

International Congress of Psychology.

THE eighth International Congress of Psychology was held at Groningen on September 6-11. Nearly 250 psychologists attended. All appreciated the arrangements made by the national committee, consisting of Profs. Heymans (president), Wiersma, Roels (secretary), Brugmans (2nd secretary), Bouman, Buytendijk, Zwaardemaker, and the late Prof. van Wayenburg, and especially by the local reception committee. On the social side, concerts and other entertainments and excursions were arranged, and the reception by the Municipality of Groningen in the Stadspark was a brilliant function.

More than eighty papers were read. Mention may be made of a symposium on intensity differences of sensation, which was opened by Dr. C. S. Myers (London), and Prof. Werner (Hamburg).

Dr. Myers showed how the study of spinal reflexes contributed to our knowledge of intensity differences. As the strength of a stimulus increases, not only does each muscle contract with greater vigour, but *additional* muscles are also brought into play. Moreover, when the stimulus becomes strong enough, the original reflex may be suddenly transformed into another. Thus if the skin between the pads and cushion of the dog's hind foot be pressed or stretched in the spinal animal, the leg is reflexly *extended*. But if the stimulus becomes sufficiently powerful, this reflex changes into one totally different, and the leg is reflexly *flexed*. Instead of inducing contact with the stimulus-object, the stimulus now evokes escape from it. Instead of being, as before, related to the act of walking, the reaction now has reference to that of flight. The sensation passes from one of touch to one of pain. Corresponding to such an abrupt change in type of reaction, the whole pattern of events in the spinal cord must be supposed to undergo an equally abrupt change. The evidence thus points to sensational intensity being in actual experience inevitably an impure variable. Just as with increase of a reflex stimulus the latter spreads to other reflexes, so, as we increase the strength of a tonal stimulus, new sensations inevitably arise; it alters not merely in intensity but also in timbre. It is indeed seldom, if ever, possible that a stimulus is so weak (or so pure) as not to affect mixed sensory elements.

Yet another feature of reflex action is that, when a stimulus provokes reflex flexion of a limb, it simultaneously inhibits antagonistic reflex extension of that limb. If proven applicable to the sensory field, this means that increase of one sensation is accompanied by decrease of an opposite sensation, *e.g.* warmth and coolness, red and green, blue and yellow, white and black. In the white-black pairs there is even a gradual transition from one pure pattern to the other pure pattern through every degree of admixture. It is therefore not surprising that so much discussion has been evoked as to whether changes in the white-black series of sensation are to be regarded as changes in quality or in intensity of sensation. The true answer is that both are inevitably simultaneously changed; or, as Dr. Myers long ago pointed out (*Brit. Journ. of Psychology*, Oct. 1913), intensity differences may be regarded as neither qualitative nor quantitative, but strictly *sui generis*, *i.e.* intensive.

Prof. Spearman (London) communicated some results obtained from his well-known doctrine of noegenesis, according to which all cognitive operations can be analysed into a system of ultimate laws and

processes. These processes were sharply divided into two kinds, the insightful and especially the *eductive* processes, and those which are merely *reproductive*. Thus in the study of individual differences of ability, all current tests of intelligence may be analysed into their eductive and reproductive constituents. The former has shown itself to involve one single general factor, and if anything is to be given the title of 'general intelligence,' it can be nothing else than this. As for the other or reproductive kind of process, this has proved to be wholly independent of the general factor. Thus eduction and not reproduction is the only trustworthy basis of a successful mental test. In the same way the operations involved in the so-called learning by trial and error admit of analysis into the two kinds of constituents, eductive and reproductive, and are far from being 'mechanical,' as generally supposed. The topic of error is another field illuminated by this doctrine. An exhaustive examination of every sort of belief that can unquestionably be regarded as erroneous—from the highest chains of reasoning down to the merest tricks of illusion—every one of them prove to rest primarily upon the law of retentivity and the process of reproduction. All purely noegenetic processes are incapable of error in the slightest degree.

The doctrine of noegenesis also enables the whole range of cognition to be surveyed, and such ancient 'faculties' as 'memory,' 'imagination,' 'attention,' and so forth, as well as such modern ones as 'the power of censorship' or 'keenness in breaking up a complex'—always resolve themselves without the smallest remainder in terms of ultimate psychological laws.

Demonstrations were given by Dr. Godefroy (Amsterdam) on the principles of electrotachography. His method of investigating the psychogalvanic reflex is essentially the transformation of the galvanogram obtained by the Veraguth-Waller method into its first differential or speed curve. Into the circuit which is led through the person tested, the primary coil of an alternating current transformer has been introduced, while the secondary is connected directly with the galvanometer. Thus whenever a change of intensity of the primary current takes place the galvanometer shows a deflexion, and the ordinates of the curve obtained are proportional to the rapidity of the changes in intensity of the primary current. There is also the advantage that the galvanometer returns to zero after each tachographic deflexion. There is, however, at present considerable difference of opinion as to the cause of the psychogalvanic reflex. Dr. Godefroy's experiments lead him to support the hypothesis of the emotional genesis of the phenomenon. Dr. Aveling (London), however, after elaborate experimentation, concludes that the psychogalvanic phenomenon is characteristically the consequent of conation.

Several interesting exhibits and demonstrations were given of various apparatus, designed by Prof. Zwaardemaker of Utrecht, which are well-known to psychologists and to nose and ear specialists, namely, various kinds of olfactometers, an apparatus for demonstrating the presence of odorous molecules in the air, etc.

