geodynamic evolution of the north-eastern Armorican Massif (Normandy and Maine). In: D'Lemos, R.S., Strachan, R.A., and Topley, C.G. (Eds.), *The Cadomian Orogeny*. Geological Society of London, 51, pp. 115-131.
- Edwards, M.A. and Harrison, T.M. (1997) When did the roof collapse? Late Miocene north-south extension in the High Himalaya revealed by Th-Pb monazite dating of the Khula Kangri granite. *Geology*, 25, 543-546.
- Edwards, R.M. (1995)  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology of the Main Central Thrust (MCT) region; evidence for late Miocene to Pliocene disturbances along the MCT, Marsyangdi River valley, west-central Nepal Himalaya. *J. Nepal Geol. Soc.*, 10, 41-46.
- England, P.C. and Molnar, P. (1993) The interpretation of inverted metamorphic isograds using simple physical calculations. *Tectonics*, 12, 145-157.
- England, P.C., Le Fort P., Molnar P., and Pêcher, A. (1992) Heat sources for Tertiary metamorphism and anatexis in the Annapurna-Manaslu region, central Nepal. *J. Geophys. Res.*, 97, 2107-2128.

- England, P.C. and Thompson, A.B. (1984) Pressure temperature time paths of regional metamorphism. 1. Heat-transfer during the evolution of regions of thickened continental crust. *J. Petrol.*, 25, 894-928.
- Ernst, W.G. (1973) Blueschist metamorphism and P-T regimes in active subduction zones. *Tectonophysics*, 17, 255.
- Exley, R.A. (1980) Microprobe studies of REE-rich accessory minerals: implications for Skye granite petrogenesis and REE mobility in hydrothermal systems. *Earth Planet. Sci. Lett.*, 48, 97-110.
- Eyal, Y. and Kaufman, A. (1982) Alpha-recoil damage in monazite: preferential dissolution of the radiogenic actinide isotopes. *J. Nucl. Tech.*, 58, 77-83.
- Ferry, J.M. and Spear, F.S. (1978) Experimental calibration of partitioning of Fe and Mg between biotite and garnet. *Contrib. Mineral. Petrol.*, 66, 113-117.
- Finger, F., Broska, I., Roberts, M.P., and Schermaier, A. (1998) Replacement of primary monazite by apatite-allanite-epidote coronas in an amphibolite facies granite gneiss from the eastern Alps. *Am. Min.*, 83, 248-258.
- Florence, F.P. and Spear, F.S. (1991) Effects of diffusional modification of garnet growth zoning on P-T path calculations. *Contrib. Mineral. Petrol.*, 107, 487-500.
- Foster, G.L. (2000) The pre-Neogene thermal history of the Nanga Parbat Haramosh Massif and the NW Himalaya. PhD dissertation, The Open University, England, 345 pp.
- Franz, G., Thomas, S., and Smith D.C. (1986) High-pressure phengite decomposition in the Weissenstein eclogite, Muenchberger Gneiss Massif, Germany. *Contrib. Mineral. Petrol.*, 92, 71-85.
- Frost, B.R. and Tracy, R.J. (1991) P-T paths from zoned garnets: some minimum criteria. *Am. J. Sci.*, 291, 917-939.
- Fuchs, G., Regmi, K., and Schill, E. (1999) Note on the geology of the Nar-Manang Region in northern Nepal [Himalaya]. In 14<sup>th</sup> Himalaya-Karakoram-Tibet, Kloster Ettal Germany, *Terra Nostra*, 99/2, pp. 46-47.
- Fuchs, G. and Linner, M. (1995) Geological traverse across the western Himalaya- a contribution to the geology of eastern Ladakh, Lahul, and Chamba. *Jb. Geol. B.-A.*, 138, 655-685.

- Fuchs, G., Widder, R.W., and Tuladhar, R. (1988) Contributions to the Geology of the Annapurna Range [Manang Area, Nepal]. *Jb. Geol. B.-A.*, 131, 593-607.
- Fuchs, G. (1987) The Geology of southern Zaskar (Ladakh) - Evidence for the autochthony of the Tethys Zone of the Himalaya. *Jb. Geol. B.-A.*, 130, 465-491.
- Fuchs, G. (1986) The Geology of the Markha-Khurnak region in Ladakh (India). *Jb. Geol. B.-A.*, 128, 403-437.
- Fuchs, G. (1968) The geological history of the Himalayas. Report of the 22<sup>nd</sup> International Geological Congress, 3, 161-174.
- Gansser, A. (1981) The geodynamic history of the Himalaya. In Gupta, H.K., and Delany, F.M., (Eds.), *Zagros, Hindu Kush, Himalayan Geodynamic Evolution*. American Geophysical Union, 3, pp. 111-121.
- Gansser, A. (1964) *The geology of the Himalayas*. John Wiley Press, 289 pp.
- Garzanti, E., Casnedi, R., and Jadoul, F. (1986) Sedimentary evidence of a Cambro-Ordovician orogenic event in the Northwestern Himalaya. *Sediment. Geol.*, 48, 237-265.
- Geist, E.L. (1996) Relationship between the present-day stress field and plate boundary forces in the Pacific Northwest. *Geophys. Res. Lett.*, 23, 3381-3384.
- Geyra, T.V., Perchuk, L.L., van Reenan, D.D., and Smit, C.A. (2000) Two-dimensional numerical modeling of pressure-temperature-time paths for the exhumation of some granulite facies terrains in the Precambrian. *J. Geodyn.*, 30, 17-35.
- Gibson, H.D., Brown, R.L., and Parrish, R.R. (1999) Deformation-induced inverted metamorphic field gradients: an example from the southeastern Canadian Cordillera. *J. Str. Geol.*, 21, 751-767.
- Gieré, R., Virgo, D., and Robert, K.P. (1999) Oxidation state of iron and incorporation of REE in igneous allanite. EUG 10, Journal of Conference Abstracts, 4, 721.
- Gilmore, M.S., Collins, G.C., and Ivanov, M.A. (1998) Style and sequence of extensional structures in tessera terrain, Venus. *J. Geophys. Res.*, 103, 16813-16840.
- Godin, L., Brown, R.L., Hanmer, S., and Parrish, R.R. (1999a) Back folds in the Himalayan orogen: an alternative interpretation. *Geology*, 27, 151-154.
- Godin, L., Brown, R.L., and Hanmer, S. (1999b) High strain zone in the hanging wall of the Annapurna detachment, central Nepal Himalaya. In Macfarlane, A., Sorkhabi,

- R.B., and Quade, J., (Eds.), Himalaya and Tibet: Mountain roots to mountain tops. *GSA Special Paper*, 328, pp. 199-210.
- Graham, C.M. and Powell, R. (1984) A garnet-hornblende geothermometer; calibration, testing, and application to the Pelona Schist, Southern California. *J. Metamorph. Geol.*, 2, 13-31.
- Graham, C. M. and England, P.C. (1976) Thermal regimes and regional metamorphism in the vicinity of overthrust faults: an example of shear heating and inverted metamorphic zonation from southern California. *Earth Planet. Sci. Lett.*, 31, 142-152.
- Grasemann, B., Fritz, H., and Vannay, J-C. (1999a) Quantitative kinematic flow analysis from the Main Central Thrust Zone (NW-Himalaya, India): implications for a decelerating strain path and the extrusion of orogenic wedges. *J. Str. Geol.*, 21, 837-853.
- Grasemann, B., Vannay, J-C., and Rice, H. (1999b). Flow type controlled inverted metamorphism: An example from the Sutlej Valley (NW Himalaya, India). In 14<sup>th</sup> Himalaya-Karakoram-Tibet Workshop, Kloster Ettal Germany, *Terra Nostra*, 99/2, pp. 62-63.
- Grasemann B. and Vannay J-C. (1999) Flow controlled inverted metamorphism in shear zones. *J. Str. Geol.*, 21, 743-750.
- Gray, M.B. and Mitra, G. (1999) Ramifications of four-dimensional progressive deformation in contractional mountain belts. *J. Str. Geol.*, 21, 1151-1160.
- Green, T.H. and Pearson, N.J. (1983) Effect of pressure on rare earth element partition coefficients in common magmas. *Nature*, 305, 414-416.
- Grove, M. and Harrison, T.M. (1999) Monazite Th-Pb age depth profiling. *Geology*, 27, 487-490.
- Gruijic, D., Grasemann, B., and Vannay, J-C. (1999) Extrusion of tectonic wedges as a process of exhumation: Which models fit the field data from the High Himalayan Crystalline? In 14<sup>th</sup> Himalaya-Karakoram-Tibet Workshop, Kloster Ettal Germany, *Terra Nostra*, 99/2, pp. 60-62.
- Gruijic, D., and Wosnitza, E. (1999) Thermomechanical analogue modelling of Himalayan collision processes In 14<sup>th</sup> Himalaya-Karakoram-Tibet Workshop, Kloster Ettal Germany, *Terra Nostra*, 99/2, pp. 63-64.

