

a tropical landscape, with a wonderful lawn of *Selaginella Kraussiana*, and forming the main feature in a four-sided series of smaller houses devoted especially to aroids, tropical dicotyledons, tropical orchids, other tropical monocotyledons, tropical ferns, various succulents, Cactaceæ—these last two forming a particularly fine collection—tropical economic plants, tropical water and marsh plants, Cape plants, subtropical Australian plants, and others; also a large temperature house and numerous culture houses. The museum contains a spacious herbarium and a number of fine exhibition galleries, including sections devoted to biology, systematic botany, palæobotany, plant-geography, and economic botany, also a section illustrating the products of the various German colonies. In addition there is a large lecture theatre, a laboratory, and a number of work-rooms. The whole forms a magnificent example of botanical organisation and enterprise.

On the following day opportunity was given for visiting the State School of Horticulture and the Biological Institute for Agriculture and Forestry, both adjoining the Botanic Garden.

An interesting and enjoyable meeting closed with a pleasant excursion on the Wannsee to Potsdam, arranged by the Union of Systematists and Plant-geographers. This included a visit to Sans-Souci and the Royal Park and Gardens under the guidance of Director Fintelmann.

A. B. R.

AN ENGLISH PHILOSOPHICAL CONGRESS.

ON Friday and Saturday last, June 24 and 25, joint meetings of the Aristotelian Society, the British Psychological Society, and the Mind Association were held at 22 Albemarle Street, London, at which subjects of wide philosophical and psychological importance were discussed before large and interested audiences. The discussions were based upon papers previously printed and circulated among the members of the several societies. On Friday afternoon the problem of "Instinct and Intelligence" was considered on the basis of papers by Messrs. C. S. Myers, C. Lloyd Morgan, H. Wildon Carr, G. F. Stout, and Wm. McDougall; Saturday morning was devoted to the discussion of the question, "Are Secondary Qualities Independent of Perception?" on the basis of papers by Messrs. T. Percy Nunn and F. C. S. Schiller; and the congress was brought to a close on Saturday afternoon with papers on the nature and development of attention, by Mr. G. Dawes Hicks; the "faculty" doctrine: outline of some experiments on school children in relation to this doctrine, by Mr. W. H. Winch; and some observations on the æsthetic appreciation of colour combinations, by Mr. E. Bullough.

I.—Instinct and Intelligence.

Dr. C. S. Myers maintained the view that instinct and intelligence are inseparable in all forms of mental activity, animal and human alike; that they are respectively the objective and subjective aspects of the same thing, viz. mental process in general and in its various particular manifestations; and that instinctive behaviour, while characterised by mechanism in its objective aspect, is from the point of view of the experiencing subject characterised by finalism. He criticised the two assumptions commonly made with regard to instinct as a form of mental process distinct from intelligence, viz. that in instinctive behaviour as such there is no awareness in the individual's consciousness of the end to be achieved, and that such behaviour is fixed and from the beginning perfect. He pointed out that an instinct is to be distinguished from a mere reflex or chain of reflexes by (1) a feeling of activity, and (2) a vague awareness of the result of the instinctive action *before* the action is actually performed, both characteristics being present in the very first manifestation of the instinct. These rudiments of conation and meaning are essential constituents of any activity deserving the characterisation "instinctive." Observations of instinctive activities in insects and other animals do not justify the view that such activities are "perfect the very first time," or that they

exhibit undeviating uniformity; "even ants are capable of learning from their elders," and this power is generally regarded as a sign of intelligence. The common view that man has few instincts compared with the lower animals is partly accountable for by the fact that "he is never aware that he is acting instinctively." His inner or subjective acquaintance with those activities pronounces them to be of the nature of intelligence.

Lastly, from the more general points of view of evolution and philosophy, the finalistic interpretation of the evolution of mind, and indeed of the entire universe, is the necessary complement and essential correlative of the mechanical interpretation, if our thought is to be saved from that pure abstraction—purposeless mechanism.

