

Principal Griffiths, vice-chancellor of the University of Wales, presided, and in his opening address submitted the points which it was most important that the conference should decide. Briefly they were these: What were the real demands of the Principality, and how far were they met by existing institutions? Was Wales to import the shortage of teachers, or to increase her own production? In what manner could the schools be best utilised as training grounds without injuring the schools? and should local education authorities undertake the training of secondary teachers? To these questions no uncertain answer was suggested, although the conference abstained from passing formal resolutions until an opportunity had been accorded the members to consider the verbatim report, which it was decided to publish at an early date.

At the second session Mr. Lloyd George, M.P., presided, and a paper was read by Lord Stanley of Alderley, chairman of the Anglesea Education Committee, and late chairman of the London School Board, on "The Point of View of the Local Authorities." The debate was opened by Mr. S. J. Hughes, county alderman of Glamorganshire. Both Lord Stanley and Alderman Hughes emphasised the paramount importance of training for the elementary school teacher. In summing up the debate, Mr. Lloyd George replaced the sword by the trowel, and emphasised the need for additional accommodation and for subsidising the buildings and the staffs. Enthusiasm was required, he said, to meet the increased burden on the rates, but he believed that the enthusiasm would be forthcoming. At this stage the only resolution of the conference was passed. This was moved by Principal Griffiths, and asserted "That it is the duty of the Principality to undertake the training and supply of teachers sufficient to meet the requirements of the Principality."

At the third session, which was presided over by Sir John Gorst, "The Special Aspects of the Problem of the Training of Elementary Teachers" was considered, a paper being read by Mr. T. John, vice-president of the National Union of Teachers. The experiments already being tried in the utilisation of the intermediate schools of Wales for the training of pupil teachers were described in detail, but the general opinion of the conference was unmistakable—that any half-time system should be a temporary expedient only.

As regards the question of the concurrent instruction of primary and secondary teachers, it was agreed that it is necessary for the separation of the primary teacher's professional training from his general education, and that under certain conditions it is possible and desirable that primary and secondary students should be trained together. The important question of the further training of those acting teachers whose qualifications are incomplete was introduced by Mr. Badger, director of higher education for Monmouthshire.

The relations between the various qualifying examinations were considered, and there was practical unanimity that matriculation should be a condition of entering the primary training departments of the three university colleges of Wales.

Mr. Humphreys Owen, M.P., chairman of the Central Welsh Board, presided over the fourth session, which was devoted to the "Special Aspects of the Problem of Secondary Training." Two papers were read, by Miss E. P. Hughes, late principal of the Cambridge Training College for Secondary Teachers, and Mr. Trevor Owen, Swansea, who acted as the official spokesman of the Association of Welsh County Schoolmasters. The conference was decidedly of opinion that secondary training should be post-graduate and completely differentiated from the degree course, but that the training college should be essentially attached to the university college. Representatives of the Association of Assistant Masters also addressed the conference and endorsed the views expressed by the readers of the papers.

There can be no doubt that the ultimate result of the conference will be far-reaching and beneficial. The interchange of ideas always makes for good, and it is not too much to hope that from the deliberations there may be devised a scheme which will be workable for all parts of the Principality, and will in time produce a supply of fully trained teachers of all grades, which, like her system of secondary education already established, will be a lasting and tangible proof of the enthusiasm of the Welsh people for education.

THERAPEUTIC BACTERIAL INOCULATION.¹

ALTHOUGH the majority of diseases are produced directly or indirectly by the invasion of microbes, it has come to be generally recognised that the soil in which they grow plays a cardinal part in determining the ultimate effect or fate of the microbe. The finding of a pathogenic microbe, and even the accessory disposing factors of a disease, are, however, after all only the beginnings of the greater problem which is the end and aim of all medical science, viz. the cure of the disease.

To attack the causal agent is manifestly a solution of the problem, and this was the method originally advocated by Lister, who may be regarded as the founder of the doctrine of the aetiological curative principle. Experience has, however, shown that the attempt to destroy by means of ordinary chemical poisons the microbes in the living body is fraught with danger, for long before the protoplasm of the microbe is destroyed the cells of the body are irreparably damaged. Internal antiseptic therapy is a thing of the past. To-day we must rely on the stimulus produced by bacteria in the body whereby the cells of the latter elaborate substances which are antagonistic to these same bacteria. These substances—germicidal in the widest sense of the word—differ considerably in their mode of action. Some neutralise the bacterial poisons, others produce a solution—a lysis—of the bacteria. In other cases, again, Metchnikoff claims that the destruction takes place by a kind of digestion in the interior of certain cells of which the chief representatives are the wandering corpuscles of the blood.