Prof. Zwaardemaker has recently designed an apparatus for the reinforcement of speech on behalf of the deaf by audions and thermotelephones. The choice of the microphone, the valves and the transformers is a matter of knowledge of modern radio

telephony, but Zwaardemaker, not content with subjective listening at the thermotelephone, secured objective measurements by employing the Rayleigh principle of the acoustic mirror.

In conclusion, the records of the Congress point to activity along lines already initiated, and there

was little evidence of the breaking of new ground. Thus the researches of the 'configurationists, useful as they are, as a contrast to the work of some 'atomists,' could yet be assimilated by many outside their camp without sacrificing any psychological principles.
L. W. J.

Coal Blending.

THE gradual exhaustion of the more easily mined seams of coal in Great Britain, and other factors which are resulting in increasing costs of mining and transport, are combining to focus attention on the necessity of employing more scientific methods in the preparation and utilisation of coal. In coal carbonisation, the main object of the coke oven is to produce coke possessing the special properties required by the metallurgical industries; whereas the chief aim of the gas industry has been to manufacture gas of the quality required for domestic and industrial purposes, and coke as a secondary product has not received the attention it deserves. The possibility of producing coke with the qualities desirable in a solid smokeless fuel for domestic use is now being realised, and coke quality and structure are consequently being given much more consideration.

Many attempts have been made to manufacture a solid smokeless fuel, containing a comparatively high percentage of volatile matter, by the carbonisation of coal at low temperatures; and satisfactory products have been obtained, but the costs of the processes have been so great that it has not yet been possible to establish them on a sound commercial basis.

In high temperature carbonisation processes, largely on account of the low thermal conductivity of coal, the charge adjacent to the retort walls is fully carbonised before any marked decomposition of the coal in the centre of the charge has commenced. The exposure of the coke to high temperatures for long periods, and the small amount of volatile matter, both operate in the direction of rendering the product difficult to ignite. The work of numerous investigators, however, has led definitely to the conclusion that these are not the only factors which influence the quality of coke as regards relative ignitability, combustibility, and reactivity. Other factors of importance include the character of the coal carbonised, the state of division of the coal, the method, speed, and duration of heating and the temperature of carbonisation.

The character of the coal to be carbonised may be controlled by grinding and mixing coals of different coking properties with one another or with coke breeze or other substances, in predetermined proportions. The main effects of efficient blending are more rapid heat penetration of the charge and the production of a harder and more easily combustible coke. The method, speed, and duration of heating are largely determined by the design of carbonisation plant.

In a recent paper to the Iron and Steel Institute,¹ Mr. David Brownlie presents a useful survey of the subject of coal blending; that is, the mixing of coals with one another and with other carbonaceous materials, such as low temperature fuels, coke, pitch, etc., especially in connexion with carbonisation. A summary of the paper is not attempted in this article, since the paper, although extending to forty-two pages, is in itself a summary, and the titles of the sections alone occupy more than one page.

Some coking coals are so constituted that they do not require blending for the production of good high temperature coke, but the amount of coal of this type is limited. Scientific blending would render many more coals available for use in the carbonisation industries. It must be emphasised, however, that the blending of coals on a commercial scale requires close attention, as the correct blend for a particular process and temperature of carbonisation would not necessarily be suitable for other processes or temperatures. Other factors, in addition to the amounts of resinous material in the coals constituting a blend, must also be taken into account. For example, the investigations of the Joint Research Committee of the University of Leeds and the Institution of Gas Engineers have shown that the degree of fineness of the coal carbonised exerts important influences. Further, the work of C. B. Marson and J. W. Cobb has demonstrated that the character of the coke may be influenced considerably by the nature of the ash constituents. Iron oxide, calcium oxide, and sodium carbonate have marked beneficial effects, but certain other substances examined were apparently inert.

The application, on a commercial scale, of the results obtained in laboratory investigations of coal blending presents certain difficulties. In addition to the installation of grinding and mixing machinery, increased bunker capacity would be required. It would also be necessary to ensure that only small variations in the quality of coal from a particular colliery occurred in different consignments. The advantages obtained by blending must also compensate for the additional cost of the preparation of the blends; and in this connexion it must be pointed out that the depreciation of grinding machinery, when coke is one of the constituents of the blend, may be considerable.
A. PARKER.

¹ Coal Blending. A General Review of Principles as Applied both to High and Low-Temperature Carbonisation, by D. Brownlie. Iron and Steel Institute, June 1926.

Physical Phenomena and Molecular Orientation at Interfaces.

THE behaviour and properties of interfaces were discussed at a conference arranged by the Faraday Society on October 1. The subject is of fundamental importance in the science of colloids, and it is only by a better appreciation of the former that we can hope to unravel the peculiarities of such complex systems as are to be found in natural colloidal materials. The liquid-gas and liquid-liquid interfaces are more simple than those containing a solid surface, since liquids present equipotential surfaces. There is little doubt that the concept of a unimolecular layer

of orientated molecules as constituting the surface layer of an insoluble oil on the surface of water is correct, and many investigations are being made on the conditions of formation and stability of these orientated, two-dimensional systems in their solid, liquid, vapour, and gaseous states of aggregation. All the usual three-dimensional phase phenomena, such as allotropy or the process of vaporisation, have been shown to have their two-dimensional prototypes. For soluble substances the surface composition can only be calculated by means of the Gibbs' equation, a