In conclusion, neither are instincts identifiable with reflexes, nor do they form a third class in addition to those of reflexes and intelligence. Summing up in Dr. Myers's own words:—"According to my view and my use of the words, instinct regarded from within becomes intelligence; intelligence regarded from without becomes instinct."

Prof. Lloyd Morgan agreed with Dr. Myers so far as to admit that the two factors, instinct and intelligence, "are present in the most intimate relationship throughout very nearly the whole range of animal behaviour as exhibited by those organisms in which the central nervous system has reached a sufficiently high level of development and differentiation to justify the use of the words 'instinctive' and 'intelligent.'" In his view, "the instinctive factors depend entirely on how the nervous system has been built up through heredity under that mode of racial preparation which we call evolution; intelligent behaviour depends also on how the nervous system has been modified and moulded in the course of that individual preparation which we call the acquisition of experience." (Dr. Myers suggested in the course of the discussion that this was genetic rather than psychological analysis.)

Prof. Lloyd Morgan illustrated his views by means of a somewhat detailed account of the experience of a young moorhen chick, and gave as a brief definition of instinctive behaviour, behaviour which is "practically serviceable on the occasion of its first performance," thus including within its scope reflex action so far as this is accompanied by consciousness. He also referred to the behaviour of the Yucca moth, and to the stinging of prey by the solitary wasps, as instances of instincts performed once only in the lifetime of the individual, where learning by imitation, &c., was impossible. He considered that the element of intelligence supervened in originally instinctive behaviour by the introduction of "meaning" through "factors of revival," though he emphasised the fact that "this is every whit as much the outcome of the innate potentiality of the moorhen as the originally instinctive performance." If instinct be identified with innate potentiality, all intelligent behaviour involves an instinctive element.

Mr. H. Wildon Carr considered the problem from the philosophical standpoint, and gave a detailed exposition of Bergson's views, which he supported by arguments for the most part metaphysical. He refused to identify natural dispositions or tendencies with instinct, and for this reason found himself unable to agree with Dr. Myers's view. He emphasised the contrast between the very complicated instinctive activities of ants, bees, &c., many of which cannot by any possibility have been learnt by individual experience, and the more pronounced cases of intelligence in man, and, reminding his audience that "instinct and intelligence are not observable facts, but interpretations," proceeded to show how the two terms represent two distinct lines of evolution of animal life, along each of which there is to be found no tendency towards evolution in the direction of the other. Along one, instinct evolves at the expense of intelligence; along the other, intelligence evolves at the expense of instinct. "The fundamental difference is one of kind, and lies in the mode of apprehension of reality, and the kind of knowledge that serves the activity of each. It is this essential difference that accounts for the degree of consciousness or unconsciousness, plasticity or fixity that characterises each, and not *vice versa*. . . . It is not a scientific but a metaphysical distinction, which rests on a criticism of the nature and limitations of intel-

lectual and instinctive knowledge." Intelligence is a knowledge of the relations of things, instinct is a direct insight into their inner nature. Bergson has employed the word "sympathy," in its technical sense, to represent this kind of knowledge. In Mr. Carr's view, mechanism and finalism are mutual contradictions, resulting from the limitations of merely intellectual knowledge.

Prof. G. F. Stout agreed with Dr. Myers, as against Prof. Lloyd Morgan, that every instinctive action as such is determined by intelligence, for the reason that the very first performance of an instinctive action involves intelligence. Adopting provisionally Prof. Morgan's own criterion of intelligence as "learning by experience," he showed that the learning must take place on the first occasion and not on the second (where the second is the presentation of a situation similar to that of the first, but to which the animal reacts in a different way owing to its previous experience). "On the second occasion the lesson is utilised; but in order to be utilised it must already have been learned." Unless there is mental reference beyond the immediate present there can be no intelligence, but such reference cannot be furnished by mere revival of past experience itself lacking reference. Conation, or the felt tendency towards an end, which, equally with the cognitive aspect, is present in the first performance of an instinctive act, forms the basis of attention and initiative which contributes to the "future reference" above-mentioned, and also definitely marks off instinctive action from merely reflex action.

