Though it may be premature to state general conclusions here, it seems not out of place to note that these angles are nearly the same, and that one of the (100) planes of the crystal is situated nearly parallel to the axis of the wire, at any rate for all the six specimens tabulated above.

The present method of determining the orientation of the axes of crystals is very simple, and at the same time it shows very clearly on the photograph whether the specimen is composed of a perfect single crystal or not. So far we have applied this method to thin wires only, but it may equally be applied to thin plates or to any specimen which has a plane or cylindrical surface.

USABURO YOSHIDA.
KENZO TANAKA.

Physical Laboratory,
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Japan, September 21.

The Crystalline Nature of the Chief Constituent of Ordinary Coal.

AN examination of a microscope section of Indian coal from the Raniganj coal-field showed that the main substance of the coal was a madder-red coloured, translucent material, which in a section cut vertical to the bedding planes of the coal, gave faint pleochroic effects when examined in plane polarised light. The same substance, when viewed between crossed Nicols, had distinct extinction parallel to the lines of the laminæ and behaved like a uniaxial mineral. The peculiarity is that the whole of the red-madder substance, seen in the field of the microscope, behaved as though in optical continuity and as if part of a single crystal.

Eight slides, two each, one cut parallel to the planes of bedding and the other vertical to this direction, of so-called clarain, vitrain, durain, and fusain made by Mr. James Lomax of Bolton, were procured, and in the vertically cut sections the same phenomena are to be observed. In the sections cut parallel to the bedding the substance behaves as an isotropic mineral. The first six slides are of the thick coal of Exhall in Warwickshire, while the sections of fusain are of the Trencherbone coal of Lancashire.

These slides show that there is only one chief constituent in the coals examined, which for lack of a better name, one may speak of as vitro-clarain (after Stopes) or anthraxylon (after Thiessen). Scattered through the coal, usually along the planes of bedding, are sections of bright gold or red resinous matter suggestive of the sheaths or walls of sporangia, and smaller gold specks and lenticles which may be spores. In addition, there are red translucent patches of a rough, pitted nature, which might be the outer skin of sporangia, as some of these, cut obliquely, show a distinct cellular structure.

In the sections of durain the laminæ are rather closer together than in the slides of clarain, and the laminæ are well marked, as though with thin sheets of opaque inorganic material. The fusain is obviously associated with 'dirt' bands in which pyrite, siderite, and calcite can be distinguished along with the powdery carbon. In some cases a beautiful reticulated structure is evident in the fusain, as though the inorganic matter was an infilling in some organic structure.

Thus it appears, from a petrographic examination of the usual kind, that these coals consist of four components, but rather different from those identified by Dr. Marie Stopes. My components are as follows: (*A*) One main constituent which simulates a crystalline structure, and (*B*) three minor or relatively minor constituents—(1) resinous bodies, such as sporangia and spores which may be present in large or small quantities and may markedly affect the quality of the coal; (2) powdery, soft carbon with the macrostructure of charred wood, which is well known as mineral charcoal or fusain; and (3) inorganic matter—clay along the laminæ or scattered through the coal, as well as other such recognisable minerals as pyrite, calcite, siderite, etc., usually associated with the fusain. With this inorganic matter could be grouped the inorganic impurities, for example, ankerite, etc., which occur in cracks and joints in the coal.

The most important and certainly most uniform substance of these coals is the material, designated *vitro-clarain* in courtesy to Dr. Stopes, which constitutes the main bulk of good coal and probably represents the mineralised form of woody tissue. Its crystalline behaviour is strange, but will probably be fully accounted for by organic chemists as some kind of strain phenomenon.

CYRIL S. FOX.

Geological Survey of India,
Calcutta, September 23.

THE application of the petrological microscope to the study of coal sections may lead to interesting observations on the details of coal structure, and I am glad Mr. Fox is taking it up. It is a little unfortunate, however, that he should add to the complexities of coal nomenclature on so slender a basis as his observations on his first few sections.

In his third paragraph he writes as though "vitro-clarain (after Stopes)" were identical with "anthraxylon (after Thiessen)," a confusion which has already been exposed concisely by Seyler; see "The Nomenclature of the Banded Constituents of Coal" (NATURE, April 3, 1926).

In his fourth paragraph Mr. Fox describes "a beautiful reticulated structure" as being evident, "as though the inorganic matter was an infilling in some organic structure." This is a truism to students of coal, the "reticulated structure" being tracheids of woody tissue, generally the secondary wood of Lepidodendron, or Cordaitean trees, which constantly have crystalline matter filling the laminæ of the tracheids.

Mr. Fox's main point, however, that there is *one* main constituent which simulates crystalline structure in coal, is a suggestion which, if true, would have a very material bearing on the details of research into coal structure, and should certainly be checked by observations on much larger numbers and varieties of coal sections.

It must be borne in mind that, in general, the large bulk of bituminous coal contains ulmic compounds which are colloidal in their nature.

I must dissent from the phrase in the concluding paragraph that this ". . . constitutes the main bulk of good coal and probably represents the mineralised form of woody tissue." The major part of coal substances is not mineralised but mummified; and woody tissue is *one* of its constituents, but only one of many.

MARIE C. STOPES.

Givons Grove, Leatherhead, Surrey,
October 25.

Adsorption of Dyes to Silver Halides.

THE quantitative determination of the amounts of dyes taken up by crystalline solids has both a general and special interest. The adsorption of dyes to silver halides, and particularly of sensitising dyes, has considerable photographic importance in relation to the theory of optical sensitising. Work has been in progress for some time in this laboratory on this problem by methods devised by the