be taboo. The daily life of the natives is described, first as to the individual (toilet, dress, ornaments, and food), and then with regard to the community (seasonal occupations, courtship and marriage, children and their play, public law and the restrictions of taboo, warfare, economics). The sections on agriculture and hunting are illustrated by plans and diagrams. Fishing, trade, and industries are similarly illustrated.

In magic and religion a very prominent feature is belief in the *Bara'u,* a living man who can make himself invisible and prowls about in the night working evil magic. Some suppose him to be invisible in front, though he can be seen from behind. He can be heard, travels like the wind, and injures his victim in various ways. The ghosts, or *Bo'i,* who dwell in the preserved skulls of the dead, are not so feared. Their spirits go to a distant place.

The author deals fully with maleficent and beneficent magic and with feasting and ceremonial, both in joy and sorrow. He concludes with an account of burial customs, art, and knowledge.

Dr. Malinowski's long paper is a fine piece of work, and an extremely valuable and interesting contribution to the ethnography of New Guinea. It is abundantly illustrated by diagrams in the text, by thirty-four pictures from the author's photographs, and by a map. The paper is a credit to the society which has found such ample space for it in its Transactions.

SIDNEY H. RAY.

OIL PROSPECTS IN THE BRITISH ISLES.

MR. W. H. DALTON read a paper upon the above subject before the Institution of Petroleum Technologists on November 20. He deals in the paper with actual liquid petroleum only, and not with the potentialities of distillation from so-called oil shale, from coal, peat, or any other carbonaceous solids. He regards the widespread conception of a store of petroleum of commercial value lying intact within the limits of the British Isles as wholly untenable. Nature seems at all times since the initiation of organic life to have evolved hydrocarbons, in very variable quantity, sometimes for prolonged storage, often for rapid dissipation. In a rapid summary, in geological order, of all recorded appearances of oil or tar within the kingdom, the Carboniferous series receives most attention, chiefly from the extensive mining operations, which have revealed pockets of oil where none is seen at the surface. Those occurring in the Scotch oil shales are presumably due to natural distillation by the heat of intruded igneous rock. Others, in the Yorkshire and associated coalfields, are assigned to the alternations of terrestrial with marine conditions.

It must be borne in mind that the roof of a coal seam *ipso facto* implies a change of conditions, from terrestrial vegetation to subaqueous deposit of sediment, and this was in not a few cases brought about by subsidence, the sea often invading an area previously supporting terrestrial growth. In the Staffordshire coalfield many such marine invasions have been detected, and several in Derbyshire and Nottinghamshire. The coeval deposits of Yorkshire and Lancashire would doubtless furnish similar evidence if fully studied in this respect.

If petroleum is principally due to marine organisms, whether vegetal, animal, or of the neutral character at the bottom of either scale, such invasion furnishes at once a wider area for occupation, and abundance of dead vegetation as nutriment. Consequently, the roof of a coal seam is a watery paradise for the development of oil-making organisms, and if the deposited sands or clays are of suitable character for storage and cover, there is a chance for the formation of oil, but in no case has there been found a store of high commercial value.

Besides abundant exposure at the surface, the British geological series has for centuries been subjected to penetration by mines and borings practically throughout its thickness, and no extensive area has escaped the test of drill or pick.

It is much to be doubted whether in any part of the Secondary rocks or of the subjacent Palæozoic series there exists any deposit of petroleum of a commercial value commensurate with the cost of wild-cat search (for such it must needs be) and subsequent exploitation. Yet the Kelham and Norton instances, in the Millstone Grit and Yoredale beds respectively, demonstrate the possible occurrence of oil in deep-seated portions of series of which the wide areas of outcrop yield no similar indications. In view of our ignorance of the tectonic structure obtaining in these older rocks to the eastward of proved points, the term wild-cat is not too strong; for, although the overlying rocks indicate various tectonic movements—presumably influenced in depth by pre-existing structure—we do not know the degree of that influence, still less the extent to which the older rocks have been brought within reach of denuding agencies to form the floor on which rest the newer rocks; an anticline in the Secondaries may be "posthumously" along one of older date—it may be oblique or directly transverse to flexures that would control the accumulation of Palæozoic oil, if such exists.

It is demonstrated, then, that in the British Isles—as in other parts of the world—oil-forming conditions have frequently recurred, but to a very limited extent; and although conditions favouring its accumulation, and tectonic structures capable of conserving it from escape, are also of frequent occurrence, the conjunction of the latter essentials with original formation has generally failed. Our reservoir rocks are full of water, demonstrating the absence of liquid hydrocarbons. The curves of our anticlines and synclines serve to enhance the beauty of our landscapes, and their formation has, under favourable conditions, resulted in ore-bearing veins, but to reduce that ore, as generally for heat, illumination, and motive-power, we must continue to depend upon solid minerals of native source, and fluid combustibles imported from abroad.

The feeble and short-lived flows which our rocks exhibit necessarily conform to the same hydrostatic laws as the vast bulks of other regions, but whether from defect of original formation, of space accessible for accumulation, or of adequate seal from escape, the total result is, from a practical commercial point of view, valueless, except possibly in the one or two cases mentioned above. To geologists, negative evidence in respect of petroleum would be accompanied by so much of interest and value in other directions that their trivial share in the cost would be gladly borne, but owners who looked for royalties would be less complacent under their disappointment. Hope is more easily excited than regrets are consoled. It is scarcely necessary to say that the drill and pump constitute the final court of appeal, but the charge of hoarding petroleum is not one at all likely to be substantiated.

EXPERIMENTS ON TRIBO-ELECTRICITY.