- Grujic D., Casey M., Davidson C., Hollister L.S., Kundig R., Pavlis T., and Schmid S. (1996) Ductile extrusion of the Higher Himalayan Crystalline in Bhutan: Evidence from quartz microfabrics. *Tectonophysics*, 260, 21-43.
- Guillot, S. (1999) An overview of the metamorphic evolution in Central Nepal. *J. Asian Earth Sci.*, 17, 713-725.
- Harris, N. and Massey, J. (1994) Decompression and anatexis of Himalayan metapelites. *Tectonics*, 13, 1537-1546.
- Harris, N., Inger, S., and Massey, J. (1993) The role of fluids in the formation of High Himalayan leucogranites. In Treloar, P.J., and Searle, M.P., (Eds.), *Himalayan Tectonics*. Geological Society Special Publication, 74, pp. 391-400.
- Harrison, T.M., Grove, M., Lovera, O.M., Catlos, E.J., and D'Andrea, J. (1999a) The origin of Himalayan anatexis and inverted metamorphism: Models and constraints. *J. Asian Earth Sci.*, 17, 755-772.
- Harrison, T.M., Grove, M., McKeegan, K.D., Coath, C.D., Lovera, O.M., and Le Fort, P. (1999b) Origin and emplacement of the Manaslu intrusive complex, Central Himalaya. *J. Petrology*, 40, 3-19.
- Harrison, T.M., Grove M., Lovera O.M., and Catlos E.J. (1998) A model for the origin on Himalayan anatexis and inverted metamorphism. *J. Gephys. Res.*, 103, 27017-27032.
- Harrison, T.M., Grove M., and Lovera O.M. (1997a) New insights into the origin of two contrasting Himalayan granite belts. *Geology*, 25, 899-902.
- Harrison, T.M., Ryerson, F.J., Le Fort, P., Yin, A., Lovera, O.M., and Catlos, E.J. (1997b) A Late Miocene-Pliocene origin for central Himalayan inverted metamorphism. *Earth Planet. Sci. Lett.*, 146, E1-E8.
- Harrison, T.M., McKeegan, K.D., and Le Fort, P. (1995) Detection of inherited monazite in the Manaslu leucogranite by  $^{208}\text{Pb}/^{232}\text{Th}$  ion microprobe dating: crystallization age and tectonic implications. *Earth Planet. Sci. Lett.*, 133, 271-282.
- Harrison, T.M., Copeland, P., Hall, S.A., Quade, J., Burner, S., Ojha, T.P., and Kidd, W.S.F. (1993) Isotopic preservation of Himalayan/Tibetan uplift, denudation, and climatic histories of two molasse deposits. *J. Geology*, 101, 157-175.
- Havette, A. (1985) Mineralogical application of the ion microscope elementary analysis. *Scanning Electron Microscopy*, 2, 585-594.

- Hawkings, D.P. and Bowring, S.A. (1997) U-Pb systematics of monazite and xenotime: case studies from the Paleoproterozoic of the Grand Canyon, Arizona. *Contrib. Mineral. Petrol.*, 127, 87-103.
- Henry, P., Le Pichon, X., and Goffe, B. (1997) Kinematic, thermal and petrological model of the Himalayas: Constraints related to metamorphism within the underthrust Indian crust and topographic elevation. *Tectonophysics*, 273, 31-56.
- Heuberger, H. and Ibertsberger, H.J. (1996) Problems of late-glacial and Holocene advances in the Langtang, Nepal. In Chalise, S.R. and Khanal, N.R., (Eds.), International Conference on Ecohydrology of High Mountain Areas, Extended Abstracts. International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, pp. 331-333.
- Hinton, R.W. (1995) Ion microprobe analysis in geology. In Potts, P.J., Bowles, J.F.W., Reed, S.J.B., and Cave, M.R., (Eds.), Microprobe techniques in the Earth Sciences. Chapman and Hall, London, pp. 235-289.
- Hodges, K.V. (2000) Tectonics of the Himalaya and southern Tibet from two perspectives. *GSA Bull.*, 112, 324-350.
- Hodges, K., Bowring, S., Davidek, K., Hawkins, D., and Krol, M. (1998) Evidence for rapid displacement on Himalayan normal faults and the importance of tectonic denudation in the evolution of mountain ranges. *Geology*, 26, 483-486.
- Hodges, K.V., Parrish, R.R., and Searle, M.P. (1996) Tectonic evolution of the central Annapurna Range, Nepalese Himalayas. *Tectonics*, 15, 1264-1291.
- Hodges, K.V., Burchfiel, B.C., Royden, L.H., Chen, Z., and Liu, Y. (1993) The metamorphic signature of contemporaneous extension and shortening in the central Himalayan orogen: data from the Nyalam transect, southern Tibet. *J. Metamorph. Geol.*, 11, 721-737.
- Hodges, K.V., Parrish, R.R., Housh, T.B., Lux, D.R., Burchfiel, L.H., Royden, L.H., and Chen, Z. (1992) Simultaneous Miocene extension and shortening in the Himalayan orogen. *Science*, 258, 1466-1470.
- Hodges, K.V., Le Fort, P., and Pêcher, A. (1988) Possible thermal buffering by crustal anatexis in collisional orogens: thermobarometric evidence from the Nepalese Himalaya. *Geology*, 16, 707-710.
- Hodges, K.V. and Silverberg, D.S. (1988) Thermal evolution of the Greater Himalaya, Garhwal, India. *Tectonics*, 7, 583-600.

- Hodges, K.V. and Spear, F.S. (1982) Geothermometry, geobarometry and the  $\text{Al}_2\text{SiO}_5$  triple point at Mt. Moosilauke, New Hampshire. *Am. Min.*, 67, 1118-1134.
- Hoisch, T.D. (1990) Empirical calibration of six geobarometers for the mineral assemblage quartz + muscovite + biotite + plagioclase + garnet. *Contrib. Mineral. Petrol.*, 104, 225-234.
- Hollister, L.S. (1993) The role of melt in the uplift and exhumation of orogenic belts. *Chemical Geol.*, 108, 31-48.
- Houseman and England (1996) A lithospheric-thickening model for the Indo-Asian collision. In Yin, A., and Harrison, T.M., (Eds.), *The Tectonic Evolution of Asia*. Cambridge University Press, pp. 1-17.
- Hubbard, M.S. and House, M. (2000) Low temperature dating of high mountain rocks: (U-Th)/He ages from Higher Himalayan samples, eastern Nepal. In 15<sup>th</sup> Himalaya-Karakoram-Tibet Workshop, Chengdu, China, *Earth Science Frontiers*, 7 suppl., pp. 16-17.
- Hubbard, M.S. (1996) Ductile shear as a cause of inverted metamorphism: example from the Nepal Himalaya. *J. Geology*, 104, 493-499.
- Hubbard, M.S. and Harrison, T.M. (1989)  $^{40}\text{Ar}/^{39}\text{Ar}$  constraints on deformation and metamorphism in the Main Central Thrust zone and Tibetan Slab, eastern Nepal Himalaya. *Tectonics*, 8, 865-880.
- Hubbard, M.S. (1989) Thermobarometric constraints on the thermal history of the Main Central Thrust Zone and Tibet Slab, eastern Nepal Himalaya. *J. Metamorph. Geol.*, 7, 19-30.
- Hubbard, M.S. (1988) Thermobarometry,  $^{40}\text{Ar}/^{39}\text{Ar}$  geochronology, and structure of the Main Central Thrust Zone and Tibetan Slab, eastern Nepal Himalaya. Ph.D. dissertation, Massachusetts Institute of Technology, Cambridge, Massachusetts, 169 pp.
- Huerta, A.D., Royden, L.H., and Hodges, K.V. (1999) The effects of accretion, erosion, and radiogenic heat on the metamorphic evolution of collisional orogens. *J. Metamorph. Geol.*, 17, 349-366.
- Huerta, A.D., Royden, L.H., and Hodges, K.V. (1998) The thermal structure of collisional orogens as a response to accretion, erosion, and radiogenic heating. *J. Geophys. Res.*, 103, 15287-15302.

