

## References

- Altschuler, Z. S., Schnepfe, M. M., Silber, C. C., and Simon, F. O. (1983). Sulphur diagenesis in everglades, peat and origin of pyrite in coal. *Science* 221, 221-227.
- Andrejko, M. J., Raymond Jr., R., and Cohen, A. D. (1983). Biogenic silica in peats: possible source chertification in lignites. In: R. Raymond, and M. Andrejko (eds.), Mineral matter in peat, its occurrence, form and distribution. Los Alamos National Laboratory, LA-9907-OBES, Los Alamos, New Mexico, 235-242.
- Andrews-Jones, D. A. (1968). Mineral. *Industrial Bulletin*, 2(6), 31.
- Baas Becking, L. G. M., and Moore, D. (1961). Biogenic sulfides. *Economic Geology*, 56, 259-272.
- Barr, S. M., and Macdonald, A. S. (1978). Geochemistry and petrogenesis of late Cenozoic alkaline basalt in Thailand. *Geological Society of Malaysia Bulletin*, 10, 25-52.
- Barr, S. M., and MacDonald, A. S. (1981). Geochemistry and geochronogy of late Cenozoic basalts of Southeast Asia. *Geological Society of America Bulletin*, 92, 508-512.
- Barr, S. M., Ratanasthien, B., Breen, D., Ramingwong, T., and Sertsrivanit, S. (1980). Hot springs and geothermal gradients in northern Thailand. *Geothermics*, 8, 85-95.
- Barr, S. M., MacDonald, A. S., Dunning, G. R., Ounchanum, P., and Yaowanoyothin, W. (2000). Petrochemistry, U-Pb (zircon) age, and

palaeotectonic setting of the Lampang volcanic belt, northern Thailand.

*Journal of Geological Society of London*, 157, 553-563.

Barr, S. M., MacDonald, A. S., Haile, N. S., and Reynold, P. H. (1976).

Palaeomagnetism and age of the Lampang basalt (northern Thailand) and age of the underlying pebble tools. *Journal of Geological Society of Thailand*, 3 (1-2), 1-10.

Baum, F., and Hahn, L. (compilers) (1977). *Geological map of northern Thailand, Sheet Phayao, scale 1: 250,000*. German Geological Mission in Thailand in cooperation with Geological Survey Division Department of Mineral Resources Thailand, Federal Institute for Geosciences and Natural Resources, Stuttgart.

Baum, F., Braun, E.v., Hahn, L., Hess, A., Koch, K. E., Kruse, G., Quarch, H., and Siebenhuner, M. (1970). On the geology of northern Thailand. Beihefte zum *Geologischen Jahrbuch*, 102, 1-24.

Benammi, M., Urrutia-Fucugauchi, J., Alva-Valdivia, L. M., Chaimanee, Y., Triamwichanon, S., and Jaeger, J. J. (2002). Magnetostratigraphy of the Middle Miocene continental sedimentary sequences of the Mae Moh basin in northern Thailand: evidence for counterclockwise block rotation. *Earth and Planetary Science Letters*, 204: 373-383.

Benammi, M., Urrutia-Fucugauchi, J., Chaimanee, Y., and Jaeger, J. J. (2003).

Preliminary paleomagnetic study of the Chiang Muan basin in northern Thailand. In B. Ratanasthien, S.L. Rieb, and S. Chantraprasert (eds.), *Proceedings of the 8<sup>th</sup> International Congress on Pacific Neogene Stratigraphy: Pacific Neogene Paleoenvironments and Their Evolution* (pp.

- 352), Chiang Mai University, Chiang Mai, Thailand.
- Benson, S. A., and Holm, P. L. (1985). Composition of organic constituents in three low rank coals. *Industrial Engineer and Chemical Resources Development*, 24, 145-149.
- Benson, S. A., Falcone, S. K., and Karner, F. R. (1984). Elemental distribution and association with inorganic and organic components in two North Dakota lignite. *American Chemical Society, Division of Fuel Chemical*, 29 (4), 36-47.
- Berner, R. A. (1970). Sedimentary pyrite formation. *American Journal of Science*, 268, 1-23.
- Berner, R. A. (1972). Sulfate reduction, pyrite formation, and the oceanic sulfur budget. In: D. Dryssen and D. Jagner (eds.), the changing chemistry of the oceans. Nobel Symposium 20. (pp.347-361), London: John Wiley & Sons.
- Berner, R. A. (1982). Burial of organic carbon and pyrite sulfur in the modern ocean: its geochemical and environmental significance. *American Journal of Science*, 285, 451-473.
- Berner, R. A. (1984). Sedimentary pyrite formation-An update. *Geochimica et Cosmochimica Acta*, 48, 605-615.
- Berner, R. A. (1989). Biogeochemical cycles of carbon and sulfur and their effect on atmospheric oxygen over Phanerozoic time. *Palaeogeography Palaeochimatology, Palaeoecology (Global and Planetary Change Section)*, 75, 97-122.
- Berner, R. A., and Raiswell, R. (1983). Burial of organic carbon and pyrite sulfur in sediments over Phanerozoic time: A new theory: *Geochimica et Cosmochimica Acta*, 47, 855-862.

- Berner, R. A., and Raiswell, R. (1984). C/S method for distinguishing freshwater from marine sedimentary rocks. *Geology*, 12, 365-368.
- Boonsoong, A. (1997). *Geochemistry and petrology of Mae Tha basalt, Changwat Lampang*. Master's thesis, Chiang Mai University, Thailand.
- Brown, G. F., Buravas, S., Charaljavanaphet, J., Jalichandra, N., Johnston, W. D., Sresthaputra, V., and Taylor, G. C., (1953). Geological reconnaissance of the mineral deposits of Thailand. *U.S. Geological Survey Bulletin*, 984, 1-183.
- BS 1016. (1973). British Standards Institution, Methods for The Analysis and Testing of Coal and Coke. London, England.
- Buffetaut, E., Helmcke-Ingavat, R., Jaeger, J. J., Jongkanjanasoontorn, Y., Suteethorn, S., and Tong, H. (1989). Fossil vertebrates and the age of the intermontane basins of Thailand. In: T. Thanasuthipitak, and P. Ounchanum (eds.), *Proceedings of the International Symposium on Intermontane Basins: Geology and Resources* (pp.187-195), Chiang Mai University, Chiang Mai, Thailand.
- Casgrande, D. J., Siefert, K., Berschinski, C., and Sutton, N. (1977) Sulfur in peat forming system of the Okefenokee swamp and Florida Everglades: origins of sulfur in coal. *Geochimica et Cosmochimica Acta*, 41, 161-167.
- Chaimanee, Y., Jolly, D., Benammi, M., Tafforeau, P., Duzer, D., Moussa, I., and Jaeger, J. J. (2003). A Middle Miocene hominoid from Thailand and orangutan origins. *Nature* 422, 61-65.
- Chaodumrong, P. (1985). *Sedimentological studies of some Tertiary deposits of Mae Moh basin, Changwat Lampang*. Master's thesis. Chulalongkorn University, Thailand.

