this important elephant population warrants immediate management action.

5. Anonymous, Project Elephant (Gajam), Ministry of Environment and Forest, Govt. of India, 1993, p. 46.

ACKNOWLEDGEMENTS. We thank the Forest Department of Kerala for facilities and research permissions. This study was funded by the Ministry of Environment and Forests, Government of India. The preliminary survey was funded by the Calgary Zoological Society and Wildlife Preservation Trust International through the IUCN/SSC Asian Elephant Specialist Group.

The authors are from the Asian Elephant Conservation Centre and Centre for Ecological Sciences, Indian Institute of Science, Bangalore 560 012, India.

SCIENTIFIC CORRESPONDENCE

Typical liptinitic bodies from Neyveli lignite deposits, India

Coal and lignite, the sedimentary organic deposits consist of various microconstituents called 'macerals' (= 'minerals' in inorganic rocks) which originate during the 'coalification' process, that is transformation of vegetal matter into coal. Different maceral groups are vitrinite – originated from woody plant remains, liptinite – derived from hydrogen-rich plant parts (pollen-sporae, cuticles, resins, suberins, etc.), and inertinite – incorporating the carbon-rich oxidized plant remains, show different behaviour under normal and fluorescence modes. Relatively hydrogen-rich liptinite macerals fluoresce under fluorescence mode with wide range of colours. Based on morphological and optical properties, it is possible to correlate various macerals to their original plant parts and to reconstruct the palaeoflora.

Besides traditional macerals, typical multicellular bodies emitting the light of yellow and brownish-yellow colours have been found during the investiga-

Figure 1. Location map of Neyveli Lignite field and investigated bore holes NLE 27, 35 and 36 in Mine III. (Source: Neyveli Lignite Corporation Limited.)
tion of particulate polished pellets, made from core samples of bore-holes NLE-27, 35 and 36 (courtesy GSI) from mini III area of the Neyveli Lignitefield, Tamil Nadu, India (Figure 1), under blue light excitation (fluorescence mode). The observations have been made on Leitz MPV-3 Unit following the recommendations of ICCP. The recovered fluorescing bodies, ranging in frequency between 0.2 and 6.8%, average 0.8%, have always been found aligned parallel to the maceral cutinites (cuticles), either discretely or in rows (Figure 2). The bodies are either uniseriate or multisierate with the size range 160-400 μm x 40-135 μm. In vertical section, the bodies are spindle-shaped, tapering at both the ends. The cells in the median part are round and larger, gradually reducing in size and tapering towards ends.

The property of auto-fluorescence and its close association with the cutinites suggest that these bodies might be some epidermal structures (rich in hydrogen content) borne on leaf surfaces of lignite-forming plants. However, these bodies of the liptinite group, at present, could not be assigned to their original plant part or organ. The affiliation may be possible when additional morphological characters are obtained on more specimens.

Various morphological and anatomical characters, like cuticle thickness, number and nature of stomata, epidermal appendages, salt glands, pollen spores size, exine sculpture, etc. reveal different habitats of plants or ecological conditions. The newly-recorded epidermal bodies/structures are, therefore, significant for the reconstruction of palaeoflora and for deducing the depositional conditions of the Neyveli lignite deposit, as the plants bearing these fluorescing bodies may indicate some specific palaeoecological conditions.

Further, increase in the amount of liptinitic content may also be influential for the assessment of technological properties of the deposit for its various uses.


**Alphana Singh**  
**Basant K. Misra**

*Birbal Sahni Institute of Palaeobotany, 53, University Road, Lucknow 226 007, India*