- Huerta, A.D., Royden, L.H., and Hodges, K.V. (1996) The interdependence of deformational and thermal processes in mountain belts. *Science*, 273, 637-639.
- Inger, S. (1994) Magmagenesis associated with extension in orogenic belts- examples from the Himalaya and Tibet. *Tectonophysics*, 238, 183-197.
- Inger, S. and Harris, N.B.W. (1992) Tectonothermal evolution of the High Himalaya Crystalline sequence, Langtang Valley, northern Nepal. *J. Metamorph. Geol.*, 10, 439-452.
- Jäger, E. (1979) Introduction to geochronology. In Jager, E. and Hunziker, J.C., (Eds.), Lectures in isotope geology. Springer-Verlang, Berlin, pp. 1-12.
- Jain, A.K., Kumar, D., Singh, S., Kumar, A., and Lal, N. (2000) Timing, quantification and tectonic modelling of Pliocene-Quaternary movements in the NW Himalaya: evidence from fission track dating. *Earth Planet. Sci. Lett.*, 179, 437-451.
- Jarosewich, E. and Boatner, L.A. (1991) Rare earth element reference samples for electron microprobe analysis. *Geostandards Newsletter*, 15, 397-399.
- Johnston, D.H., Williams, P.F., Brown, R.L., Crowley, J.L., and Carr, S.D. (2000) Northeastward extrusion and extensional exhumation of crystalline rocks of the Monashee complex, southeastern Canadian Cordillera. *J. Str. Geol.*, 22, 603-625.
- Joshi, A. and Patel, R.C. (1997) Modelling of active lineaments for predicting a possible earthquake scenario around Dehradun, Garhwal Himalaya, India. *Tectonophysics*, 283, 289-310.
- Kaneko, Y. (1995) Thermal structure in the Annapurna region, central Nepal Himalaya: implication for the inverted metamorphism. *J. Mineral. Petrol. Econ. Geol.*, 90, 143-154.
- Kaneoka, I. and Kono, M. (1981)  $^{40}\text{Ar}/^{39}\text{Ar}$  dating of Himalayan rocks from the Mount Everest Region. *J. Geophysics*, 49, 207-211.
- Kayal, J.R. (1996) Precursor seismicity, foreshocks and aftershocks of the Uttarkashi earthquake of October 20, 1991 at Garhwal Himalaya. *Tectonophysics*, 263, 339-345.
- Kerrick, D.M. and Caldeira, K. (1999) Was the Himalayan orogen a climatically significant coupled source and sink for atmospheric  $\text{CO}_2$  during the Cenozoic? *Earth Planet. Sci. Lett.*, 173, 195-203.

- Kerrick, D.M. and Caldeira, K. (1993) Paleoatmospheric consequences of CO<sub>2</sub> released during early Cenozoic regional metamorphism in the Tethyan orogen. *Chemical Geol.*, 108, 201-230.
- Khattari, K.N. and Tyagi, A.K. (1983) Seismicity patterns in the Himalayan plate boundary and identification of areas of high seismic potential. *Tectonophysics*, 96, 281-297.
- Kingsbury, J.A., Miller, C.F., Wooden, J.L., and Harrison, T.M. (1993) Monazite paragenesis and U-Pb systematics in rocks of the eastern Mojave Desert, California, U.S.A.: implications for thermochronometry. *Chemical Geol.*, 110, 147-167.
- Klootwijk, C.T., Conaghan, P.J., and Powell, C.M. (1985) The Himalayan arc: largescale continental subduction, oroclinal bending, and backarc spreading. *Earth Planet. Sci. Lett.*, 75, 167-183.
- Kohn, M.J., Catlos, E.J., Ryerson, F.J., and Harrison T.M. (submitted) P-T-t Path Discontinuity in the MCT Zone, Central Nepal. *Geology*.
- Kohn, M.J. and Spear, F.S. (submitted) Retrograde Net Transfer Reaction (ReNTR) Insurance for P-T Estimates. *Geology*.
- Kohn, M.J., Catlos, E.J., Ryerson, F.J., and Harrison, T.M. (1999) Metamorphic P-T discontinuity at the base of the MCT zone, central Nepal. In American Geophysical Union, 1999 annual meeting, *Abstracts with Programs*, vol, p. XX.
- Kohn, M.J., Spear, F.S., and Valley, J.W. (1997) Dehydration-melting and fluid recycling during metamorphism: Rangeley Formation, New Hampshire, USA. *J. Petrology*, 38, 1255-1277.
- Kohn, M.J. (1993) Uncertainties in differential thermodynamic (Gibbs Method) P-T paths. *Contrib. Mineral. Petrol.*, 113, 24-39.
- Kohn, M.J., Spear, F.S., and Dalziel, I.W.D. (1993) Metamorphic P-T paths from Cordillera Darwin, a core complex in Tierra del Fuego, Chile. *J. Petrology*, 34, 519-542.
- Kohn, M.J., Orange, D.L., Spear, F.S., Rumble, D., and Harrison, T.M. (1992) Pressure, temperature, and structural evolution of west-central New Hampshire: Hot thrusts over cold basements. *J. Petrology*, 33, 521-556.
- Kohn, M. J. and Spear, F. S. (1990) Two new barometers for garnet amphibolites with applications to eastern Vermont. *Am. Min.*, 75, 89-96.