- Chaodumrong, P., and Burrett, F. C. (1997). Stratigraphy of the Lampang Group in central north Thailand : New Version. *CCOP Technical Bulletin*, 26, 65-80.
- Chaodumrong, P., and Chaimanee, Y. (2002). Tertiary sedimentary basins in Thailand. In: N. Mantajit (ed.), In: *Proceedings of the Symposium on Geology of Thailand* (pp. 156-169), Bangkok, Thailand.
- Chaodumrong, P., Uk-kakimapan, Y., Snansieng, S., Janmaha, S., Pradidtan, S. and Sae Leow, N. (1983). A review of the Tertiary sedimentary rocks of Thailand. In: Nutalaya, P. (ed.), *Proceedings of a Workshop on Stratigraphic Correlation of Thailand and Malaysia, Geological Society of Thailand, Bangkok/Geological Society of Malaysia* (pp. 159-187), Kuala Lumpur, Malaysia.
- Charoenprawat, A., Chuaviroj, S., Hinthon, C., and Chonglakmani, C. (compilers) (1994a). "Geological map of Thailand, Sheet Lampang (NE47-7), scale 1: 250,000", Geological Survey Division, Department of Mineral Resources, Bangkok, Thailand.
- Charoenprawat, A., Chuaviroj, S., Hinthon, C., and Chonglakmani, C. (compilers) (1994b). *Geological map of Thailand, Sheet Phayao (NE47-3), scale 1: 250,000*. Geological Survey Division, Department of Mineral Resources, Bangkok, Thailand.
- Chinbunchorn, N., Pradidtan, S., and Sattayararak, N. (1989). Petroleum potential of Tertiary intermontane basin in Thailand. In: Thanasuthipitak, T., and Ounchanum, P. (eds.) *Proceedings of the International Symposium on Intermontane Basin: Geology and resources* (pp. 29-41) Chiang Mai University, Chiang Mai, Thailand.

- Claypool, G. E., Holser, W. T., Kaplan, I. R., Sakai, H., and Zak, I. (1980). The age curves of sulfur and oxygen isotopes in marine sulfate and their mutual interpretation. *Chemistry Geology*, 28, 199-260.
- Cohen, A. D., Spackman, W., and Dolson, P. (1983). Occurrence and distribution of sulfur in peat-forming environments of southern Florida. In: R. Raymond, and M. Andrejko (eds.), *Mineral matter in peat, its occurrence, from and distribution*, Los Alamos National Laboratory, LA-9907-OBES, Los Alamos, New Mexico, 87- 113.
- Coleman, S. L., and Bragg, L. J. (1990). Distribution and occurrence of arsenic in coal. In: L.L. Chyi, and C.L. Chou (eds.), *Recent advance in coal geochemistry, Geological Society of America, Special paper*, 248, 13-25.
- Corsiri, R., and Crouch, A. (1985). *Mae Moh coal deposit : Geological report, vol. 1.* Report of Thailand- Australia Lignite Mines Department Project, Electricity Generating Authority of Thailand.
- Craig, H. (1957). Isotope standards for carbon and oxygen and correction factors for mass-spectrometric analysis of carbon dioxide. *Geochimica et Cosmochimica Acta*, 12, 133-149.
- Curtis, C. D. (1983). Geochemistry of porosity enhancement and reduction clastic sediments. In : J. Brooks (ed.), *Petroleum geochemistry and exploration of Europe*. Special Publications of the Geological Society of London 12 (pp. 113-125), Oxford, Blackwell Scientific Publications.
- Davis, A., Russell, S. J., Rimmer, S. M., and Yeakel, J. D. (1984). Some genetic implications of silica and aluminosilicates in peat and coal. *International Journal of Coal Geology, Geol*, 3, 293-314.

- Davis, T. D., and Raymond, Jr. R. (1983). Sulfur as a reflection of depositional environments. In: R. Raymond, and M. Andrejko (eds.), Mineral matter in peat, its occurrence, from and distribution, Los Alamos National Laboratory, LA-9907- OBES, Los Alamos, New Mexico, 123-141.
- Daly, M. C., Cooper, M. A., Wilson, I., Smith, D. G., and Hooper, B. G. D. (1991). Cenozoic plate tectonics and basin evolution in Indonesia. *Marine and Petroleum Geology*, 8, 2-21.
- Deer, W. A., Howie, R. A. and Zussman, J. (1992). *Phosphates. In: an introduction to the rock-forming minerals* (pp. 663-669), England, Longman Group (FE) Ltd.
- Department of Mineral Resources. (1989). *Report of the coal exploration and assessment project of Wang Nua basin*. In: Summary Report of the Coal Exploration and Assessment Project (Report no. CEP. 008/32/52), Department of Mineral Resources, Bangkok, Thailand.
- Dewey, J.F., Cande, S., and Pitman, W. (1989). Tectonic evolution of the India/Eurasia collision zone. *Eclogae Geologica Helvetica*, 82, 717-734.
- Ducrocq, S., Buffetaut, E., Chaimanee, Y., Suteethorn, V., and Jaeger, J. J. (1995). Mammalian faunas and the ages of the continental Tertiary fossiliferous localities from Thailand. *Journal of Southeast Asian Earth Science*, 12(1-2), 65-78.
- Ducrocq, S., Chaimanee, Y., Suteethorn, V., and Jaeger, J. J. (1994). Ages and paleoenvironment of Miocene mammalian faunas from Thailand. *Palaeogeography, Palaeoclimatology, Palaeoecology*, 108(1-2), 149-163.
- Endo, S. (1964). Some older Tertiary plants from northern Thailand. in: T. Kobayashi