IT is strange that tribo-electricity—that is, the subject which deals with the production of charges by rubbing together unlike materials—has been so greatly neglected by experimentalists during the last century. A dozen branches of electricity have, during that period, been developed to the dignity of voluminous quantitative sciences, whilst this section of the subject, which is of great antiquity, can be dealt with on a page or two of a text-book, and consists of incoherent qualitative facts.

A recent paper by Dr. P. E. Shaw (Proc. Roy. Soc., November, 1917) discloses interesting results, and indicates that this neglected field of research is being developed. Throughout the experiments described the conditions of the surfaces used were varied systematically—by rise of temperature before and during friction; by treatment when flexed; and by previously grinding or polishing, and so on. It is well known that there are condensed films on the surfaces of many solid materials. Little is understood as to the nature or depth of these adsorbed layers, but they have proved a veritable stumbling-block to the investigator of certain phenomena—*e.g.* surface-tension and photo-electricity. But these films have little influence on tribo-electric effects, for here there is always a rough impact of solid on solid, the films are penetrated, and the true solid surfaces bear on one another.

The tribo-electric series consists of thirty-six places in order from the extreme + at top to the extreme – at bottom. The outstanding feature of the present results is the readiness with which a solid changes its place in the series when its surface condition is changed by heat, abrasion, flexure, and the like. Thus ordinary soda-glass drops from place 5 to place 21 when made matt, and to place 26 when its temperature has been raised to 245° C. Mica, which normally occupies place 6, drops to place 18 when matt, and to place 26 when heated to 270°. On the other hand, ebonite rises from place 28 to place 27 when matt, and to place 21 when heated to 100°. The remarkable character of these changes is that they are not erratic, but follow a simple law, as follows: All materials in the series above place 14 fall when rendered matt or after heating; but all materials in the series below 14 have the contrary tendency, and rise when heated or made matt. Thus the tendency is for the two ends of the series to come together as a result of these changes of condition. The temperature at which the change by heat occurs is quite definite for each material, and has been found for some sixteen metals and non-metals. It ranges from 70° C. to 300° C.

Dr. Shaw considers that this diametrically opposite behaviour in the + and – groups of the series indicates the existence of two kinds of atom or atomic group, one kind for each group, the difference between the two kinds being fundamental. But whatever form the theory of these effects may take, these new facts can scarcely fail to be of great importance. The research provides an explanation of the well-known readiness with which materials change their tribo-electric character. It should now be possible to avoid, in great measure, the confusion and irregularity which have hitherto characterised the subject.

THE RELATION BETWEEN CHEMICAL CONSTITUTION AND PHYSIOLOGICAL ACTION.[1]

THE relation between chemical constitution and physiological action occupies a definite and important place in the study of drugs. Chemical investigation of a drug begins with the attempt to isolate the principle to which its activity is due. Then follow the determination of its constitution and the synthesis of a number of substances related to the parent compound, and comparison of their physiological action.

The wideness of the term "physiological action," covering as it does any action on the living organism, renders its discussion difficult. It is impossible, for instance, to compare the bactericidal action of phenol with the hypnotic effect of diethylbarbituric acid, or with the anæsthetic action of cocaine, for the same superficial signs of physiological action may be due to widely different causes. Examples of physiological action are not wanting. Compounds of similar constitution generally possess a characteristic group-smell, whilst each member may have a specific odour. Sense of taste also provides an occasional means of discrimination not only between side-chains of different length, but also in certain cases between stereoisomerides.

Stereochemical influences often exercise profound effects, particularly on nerve-endings. Thus *l*-hyoscyamine has about a hundred times the mydriatic action of *d*-hyoscyamine, and *l*-adrenine many times the pressor effect of the dextro-compound. Asymmetry of a nitrogen atom may also condition a difference, as in the case of the α- and β-methochlorides of *l*-canadine. The cause of this variation still remains in doubt.

The influence of physical properties, such as solubility in different media, may be of importance, and it has been shown that for a particular series of aliphatic compounds their narcotic effect on tadpoles was proportional to the partition-coefficients of their solubilities in oil and water.

As an indication of the effect of chemical properties, it has been shown that whilst certain basic dyes stain the grey nerve substance, their sulphonic acids do not. This difference suggested that bases, liberated in the blood-stream by alkalis, are extracted by the nerve substance, whilst their sulphonic acids remain in solution as alkali salts.

In the case of alkaloids it is a general rule that the introduction of a free carboxyl group profoundly modifies the physiological action. Benzoyl ecgonine, of which cocaine is the methyl ester, has no local anæsthetic action; whilst quitenine, obtained from quinine by oxidation of the vinyl group, is non-toxic. Formation of quaternary salts has also a considerable effect. For instance, papaverine has a strychnine-like action which is missing in its methochloride, and reappears in its reduction product laudanosine.

In the many cases in which members of a group of compounds of similar constitution resemble one another in physiological action it is of interest to observe the effect of slight chemical alterations. The following four pieces of work were then outlined:—(1) *Tropeines* (acyl derivatives of the amino-alcohol tropine); (2) *aminoalkyl esters* (formed by the esterification of an *acid* with an *alcohol* containing an *amino*-group); (3) *adrenine and the amines* (adrenine is the active principle of the suprarenal gland); (4) *protozoacidal drugs*. The results of experiments that have been made on the relative toxicity to infusoria of a number of cinchona derivatives, with a view to their employment in the treatment in malaria, indicate that ethylhydrocupreine was the most active, but they do not admit of any certain conclusions as to the relation between their chemical constitution and protozoacidal action.

Experiments have also been made on the relative toxicity of the ipecacuanha alkaloids to amœbæ, and they indicate that the full amœbacidal action characteristic of emetine is exhibited only when the nucleus is intact.

[1] Summary of a lecture delivered before the Chemical Society on December 6 by Dr. F. L. Pyman.