- Kong, X. and Bird P. (1996) Neotectonics of Asia: Thin-shell finite-element models with faults. In Yin, A., and Harrison, T.M., (Eds.), *The Tectonic Evolution of Asia*. Cambridge University Press, pp. 18-34.
- Kucha, H. (1980) Continuity in the monazite-huttonite series. *Min. Mag.*, 43, 1031-1034.
- Laird, J. (1988) Chlorites: Metamorphic petrology. In Bailey, S.W. (Ed.), *Hydrous phyllosilicates (exclusive of micas)*. Mineralogical Society of America Reviews in Mineralogy 19, 405-453.
- Lavé, J. and Avouac J.P. (2000) Active folding of fluvial terraces across the Siwaliks Hills, Himalayas of central Nepal. *J. Geophys. Res.*, 105, 5735-5770.
- Lee, D.H. and Barston, H. (1967) Fractionation of rare-earth elements in allanite and monazite as related to geology of the Mt. Wheeler mine area, Nevada. *Geochim. Cosmochim. Acta*, 31, 339-356.
- Le Fort, P. (1996) Evolution of the Himalaya. In Yin, A., and Harrison, T.M., (Eds.), *The Tectonic Evolution of Asia*. Cambridge University Press, pp. 95-109.
- Le Fort, P. and Guillot, S. (1988) Preliminary results of Himlung expedition to northern Manaslu massif, central Nepal. In 13<sup>th</sup> Himalaya-Karakoram-Tibet Workshop, Peshwar, *Geological Bulletin Special Issue*, 31, pp. 110-112.
- Le Fort, P., Debon, F., Pêcher, A., Sonet, J., and Vidal, P. (1986) The 500 Ma magmatic event in Alpine southern Asia, a thermal episode at Gondwana scale. *Sciences de la Terre*, 47, 191-209.
- Le Fort, P. (1975) Himalaya, the collided range, Present knowledge of the continental arc. *Am. J. Sci.*, 275A, 1-44.
- Lombardo, B. and Rolfo, F. (2000) Two contrasting eclogite types in the Himalayas: implications for the Himalayan orogeny. *J. Geodyn.*, 30, 37-60.
- Lombardo B., Pertusati, P., and Borghi, S. (1993) Geology and tectonomagmatic evolution of the eastern Himalaya along the Chomolungma-Makalu transect. In Trearlor, P.J., and Searle, M.P., (Eds.), *Himalayan Tectonics*. Geological Society Special Publication, 74, pp. 341-355.
- Lyon-Caen, H. and Molnar, P. (1983) Constraints on the structure of the Himalaya from the analysis of gravity anomalies and a flexural model of the lithosphere. *J. Geophys. Res.*, 88, 8171-8191.

- Macfarlane, A.M. (1999) The metamorphic history of the crystalline rocks in the high Himalaya, Nepal: insights from thermobarometric data. *J. Asian Earth Sci.*, 17, 741-753.
- Macfarlane, A.M. (1995) An evaluation of the inverted metamorphic gradient at Langtang National Park, central Nepal Himalaya. *J. Metamorph. Geol.*, 13, 595-612.
- Macfarlane, A.M. (1993) The chronology of tectonic events in the crystalline core of the Himalaya, Langtang National Park, central Nepal. *Tectonics*, 12, 1004-1025.
- Malod, J.A., Droz, L., Mustafa Kemal B., and Patriat P. (1997) Early spreading and continental to oceanic basement transition beneath the Indus deep-sea fan: northeastern Arabian Sea. *Marine Geology*, 141, 221-235.
- Mandal, P. (1999) Intraplate stress distribution induced by topography and crustal density heterogeneities beneath the south Indian shield, India. *Tectonophysics*, 302, 159-172.
- Manickavasagam, R.M., Jain, A.K., Singh, S., and Asokan, A. (1999) Metamorphic evolution of the northwest Himalaya, India: Pressure-temperature data, inverted metamorphism, and exhumation in the Kashmir, Himachal, and Garhwal Himalayas. In Macfarlane, A., Sorkhabai, R.B., and Quade, J. (Eds.), Himalaya and Tibet: Mountain roots to mountain tops. *GSA Special Paper*, 328, pp. 179-198.
- Martelat, J-E., Lardeaux, J-M., Nicollet, C., and Rakotondrazafy, R. (2000) Strain pattern and late Precambrian deformation history in southern Madagascar. *Precambrian Res.*, 102, 1-20.
- Matsumoto, N. and Hirajima, T. (2000) Garnet in pelitic schists from a quartz-eclogite unit of the southern Dora-Maira massif, Western Alps. *Schweiz. Mineral. Petrogr. Mitt.*, 80, 53-62.
- McDougall, I. and Harrison, T.M. (1999) Geochronology and thermochronology by the  $^{40}\text{Ar}/^{39}\text{Ar}$  method. Oxford University Press, New York, 269 pp.
- Medicott, H.B. (1864) On the geologic structure and relations of the southern portion of the Himalayan range between the rivers Ganges and Ravee. *Mem. Geol. Surv. India*, 3, 1-206.
- Meigs, A.J., Burbank, D.W., and Beck, R.A. (1995) Middle-late Miocene [ $>10$  Ma] formation of the Main Boundary Thrust in the Western Himalaya. *Geology*, 23, 423-426.

- Meldrum, A., Boatner, L.A., Weber, W.J., and Ewing, R.C. (1998) Radiation damage in zircon and monazite. *Geochim. Cosmochim. Acta*, 62, 2509-2520.
- Meldrum, A., Boatner, L.A., and Ewing, R.C. (1997) Displacive radiation effects in the monazite- and zircon-structure orthophosphates. *Phys. Rev. B*, 56, 13805-13814.
- Meldrum, A., Wang, L.M., and Ewing, R.C. (1996) Ion beam induced amorphization of monazite. *Nucl Instr. Meth. Phys. Res. B*, 116, 220-224.
- Metcalf, R.P. (1993) Pressure, temperature and time constraints on metamorphism across the Main Central Thrust zone and High Himalaya Slab in the Garhwal Himalaya. In Treloar, P.J., and Searle, M.P., (Eds.), *Himalayan Tectonics*. Geological Society Special Publication, 74, pp. 485-509.
- Mezger, K., Hanson, G.N., and Bohlen, S.R. (1989) U-Pb Systematics of garnet: dating the growth of garnet in the Late Archean Pikwitonei granulite domain at Cauchon and Natawahunan Lakes, Manitoba, Canada. *Contrib. Mineral. Petrol.*, 101, 136-148.
- Middlemiss (1887) Physical geology of West British Garhwal; with notes on a route traverse through Jaunsar Bawar and Tiri-Garhwal. *Rec. Geol. Surv. India*, 20, 26-40.
- Minster, J.B. and Jordan, T.H. (1978) Present-day plate motions, *J. Geophys. Res.*, 83, 5331-5354,
- Mishra, D.C. (1992) Mid-continent gravity "high" of central India and the Gondwana tectonics. *Tectonophysics*, 212, 153-161.
- Mishra, S., Deomurari, M.P., Wiedenbeck, M., Goswami, J.N., Ray S., and Saha A.K. (1999)  $^{207}\text{Pb}/^{206}\text{Pb}$  zircon ages and the evolution of the Singhbhum Craton, eastern India: an ion microprobe study. *Precambrian Res.*, 93, 139-151.
- Molnar, P. and England, P.C. (1990) Temperatures, heat flux, and frictional stress near major thrust faults. *J. Geophys. Res.*, 95, 4833-5856.
- Molnar, P., Chen, W.P., and Padovani, E. (1983) Calculated temperatures in overthrust terrains and possible combinations of heat sources responsible for the tertiary granites in the greater Himalaya. *J. Geophys. Res.*, 88, 6415-6429.
- Montel, J-M. (1999) Some good reasons for monazite to be concordant. EUG 10 Journal of Conference Abstracts, 4, p. 800.

- Montel, J-M., Foret, S., Veschambre, M., Nicollet, C., and Provost, A. (1996) Electron microprobe dating of monazite. *Chemical Geol.*, 131, 37-53.
- Montel, J-M. (1995) Shielding effect of garnet for the U-Th-Pb system in monazite: an e-probe study at Beni Bousera (Marocco). EUG 8, *Terra Nova*, Terra Abstract Supplement, 7, p. 348.
- Montel, J-M. (1993) A model for monazite/melt equilibrium and application to the generation of granitic magmas. *Chemical Geol.*, 110, 127-146.
- Morely, C.K. (1988) Out-of-sequence thrusts. *Tectonics*, 7, 539-561.
- Mugnier, J.L., Leturmy, P., Mascle, G., Huyghe, P., Chalaron, E., Vidal, G., Husson, L., and Delcaillau, B. (1999) The Siwaliks of western Nepal I. Geometry and kinematics. *J. Asian Earth Sci.*, 17, 629-642.
- Naidu P.D. (1998) Driving forces of Indian summer monsoon on Milankovitch and sub-Milankovitch time scales: A review. *J. Geol. Soc. India*, 52, 257-272.
- Nazarchuk, J.H. (1993) Structure and geochronology of the Greater Himalaya, Kali Gandaki region, west-central Nepal. Masters thesis, Carleton University, Ottawa, Ontario, 157 pp.
- Nelson, K.D., Zhao, W., Brown, L.D., and others (1996) Partially molten crust beneath Southern Tibet: synthesis of project INDEPTH results. *Science*, 274, 1684-1688.
- Neto, M.C.C.N. and Caby, R. (1999) Neoproterozoic high-pressure metamorphism and tectonic constraint from the nappe system south of the Sao Francisco Craton, southeast Brazil. *Precambrian Res.*, 97, 3-26.
- Neves, S.P., Vacuhez, A., and Archanjo, C.J. (1996) Shear zone-controlled magma emplacement or magma-assisted nucleation of shear zones? Insights from northeast Brazil. *Tectonophysics*, 262, 349-364.
- Ni, J. and Barazangi, M. (1984) Seismotectonics of the Himalayan collision zone; geometry of the underthrusting Indian Plate beneath the Himalaya. *J. Geophys. Res.*, 89, 1147-1163.
- Noble, S.R. and Searle, M.P. (1995) Age of crustal melting and leucogranite formation from U-Pb zircon and monazite dating in the western Himalaya, Zaskar, India. *Geology*, 23, 1135-1138.

