

yield large increases in the amount of ammonia and of nitrate.

This was followed by a paper by Mr. Goodey describing his investigations on the protozoa of the soil. The first forms investigated were the ciliated protozoa, particularly Colpoda. Evidence was adduced to show that this organism probably exists in the soil as cysts, though it must have had some active existence some time because of the large numbers in which cysts occur. Another investigation dealt with the effects of partial sterilisation on two old soils which had been stored in bottles for many years at Rothamsted, one since 1846 and the other since 1870. The 1870 soil behaves normally on partial sterilisation, giving an increase in bacterial numbers and also in ammonia and nitrate, showing that the limiting factor present in ordinary soils was also present in this soil; amœbæ and flagellates also occurred.

The 1846 soil, however, behaved entirely differently and showed the phenomena of a soil already partially sterilised; there was no evidence of any limiting factor being present, and no amœbæ, flagellates, or other protozoa could be found.

In the discussion that followed Prof. Gamble expressed the opinion that amœbæ and flagellates could probably be found in an active condition in the soil although the ciliates probably were not.

A third paper dealt with the nitrification in some pasture soils, and was presented by Mr. Gimmingham. It is known that nitrification is reduced to a minimum in pasture soils rendered acid by the continued use of ammonium salts as manure, and an investigation was therefore made of a soil intermediate in character between the true moor and the true fen soil. This contains 30 to 40 per cent. of organic matter and only traces of carbonate, but the water is neutral in action. The soil was found to be capable of bringing about rapid nitrification of peptone, a remarkable feature being the great amount of action directly the peptone was added. Ammonium sulphate also quickly nitrifies, but the soil in this case takes on a feebly acid reaction.

Prof. Bottomley described experiments in which peat was treated with certain aerobic soil bacteria, and then became converted into a blackish-looking powder of distinct manurial value. It was also stated that the substance conditioned fixation of nitrogen in the soil.

A paper was presented by Miss Taylor on the life-history of *Eriophyes ribis*. When *Ribis nigrum* is the host-plant the embryonic true leaves of the bud are attacked by the mite and the bud develops into a "big-bud." No injury is caused, however, to the foliage of the tree. The migration of mites from infested buds is carried out mainly by the wind. On the other hand, when *Ribis grossularia* is the host-plant the scales leaves of the bud only are attacked and no big-bud is formed. Apparently the mite cannot penetrate the true leaves of the bud, and injury is confined to the foliage. Distribution by wind is not general, migration being mainly due to the mite crawling from the infested bud to the expanding leaves.

Dr. Winifred Brenchley summarised her investigations on the weeds of arable land. On clay soils the weed flora is less rich in species than on light loam, and though several plants have a distinct preference for heavy land no species can be said to be symptomatic of clay, occurring on such soils and nowhere else. Sandy soils possess a much more characteristic weed flora, as they are colonised by a great diversity of plants, a number of which are distinctly associated with light soils. Such plants as spurry, corn marigold, sheep's sorrel, and knawel appeared to be characteristic of sandy soils which are deficient in chalk;

in other words, "sour" soils. Chalk provides a peculiar habitat for weeds, and the weed flora is very rich in species, some of which are markedly characteristic. There is evidence now that a distinct association exists between the species of weed and the soil in which they grow. This association may be local, when the weed is symptomatic of the soil in one district, but not exclusively associated with it in another. On the other hand, it may be general, when a certain species is symptomatic or characteristic of the same type of soil in different districts. The nature of the crop also plays a part in determining the weed flora.

A note was presented by Miss Armitage on the two varieties of corn spurry. *Spergula arvensis* is a rather frequent weed on the red sandy loam in Herefordshire, but the author never observed it in such development as to cause injury to crops. *Spergula sativa*, as she had seen it in Cheshire, is a terrible pest, causing marked injury both to roots and clover. It would be interesting to know whether this was always more harmful than *S. arvensis*.

