The Oudtshoorn Meeting of the South African Association for the Advancement of Science.

THE twenty-third annual meeting of the South African Association for the Advancement of Science was held at Oudtshoorn on July 6-11, 1925, under the presidency of the Right Hon. General J. C. Smuts. The meeting was well attended, eighty papers were read, and there was a number of exhibits. Joint meetings of sections were held for Prof. C. G. S. de Villiers' demonstration of Rudolf Martin's anthropometrical instrumentarium and for Prof. H. B. Fantham's paper on "Some Factors in Eugenics, together with Notes on some South African Cases." After the conclusion of his presidential address, Gen. Smuts presented the South Africa Medal and grant to Dr. R. B. Young, professor of geology in the University of the Witwatersrand. A popular lecture on "Fossilised South Africans" was given by Prof. R. A. Dart, and a public lecture on "Thomas Henry Huxley, his Life and Work" (in honour of the centenary of Huxley's birth) was delivered by Dr. Annie Porter. There was a reception by the Mayor and Mayoress of Oudtshoorn and visits to various places of scientific interest in the neighbourhood.

The president of the Association, General J. C. Smuts, gave as his presidential address, "South Africa in Science" (see *NATURE*, August 15, p. 245). He pointed out the desirability of a South African, as opposed to a European, point of view in science. Using the Wegener hypothesis of continental drift and Darwin's hypothesis of a southern and not northern origin of the fauna and flora of Africa, the relations of South Africa with other southern land masses were traced, its affinities being rather with South America, India, and Australia than with the northern hemisphere. The peculiar Cape flora appears to be rather a survival of the great flora of a southern hemisphere than the remnants of one of northern origin. The geology of South Africa is paralleled, both now and in Mesozoic times, with that of South America. The same applies to zoology. In palaeontology there is more need for comparative study. Meteorology and climatology were considered, and the need for an Antarctic meteorological station for South America, South Africa, and Australia was indicated. The address concluded with a plea for the encouragement and Government recognition of research.

The presidential address to Section A was delivered by Mr. R. J. van Reenen on "Development of Irrigation in the Union of South Africa." The development of various phases of irrigation, irrigation legislation, and the institution of irrigation districts were considered. The rôle of the State in relation to irrigated land settlement was discussed, and it was urged that the State should settle irrigable land and privately owned land in excess of the owner's ability to cultivate. State loans, the growth of capital invested in irrigation, and the need for providing settlers were mentioned. Further necessary developments were noted, such as improved marketing facilities, encouragement of co-operation, and provision of factories for utilising raw products. The need of systematised water storage and its value to the stock farmer was emphasised, and a plea for more economic use of water generally was advanced.

"Soil Formation and Classification" was the subject of Dr. B. de C. Marchand's presidential address to Section B. The origin, properties, composition, and distribution of soils were discussed. The rôle of hydrolysis in soil formation was indicated. The degree of reaction, fate of the products, admixture and influence of organic matter, residue of plant growth, all determine the nature of soil. Climate as the deter-

minant of the rate and nature of mineral decomposition, and the transference of substances from one layer to another, were discussed, and also the effect of arid and high rainfall conditions. Climatic soil types in the Transvaal and the influence of climate and rainfall there on soil formation, where the soils are largely endodynamomorphic, were fully treated. The general tendency is to the formation of lateritic types of soil. One important European soil-forming factor, earthworms, is absent from the Transvaal. The fundamental classification of soils of the country is an essential preliminary to a systematic agricultural survey.

The president of Section C, Mr. E. Parish, dealt with "Problems in Agriculture in South Africa," more from the point of view of scientific agriculture than agricultural science. The adoption of mixed farming was advocated as of primary importance, the present system of crop production being compared with what occurred in the United States when land was plentiful and soil depletion and spoliation ensued. Conservation in South Africa is essential. Farming can be intensified by increasing production per unit of labour and by the supply of agricultural machinery at lower rates. Farming under irrigation was considered and the need of suitable crops in irrigated areas indicated. Technical education is a necessity for farmers, and specialised technical training is required for different sections of farming. Provision for agricultural research, freed from routine and administrative work, was urged.

Prof. J. E. Duerden, president of Section D, took as his subject, "Genetics and Eugenics in South Africa: Heredity and Environment." The special problems of South Africa in relation to heredity and environment in connexion with human beings and domestic stock were outlined. Hereditary constitution and environmental influences are both important, and change in one affects the other. In agricultural stock, blood improvement is going on, but better conditions of maintenance are necessary. Variations in parts of ostrich plumes and merino wool show the diversity resulting from differences in nutrition, though from the same germ plasm. The limitations of germ plasm and environment were discussed. The interactions of the white race and the Bantu were considered; "indigent" whites were regarded as products of unfavourable environment and the presence of the primitive native. The rôle of the white races in South Africa was considered to be that of a benevolent aristocracy of ability. The extreme importance of genetics and eugenics to South Africa was emphasised.