- Oberli, F., Meier, M., Berger, A., Rosenburg, C., and Gieré, R. (1999) U-Th-Pb Isotope systematics in zoned allanite: a test for geochronological significance. *EUG 10, Journal of Conference Abstracts*, 4, 722.
- Oldham, R.D. (1883) The geology of Jaunsar and the Lower Himalayas. *Rec. Geol. Surv. India*, 16, 193-198.
- Oliver, G.J.H., Johnson, M.R.W., and Fallick, A.E. (1995) Age of metamorphism in the Lesser Himalaya and the Main Central Thrust zone, Garhwal India: results of illite crystallinity,  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  fusion and K-Ar studies. *Geol. Mag.*, 132, 139-149.
- Olsen, S.N. and Livi, K. (1998) Dating of monazite from migmatites in the Aar Massif, Swiss Alps, by electron microprobe analyses. In Geological Society of America, 1998 annual meeting Toronto, ON, Canada, *Abstracts with Programs*, 30, p. 231.
- Overstreet, W.C. (1967) The geologic occurrence of monazite. *Geological Survey Professional Papers*, 530, 1-327.
- Pandey, M.R., Lavé, J., and Massot, J.P. (1995) Interseismic strain accumulation on the Himalayan Crustal Ramp (Nepal). *Geophys. Res. Lett.*, 22, 751-754.
- Pandey, M.R., Tandukar, R.P., Avouac, J.P., Vergne, J., and Héritier, Th. (1999) Seismotectonics of the Nepal Himalaya from a local seismic network. *J. Asian Earth Sci.*, 17, 703-712.
- Parrish, R.R. and Hodges, K.V. (1996) Isotopic constraints on the age and provenance of the Lesser and Greater Himalaya sequences, Nepalese Himalaya. *GSA Bull.*, 108, 904-911.
- Parrish, R.R. (1995) Thermal evolution of the southeastern Canadian Cordillera. *Can. J. Earth Sci.*, 32, 1618-1642.
- Parrish, R.R. (1990) U-Pb dating of monazite and its application to geological problems. *Can. J. Earth Sci.*, 27, 1431-1450.
- Patel, R.C., Singh, S., Asokan, A., Manickavasagam, R.M., and Jain, A.K. (1993) Extensional tectonics in the Himalayan orogen, Zanskar, NW India. In Trearlor, P.J., and Searle, M.P., (Eds.), *Himalayan Tectonics*. Geological Society Special Publication, 74, pp. 445-459.
- Patzelt, A., Huami, L., Wang, J., and Appel, E. (1996) Palaeomagnetism of Cretaceous to Tertiary sediments from southern Tibet: evidence for the extent of the northern margin of India prior to the collision with Eurasia. *Tectonophysics*, 259, 259-284.

- Pêcher, A. (1991) The contact between the Higher Himalayan crystallines and the Tibetan sedimentary series: Miocene large-scale dextral shearing. *Tectonics*, 10, 587-598.
- Pêcher, A. (1989) The metamorphism in the central Himalaya. *J. Metamorph. Geol.*, 7, 31-41.
- Pêcher, A. and Scaillet, B. (1989) La structure du Haut-Himalaya au Garhwal (Indes). *Eclog. Geol. Helv.*, 82/2, 655-668.
- Pêcher, A., and Le Fort, P. (1986) The metamorphism in central Himalaya, its relations with the thrust tectonic. In P. Le Fort, M. Colchen, and C. Montenat, (Eds.), *Évolution des domaines orogéniques d'Asie méridionale (de la Turquie à l'Indonésie)*. *Science de la Terre*, 47, pp. 285-309.
- Pereira, M.D. and Shaw, D.M. (1999) Relationship between tectonic structures and generation of anatectic melt, central Spain. *Phys. Chem. Earth, A*, 24, 317-319.
- Peterson, R.C. and MacFarlane, D. (1993) The rare-earth-element chemistry of allanite from the Grenville Province. *Can. Mineral.*, 31, 159-166.
- Petrík, I., Broska, I., Lipka, J., and Siman, P. (1995) Granitoid allanite-(Ce); substitution relations, redox conditions and REE distributions (on an example of I-type granitoids, Western Carpathians, Slovakia). *Geol. Carpathica*, 46, 79-94.
- Pilgrim, G.E. and West, W.D. (1928) The structure and correlation of the Simla Rocks. *Mem. Geol. Surv. India*, 53, 1-138.
- Pognante, U. and Benna, P. (1993) Metamorphic zonation, migmatization and leucogranites along the Everest transect of Eastern Nepal and Tibet: Record of an exhumation history. In Treloar, P.J., and Searle, M.P., (Eds.), *Himalayan Tectonics*. Geological Society Special Publication, 74, pp. 323-340.
- Powell, R. and Holland, T.J. (1988) An internally consistent thermodynamic dataset with uncertainties and correlations. 3. Applications to geobarometry, worked examples and a computer program. *J. Metamorph. Geol.*, 6, 173-204.
- Powers, P.M., Lillie, R.J., and Yeats, R.S. (1998) Structure and shortening of the Kangra and Dehra Dun reentrants, Sub-Himalaya, India. *GSA Bull.*, 110, 1010-1027.
- Purdy, J.W. and Jäger, E. (1976) K-Ar ages on rock-forming minerals from the Central Alps. *Memorie degli Istituti di Geologia e Mineralogia dell' Università di Padova*, 30, 31 pp.

- Quade, J., Cater, J.M.L., Ohja, T.P., Adam, J., and Harrison, T.M. (1995) Late Miocene environmental change in Nepal and the northern Indian subcontinent: stable isotopic evidence from paleosols. *GSA Bull.*, 107, 1381-1397.
- Quidelleur, X., Grove, M., Lovera, O.M., Harrison, T. M., Yin, A., and Ryerson F.J. (1997) The thermal evolution and slip history of the Renbu Zedong Thrust, southeastern Tibet. *J. Geophys. Res.*, 102, 2659-2679.
- Qureshy, M.N. and Iqbaluddin (1992) A review of the geophysical constraints in modelling the Gondwana crust in India. *Tectonophysics*, 212, 141-151.
- Rabi, D., Chantraine, J., Chauvel, J.J., Dens, E., Bale, P., and Bardz, P. (1990) The Briovernian (Upper Proterozoic) and Cadomian Orogeny in the Armorican massif. In D'Lemos, R.S., Strachan, R.A., and Topley C.G., (Eds.), *The Cadomian Orogeny*. Geological Society of London, 51, pp. 81-94.
- Radhakrishana, B.P. (1989) Suspect tectono-stratigraphic terrane elements in the Indian subcontinent. *J. Geol. Soc. India*, 4, 1-24.
- Rao, D.A., Ram Babu, H.V., and Sivakumar Sinha, G.D.J. (1992) Crustal structure associated with Gondwana graben across the Narmada-Son lineament in India: an inference from aeromagnetism. *Tectonophysics*, 212, 153-161.
- Raval, U. (2000) Laterally heterogeneous seismic vulnerability of the Himalayan arc: A consequence of cratonic and mobile nature of underthrusting Indian crust. *Curr. Science*, 78, 546-549.
- Ray, G. and Hart, S.R. (1982) Quantitative analysis of silicates by the ion microprobe. *Internat. J. Mass Spec. Ion Phys.*, 44, 231-255.
- Ray, S. (1947) Zonal metamorphism in the eastern Himalayas and some aspects of local geology. *Quart. J. Geol. Min. Metal. Soc. India*, 19, 117-140.
- Reddy, V.D. and Prasad, C.V.R.K. (1979) Paleomagnetism of the dykes from Kolar gold Mines. *J. Geol. Soc. India*, 20, 489-500.
- Reed, S.J.B. and Buckley, A. (1998) Rare-earth element determination in minerals by electron-probe microanalysis: application of spectrum synthesis. *Min. Mag.*, 62, 1-8.
- Reed, S.J.B. (1986) Ion microprobe determination of rare earth elements in accessory minerals. *Min. Mag.*, 50, 3-15.