The section concluded with a very interesting and important paper by Sir Richard Paget on the possibility of partnership between landlord and tenant. A form of agreement has been drawn up on this basis and was distributed at the meeting. An interesting discussion followed, which, however, is rather of general than of purely scientific interest.

PSYCHOLOGY AT THE BRITISH ASSOCIATION.

A SEPARATE Subsection of Psychology was formed this year at the British Association for the first time. The experiment was even more successful than had been anticipated. The general attendance was large and often crowded. Almost every experimental psychologist in Great Britain either attended the meetings or else sent or promised papers. The contributions received were so numerous that four meetings were held during afternoons.

The proceedings of the subsection opened on Thursday with a series of papers, for the most part philosophical in character. The first paper was one by Dr. Wildon Carr, upon "The Absurdity of Psychophysiological Parallelism even as a Hypothesis." Dr. Carr suggested that in considering the relation between body and mind, parallelism was not the only alternative to interaction; the relation might be solidarity of function, in which two independent realities are united. Mr. McDougall's paper upon laughter aroused especial interest. Taking the chief theories of laughter hitherto propounded, he claimed that they did not account for all varieties of laughter, and, further, that they did not even seek to answer the most fundamental problem, namely to what end did the human species acquire this capacity for laughing? The conditions exciting laughter he endeavoured to reduce to (1) situations that are mildly unpleasant, except so far as they are redeemed by laughter; (2) those things which would excite a feeble degree of sympathetic pain, if we did not actually laugh at them. The effects of laughter he described as consisting especially in an increase of the general and pleasurable sense of well-being. He added that the appearance of laughter seemed especially associated with the development of social life. From these considerations he argued that laughter proper (as distinguished from the smile, which in the adult has become secondarily associated with it) is a protective reaction which shields us from the depressing influence of the shortcomings of our fellow-men. Laughter, in short, is the antidote to sympathy.

In the afternoon Dr. Watt gave a careful exposition of "Some Main Principles of Integration." Prof. Carveth Read followed with an analysis of "The Conditions of Belief in Immature Minds." The chief relevant characteristic of the mind of the savage and the child, he pointed out, is the unusual influence of illogical inferences, or imaginations, and of non-evidentiary causes of belief. This characteristic depends upon (1) an unusual vividness of imagination; (2) an absence of exact knowledge as a standard; (3) an inability to make comparisons, either because of the influence of desires, or because of the imperfect development or education of the mind; the mind is consequently in a state of incoordination, and its beliefs form relatively isolated systems.

On Friday the subsection held a joint sitting with Section I (Physiology). In the morning Prof. R. M. Ogden (of Knoxville, Tennessee, U.S.A.) gave an account of "Some Experiments on the Localisation of Visual Images." The images were suggested by a series of fifty words. It was found that the images of memory tended to be located at their proper place and distance, while the images of imagination tended to be placed upon the disc fixated during the introspections.

Dr. Myers, described "Experiments on Sound Localisation," carried out in the sound-proof room of the new psychological laboratory at Cambridge. The sound was usually a fundamental tone of 200 vibrations, accompanied by overtones separately emitted; these were led into the sound-proof room by a tube ending in a movable funnel carried by a noiseless perimeter. In the end, timbre and loudness proved the only trustworthy criteria whereby his subjects localised the sounds; laterality and medial incidence, exploited at first, were eventually abandoned. Alteration in the intensity of the several overtones, and in the loudness of the whole sound, increased very distinctly the number of erroneous localisations. In the case of a medial sound, just as in the case of a lateral sound, the spatial (and, sometimes, tactual) impressions seemed illusory. In reality they appeared to be of auditory origin. And in each case the spatial experience seemed to be a cue leading to a head movement, whereby the sound is more correctly localised.