"The Present Position of Anthropology in South Africa" was the presidential address to Section E, delivered by Prof. R. A. Dart, who pointed out that in South Africa every one is bound to have anthropological interests. A brief historical résumé of the discoveries at Boskop, Oldaway, Broken Hill, Zitzikama, and Taungs showed that the negroid is not the primitive South African stock. The various fields of anthropological study in South Africa were noted. Philology needs attention in view of numerous native tongues, official bilingualism, Arab, Malay, and Asiatic populations. Ethnology needs much study, as do also native music and arts. Physical anthropology deserves attention in order to obtain an understanding of the laws that govern racial divergence. The address concluded with an appeal for fostering and retaining an African and not a European outlook in regard to African problems.

Prof. H. A. Reyburn chose "Psychology and

Grammar" as the subject of his presidential address to Section F. He discussed language from the psychological point of view, showing that in grammar, confusion arises between the mechanism of the language and the function that mechanism fulfils. Accidence and syntax, considered psychologically, break down these distinctions. The definitions of some of the parts of speech were discussed and their unsatisfactory nature demonstrated. The conception of different grammatical categories, with reference more especially to the work of Jespersen, was critically examined. Language as applied logic was discountenanced and a plea made for the psychological study of language. A suggested scheme for the re-study and re-writing of grammar was outlined.

It is only possible to note briefly the interesting papers and exhibits given before the various sections.

In Section A, Prof. G. H. Stanley gave a paper on a method of determining the relative resistance of paving materials to wear by subjecting flat pieces of equal area of the various materials to the grinding action of horizontally rotating steel discs. Mr. R. J. van Reenen gave an account of the apparent regularity of wet and dry years in South-West Africa, a series of dry years occurring at thirty-five years' intervals, coinciding with the Brückner cycle. Dr. J. Schonken discussed effective rainfall. A paper by Mr. A. G. Hoyer dealt with star streaming and the structure of the universe.

In Section B, Dr. B. de C. Marchand and Mr. C. R. van der Merwe gave an account of the fractions separated by mechanical analysis from some Transvaal soils, the differences between the clays from the red and black soils being determined. Mr. W. Torrance described a prehnite vein in the dolerite at Grootfontein, Middelburg, C.P., due to percolating waters depositing their load in a fissure in the dolerite. Mr. G. Ingham contributed a paper on the relative availability of phosphatic fertilisers on acid and non-acid soils, this being generally low on acid soils and high on non-acid ones. A note on the banded ingredients of South African coal was given by Prof. J. A. Wilkinson. Mr. B. J. Smit and Dr. T. J. Naude gave a paper on fumigation with liquid hydrocyanic acid, and Mr. E. George presented papers on phenol 5-methyl-isatein, phenol phthalamein, phenol umbellein, and resorcinol umbellein, and on the preparation of umbelliferone.

In Section C, Dr. E. M. Robinson described the bacteria of the *Clostridium botulinum* C type and their distribution, with notes on his work on lamsiekte. Mr. J. F. V. Phillips gave an account of the ecology of *Platylophus trifolius* as seen in the Knysna forest. Mr. L. Verwoerd described some South African Hymenogastraceæ. Prof. P. A. van der Bijl described some new South African fungi and also gave a preliminary report on the fungi of the Knysna district in his herbarium. A paper on the retardation of the ripening processes of pears at high temperatures was contributed by Dr. F. J. de Villiers, who finds that 30° C. appears to be the optimum for ripening. Mr. J. F. V. Phillips contributed a paper on plant phytometers and the use of indigenous tree seedlings in this capacity in practical forestry. Mr. A. Stead presented a note on the fructifying action of heat on the pineapple; so many as twenty small fruits have been obtained from one plant. Dr. F. J. de Villiers discussed the differential freezing of pear tissues, and Miss E. Stephens demonstrated the plants obtained by her from cultures of dried mud.