The inoculation of a living microbe for the purposes of prophylaxis dates from the time of Edward Jenner, whose work was widely extended by Pasteur. It is not even necessary to use living bacteria, dead bacteria being likewise capable of conferring immunity. In any case, with the exception of diphtheria antitoxin, previous attempts have aimed at prevention rather than cure. The authors of the papers before us are the first who have utilised bacterial inoculations as a curative agent. Dr. A. E. Wright, late professor in the Army Medical School, is already widely known for his method of the preventive inoculation against typhoid fever—a method which is admitted to have led to a marked diminution of this disease in the British Army. His most important work, however, has been the discovery of therapeutic inoculation. To introduce bacteria into an individual already infected with the same bacteria would at first sight appear to be a paradox, but the results obtained justify the means. By the invention of accurate methods of testing the effects produced in the body by the inoculations, Dr. Wright has been able to demonstrate that the elaboration of protective substances follows a general law, characterised at first by a negative phase and followed by a positive phase in which the protective substances in the blood are increased in quantity.

In a series of papers he has likewise shown that in so-called phagocytosis there is really a cooperation of the cells and fluids of the body, and that in the latter there are substances—opsonins—which in some way or other act upon the microbes and prepare them for subsequent destruction by the leucocytes. This opsonic type of immunity is applicable to a number of diseases, but the present researches show that the mere presence of these opsonins is not sufficient to induce immunity. They must be in the proper place and at the required time if they are to exert their action, and a great deal of art is required on the part of the inoculator to create the most advantageous conditions for his patient. The methods advocated by Prof. Wright are so new that it is difficult to foresee how far they may go, but the striking curative results obtained justify one in prophesying that the time is not so very far distant when the abilities of the physician will be judged by his successes as an immunisator, for it must not be imagined that

¹ "On the Action exerted upon the *Staphylococcus pyogenes* by the Human Blood Fluids, and on the Elaboration of Protective Elements in the Human Organism in response to Inoculations of a *Staphylococcus Vaccine*." By Dr. A. E. Wright and Capt. Stewart R. Douglas, I.M.S. (*Proc. Roy. Soc.*, September, 1904).

"On the Action exerted upon the Tubercle Bacillus by the Human Blood Fluids, and on the Elaboration of Protective Elements in the Human Organism in response to Inoculations of a Tubercle Vaccine." By the same Authors (*Proc. Roy. Soc.*, September, 1904).

immunisation consists in the subcutaneous inoculation of some mysterious bacterial fluid prepared in the laboratory. On the contrary, it is a complex process, and it is only with the help of accurate scientific measuring methods that the physician will be able to gauge whether he is helping or injuring his patient. B.

PALÆOZOIC SEED PLANTS.

IT may be doubted if those who are not directly concerned with the study of the vegetable kingdom appreciate the full significance of the distinction which the botanist maintains between plants of seed-bearing and spore-bearing habit. For this reason the recent and important discoveries proving that the seed-bearing habit existed among more than one group of Palæozoic vegetation, discoveries which will form a historical landmark in the study of fossil plants, may not attract the attention which is their due outside the circle of workers on recent and fossil botany.

The seed-bearing habit is, from many points of view, regarded as a far higher stage in plant evolution than that attained by any known member of the vegetable kingdom in which the fertilised megasporangium remains without any integument of the nature of a seed-coat. So far, the botanist has associated the seed habit with two classes of plants, the gymnosperms (Coniferæ, Cycadææ, &c.) and the angiosperms or flowering plants, and with these alone. It has not been suspected that members assigned to other groups, including the great race of vascular cryptogams (Pteridophyta), had at any period in their evolution attained to this high status. Yet such has recently been shown to be the case.

It is interesting to notice that these discoveries have been mainly due to the British school of palæobotany. Although it has been known for a long period that remains, obviously of the nature of seeds, occur here and there in the sandstones and shales of the Carboniferous period, Carruthers was the first to suggest, in 1872, that some of these fossil seeds may be attributed to the genus *Cordaites*, an extinct race, of gymnospermous affinities. This conclusion was subsequently confirmed by Geinitz, Grand'Eury, Renault, and other Continental botanists, who have greatly extended our knowledge of this Palæozoic type.

Until recently *Cordaites* has remained the solitary Palæozoic genus which was known to have attained the seed-bearing habit.

In 1901, however, Dr. Scott published a full description of a Carboniferous cone, *Lepidocarpon*, of undoubted lycopodian affinities, where integumented megasporangia are found when fully mature, and in which each sporangium contains a single embryo-sac. It has thus become clear that in the history of the lycopodian stock the evolution of seed-bearing members had taken place. More recently other evidence has accumulated which not only confirms this conclusion, but tends to show that *Lepidocarpon* did not stand alone among lycopods in this respect.