- (ed.), *Geology and Palaeontology of Southeast Asia*, 1 (pp. 113-117), Tokyo: The University of Tokyo Press.
- Endo, S. (1966). A supplementary note on the Paleogene Li flora in northern Thailand. in: T. Kobayashi and R. Toriyama (eds.), *Geology and Palaeontology of Southeast Asia*, 3 (pp. 165-169), Tokyo: The University of Tokyo Press.
- Evans, P. R., and Jitapunkul, S. (1989). Geology of the Mae Moh basin, northern Thailand. In: Report of the Electricity Generating Authority of Thailand, Thailand-Australia Lignite Mines Development Project (unpublished).
- Faure, G. (1986) Sulfur. In: Principles of isotope geology (pp. 523-552), New York: John Wiley & Sons.
- Faure, G. (1991). *Principles and applications of inorganic geochemistry*. New York: MacMillan Publishing.
- Finkelman, R. B. (1981). Modes of occurrence of trace elements in coal. *U.S. Geological Survey, Open File Report*, 81-99, 1-301.
- Finkelman, R. B. (1982). The origin, occurrence and the distribution of the inorganic constituents in low rank coals. In: Low-rank coal basic coal science workshop. In: Proceedings of Conference No. 811268, U.S. Department of Energy, Division of Oil and Energy, Washington, 70-89.
- Finkelman, R. B. (1993). *Trace and minor elements in coal*. Plenum Press, New York, p, 593-607.
- Francis, W., (1960). *Coal: its formation and composition*. London: Edward Arnold Ltd.
- Gardner, L. S., (1967). *The Mae Moh lignite deposit in Northwestern Thailand*. In:

- Report of Investigation No. 12, Department of Mineral Resources, Thailand.
- Gardner, S., Sidisunthorn, P., and Anusarnsunthorn, V. (2000). A field guide to forest trees of northern Thailand. CMU Herbarium, Biology Department, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.
- Garrels, R. M., and Christ, C. L. (1965). Solutions minerals and equilibria. New York: Harper and Row.
- Gibling, A. E. (1988). Pyrite formation in marshes during early diagenesis. *Geomicrobiology Journal*, 6, 77-97.
- Gibling, M., and Ratanasthien, B. (1980). Cenozoic basins of Thailand and their coal deposit. *A preliminary report. Bulletin of the Geological Society of Malaysia*, 13, 27-42.
- Ginsburg, L. (1983). *Siamogale thailandica*, a new mustelid (carnivora, Mammalia) from The Neogene of northern Thailand. *Bulletin of the Geological Society of France*, (6), 953- 956.
- Ginsburg, L. (1989). The fossils mammals of Pong (Phayao) and the age of some intermontane basins of northern Thailand. In: T. Thanasuthipitak and P. Ounhanum (eds.), *Proceedings of the International Symposium on Intermontane Basins: geology and resources*, (pp. 196-204), Chiang Mai, Thailand.
- Ginsburg, L., and Tassy, P. (1985). The fossil mammals and the age of the lignite beds in the intermontane basins of northern Thailand. *Journal of Geological Society of Thailand*, 8(1-2), 13-27.
- Ginsburg, L., and Uk-kakimapan, Y. (1983). Uncervid nouveau du Miocene d'Asie et

- l'age des lignites des basins intramontagneux du Nord de la Thailande.  
*Comptes rendus de l'Académie des sciences, Paris:* 297-300.
- Gloe, C. (1955). *Report of lignite investigations, Mae Moh basin, Northern Thailand.*  
 Thai Lignite Thermal Power Organisation, Bangkok, 1-40, (unpublished).
- Gluskoter, H. J., Ruch, R. R., Miller, W. G., Cahill, R. A., Dreher, G. B., and Kuhn, J. K. (1977). Trace elements in coal: occurrence and distribution. Illinois State Geological Survey Circular 499, 1-154.
- Gluskoter, H. J. (1975), Mineral matter and trace elements in coal, In: S.P. Babu (ed.), Trace elements in fuel: American Chemical Society, Washington, D.C., Advances in Chemistry Series no. 141, 1-22.
- Goldschmidt, V. M., (1935). Rare elements in coal ashes, Industrial and Engineering. *Chemistry*, 27 (9), 1100-1102.
- Goodarzi, F. (1987). Concentration of elements in lacustrine coals from Zone A Hat Creek deposit No. 1, British Columbia, Canada, *International Journal of Coal Geology*, 8, 247-268.
- Goodarzi, F. (1988). Elemental distribution in coal seams at the Fording coal mine, British Columbia, Canada. *Chemical Geology*, 68, 129-154.
- Goodarzi, F., and Swaine, D. J. (1993). Chalcophile elements in western Canadian coals. *International Journal of Coal Geology*, 24, 281-292.
- Goodarzi, F., and Van Der Flier-Keller, E. (1991). Geological controls and constraints on the concentration of elements in western Canadian coals. In: D.C. Peters (ed.), *Geology in coal resource utilization*, Tech Books, Fairfax, Va, 389-412.
- Goodwin, D. V., Flessa, K. W., Schone, B. R., and Dettman, D. L. (2001). Cross-

- calibration of daily growth increments, stable isotope variation, and temperature in the Gulf of California bivalve mollusk *Chione cortezi*: implications for paleoenvironmental analysis, *Palaios* 16, 387-398.
- Griffin, G. M. (1971). Interpretation of X-ray diffraction data. In: R. B. Carver (ed.), *Procedures in sedimentary petrology* (pp. 541-569), New York: John Wiley & Sons.
- Hall, R. (1996). Reconstructing Cenozoic SE Asia. In: Hall, R. and Blundell, D.J. (eds.) Tectonic Evolution of Southeast Asia. Geological Society Special Publications, 106, 153-184.
- Hall, R. (1997). Cenozoic plate tectonic reconstructions of SE Asia. In: Fraser, A.J., Matthews, S.J., and Murphy, R.W. (eds.), Petroleum Geology of Southeast Asia, Geological Society Special Publication No. 126, 11-23.
- Hall, R. (2002). Cenozoic geological and plate tectonic evolution of SE Asia and the SW Pacific: computer-based reconstructions and animations. *Journal of Asian Earth Sciences*, 20 (4), 353–434.
- Hart, B. R. (1995). The mineralogy and inorganic geochemistry of coal and combustion products from the Mae Moh, Thailand: environmental implications of resource utilization. Doctor's thesis. University of Western Ontario, Canada.
- Harvey, R. D., and Ruch, R. R., (1986). Mineral matter in Illinois and other U.S. coals, in K.S. Vorres (ed.) Mineral Matter and Ash in Coal. *American Chemical Society Symposium Series*, 301, 10-40.
- Hedges, J. I., Clark, W. A., Quay, P. D., Richey, J. E., Devol, A. H., and Santos, U. M. (1986). Compositions and fluxes of particulate organic material in the

Amazon River. *American Society of Limnology and Oceanography*, 31, 717-738.