- Reed, S.J.B. (1985) Ion-probe determination of rare earths in allanite. *Chemical Geol.*, 48, 137-43.
- Rowley, D.B. (1996) Age of collision between India and Asia: A review of the stratigraphic data. *Earth Planet. Sci. Lett.*, 145, 1-13.
- Royden, L.H. (1993) The steady state thermal structure of eroding orogenic belts and accretionary prisms. *J. Geophys. Res.*, 98, 4487-4507.
- Royer, J.Y. and Sandwell, D.T. (1989) Evolution of the eastern Indian Ocean since the Late Cretaceous: constraints from Geosat altimetry. *J. Geophys. Res.*, 94, 13755-13782.
- Ruppel, C. and Hodges, K.V. (1994) Role of horizontal thermal conduction and finite-time thrust emplacement in simulation of pressure-temperature-time paths. *Earth Planet. Sci. Lett.*, 123, 49-60.
- Sakai, H., Takigami, Y., Nakamuta, Y., and Nomura, H. (1999) Inverted metamorphism in the pre-Siwalik foreland basin sediments beneath the crystalline nappe, western Nepal Himalaya. *J. Asian Earth Sci.*, 17, 727-739.
- Samson, S.D., Coler, D.G., and Speer, J.A. (1995) Geochemical and Nd-Sr-Pb isotopic composition of Alleghanian granites of the southern Appalachians: Origin, tectonic setting, and source characterization. *Earth Planet. Sci. Lett.*, 134, 359-376.
- Sarkar, I., Pachauri, A.K., and Israil, M. (2001a) On the damage caused by the Chamoli earthquake of 29 March, 1999. *J. Asian Earth Sci.*, 19, 129-134.
- Sarkar, I., Jain, R., and Khattri, K.N. (2001b) Mapping of shallow three dimensional variations of P-wave velocity in Garhwal Himalaya. *J. Asian Earth Sci.*, 19, 155-163.
- Sawka, W.N., Chappell, B.W., and Norrish, K. (1984) Light-rare-earth-element zoning in sphene and allanite during granitoid fractionation. *Geology*, 12, 131-134.
- Schärer, U., Xu, R.H., and Allegre, C.J. (1986) U-(Th)-Pb systematics and ages of Himalayan leucogranites, South Tibet. *Earth Planet. Sci. Lett.*, 77, 35-48.
- Schärer, U. (1984) The effect of initial  $^{230}\text{Th}$  disequilibrium on young U-Pb ages: the Makalu case, Himalaya. *Earth Planet. Sci. Lett.*, 67, 191-204.
- Schelling, D. (1992) The tectonostratigraphy and structure of the Eastern Nepal Himalaya. *Tectonics*, 11, 925-943.

- Schelling, D. and Arita, K. (1991) Thrust tectonics, crustal shortening, and the structure of the far-eastern Nepal Himalayas. *Tectonics*, 10, 851-862.
- Schmidt, M.W. and Thompson, A.B. (1996) Epidote in calc-alkaline magmas: An experimental study of stability, phase relationships, and the role of epidote in magmatic evolution. *Am. Min.*, 81, 462-474.
- Schneider, C. and Masch, L. (1993) The metamorphism of the Tibet Series from the Manang area, Marsyandi Valley, central Nepal. In Trealar, P.J., Searle, M.P., (Eds.), Himalayan Tectonics. Geological Society Special Publication, 74, pp. 357-374.
- Schneider, E., Aerberli, S., Fuerer, H., Gürtler, R., Jenny, R., and Schriebl, H. (1981a) Dudh Kosi 1:50000. Research Scheme Nepal Himalaya, (Ed.), GEO-Buch Verlag, Kartographische Anstalt Freytag-Berndt und Artaira, Vienna.
- Schneider, E., Aerberli, S., Fuerer, H., Gürtler, R., Jenny, R., and Schriebl, H. (1981b) Shrong/Hinku 1:50000. Research Scheme Nepal Himalaya, (Ed.), GEO-Buch Verlag, Kartographische Anstalt Freytag-Berndt und Artaira, Vienna.
- Schneider, E., Aerberli, S., Fuerer, H., Gürtler, R., Jenny, R., and Schriebl, H. (1981c) Khumbu Himal 1:50000. Research Scheme Nepal Himalaya, (Ed.), GEO-Buch Verlag, Kartographische Anstalt Freytag-Berndt und Artaira, Vienna.
- Schramm, J.-M., Weidinger J.T., and Ibetsberger, H.J. (1998) Petrologic and structural controls on geomorphology of prehistoric Tsergo Ri slope failure, Langtang Himal, Nepal. *Geomorphology*, 26, 107-121.
- Searle, M.P. (1999) Extensional and compressional faults in the Everest-Lhotse massif, Khumbu Himalaya, Nepal. *J. Geol. Soc. London*, 156, 227-240.
- Searle M.P., Parrish, R.R., Hodges, K.V., Hurford, A.J., Ayres, M.W., and Whitehouse, M.J. (1997) Shisha-Pangma leucogranite, South Tibetan Himalaya: Field relations, geochemistry, age, origin, and emplacement. *J. Geology*, 105, 295-317.
- Searle, M.P., Metcalfe, R.P., Rex, A.J., and Norry, M.J. (1993) Field relations, petrogenesis and emplacement of the Bhagirathi leucogranite, Garhwal Himalayas. In Trealar, P.J., and Searle, M.P., (Eds.), Himalayan Tectonics. Geological Society Special Publication, 74, pp. 429-444.
- Searle, M.P. and Rex, A.J. (1989) Thermal model for the Zaskar Himalaya. *J. Metamorph. Geol.*, 7, 127-134.