In Section D, Prof. H. B. Fantham gave an account of some more parasitic Protozoa found by him in South Africa, including herpetomonads from new molluscan hosts and flagellates from various veld

rodents that transmit plague. The interesting ciliate, *Discomorpha*, has been obtained from the intestine of a horse. Prof. E. H. Cluver gave a paper on cardiac mortality in Johannesburg and at the Coast, showing from statistics that such mortality in Johannesburg, despite its altitude, is less than at the Coast. Miss N. F. Paterson summarised her experiments on the effects of differences of hydrogen-ion concentrations on the development and longevity of certain mosquito larvæ. Prof. J. E. Duerden and Mr. V. Bosman gave an account of their biometric analysis of wool fibres, establishing the proportion of various sizes of fibres in a staple. Prof. E. Warren dealt with amitosis and fragmentation of nuclei in the development of the spider, *Palystes*, in which four types of chromosomes occur. Prof. C. G. S. de Villiers gave an account of recent researches on the breast-shoulder apparatus of certain Anura, both living and extinct. Prof. R. W. M. Mettam gave a note on the occurrence of a muscle of doubtful origin found by him in the foot of a horse. Mr. H. H. Curson notified the occurrence of *Trypanosoma vivax* in Bechuanaland, this being one of the three parasites of nagana. The histology of the lining of the stomach of the ostrich was described by Miss G. T. Brock. Prof. A. J. T. Janse described the anatomy of a gynandrous form of the butterfly, *Precis sophia*. Mr. J. F. V. Phillips gave an account of the natural history of the herd of Knysna elephant. The locust-fungus, *Empusa grylli*, and its effects on its host were described by Dr. S. H. Skaife, who finds that the epidemic among the locusts stops on the cessation of the rains. Dr. F. G. Cawston gave a note on the radulæ of some fresh water molluscs. Prof. C. G. S. de Villiers gave a demonstration of Rudolf Martin's improved instrumentarium for anthropometrical investigation. Prof. H. B. Fantham and Miss N. F. Paterson reported on their further work on the Protozoa of certain South African soils, in which the seasonal variation in the protozoal fauna of waterlogged soils and those of waterlogged soils from mining areas were noted, as were various environmental effects. Prof. Janse gave a paper on the systematics of the Lepidoptera. Dr. Annie Porter reported that *Limnæa truncatula* serves as an additional host for *Fasciola hepatica* in South Africa.

A joint meeting of Sections C, D, E, and F was held for a paper by Prof. H. B. Fantham on "Some Factors in Eugenics, together with Notes on some South African Cases." Selective birth-rate and selective death-rate, differential birth-rate in different strata of society, and racial admixture were discussed, and notes on some cases of inheritance of certain well-marked physical and mental characteristics and of the results of racial admixture were given.

In Section E, Mr. C. van Riet Lowe gave an account of the kinds and distribution of stone implement workshops in the Orange Free State. Mr. A. J. H. Goodwin discussed the Capsian affinities of the South African later Stone Age culture; he considers that the Smithfield and Pygmy industries in South Africa are culturally the same as the North African Capsian one. Prof. R. A. Dart described the round stone culture in South Africa. An exhibit of copies of numerous Bushman paintings from the Kei River was arranged by Brother Otto, and Prof. E. H. L. Schwarz exhibited tracings of Bushman paintings from the Clanwilliam District. Mr. J. Hewitt's paper dealt with stone implements from various sites in the Cape Province, representing different cultural developments. Prof. Dart gave a note on Makapansgat, where beds of fragments of fossilised bones, too small for identification, occur. Mr. G. D. Laing gave a further report on the Zitzikama material and described another skeletal find in an ancient Rooiberg

mmeworking. Mrs. J. D. Laing contributed remarks on the temporo-mandibular region in the Boskop, Strandlooper, Bushman, and negro peoples. Anthropometric measurements of the skeleton of the Boskop race were given by Mr. H. S. Gear, and the brain of the Boskop race was discussed by Prof. Dart, who also exhibited casts of the Taungs skull and a Boskopoid skull obtained by Prof. M. R. Drennan from a subject in his dissecting-room at the University of Cape Town. Miss E. Dora Eathly gave a paper on the rôle of the father's sister among the Va-Lenge of Gazaland. Mrs. A. W. Hoernlé discussed the sib in Southern Bantu marriage ceremonies, showing the deep-seated nature of the relation of the sibs and their relation to lobola, which involves the contracting parties, the sibs, and the ancestral spirits. Mr. E. C. Randell described a supernumerary molar tooth in a Bantu. Mr. H. Q. F. Thompson described the custom of amputation of part of one of the fingers by the Zulu-Xosa groups of Bantu. Mr. G. D. Laing gave an initial report on somatometric investigations among the natives recruited for the Witwatersrand. Mr. C. Dawson described the Neanderthaloid foot of the Zuurberg Bushman. Father Huss and Brother Otto discussed the origin of Bushman paintings at the Kei River. Mr. I. Schapera gave a paper on stylistic affinities of Bushman art, stating the criteria for comparison of

Capsian, North African, and Bushman art. Mr. F. R. Paver traced Asiatic influence on early South-East African development from various records. Mr. S. Zuckerman gave a note on a superficial scraping of the floor of a rock shelter in the Cape Midlands.