Hoefs, J. (1987). Isotopic Properties of Selected Elements. In: *Stable isotope geochemistry* (pp. 26-64), New York: Springer-Verlag.

Holser, W. T. (1979). Rotielgeng evaporites, Lower Permian of northern Europe: geochemical confirmation of the non-marine origin. *Erdöl und Kohle-Erdgas-Petrochemie vereinigt mit brennstoffchemie* 32, 159-162.

Howarth, R. W., and Teal, J. M. (1979). Sulfate reduction in a New England salt marsh. *American Society of Limnology and Oceanography*, 24, 999-1013.

Hower, J. C., and Bland, A.E. (1989). Geochemistry of the Pond Creek coal bed eastern Kentucky. *International Journal of Coal Geology*, 11, 205-226.

Hower, J. C., Rimmer, S. M., and Bland, A. E. (1991). Geochemistry of the Blue Gem coal bed, Knox county, Kentucky. *International Journal of Coal Geology*, 18, 221-231.

Huchon, P., Le Pichon, X., and Rangin, C. (1994). Indochina Peninsula and the collision of India and Eurasia. *Geology*, 22, 27-30.

Hutchison, C. S. (1992). *Geological Evolution of South-East Asia*. New York: Oxford University Press.

Japanese Industrial Standards Committee. (1988). Methods for ultimate analysis of coal and coke. In: *Japanese Standards Association, JIS M8813*, Japan.

Jitapunkul, S., Charussuriyong, P., and Jantanachotivont, S. (1985). Geology of Tertiary deposits of Mae Moh basin. In: *Proceedings of Conference on Lignite Industry in Thailand EGAT*, Thailand. P. 1/16-16/16.

Jungyusuk, N., and Sirinawin, T. (1983). Cenozoic basalt of Thailand. In:

*Proceedings of Conference on Geology and Mineral Resource of Thailand,*  
Bangkok, Thailand, 1-9.

- Karner, F. R., Schobert, H. H., Falcone, S. K., and Benson, S. A.: (1986), Elemental distribution and association with inorganic and organic components in North Dakota lignites, In: K.S. Vorres (ed.) *Mineral Matter and Ash in Coal. American Chemical Society Symposium Series, 301*, 70-89.
- Keith, M. L., and Weber, J. N. (1964). Carbon and oxygen isotopic composition of selected limestone and fossils. *Geochimica et Cosmochimica Acta*, 28, 1787-1816.
- Khantaprab, C. (1985). Tertiary coal exploration model, In: *Proceeding of Conference on Lignite Industry in Thailand*, (pp.18-22), Thailand.
- Koenigswald, G. H. R. V. (1959). A mastodon and other fossil mammals from Thailand. Report of Investigations, Royal Department of Mines, Bangkok, 2, 25-58.
- Krauskopf, K.B. (1967). *Introduction to geochemistry*. New York: McGraw-Hill Inc.
- Kuhn, J. K., Fiene, F. L., Cahill, R. A., Gluskoter, H. J., and Shimp, N. F. (1980). Abundance of trace and minor elements in organic and mineral fractions of coal. Illinois State Geological Survey, Environmental Geology Notes 88, 1-67.
- Kunimatsu, Y., Ratanasthien, B., Nagaya, H., Saegusa, H., and Nagaoka, S. (2003). The potential of Thailand for understanding the hominoid evolution in southeast asia. In B. Ratanasthien, S.L. Rieb, and S. Chantraprasert (eds.), *Proceedings of the 8th International Congress on Pacific Neogene Stratigraphy: Pacific Neogene Paleoenvironments and their Evolution* (pp. 83-89), Chiang Mai University, Chiang Mai, Thailand.

- Kunimatsu, Y., Ratanasthien, B., Nagaya, H., Saegusa, H., and Nagaoka, S. (2004). Earliest Miocene hominoid from southeast Asia. *American Journal of Physical Anthropology* 124, 99-108.
- Kunimatsu, Y., Saegusa, H., Nagaya, H., Ratanasthien, B., Nagaoka, S., and Tsubamoto, T. (2000). Field notes on the fossil localities in northern Thailand visited during the field season of February 1999. *Asian Paleoprimatology*. Primate Research Institute, Kyoto University, Japan, 1,115-136.
- Kusakabe, M., and Chiba, H. (1983). Oxygen and sulfur isotope composition of barite and anhydrite from Fukuzawa deposit, Japan. *Economic Geology Monograph* 5, 292-301.
- Lacassin, R., Maluski, P., Leloup, P. H., Tapponnier, P., Hinthong, C., Siribhakdi, K., Chuavithit, S., and Charoenpravat, S. (1997). Tertiary diachronic extrusion and deformation of western Indochina: Structural and  $^{40}\text{Ar}/^{39}\text{Ar}$  evidence from NW Thailand. *Journal of Geophysical Research*, 102, 10013-10037.
- Lee, Y. T., and Lawver, A. L. (1995). Cenozoic plate reconstruction of Southeast Asia. *Journal of Tectonophysics* 251, 85-138.
- Longworth-CMPS Engineers (1981). Mae Moh lignite assessment. In: *Report of the Electricity Generating Authority of Thailand*, Thailand, 1-244.
- Loughnan, F. C. (1969). *Chemical weathering of the silicate minerals*. New York: American Elsevier Publishing Company, Inc.
- Luther, G. W., Giblin, A. E., Howarth, R. W., and Ryans, R. A. (1982). Pyrite and oxidized iron mineral phases formed from pyrite oxidation in salt marsh and estuarine sediments. *Geochimica et Cosmochimica Acta*, 46, 2665-2669.
- Lyons, P. C., Palmer, C. A., Bostick, N. H., Fletcher, J. D., Dulong, F. T., Brown, F.