- Seeber, L. and Gornitz, V. (1983) River profiles along the Himalayan arc as indicators of active tectonics. *Tectonophysics*, 92, 335-367.
- Seeber, L., Armbruster, J.G., and Quittmeyer, R. (1981) Seismicity and continental subduction in the Himalayan arc. In Gupta, H.K., and Delany, F.M., (Eds.), *Zagros, Hindu Kush, Himalayan Geodynamic Evolution*. American Geophysical Union, 3, pp. 215-242.
- Seth, B., Kröner, A., Mezger, K., Nemchin, A.A., Pidgeon R.T., and Okrusch, M. (1998) Archaean to Neoproterozoic magmatic events in the Kaoko belt of NW Namibia and their geodynamic significance. *Precambrian Res.*, 92, 341-363.
- Sharma, K.K. (1998) Geologic and tectonic evolution of the Himalaya before and after the India-Asia collision. *P. Indian As-Earth*, 107, 265-282.
- Shen, Z-K., Zhao, C., Yin, A., Yanxing, Li., Jackson, D.D., Fang, P., and Dong, D. (2000) Contemporary crustal deformation in east Asia constrained by Global Positioning System measurements. *J. Geophys. Res.*, 105, 5721-5734.
- Shimizu, N. and LeRoex, A.P. (1986) The chemical zoning of augite phenocrysts in alkaline basalts from Gough Island, South Atlantic. *J. Volcan. Geotherm. Res.*, 29, 159-188.
- Shimizu, N., Semet, M.P., and Allegre, C.J. (1978) Geochemical applications of quantitative ion-microprobe analysis. *Geochim. Cosmochim. Acta*, 42, 1321-1334.
- Silver, L.T., McKinney, C.R., Deutsch, S., and Bolinger, J. (1963) Precambrian age determinations in the western San Gabriel Mountains, California. *J. Geology*, 71, 196-214.
- Simpson, R.L., Parrish, R.R., Searle, M.P., and Waters, D.J. (2000) Two episodes of monazite crystallization during metamorphism and crustal melting in the Everest region of the Nepalese Himalaya. *Geology*, 28, 403-406.
- Singh, K. and Thakur V.C. (2001) Microstructures and strain variation across the footwall of the Main Central Thrust Zone, Garhwal Himalaya, India. *J. Asian Earth Sci.*, 19, 17-29.
- Smith, A.G. (1999) Gondwana: its shape, size and position from Cambrian to Triassic times. *J. African Earth Sci.*, 28, 71-97.
- Smith, H.A. and Barreiro, B. (1990) Monazite U-Pb dating of staurolite grade metamorphism in pelitic schists. *Contrib. Mineral. Petrol.*, 105, 602-615.

- Smith, H.A. and Giletti, B.J. (1997) Lead diffusion in monazite. *Geochim. Cosmochim. Acta*, 61, 1047-1055.
- Smith, W.H.F and Wessel P. (1990) Gridding with continuous curvature splines in tension. *Geophysics*, 55, 293-305.
- Sorensen, S. (1991) Petrogenetic significance of zoned allanite in garnet amphibolites from a paleo-subduction zone: Catalina Schist, southern California. *Am. Min.*, 76, 589-601.
- Sorkhabi, R.B., Stump, E., Foland, K.A., and Jain, A.K. (1996) Fission-track and  $^{40}\text{Ar}/^{39}\text{Ar}$  evidence for episodic denudation of the Gangotri granites in the Garhwal Higher Himalaya, India. *Tectonophysics*, 260, 187-199.
- Spear F.S. and Kohn, M.J. (1996) Trace element zoning in garnet as a monitor of crustal melting. *Geology*, 24, 1099-1102.
- Spear, F.S. and Parrish, R.R. (1996) Petrology and cooling rates of the Valhalla Complex, British Columbia, Canada. *J. Petrology*, 37, 733-765.
- Spear, F.S., Kohn, M.J., and Paetzold, S. (1995) Petrology of the regional sillimanite zone, west-central New Hampshire, USA, with implications for the development of inverted isograds. *Am. Min.*, 80, 361-376.
- Spear, F. S. (1993) Metamorphic phase equilibria and pressure-temperature-time paths. Mineralogical Society of America, Washington, D.C., 799 pp.
- Spear, F.S., Kohn, M. J., Florence, F. P., and Menard, T. (1990) A model for garnet and plagioclase growth in pelitic schists: implications for thermobarometry and P-T path determinations. *J. Metamorph. Geol.*, 8, 683-696.
- Spear, F.S. and Peacock, S.M. (1989) Metamorphic pressure-temperature-time paths. American Geophysical Union Short Course in Geology 7, 102 pp.
- Spear, F.S., Selverstone, J., Hickmott, D., Crowley, P., and Hodges, K.V. (1984) P-T paths from garnet zoning: a new technique for deciphering tectonic processes in crystalline terranes. *Geology*, 12, 87-90.
- Spear, F.S. and Selverstone, J. (1983) Quantitative P-T paths from Zoned minerals: Theory and tectonic applications. *Contrib. Mineral. Petrol.*, 83, 348-357.

- Srivastava, P. and Mitra, G. (1994) Thrust geometries and deep structure of the outer and lesser Himalaya Kumaon and Garhwal [India]: Implications for evolution of the Himalayan fold-and-thrust belt. *Tectonics*, 13, 89-109.
- St-Ogne, M. (1987) Zoned poikiloblastic garnets: P-T paths and syn-metamorphic uplift through 30 km of structural depth, Wopmay Orogen, Canada. *J. Petrology*, 28, 1-21.
- Stacey, J.S. and Kramers, J.D. (1975) Approximate of terrestrial lead isotope evolution by a two-stage model. *Earth Planet. Sci. Lett.*, 26, 207-221.
- Stephenson, B.J. (1997) The tectonic and metamorphic evolution of the Main Central Thrust zone and High Himalaya around the Kishtwar and Kulu windows, northwest India. PhD dissertation, Oxford University, England.
- Stern, R.A. and Sanborn, N. (1998) Monazite U-Pb and Th-Pb geochronology by high-resolution secondary ion mass spectrometry. In Radiogenic age and isotopic studies, Report 11, Current Research. Geol. Surv. Canada, Ottawa, ON, 1998-F, pp. 1-18.
- Stöcklin, J. (1980) Geology of Nepal and its regional frame. *J. Geol. Soc.*, 137, 1-34.
- Stüwe, K. and Foster, D. (2001)  $^{40}\text{Ar}/^{39}\text{Ar}$ , pressure, temperature and fission track constraints on the age and nature of metamorphism around the main central thrust in the eastern Bhutan Himalaya. *J. Asian Earth Sci.*, 19, 85-95.
- Swapp, S.M. and Hollister, L.S. (1991) Inverted metamorphism within the Tibetan slab of Bhutan: evidence for a tectonically transported heat source. *Can. Mineral.*, 29, 1019-1041.
- Szyborska, W. (1993) View with a grain of sand, selected poems. Harcourt Brace and Company, Florida, 214 pp.
- Tajika, E. (1998) Climate change during the last 150 million years: reconstruction from a carbon cycle model. *Earth Planet. Sci. Lett.*, 160, 695-707.
- Tapponnier, P., Lacassin, R., Leloup, P.H., Schärer, U., Dalai, Z., Haiwei, W., Xiaohan, L., Shaocheng, J., Lianshang, Z., and Jiayou, Z. (1990) The Alio Shan/Red River metamorphic belt: Tertiary left-lateral shear between Indochina and south China. *Nature*, 343, 431-437.
- Tapponnier, P., Peltzer, A., Le Dain, A.Y., Armijo, R., and Cobbold, P. (1982) Propagating extrusion tectonics in Asia: New insights from simple experiments with plasticine. *Geology*, 10, 611-616.