It is to discoveries still more recent of a similar nature, but affecting other lines of descent, that special attention may be directed. They are concerned with a synthetic type of Upper Palæozoic vegetation of great interest, which has become widely known under the name *Cycadofilices*. More than one genus of this group has now been shown to have reached the seed-bearing status.

The credit of the first discovery of this nature is due to Prof. Oliver and Dr. Scott, who recently published a full account of the seed and the evidence for its attribution in the *Philosophical Transactions* of the Royal Society. The more important conclusion of these authors may be briefly summarised as follows. It has been found that a seed, already recorded by Williamson as *Lagenostoma Lomaxi*, was borne by the fossil plant known as *Lyginodendron*. The two have not been found in continuity, but the evidence for this conclusion, although in the main indirect, is none the less conclusive. The chief point lies in the identity of the glandular structures found on an organ termed the "cupule," which envelops the seed, with those already known to occur on the stems, petioles and pinnules of *Lyginodendron*, which are peculiar to this genus among Carboniferous plants.

Within a few months of the earlier record of this re-

markable research by Prof. Oliver and Dr. Scott, their main conclusion was confirmed in an unexpected manner by the discovery, on the part of Mr. Kidston, of the seed of another genus of the same group, *Medullosa*, of which an account has also appeared in the *Philosophical Transactions*. In this case the pedicel of a large seed, of the type known as *Rhabdocarpus*, was found to bear pinnules identical with those of the frond *Neuropteris heterophylla*, the foliage of a *Medullosa*.

Here absolute continuity, an extremely rare circumstance among fossil plants, exists between a foliar and a reproductive organ.

Further evidence, but more inconclusive and indirect, also exists, but space forbids any notice here. Attention may, however, be directed to an interesting and suggestive communication published by M. Grand'Eury in the *Comptes rendus* during the present year on the same subject.

The discoveries under discussion have made it clear that at least two genera of the *Cycadofilices* possessed the seed-bearing habit, and evidence is also available which suggests that *Lyginodendron* and *Medullosa* did not stand alone in this respect.

Prof. Oliver and Dr. Scott have concluded that "the presence in the Palæozoic flora of these primitive, Fern-like Spermophytes, so important as a phase in the history of evolution, may best be recognised by the foundation of a distinct class which may suitably be named *Pteridospermæ*." This suggestion would seem to be a happy one, even though it may eventually involve the absorption of the whole group now familiar as the *Cycadofilices*.

In connection with these researches of Prof. Oliver, Dr. Scott, and Mr. Kidston, many further points of interest, and in some cases of criticism, might be discussed, but it must suffice here to direct attention to one or two valuable clues which these discoveries afford. The phylogeny of the cycads, a race with a great past, and still existing though in greatly diminished numbers, is in its main outlines now clear. There can be little doubt that the cycads are sprung from this same pteridospermous stock, which in its turn originated from a truly fern-like ancestor.

In the investing envelope of the young seed of *Lagenostoma*, which Prof. Oliver and Dr. Scott have spoken of as the "cupule," it is not improbable that homologies may eventually be recognised with protective structures existing among members belonging to other lines of descent, which may have great value as a contribution to other phylogenetic problems.

In conclusion, the existence of the seed-bearing habit among certain members of three out of the six great groups of Upper Palæozoic times raises the interesting speculation whether other groups may not eventually be found to have attained to the same status. The *Calamites*, the representatives of the *Equisetales*, are at present above any real suspicion in this respect, yet it would now be hardly surprising if further discoveries revealed the existence of seed-bearing members in this group, although it is by no means safe to assume that the seed-bearing habit must necessarily have existed in any group. E. A. N. ARBER.

ANTHROPOLOGICAL NOTES.

THE *Reliquary and Illustrated Archaeologist* for October contains, as is usual with this journal, interesting and well illustrated articles, among which may be noted one on "the funambulist," or rope-walker, by Mr. Arthur Watson; some Norman and pre-Norman remains in the Dove-Dale district, by Mr. G. le Blanc Smith; medallion portraits of Christ in the sixteenth century, by Mr. G. F. Hill; a carved bone of the Viking age, by Mr. J. Romilly Allen.

All who are interested in primitive technology will welcome the new instalment of Dr. Walter E. Roth's monograph on North Queensland ethnography. *Bulletin* No. 7 deals with domestic implements, arts, and manufactures, and is illustrated by twenty-six plates containing 250 figures. Dr. Roth not only describes the objects in daily use of the Queensland blacks, but, what is of very much greater importance, he usually describes how and of what they are made. Of especial interest and importance is his description of the manufacture of stone implements. He says:—