- W., Brown, Z. A., Krasnow, M. R., and Romankiw, L. A. (1988). Chemistry and origin of minor and trace elements in vitrinite concentrates from a Rank Series from the eastern United States, England and Australia. *International Journal of Coal Geology*, 13, 481-527.
- Mahatthanachai, T. (1996). *Floating rocks deposited with J-zone lignite, Mae Moh mine, Amphoe Mae Moh, Changwat Lampang*. Independent study for B.S. Requirement Department of Geological Sciences, Chiang Mai University. Thailand.
- Matthews, S. J., Fraser, A. J., Lowe, S., Todd, S. P., and Peel, F. J., (1997). Structure, stratigraphy and petroleum geology of the SE Nam Con Son basin, offshore Vietnam; In: Fraser, A. J., Matthews, S. J., and Murphy, R. W. (eds.), *Petroleum Geology of Southeast Asia, Geological Society Special Publication No. 126*, 89-106.
- McBride, M.B. (1994). *Environmental chemistry of soils*. Oxford: Oxford University Press.
- Meesuk, J. (1986). *Geology of the Tertiary coal basins of Thailand*. Master's thesis, University of Aston in Birmingham, England.
- Miller, R. N., and Given, P. H. (1986). The association of major, minor and trace inorganic elements with lignites, I., Experimental approach and study of a Northern Dakota lignite. *Geochimica et Cosmochimica Acta*, 50, 2033-2043.
- Miller, R. N., and Given, P. H., (1987). The association of major, minor and trace inorganic elements with lignites, II. Minerals, major, and minor element profiles, in four seam. *Geochimica et Cosmochimica Acta*, 51, 1311-1332.
- Minkin, J. A., Finkelman, R. B., Thompson, C. L., Chao, E. C.T ., Ruppert, L. F.,

- Blank, H., and Cecil, C. B. (1984). Microcharacterization of arsenic and selenium bearing pyrite in Upper Freeport coal, Indiana County, Pennsylvania. *Scanning Electron Microscope*, 4, 1515-1524.
- Molnar, P., and Deng, Q. (1984). Faulting associated with large earthquakes and the average rate of deformation in central and eastern Asia. *Journal of Geophysical Research*, 89 (6), 203-6,228.
- Molnar, P., and Tapponnier, P. (1975). Cenozoic tectonic of Asia: effects of a continental collision. *Science*, 189, 419-426.
- Morgan, M. E., Jenkins, R. G., and Walker, P. L. (1981). Inorganic constituents in American lignite. *Fuel*, 60, 189-193.
- Morse, J. W., Millero, F. J., Cornell, J. C., and Rickard, D. (1987). The chemistry of hydrogen sulfide and iron sulfide systems in natural waters. *Earth Science Reviews*, 24, 1-42.
- Mukherjee, K. N., Dutta, N. R., Chandra, D., and Singh, M. P. (1993). Geochemistry of trace elements of Tertiary Coals of India. *International Journal of Coal Geology*, 20, 99-113.
- Nagaya, H., Saegusa, H., Kunimatsu, Y., and Ratanasthien, B. (2002). Miocene mammalian faunas of northern Thailand and their geological age. *Primate Research*, 18, 131-141.
- Nagaya, H., Saegusa, H., Ratanasthien, B., and Kunimatsu, Y. (2003). Late Cenozoic mammalian faunas of Thailand. In B. Ratanasthien, S. L. Rieb, and S. Chantraprasert (eds.), *Proceedings of the 8th International Congress on Pacific Neogene Stratigraphy: Pacific Neogene Paleoenvironments and their Evolution* (p. 90), Chiang Mai University, Chiang Mai, Thailand.

- Nakai, N., and Jensen, M. L. (1967). Sources of atmospheric sulfur compounds. *Geochemical Journal*, 1, 199-210.
- Nagaoka, S., Suganuma, Y., and Ratanasthien, B. (2003). Tectonics and paleomagnetism of Tertiary strata with mammalian fossils in northern Thailand. In: B. Ratanasthien, S. L. Rieb, and S. Chantraprasert (eds.), *Proceedings of the 8th International Congress on Pacific Neogene Stratigraphy: Pacific Neogene Paleoenvironments and their Evolution* (pp. 284- 285), Chiang Mai University, Chiang Mai, Thailand.
- Ni, J. F., and York, J. E. (1978). Late Cenozoic tectonics of the Tibetan Plateau. *Journal of Geophysics Research*, 83, 5377-5384.
- Nielsen, H. (1967). Sulphur isotopes in the Rhine graben evaporite sulphates. In: *Rhinegraben Progress Report*. (pp. 27-31), German.
- Nielsen H., Pilot J., Grinenko, L. N., Grinenko, V. A., Lein, A. Yu, Smith, J. W., and Pankina, R. G. (1991). Lithospheric sources of sulphur. In: H. R. Krouse, and V. A. Grinenko (eds.), *SCOPE43, Stable isotopes: natural and anthropogenic sulfur in the environment* (pp 65-132). New York: John Wiley & Sons.
- Ohizumi, T., Fukuzaki, N., and Kusakabe, M. (1997). Sulfur isotopic view on the sources of sulfur in atmospheric fallout along the coast of the Sea of Japan. *Atmospheric Environment*, 31, 1339-1348.
- Ohmoto, H., and Rye, R. O. (1979). Isotope of sulfur and carbon. In: R. A. Barner (ed.), *Geochemistry of hydrothermal ore deposits* (pp. 509-567), New York: John Wiley & Sons.