Prof. Stout rejected Mr. Carr's view that instinct is a peculiar way of knowing, distinct from intelligence, his reason being that he could "find nothing in the instinctive behaviour of animals which cannot be accounted for by the combination of certain purely biological adaptations with psychical processes marked by intelligence fundamentally akin in nature to all other intelligence." He sided with Prof. Morgan against Dr. Myers in thinking that use of the term instinct should not be extended to cover all cases of inherited nervous organisation conditioning the development of intelligence, but that the word should be used "to mark off a distinct kind of connate endowment," viz. congenitally definite modes of behaviour; but he supplemented Prof. Morgan's criterion of definiteness (definite enough to be "practically serviceable on the occasion of its first performance") by saying that the congenital definiteness referred to was "a definiteness such as would require to be explained as the result of learning by experience or conscious contrivance, if it were not directly provided for by inherited constitution of the nervous system, as determined by the course of biological development." What non-instinctive congenital endowment provides for is "a special capacity for acquiring skill and knowledge," itself dependent on interest and retentiveness. It is marked endowment in this direction which distinguishes genius from ordinary ability.

In Stout's view, instinct "is mainly confined to animal life, and in the life of animals it has a two-fold function. On the one hand, it is a substitute for learning by experience. On the other, it has an educative value as a condition of learning by experience; it has this value inasmuch as it provides an animal with the experiences which are useful to it, and thus enables it to learn just what it requires to learn. In the case of human beings, this function of instinct is, in the main, superseded by instruction. All that either instinct or instruction can do is to supply appropriate experiences. How this material will be utilised depends on other factors."

Mr. William McDougall found himself for the most part in close agreement with Dr. Myers and Prof. Stout. He regarded instinctive processes and intelligent processes as of essentially similar nature, as involving the same fundamental modes of mental activity, but considered that "we can properly and usefully distinguish between mental processes that are conditioned wholly or mainly by innate dispositions on the one hand, and on the other hand such as are conditioned by dispositions that have been largely built up through the experience of the individual," and that "the words instinctive and intelligent may properly be used to mark this distinction." He objected to Stout's use of the designation intelligent for every process which is capable of producing modification of innately determined

modes of behaviour, even when such modification is not, as a fact, brought about. Intelligence is only operative when a modification is effected. Thus the Yucca moth, laying its eggs in the Yucca flower on a single occasion in its life, may be said to perform an act which is purely instinctive, having no admixture of intelligence. Prof. Bergson's view of instinct, presented by Mr. Carr, is not supported by the facts. The work of Dr. and Mrs. Peckham on solitary wasps has shown that instinctive activities are far from being perfect and invariable in nature, and that they may be combined with a (seemingly) high degree of intelligence. In *Ammophila* the capacity for acquiring and acting upon detailed knowledge of locality is found developed to an extraordinary degree. This development of intellect is all the more remarkable when we consider at what a disadvantage the higher insects are placed compared with the higher mammals in being deprived of all the advantages for training of the intelligence given by a period of youth (play, &c.).

Bergson's use of the term sympathy does not seem very appropriate or helpful in many actual cases of instinctive activity, e.g. that of the paralysing wasp.

Lloyd Morgan's view that the strictly mechanical interpretation of natural processes is the only one permissible to science forces him to the identification of instinctive action with compound reflex action, and causes him to ignore the extremely important conative character exhibited by the process.

The criterion of being "practically serviceable on the occasion of its first performance" is not sufficient to mark off instinctive activity from reflex action on the one hand, and from intelligent behaviour on the other.

