21. Heim, R., *Les champignons toxiques et hallucinogenes*, 2nd edn. Boubee, Paris, 1978.
22. Jennings, D. H. and Rayner, A. D. M. (eds), *The Ecology and Physiology of the Fungal Mycelium*, Cambridge University Press, Cambridge, 1984.
23. Jong, S. C. and Birmingham, J. M., *Adv. Appl. Microbiol.*, 1992, **37**, 101–134.
24. Kaneda, T. and Tokuda, S., *J. Nutrition*, 1966, **90**, 371–376.
25. Last, F. T. and Fleming, L. V., *Proc. Indian Acad. Sci. (Plant Sci.)*, 1985, **94**, 111–127.
26. Lincoff, G. and Mitchel, D. H., *Toxic and Hallucinogenic Mushroom Poisoning*, Van Norstrand Reinhold & Co., NY, 1977.
27. Liu, J.-W., Beelman, R. B., Lineback, D. R. and Speroni, J. J., *J. Food Sci.*, 1982, **47**, 1542–1544.
28. Manjula, B., *Proc. Indian Acad. Sci. (Plant Sci.)*, 1983, **92**, 81–213.
29. Moncalvo, J. M., Wang, H. H. and Hseu, R. S., *Mycologia*, 1995, **87**, 223–238.
30. Moore, D., Casselton, L. A., Wood, D. A. and Frankland, J. C. (eds), *Developmental Biology of Higher Fungi*, Cambridge University Press, Cambridge, 1985.
31. Moser, M., *Proc. Indian Acad. Sci. (Plant Sci.)*, 1985, **94**, 381–386.
32. Natarajan, K. and Raman, N., *South Indian Agaricales*. Cramer, Vaduz, 1983.
33. Poinar, G. O. and Singer, R., *Science*, Washington D.C., 1990, **24**, 1099–1101.
34. Ramsbottom, J., *Mushrooms and Toadstools*, Collins, London, 1953.
35. Ross, A. E., Nagel, D. L. and Toth, B., *Food Chem. Toxicol.*, 1982, **20**, 903–907.
36. Rumack, B. H. and Salzman, E. (eds), *Mushroom Poisoning: Diagnosis and Treatment*, CRC Press, Florida, 1978.
37. Schultes, R. E. and Hofmann, A., *Plants of the Gods: Origins of Hallucinogenic Use*, Hutchinson, London, 1979.
38. Singer, R., *Mushrooms and Truffles. Botany, Cultivation and Utilization*, Leonard Hill, London, 1961.
39. Singer, R., *The Agaricales in Modern Taxonomy*, Cramer, Vaduz, 1975, 3rd edn.
40. Singer, R., *Marasmieae (Basidiomycetes, Tricholomataceae)* Flora Neotropica. Monograph No. 17. New York Botanical Garden, 1976, New York.
41. Speroni, J. J., Beelman, R. B. and Schisler, L. C., *J. Food. Prot.*, 1983, **46**, 506–509.
42. Subramanian, C. V., *Curr. Sci.*, 1991, **60**, 290.
43. Suzuki, S. and Oshima, S., *Mushroom Sci.*, 1974, **9**, 463–467.
44. Toth, B., *J. Toxicol. Environ. Health*, 1979, **5**, 193–202.
45. Tullos, R. E., Ovrebo, C. L. and Halling, R. E., *Mem. N.Y. Bot Gdn.*, 1992, **66**, p. 46.
46. Vilgalys, R. and Sun, B. L., *Proc. Natl. Acad. Sci. USA*, 1994, **91**, 4599–4603; 7832.
47. Wasson, R. G., *Soma, Divine Mushroom of Immortality*. Harcourt Brace & World, N.Y., 1968.
48. Wieland, Th. *Peptides of Poisonous Amanita Mushrooms*, Springer, Berlin, 1986.
49. Zhao, Ji-Ding, *The Ganodermataceae in China*. J. Cramer, 1989, Berlin.
50. Zhao, Ji-Ding. and Zhang, Y-Q., *The Polyporaceae of China*. J. Cramer, 1992, Berlin.

Note:

Authorities for Latin binomials are not given for ease of reading. These will be found in the monographs cited. Photo credits: Figures 1, 2, 5 courtesy K. Natarajan; 7, 10, 11 courtesy Chen, Hsinchu.

RESEARCH ARTICLE

Role of fluorescence microscopy in the assessment of Indian Gondwana coals

Bhagwan D. Singh

Birbal Sahni Institute of Palaeobotany, GPO Box 106, Lucknow 226 001, India

When a light of short wavelength excites organic matter, light of relatively longer wavelength is emitted from it and this phenomenon is known as autofluorescence. The coal maceral analysis under fluorescence mode (blue light/UV light excitation), therefore, has been found to be best suited to properly identify, characterize and quantify hydrogen-rich macerals. Utilizing this technique, macerals like bituminite, fluorinite and exsudatinite were recognized for the first time. Certain other macerals – alginite and liptodetrinite, normally mistaken for mineral matter under routine petrographic analysis, were also identified. Fluorescence microscopy, thus, not only added to the overall tally of liptinite group of macerals in Indian Gondwana coals, but also to their quantity. In addition to this, recognition of fluorescing vitrinite (perhydrous vitrinite) significantly contributed to the abundance of hydrogen-rich microconstituents for these coals.

FLUORESCENCE microscopic study of solid fossil fuels (coals/lignites) and kerogen (in sedimentary rocks) has been found quite successful particularly in identification, characterization and quantitative assessment of hydrogen-rich macerals, especially the liptinite (or exinite) group of macerals. It is a useful technique for determination of rank or maturity and even better suited in cases where vitrinite/huminite macerals are not in sufficient quantities or not suited for reflectivity measure-

Presented at 'Contemporary Research Trends in Palaeobotany' to commemorate The Palaeobotanical Society International Medal Award function, BSIP, Lucknow, January 12, 1993.