SUMMARY

Normal methods of clay mineral analysis do not provide information about the distribution of clay mineral species within the soil fabric, a factor which is of significance in soil-plant and pedogenic studies. Nor is it possible to identify easily grains of clay minerals in soil thin sections since their size places them beyond the limit of resolution of optical microscopes. This paper reports an investigation into techniques involving treatment with UV-fluorescent dyes, radio-isotopes, and metal cations, combined with electron probe microanalysis and autoradiography, which can supplement the information obtained by normal microscopic examination of soil thin-sections.

UV-fluorescent dyes, such as acridine orange, and yellow, rhodamine-B, etc., are detectable at low concentrations and are differentially adsorbed onto clay minerals. Direct staining of clay minerals in surfaces of resin-impregnated soil was shown to be equally effective and comparable to the staining in sections prepared from unimpregnated soil cores that had been leached with the-dyes: it also proved to be very much more rapid and convenient, and allowed iron oxides and organic matter to cable to soil micromorphology. Elements which can be successfully detected and located by this technique include K (e.g. in felspars), Ca (in calcite and gypsum) and Fe & Al (e.g. in the amorphous oxide fraction). The stain can be viewed on the thin-section or, in some cases more conveniently, when transferred from the thin section or block surface to an acetate peel where its distribution is unobscured by the pigments in the soil matrix : staining and peel production can also be carried out simultaneously.

This paper will discuss the procedures, scope and limitations of these techniques, illustrated by reference to specific applications.