The small part assigned by most psychologists to instincts in the development and functioning of the human mind is surprising and difficult to understand. Especially is this the case with regard to Prof. Stout's system of psychology, and its explanation would seem to be that Stout limits the application of the term instinct to forms of mental process expressed through innately coordinated motor mechanisms. "Now all our mental processes manifest themselves through the agency of preformed motor coordinations, innate or acquired. For Stout, then, as for me (McDougall), instinctive process can be marked off from other modes of behaviour only by reference to the origin of some part of its conditioning factors in the innate constitution of the organism. For Stout the innate factors by which it is marked off are the motor mechanisms only by which the mental process manifests itself in bodily movement; for me they are also and chiefly the innate disposition by which the whole instinctive mental process is conditioned." The specific conative tendency exhibited by each instinctive process is a far more important and characteristic feature of the process than the operation of innate motor coordinations. The only reason why Stout selects the latter rather than the former as the differentia of instinctive process is "because the more essential feature, the specific conative tendency, continues to reveal itself at all levels of mental development and throughout the life of the human mind, while the innate motor factor comes clearly into view only in instinctive processes that are relatively pure."

Another characteristic of purely instinctive activity which Stout has failed to note is the existence of an unmodified innate perceptual disposition which conditions the perception evoking the instinctive reaction. Such innate perceptual dispositions continue to be active in the adult human mind, though undoubtedly modified and differentiated through experience.

McDougall summarised his view of instinct as follows:— "A typical example of a purely instinctive action implies the existence in the creature's innate constitution of, first, a specialised perceptual disposition; secondly, a specific conative tendency that is excited when this perceptual disposition is played upon by the appropriate sense-impression; and, thirdly, some coordinated system of motor channels through which the conative tendency works towards its satisfaction. The three things belong together; each implies the other two; each can subserve the life of the organism or of the species only in conjunction with the other two; all three together constitute a functional unit which is transmitted as such from generation to

generation; and to such a functional unit of the innate constitution only, and to no part of it alone, and to no other fact or feature of the organic world, can, I submit, the name instinct be properly applied."

II.—Are Secondary Qualities Independent of Perception?

Dr. T. Percy Nunn maintained in his paper "(1) that both primary and secondary qualities of material bodies 'are really in them, whether anyone's senses perceive them or no'; (2) that they exist as they are perceived; and (3) that sensations, as mental entities exercising a representative function, need not, therefore, be postulated." He attacked the view that there are elements in experience (e.g. tooth-ache) whose being consists "only in being experienced," and these are therefore psychical in nature, showing how the (false) belief in their psychical nature arose. In place of this view he advocated a form of the theory of realism which he considered to be more consonant with the facts of science and immediate experience, and which involved the theses above-mentioned. He devoted much space to the consideration of the problems of error and illusion as they appeared from this point of view.

Dr. F. C. S. Schiller criticised Dr. Nunn's theory of realism from the point of view of pragmatism, and endeavoured to show that all his arguments were based upon pragmatist postulates. He also considered critically the senses in which the words *independent*, *extramental*, *reality*, had been used in the paper, and to what extent the theory advocated could be regarded as a metaphysical one.

III.—Psychological Papers.

Prof. G. Dawes Hicks criticised the views of attention which made it either, on the one hand, "a unique faculty" or "mode of mental energy" having presentations for its objects, or, on the other hand, a property of the presentations themselves regarded as independent and interacting with one another. He advocated the treatment of the problem of attention from the genetic point of view, and urged that the attempt should be made to form some conception of the conditions under which attention became possible in the primitive mind. After a consideration of the various factors influencing the attention process, such as feeling-tone, intensity of stimulus, &c., he traced the gradual growth of voluntary attention and indicated the relation of attention to willing and to the consciousness of self.

Mr. W. H. Winch discussed the value of the "faculty doctrine" in the light of experimental results obtained in the investigation of different forms of memory, accuracy, &c. The results of investigations into the transfer of practice effects, in which the method of "equal groups" was employed, were given, and were shown to prove slight transfer in the domain of memory, but none in that of accuracy, the improvement in the allied function being so small, even in the former case, compared with the improvement in the medium of training itself, as to make the balance of evidence against the "faculty doctrine."