- Packham, G. (1996). Cenozoic SE Asia: reconstructing, its aggregation and reorganization. In: Hall, R., and Blundell, D.J. (eds.), *Tectonic Evolution of Southeast Asia*. Geological Society, London, Special Publications, 106, 123-152.
- Palmer, C. A., and Filby, R. H. (1984). Determination of mode of occurrence of trace elements in the Upper Freeport coal bed using size and density separation procedures, International Conference on Coal; Science Proceedings, 365-368.
- Palsson, P. A., Georgsson, G., and Petursson, G. (1980). Geomedical Aspects in present and future Research: Universitetsforlaget, Oslo, 123-132.
- Pickford, M., Nagaya, H., Kunimatsu, Y., Saegusa, H., Fukuchi, A., and Ratanasthien, B. (2004). Age and taxonomic status of the Chiang Muan (Thailand) hominoids. *Journal of Comptes Rendus Palevol*, 3, 65-75.
- Plant, J. A., and Raiswell, R. (1983). Principles of environmental geochemistry. In: I. Thornton (ed.), *Applied Environmental Geochemistry*, (pp.1-39), New York: Academic Press.
- Powell, M. A., Fyfe, W. S., Landsberger, S., Sahu, K. C., and Tripathy, S. (1990). Coal utilization in India, mobilization of selected elements to the surface environment. *Energy Sources*, 12, 297-314.
- Pradittan, S. (1989). Characteristics and controls of lacustrine deposits of some Tertiary basins in Thailand. In: Thanasuthipitak, T & Ounchanum, P. (eds.) *Proceedings. of the International Symposium on Intermontane Basin: Geology and Resources. Department of Geological Sciences*, (pp. 133-145), Chiang Mai University, Chiang Mai, Thailand.
- Promma, K. (1992). *Coal petrography of Mae Moh lignite, Changwat Lampang*.

Independent study for B.S. Requirement Department of Geological Sciences,  
Chiang Mai University, Thailand.

- Piyasin, S. (1971). Marine Triassic sediments of northern Thailand. Newsletter of the Geological Society of Thailand, 4, 12-20.
- Piyasin, S. (1972). *Geology of Lampang sheet, NE 47-7*. Report of investigation number 14. Department of Mineral Resources, Bangkok, Thailand.
- Querol, X., Feruandez, T. J. L., Lopez, S. A., and Duran, M. E. (1992). Trace elements in high-S subbituminous coals from the Turel mining district, northeast Spain. *Applied Geochemistry*, 7, 547-561.
- Raask, E. (1985). The mode of occurrence of and concentration of trace elements in coal. *Program of Energy Combustion Science*, 11, 97-118.
- Raiswell, R. (1982). Pyrite texture, isotopic composition and the availability of iron. *American Science Journal*, 282, 1244-1236.
- Rangin, C., Bellon, H., Bernard, F., Letouzey, J., Muller, C., and Sanudin, T. (1990). Neogene arc-continent collision in Sabah, Northern Borneo (Malaysia). *Tectonophysics*, 183, 305-319.
- Ratanasthien, B. (1987). The effect of Pleistocene volcanic activity to Mae Moh coal-bearing Formation. In: N. Thiramongkol (ed.), *Proceedings of Workshop on Economic Geology, Tectonic, Sedimentary Processes and Environment of the Quaternary in Southeast Asia* (pp. 45-52), Bangkok, Thailand.
- Ratanasthien, B. (1989). Depositional environment of Mae Lao basin as indicated by palynology and coal petrography. In: T. Thanasuthipitak and P. Ounchanum (eds.), *International Symposium on Intermontane Basins: Geology and Resources* (pp. 205-215), Chiang Mai University, Chiang Mai,

Thailand.

Ratanasthien, B., (1994). Neogene events recorded in Thailand. In: R. Tsuchi (ed.),

Proceedings of Pacific Neogene events in time and space (pp. 65-77),

Shizuoka, Japan.

Ratanasthien, B., Chompoosri, S., and Mahatthanachai, T. (1997). Depositional environment of Mae Moh basin as indicated by coal petrography. In: P. Dheeradilok (ed.), *Proceeding of the international Conference on Stratigraphy and Tectonic Evolution of Southeast Asia and South Pacific* (pp 596-605), Bangkok, Thailand.

Ratanasthien, B., and Kandharosa, W., (1986). *Pre and Post depositional environment in northern Thailand Tertiary coal-bearing formation*. In: Report submitted to Chiang Mai University. Department of Geological Sciences, Faculty of Science, Chiang Mai University, Chiang Mai, Thailand.

Ratanasthien, B., Kojima, T., Tokumitsu, T., Katoh, A., and Uyemura, N. (1992).

Relationship between elementary analysis, origin and diagenesis of Tertiary Thai coals. *Proceedings of International Conference on Geological Resources of Thailand: Potential for future Development* (pp.273-282), Bangkok, Thailand.

Ratanasthien, B., Rayanakorn, M., Promputha, M., and Sae-Eng, P. (1995). Gasses emission characteristic of some northern Thailand lignite. *Proceedings of European-Asean Conference on Combustion of Solids and Treatment of Product* (pp. C11-C18), Prachuap Khiri Khan, Thailand.

Ratanasthien, B., and Ruangvatasirikul, K., (1984). The Effect of depositional

- environment of the properties of coal in northern Thailand. In: P. Thanasuthipitak (ed.) *Proceeding of Symposium on Cenozoic Basins of Thailand: Geology and Resources*, (pp. 81-105), Chiang Mai, Thailand.
- Renton, J. J. (1982). Mineral matter in coal, In: R. A. Meyers (ed.) *Coal structure*, (pp 283-327), New York: Academic Press.
- Rickard, D. T. (1969). The chemistry of iron sulfide formation at low temperatures. In: I. Hessland (ed.), Stockholm contributions in geology, 20, 67-95.
- Rimmer, S. M., and Davis, A., (1986). Geologic controls on the inorganic composition of lower kittanning coal, In: K. S. Vorres (ed.) Mineral Matter and Ash in Coal. *American Chemical Society Symposium Series*, 301, 41-52.
- Rubin, E.S. (1991). Environmental constraints: threat to coals future? *Proceedings of the Word Coal Institute Conference and Exhibition* (pp. 31-33), London, England.
- Ruch, R. R., Gluskoter, H. J., and Shimp, N. F. (1974). *Occurrence and distribution of potentially volatile trace elements in coal: A final report*. Illinois Geological Survey Environmental Geology Note 72.
- Rui, L. (1998). Tertiary coals and oil shales in northern Thailand (Li and Mae Moh basin): with reference to the dual petroleum systems in the Pattani basin, Tertiary Depositional Systems of northern Thailand field trip. 145-166.
- Sakai, H., and Matsubaya, O. (1976). Analytical methods for stable isotopic ratios of hydrogen, carbon, oxygen and sulfur. In: *Cosmo- and Geochemistry, Series 10*: Tokyo, Lectures on Experiments in Chemistry, 523.
- Sampei, Y., and Matsumoto, E. (2001). C/N ratio in a sediment core from Nakaumi Lagoon, southwest Japan- usefulness as an organic source indicator.