- Teufel, S. and Heinrich, W. (1997) Partial resetting of the U-Pb isotope system in monazite through hydrothermal experiments: An SEM and U-Pb isotope study. *Chemical Geol.*, 137, 273-281.
- Tracy, R.J., Robinsin, P., and Thompson, A.B. (1976) Garnet composition and zoning in the determination of temperature and pressure if metamorphism, central Massachusetts. *Am. Min.*, 61, 762-775.
- Tripathi, C. and Singh, G. (1987) Gondwana and associated rocks of the Himalaya and their significance. In: McKenzie, G.D., (Ed.), *Gondwana Six; Stratigraphy, sedimentology, and paleontology. AGU Geophysical Monograph*, 41, pp. 195-205.
- Trivedi, J.R., Gopalan, K., and Valdiya, K.S. (1984) Rb-Sr ages of granitic rocks within the Lesser Himalaya nappes, Kumaun, India. *J. Geol. Soc. India*, 25, 641-654.
- Upreti, B.N. (1999) An overview of the stratigraphy and tectonics of the Nepal Himalaya. *J. Asian Earth Sci.*, 17, 741-753.
- Upreti, B.N. and Le Fort, P. (1999) Lesser Himalayan crystalline nappes of Nepal: Problems of their origin. In Macfarlane, A., Sorkhabai, R.B., and Quade, J. (Eds.), *Himalaya and Tibet: Mountain roots to mountain tops. GSA Special Paper*, 328, pp. 225-238.
- Valdiya, K.S. (1999) Rising Himalaya: Advent and intensification of monsoon. *Curr. Science*, 76, 514-524.
- Valdiya, K.S. (1995) Proterozoic sedimentation and Pan-African geodynamic development in the Himalaya. *Precambrian Res.*, 74, 35-55.
- Valdiya, K.S. (1994) Strong-motion earthquakes in Himalaya- Geological Perspective. *Curr. Science*, 67, 313-323.
- Valdiya, K.S. (1993) Evidence for Pan-African-Cadomian tectonic upheavals in the Himalaya. *J. Palaeo. Soc. India*, 38, 51-62.
- Valdiya, K.S. (1992) The Main Boundary Thrust Zone of the Himalaya, India. *Annales Tectonicae* 6, suppl., 54-84.
- Valdiya, K.S. (1988) Tectonics and the evolution of the central sector of the Himalaya. *Phil. Trans. Royal Soc. London, A.*, 326, 151-175.

- Valdiya, K.S. (1980) Geology of the Kumaun Lesser Himalaya. Wadia Institute of Himalayan Geology, India, 291 pp.
- Vance, D. and Harris, N. (1999) The timing of prograde metamorphism in the Zaskar Himalaya. *Geology*, 27, 395-398.
- Vance, D., Ayers, M., Kelley, S., and Harris, N. (1998) The thermal response of a metamorphic belt to extension: constraints from laser Ar data on metamorphic micas. *Earth Planet. Sci. Lett.*, 162, 153-164.
- Vannay, J.-C. and Grasemann, B. (1998) Inverted metamorphism in the High Himalaya of Himachal Pradesh (NW India): phase equilibria versus thermobarometry. *Schweiz. Mineral. Petrograph. Mittl.*, 78, 107-132.
- Vannay, J.-C. and Hodges, K.V. (1996) Tectonometamorphic evolution of the Himalayan metamorphic core between Annapurna and Dhaulagiri, central Nepal. *J. Metamorph. Geol.*, 14, 635-656.
- Vannay, J.-C. and Steck, A. (1995) Tectonic evolution of the High Himalaya in upper Lahul (NW Himalaya, India). *Tectonics*, 14, 253-263.
- von Blackenburg, F. (1992) Combined high-precision chronometry and geochemical tracing using accessory minerals: applied to the Central-Alpine Bergell intrusion (central Europe). *Chemical Geol.*, 100, 19-40.
- Walawender, M.J., Gastil, R.G., Clinkenbeard, J.P., McCormick, M.V., Eastman, B.G., Wernicke, R.S., Wardlaw, M.S., Gunn, S.H., and Smith B.M. (1990) Origin and evolution of the zoned La Posta-type plutons, eastern Peninsular Ranges batholith, southern and Baja California. *GSA Memoir*, 174, 1-18.
- Walker, J.D., Martin, M.W., Bowring, S.A., Searle, M.P., Waters, D.J., and Hodges, K.V. (1999) Metamorphism, melting, and extension: Age constraints from the High Himalayan slab, S.E. Zaskar and N.W. Lahoul. *J. Geology*, 107, 473-495.
- Ward, C.D., McArthur, J.M., and Walsh, J.N. (1992) Rare earth element behavior during evolution and alteration of the Dartmoor Granite, SW England. *J. Petrology*, 33, 785-815.
- Wells, M.L. (1997) Alternating contraction and extension in the hinterlands of orogenic belts: An example from the Raft River Mountains, Utah. *GSA Bull.*, 109, 107-126.
- Wessel, P. and Smith, W.H.F. (1991) Free software helps map and display data. *EOS Trans.*, American Geophysical Union, 72, 441.

- Whitehouse, M.J., Claesson, S., Sunde, T., and Vestin, J. (1997) Ion microprobe U-Pb zircon geochronology and correlation of Archaean gneisses from the Lewisian Complex of Gruinard Bay, northwestern Scotland. *Geochim. Cosmochim. Acta*, 61, 4429-4438.
- Whittington A., Foster G., Harris N., Vance D., Ayres M. (1999) Lithostratigraphic correlations in the western Himalaya - An isotopic approach. *Geology*, 27, 585-588.
- Wickham, S.M. (1987) Segregation and emplacement of granitic magmas. *J. Geol. Soc. London*, 144, 281-297.
- Wiedenbeck, M., Goswami, J.N., and Roy, A.B. (1996) Stabilization of the Aravalli Craton of northwestern India at 2.5 Ga: An ion microprobe zircon study. *Chemical Geol.*, 129, 325-340.
- Willet, S.D. (1999) Rheological dependence of extension in wedge models of convergent orogens. *Tectonophysics*, 305, 419-435.
- Williams, C.T. (1996) Analysis of rare earth minerals. In A.P. Jones, F. Wall, and C.T. Williams, (Eds.), *Rare Earth Minerals: Chemistry, Origin, and Ore Deposits*. Mineralogical Society Series, 7, Chapman and Hall, England, pp. 327-346.
- Williams, M.L., Jercinovic, M.J., and Terry, M.P. (1999) Age mapping and dating of monazite on the electron microprobe: Deconvoluting multistage tectonic histories, *Geology*, 27, 1023-1026.
- Wing, B.A., Ferry, J.M., and Harrison, T.M. (1999) The age of andalusite and kyanite isograds in New England from Th-Pb ion microprobe dating of monazite. In Geological Society of America, 1998 annual meeting Toronto, ON, Canada, *Abstracts with Programs*, 30, p. 27.
- Woodward, N.B. (1987) Geological applicability of critical-wedge thrust-belt models. *GSA Bull.*, 99, 827-832.
- Ye, H., Zhang W., Yu Z., and Xia G. (1981) The seismicity and regional crustal movement in the Himalaya region. In Geological and ecological studies of the Qinghai-Xizang Plateau, 1, New York, 65-80.
- Yeats, R.S., Nakata, T., Farah, A., Fort, M., Mirza, M.A., Pandey, M.R., and Stein, R.S. (1992) The Himalayan Frontal Fault System. *Annales Tectonicae*, 6 suppl., 85-98.

- Yin, A. and Harrison, T.M. (2000) Geologic evolution of the Himalayan-Tibet orogen. *Ann. Rev. Earth Planet. Sci.*, 28, 211-280.
- Yin, A., Harrison, T.M., Ryerson, F.J., Wenji, C., Kidd, W.S.F., and Copeland, P. (1994) Tertiary structural evolution of the Gangdese thrust system, southeastern Tibet. *J. Geophys. Res.*, 99, 18175-18201.
- Zen, E. and Hammarstrom, J.M. (1984) Magmatic epidote and its petrologic significance. *Geology*, 12, 515-518.
- Zhao, W., Nelson K.D., and Project INDEPTH (1993) Deep seismic reflection evidence for continental underthrusting beneath southern Tibet. *Nature*, 366, 557-559.
- Zhu, X.K. and O'Nions, R.K. (1999) Zonation of monazite in metamorphic rocks and its implications for high temperature thermochronology: a case study from the Lewisian terrain. *Earth Planet. Sci. Lett.*, 171, 209-220.
- Zhu, X.K., O'Nions, R.K., Belshaw, N.S., and Gibb, A.J. (1997) Lewisian crustal history from in situ SIMS mineral chronometry and related metamorphic textures. *Chemical Geol.*, 136, 205-218.
- Zoback, M.D., Zoback, M.L., Mount, V.S., and others, (1987) New evidence on the state of stress of the San Andreas fault system. *Science*, 238, 1105-1111.