Mr. E. Bullough described a series of observations made on a large number of individuals as to their preferences for colours, when seen in pairs, and the reasons given by the subjects themselves for such preferences. The two methods of (A) appreciation and (B) production were employed, and the material used was coloured silks. The subjects were found to belong to the following "perceptive types":—(a) objective type; (b) "physiological" type; (c) "character" type; (d) associative type. Definite relations were shown to exist between these perceptive types and the various criteria of preference or rejection of pairs of colours, such as "balance," "unification and dissociation," "consonance and dissonance," &c.

The societies dined together at the Criterion Restaurant on Friday evening, Prof. W. R. Sorley being in the chair. In the course of the after-dinner speeches the important suggestion was made by Prof. S. Alexander, and accepted with acclamation by the company, that the Aristotelian Society should strive to become the representative society of English philosophers, such as the Chemical Society, the Physical Society, &c., represent English science in those subjects.

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THE MOTION OF THE MOON.

THE *American Journal of Science* for June contains an interesting article in which Prof. E. W. Brown discusses possible causes for the want of agreement between the moon's observed motion and theory. In his second section Prof. Brown gives a summary of these outstanding discordances:—(1) a secular acceleration $2''$ greater than that due to the change of the eccentricity of the earth's orbit round the sun; (2) a term of 300 years' period and coefficient $15''$; (3) a term of 60 years' period and coefficient $2''$.

The secular acceleration is usually ascribed to tidal friction. Prof. Brown considers certain hypotheses as to the origin of the three-hundred-year term. He takes no further notice of the sixty-year term. It is quite possible, however, that the secret will be ultimately revealed by the term of shorter period, for if we assume that the forces required for the two terms vary as the coefficients and inversely as the square of the periods, it appears that the force required for the smaller term is the larger; moreover, the period of the sixty-year term is already known with a smaller percentage of error, and the next few years' observations will accentuate this consideration in its favour.

The fourth section of the paper lays down the fundamental rule which controls this detective problem. Any hypothetical cause must be dismissed from consideration that would produce a motion in either perigee or node above thirty seconds of arc in a century. Here Prof. Brown is at least as cautious as there is any need to be; he might have said fifteen seconds instead of thirty.

The sixth section dismisses from consideration the figure of Jupiter, the cumulative effect of the asteroids, and light pressure. Imperfections in the calculated theory seem to Prof. Brown inconceivable, and those who have followed his work will agree with him.

The seventh section raises the hypothesis of an equatorial ellipticity in the sun's figure. There is no direct evidence of such an ellipticity, and, moreover, it becomes necessary to assume that the period of rotation of the sun must be of a length that can be specified to its hundred-thousandth part. It is true that this period lies between the extreme values that have been determined from observation of the photosphere, and these values differ by six parts in a thousand but it is clearly a large assumption to take 1.00000 (five zeroes) as the true value of a quantity of which all we are entitled to say is that it probably lies between 1 ± 0.003 .

The eighth section deals with magnetic hypotheses. The discordance between theory and observation in the moon's motion is not due to the secular motion of the magnetic axis of the earth, but it is possible to frame hypotheses as to the moon's magnetism that cannot be dismissed as impossible.

The conclusions of the ninth section, dealing with the moon's libration, are very similar in character to those of the preceding section. Some hypotheses can be ruled out, for they involve librations that would have been already detected by observation, but other hypotheses remain tenable for the present, in particular a long-period libration of fifty seconds.

THE TRAINING OF ENGINEERS IN FRANCE.¹

IN a lecture published in the *Revue générale des Sciences* for April, M. André Pelletan compares the training of engineers in France with the similar training given in the United States, England, and Germany. He devotes himself more particularly to the courses of study provided for those intended to occupy the highest engineering posts.

In so far as the lecture deals with the courses elsewhere than in France, there is, naturally, little that is new in his paper, but his statement in regard to the training given in the *École polytechnique* will cause surprise to those not well acquainted with the work of that important institution.

It appears that students enter about the age of seventeen, as soon as they have passed the French equivalent for an English matriculation examination (the *baccalauréat*).

¹ "La Formation des Ingénieurs en France et à l'Étranger." By André Pelletan.