- Geochemical Journal*, 35, 189-205.
- Sampei, Y., Matsumoto, E., Kamei, T., and Tokuoka, T. (1997). Sulfur and organic carbon relationship in sediments from coastal brackish lakes in the Shimane peninsula district, southwest Japan. *Geochemical Journal*, 31, 245-262.
- Sananseang, S., and Chaodumrong, P. (1980). Report on study of Tertiary rocks. Report of Tertiary project no. 2., Department of Mineral Resources, Bangkok, Thailand.
- Sasada, M., Ratanasthien, B., and Soponpongpipat, R. (1987). New K/Ar ages from the Lampang basalt, northern Thailand. *Geological Survey of Japan Bulletin*, 38 (1), 13-20.
- Sawyer, R. K., and Griffin, G. M. (1983). The source and origin of the mineralogy of the northern Florida Everglades, In: R. Raymond, and M. Andrejko (eds.), *Mineral matter in peat, its occurrence, form and distribution, Los Alamos National Laboratory, LA-9907-OBES, Los Alamos, New Mexico*, 189-198.
- Sethakul, N. (1984). Pongnok Oil Field. In: P. Thanasuthipitak (ed.), Proceedings of Symposium on Cenozoic Basin of Thailand (pp. 21-42), Chiang Mai University, Chiang Mai, Thailand.
- Silaratana, T., and Ratanasthien, B. (2000). The depositional environment of Chiang Muan coalfield, Payao, In: *Proceedings of RGJ-Ph.D. Congress I*, (p.67) Kanchanaburi, Thailand.
- Silaratana, T., Ratanasthien, B., Fyfe, W. S., Takayasu, K., Asanachinda, P., and

- Kandharosa, W. (2002). Mineralogical variation of clastic rocks and coal from Chiang Muan coal field in northern Thailand. In: N. Mantajit, and S. Potisat (eds.), *Geology of Thailand 2002* (pp.233-241), Bangkok, Thailand.
- Silaratana, T., Ratanasthien, B., Takayasu, K., Asanachinda, P., Kandharosa, W., and Kusakabe, M. (2003). Sulfur isotope implication of Middle Miocene marine incursion in northern Thailand. In: B. Ratanasthien, S.L. Rieb, and S. Chantraprasert (eds.), *Proceedings of the 8<sup>th</sup> International Congress on Pacific Neogene Stratigraphy: Pacific Neogene Paleoenvironments and their Evolution* (pp. 356-374), Chiang Mai University, Chiang Mai, Thailand.
- Silaratana, T., Ratanasthien, B., Takayasu, K., Fyfe, W. S., Asanachinda, P., Kandharosa, W., and Kusakabe, M. (2004). Sulfur isotope implication of Middle Miocene marine incursion in northern Thailand. *Journal of ScienceAsia* 30(1), 43-58.
- Sithiprasasna, D. (1959). Occurrence of Mae Moh fossils, Department of Mineral Resources, Bangkok, Report of Investigations, 2, 29-34.
- Smith, J. W., and Batt, B.D. (1974). The distribution and isotopic composition of sulfur in coal. *Geochemica et Cosmochimica Acta*, 38, 121-133.
- Sompong, W., Springbelt, G. M., and Evans, P. R. (1996). *Lignite mine development project (phase III) Mae Moh coal deposit*. Electricity Generating Authority of Thailand, Australia AID Geological Report.
- Songtham, W. (2003). *Stratigraphic correlation of Tertiary basins in northern Thailand using algae pollen and spore*. Ph.D. thesis, Chiang Mai University, Chiang Mai, Thailand.

- Spears, D. A. (1987). Mineral matter in coals with special reference to the Pennine coal Field. In: A.C. Scott (ed.), *Coal and coal-bearing strata: recent advances, Geological Society Special Publication*, 32: 171-185.
- Spears, D. A., and Martinez-Tarazona, M. R. (1993). Geochemical and mineralogical characteristics of power station feed coal, Eggborough, England. *International Journal of Coal Geology*, 22, 1-20.
- Stach, E., Mackowsky, M. T., Teichmuller, M., Taylor, G. H., Chandra, A. D., and Teichmuller, R. (1982). *Stach's Textbook of Coal Petrology*, 3<sup>rd</sup> ed., Berlin: Gebruder Borntraeger.
- Suganuma, Y., Okada, M., and Nagaoka, S. (2002). Preliminary magnetostratigraphy of the Tertiary sedimentary rocks, Mae Moh Group from Chiang Muan in northern Thailand. *Primate Research*, 18(2), 165-173 (in Japanese with English abstract).
- Suteethorn, V., Chaimanee, Y., Buffetaut, E., and Jaeger, J.J. (1990). Vertebrate fossil. In: Thailand. In P. Charusiri, V.P. Amond, and S. Jarupongsakul (eds.), *Prceedings of Development Geology for Thailand into the Year 2000* (pp.99-109), Chulalongkorn University, Bangkok, Thailand.
- Suteethorn, V., Buffetaut, E., Helmcke-Ingavat, R., Jaeger, J. J., and Jongkanjanasooontorn, Y. (1988). Oldest known Tertiary mammals from South East Asia: Middle Eocene primate and anthracotheres from Thailand: Neues Jahrbuch fur Geologie und Palaontologie, Monatshefte H.9, 563-570.
- Swaine, D. J. (1990). *Trace elements in Coal*. London: Butterworths.
- Tankaya, W. (2001). *Implication of geochemistry on depositional environment in Mae Moh coal field Changwat Lampang*. Master's thesis, Chiang Mai University,

Chiang Mai, Thailand.