Miss E. M. Smith described a series of observations, carried out in the same laboratory, upon "Habit Formation in Guinea-pigs." The tests used—(1) labyrinth test, (2) a new sensory test discrimination test—formed part of a larger scheme to test inheritability of learning, &c., and incidentally brought to light hitherto unrecorded points of interest concerning the behaviour of guinea-pigs. Miss May Smith reported results yielded by tests of Bergson's two forms of memory. The correlations tended to show that rote memory is distinct from pure memory (recognition) and more closely allied to physiological memory or habit. Dr. Shrubbsall briefly discussed "The Relative Fertility and Morbidity of Defective and Normal Stocks." On examining the family histories of several thousand children, he found that the correlation between the size of the paternity and the number dead is much higher in defective stocks than in normal. In spite, therefore, of the notorious fertility of defective stocks, by adult age the disparity in size of family has, owing to higher morbidity, almost disappeared.

In the afternoon papers upon "Variations in the Spatial Threshold" and "A Simple Method of Demonstrating Weber's Law" were read by Mr. Godfrey Thomson and Mr. Shepherd Dawson respectively. Two important contributions to the study of fatigue were given by Miss May Smith and Mr. J. H. Wimms.

On Monday a joint meeting was held with Sec-

tion L (Education). The morning was chiefly occupied with a discussion of spelling. A full report of the proceedings has appeared in the account of the work of the Education Section (December 25, 1913, p. 491).

The appeal of Dr. Kimmins (chief inspector, L.C.C.) for educational research may be mentioned as of special interest and importance. In the afternoon Mr. Valentine gave a paper on the phonic method of teaching reading, Mr. E. D. Lewis upon analytic and synthetic methods in learning, and Mr. Burt upon the mental differences between the sexes.

On Tuesday the greater part of the morning was occupied with papers on tests of intelligence. Dr. McIntyre and Miss Rogers described "The Application of the Binet-Simon Scale to Scots Children," and Mr. Moore and Mr. Winch described some "Tests of Reasoning" carried out at Liverpool and London. Mr. Fox recounted a series of experiments upon "The Conditions which arouse Mental Imagery in Thought." Imagery, it was found, appeared to arise chiefly when thought was momentarily hindered or obstructed.

In the afternoon the president of the Economics Section (Rev. P. H. Wicksteed) appealed for a study of "The Psychological Basis of Economics." Mr. Pear followed with an "Analysis of Some Personal Dreams," and Dr. Brown with a discussion of "Psycho-analysis." Dealing with the psychological doctrines of the school of Freud, the afternoon's discussion perhaps aroused a more general interest than any other.

On Wednesday morning the chief feature was a couple of papers by Mr. Pear and Mr. Wyatt upon testimony. Mr. Pear described the chief "Modern Experimental Investigations of Testimony," and emphasised their legal significance. Mr. Wyatt described experiments upon normal and defective school children in Manchester and Liverpool. He found that normal children, when uninfluenced by cross-examination and the personality of the questioner, can give testimony of a high degree of accuracy, but of small range; the testimony of defective children differs in quality more than in degree, but the difference is not very abrupt.

The chief impression created by the meetings of the subsection was a sense of the great and varied activity now going on in the various psychological laboratories recently established throughout the country, and the eagerness of the public and of the Press to recognise the "new" science and to emphasise (often to over-emphasise) its possibilities of development. The interest in practical applications was marked. But it was equally clear that the applications already attempted themselves pointed to the urgent need of further work the character of which shall be more purely scientific.

CYRIL BURT.

ON THE HIGHEST UNIVERSITY EDUCATION IN GERMANY AND FRANCE.¹

IN the beginning of the nineteenth century Napoleon crushed the spirit and power of the Germans for a time, but the nation soon recovered from the blow through the stirring appeals which their great men, many of them professors in the universities, made to them, and their politicians and wise men, men of deep thought and strong will, deliberated earnestly in what way they could rescue their country from the depression under which it lay and restore it to independence and to a high place amongst the nations of the earth. They became convinced that one of the most effective means for this purpose was education, and

¹ From an address delivered at the University of St. Andrews on October 13, by Principal Sir James Donaldson.