with a large forward maximum corresponds much better to reality than an isotropic scattering.

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New Zealand Coals

IN the past twenty years many hundreds of ultimate analyses and many thousands of proximate analyses of New Zealand coals have been made in accordance with British Standard Specifications at the Coal Section of the New Zealand Dominion Laboratory. A preliminary study of these analyses shows that New Zealand coals, varying in rank from peat to semi-anthracite (the anthracites are contact-metamorphosed lignites), almost all belong to a restricted range of coal type different from that of British and North American coals of Carboniferous age.

New Zealand's principal coal seams are of early Senonian to early Oligocene age, but a few Miocene coals are also worked and thin seams occur in younger beds, even as young as early Pleistocene. The rank of the coals, however, appears to be a function neither of age nor of intensity of deformation, but rather of depth of burial.

The seams are usually particularly low in ash, frequently with less than 2 per cent. Coals with high or moderate sulphur contents are widely distributed, the sulphur content bearing a close relation to the stratigraphic distance from marine beds (cf. Wellman[1]). Fig. 1 is a graph, in which the percentage of carbon is plotted against the percentage of hydrogen, for coals with not more than 0·6 per cent sulphur and 7·0 per cent ash, and shows also the 'coal band' for New Zealand coals, extended tentatively to peats. Some of the low-rank coals (in particular some of those with 65–70 per cent carbon) contain abundant resin, with consequent high hydrogen contents, so that some analyses fall above the band. Adjustment of analyses of high- and medium-sulphur coal to a sulphur-free basis cannot be made by the commonly used Parr formula, as the sulphur is almost exclusively organic. Accordingly, these coals are not shown on Fig. 1; but preliminary examination of the analyses shows that most fall within the coal band based on low-sulphur coals.

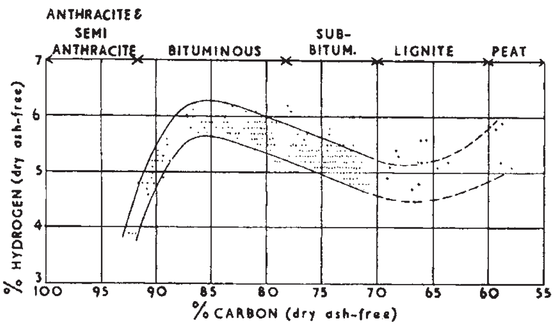

Fig. 1. The New Zealand coal band; coals with not more than 0·6 per cent sulphur and 7 per cent ash

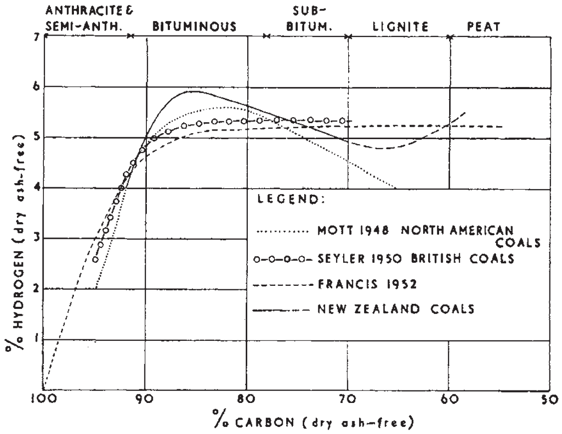

Fig. 2. Mean lines for coal bands of various authors

In Fig. 2 the mean line for the New Zealand coal band is compared with the mean lines adopted by Mott[2] for North American coals, Seyler[3] for British 'bright' coals, and Francis[4] for 'mean ulmins'. These lines trace the metamorphic development of coals of particular types from peat to anthracite. Mott found that those British coals with high durain contents require a subsidiary band of slightly lower hydrogen content than his band for North American coals, but that the difference diminishes with increasing rank; he thus acknowledged that coals of different types would fall in different bands. Likewise, Francis showed different theoretical development curves for perhydrous ulmins and sub-hydrous ulmins.

The scarcity or lack of Carboniferous coals of sub-bituminous, lignite and peat ranks made it necessary for Seyler to extend his coal band from bituminous to lower ranks on the assumption that the mean hydrogen percentage is nearly constant. Francis' theoretical development curve produces a similar result. Mott's coal band, deduced from Carboniferous, Cretaceous and Tertiary coals, shows an increasing hydrogen content from low-rank lignite to bituminous coal; and the New Zealand coal band, based on coals averaging higher hydrogen contents, shows a comparable, though smaller, increase. Thus Seyler's and Francis' theoretical paths of development for coals of low rank do not appear to be borne out in practice.

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African Pleistocene Pluvials and European Glaciations

THE most recent book on African prehistory by Mlle. H. Alimen[1] continues to adopt the theory of three pleistocene pluvials and two interpluvials. Her field-work having been mainly in the Sahara, this must be taken as her considered interpretation of phenomena in this part of Africa.