- Tapponnier, P., Peltzer, G., and Armijo, R. (1986). On the mechanism of the collision between India and Asia. In: M. P. Coward, and A. C. Ries (eds.), Collision Tectonic. Geological Socociety Special Publication, 19, 115-157.
- Tapponnier, P., Peltzer, G., Armijo, R., Le Dain, A. Y., and Cobbold, P. (1982). Propagating extrusion tectonics in Asia: New insights from simple experiments with plasticine. *Geology*, 10, 611-616.
- Tassy, P., Anupandhanant, P., Ginsburg, L., Mein, P., Ratanasthien, B., and Sutteethorn, V. (1992). A new Stegolophodon (Proboscidea, Mammalia) from the Early Miocene of northern Thailand. *Geobios*, 25(4), 511-523.
- Teichmuller, M., and Teichmuller, R. (1982). Fundamentals of coal petrology In: E. Stach, M-Th., Mackowsky, M. Teichmuller, G. H. Tayler, and D. Chandra, Coal Petrology. R. Gebruder Borntraeger, Berlin-Stuttgart, 5-86.
- Upchurch, S. B., Strom, R. N., and Andrejko, M. J. (1983). A model for silification in peat-forming environments. In: R. Raymond, and M. Andrejko (eds.), Mineral matter in peat, its occurrence, form and distribution. Los Alamos National Laboratory, LA-9907-OBES, Los Alamos, New Mexico, 235-242.
- Uttamo, W. (1998). Lithofacies of Mae Moh and Li basins, Northern Thailand. Southeast Asia Research Group, Royal Holloway, University of London.
- Uttamo, W. (2000). *Structural and Sedimentological Evolution of Tertiary Sedimentary Basins in northern Thailand*, Ph.D. thesis, Royal Holloway, University of London.
- Uttamo, W., Elders, C., and Nichols, G. (2003). Sedimentology of Neogene sequences in the Mae Moh basin, northern Thailand. In B. Ratanasthien, S.L. Rieb, and

- S. Chantraprasert (eds.), *Proceedings of the 8<sup>th</sup> International Congress on Pacific Neogene Stratigraphy: Pacific Neogene Paleoenvironments and their Evolution* (pp. 31-48), Chiang Mai, Thailand.
- Uttamo, W., Nichols, G. J. and Elders, C. F. (1999). The Tertiary sedimentary basins of northern Thailand: In: C. Khantaprab and others (eds.), *Proceeding of Mineral, Energy, and Water Resources of Thailand: Toward the Year 2000* (pp. 71- 92), Bangkok, Thailand.
- Van Der Flier-Keller and Fyfe, W.S. (1988). Mineralogy of lower Cretaceous coal from the Moose River basin, Ontario and Monkman, British Columbia. *Canadian Mineralogist*, 29, 343-353.
- Van Der Flier-Keller and Fyfe, W.S. (1987). Geochemistry of two Cretaceous coal-bearing sequences: James Bay Lowlands, northern Ontario and Peace River Basin, north east British Columbia. *Canadian Journal of Earth Science*, 24, 1038-1052.
- Valkovic, V. (1983). *Trace Elements in Coal*, vol. 2, Florida: CRC Press.
- Ward, C. R. (1980). Mode of occurrence of trace elements in some Australian bituminous coals. *Coal Geology*, 2, 77-98.
- Ward, C. R. (1989). Minerals in bituminous coal in the Sydney basin (Australia) and the Illinois basin (U. S. A.), In: P. C. Lyons and B. Alpern (eds.), Coal, mineralogy, classification, coalification, trace-element chemistry and oil and gas potential, *Int. J. Coal Geol.*, 13, 455-479.
- Ward, C. R. (1991). Mineral matter in low-rank coals and associated strata of the Mae Moh basin, northern Thailand. *International Journal of Coal Geology*, 17, 69-93.

- Ward, C. R., and Christie, P. L. (1994). Clays and other minerals in coal seams of the Moura-Baralaba area, Bowen Basin, Australia. . *International Journal of Coal Geology*, 25, 287-309.
- Watanasak, M. (1988). *Mid-Tertiary palynology of onshore and offshore Thailand*. Doctor's thesis, University of Adelaide, Australia.
- Watanasak, M. (1989). Palynological zonation of Mid-Tertiary intermontane basins in northern Thailand. In: T. Thanasuthipitak and P. Ounchanum (eds.), Proceedings of International Symposium On Intermontane Basins: Geology and resources, (pp. 216-225), Chiang Mai University, Chiang Mai, Thailand.
- Water Resource Engineer (Ltd.) company (1998) *Report of the coal exploration and assessment project of Ngao basin, Lampang Province*. In: Summary Report of the Coal Exploration and Assessment Project (Report no. 2 CEP. 98/2540), Department of Mineral Resources, Bangkok, Thailand.
- Watson, P. V. (1996). *Biostratigraphy and palaeoenvironments of PH1 and PH2 well samples, Phrae Basin, Thailand*. A report submitted to PTT Exploration and Production Public Company Ltd by Core Laboratories Company.
- Wedepohl, K. H. (1969). *Handbook of Geochemistry*. Berlin: Springer-Verlag.
- Yabe, A. (2002). Paleoclimatic condition inferred from the Tertiary plant megafossil assemblages from northern Thailand. *Primate Research*, 18(2), 143-157 (in Japanese with English abstract).
- Yanagisawa, F., and Sakai, H. (1983). Thermal decomposition of barium sulfate-vanadium pentoxide-silica glass mixtures for preparation of sulfur dioxide in sulfur isotope ratio measurements. *Analytical Chemistry* 55, 985-987.
- Zubovic, P. (1976). Geochemistry of trace elements in coal. In: F.A. Ayer (ed.),

*Proceedings of Environmental aspects of fuel conversion technology, Washington D.C. Environmental Protection Agency, Environmental Protection Technology Series EPA-600/2-76-149, p. 47-63.*

- Zubovic, P. (1966). Physicochemical properties of certain minor elements as controlling factors of their distribution in coal. *Advances in Chemistry Series*, 55, 221-230.
- Zubovic, P., Stadnichenko, T., and Sheffey, N.B. (1961). The association of minor element associations in coal and other carbonaceous sediments. United States Geological Survey Professional Paper 424-D, Article 411, D345-D348.

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