In Section F, the normative character of ethics was discussed by Prof. G. H. T. Malan. Mr. C. Graham Botha gave a paper on the distribution of South African fauna in relation to place-names, indicating the former distribution of animals now extinct. He also described social customs in South Africa during the eighteenth century, such being influenced both by Holland and the East Indies. Prof. R. D. Nauta gave a paper on the Spanish Cid. Dr. F. G. Cawston gave notes on some removable causes of unemployment and crime. Mrs. C. G. Botha described some minor experiments in the unconscious. Dr. A. Barradas gave statistics of mortality in Lourenço Marques for the past seventy years. Mrs. Mabel Palmer traced the evolution of the organisation and technique of adult non-vocational education. Mr. C. S. Richards gave a critical paper on the Kammerer-Vissering Report and the position of the Reserve Bank, the proper function of which was outlined.

The next annual meeting of the Association will be held at Pretoria, under the presidency of Dr. E. T. Mellor, in July 1926. H. B. FANTHAM.

Transmission of Power.

AN interesting analysis of the problem of the transmission of power is contained in a paper read by Mr. G. Constantinesco before the North-East Coast Institution of Engineers and Shipbuilders on December 4. The author is well known in engineering circles as the inventor of the method of transmitting energy by "wave transmission," in which the liquid does not circulate. He formulates the following fundamental laws governing any transmission of power: (1) Energy can be transmitted from one point to another only at the expense of a definite loss. (2) There is a minimum loss in any given system or method of transmission which cannot be decreased by any conceivable improvement in the system. (3) The transport of energy is possible only by circulation or oscillation, and there is a minimum amount of matter necessary for such transport. Such minimum is also independent of present or future methods of transmission, and depends only on the amount of energy, distance of transport, and change of form of the energy.

There are three broad classes of systems of power transmission, namely, mechanical, fluid, and electric. The author takes a few random problems of power transmission and first shows that the efficiency curve for any electric system can be drawn irrespective of the particulars of the transmission considered. The curve appears as an invariant when the units of measure are taken as the minimum possible loss and the critical voltage for which this minimum loss occurs. He then gives a lengthy investigation of hydraulic transmission and shows that the whole curve of efficiency is also an invariant, and that once the maximum "peak" possible efficiency is known, the whole behaviour of the transmission can be predicted. There is a handicap to high efficiencies in fluid transmissions owing to the unavoidable loss in changing the energy abruptly from one form to another. Thus, if the energy is available at the shaft of a prime mover in the form of a rotating torque, the transformation of this into hydraulic energy is accompanied by a definite loss, which is independent of the means by which the transformation is made.

The peak efficiency of transformation depends only on fixed constants defining the fluid itself. The same conclusions are reached in the transmission of energy by use of gases.

The efficiency curves for electric, hydraulic, and gas transmissions show the same fundamental property, namely, they are invariables of very nearly the same shape.

Experimental data regarding mechanical systems are not complete, but Mr. Constantinesco thinks that the figures would not be very different from those relating to electric and hydraulic transmissions. Peak efficiencies of a very high order are found to-day only in mechanical transmissions. There is an absolute limit to the possible peak efficiency which the author is inclined to think has already been reached in some mechanical transmissions such as link motions, gear wheels, and the like. Efficiencies of the order of 95 per cent. are practical possibilities for almost any sound mechanical transmission of moderate power when carefully designed. Hydraulic and electric transmissions may be credited with 85 per cent. This small difference in peak efficiencies is sufficient to make a relatively important difference in average efficiencies. From the efficiency point of view alone, there appears to be no doubt that mechanical transmissions are superior to electric or fluid transmissions, and if the latter can replace in certain cases mechanical transmissions, it is only from the point of view of convenience.

With one single exception, in each field, electric, fluid, and mechanical, rotary power cannot be transmitted from one point to another except by periodic or intermittent impulses. The exception is when the power is transmitted through a material body rotating at uniform speed and transmitting a constant torque along its axis of rotation. A more general statement of this *postulatum* is: "Any transmission in which the output energy differs in shape from the input cannot be accomplished without the power being transformed at one stage or another into periodic impulses." The author considers that the relations which are the basis of electric current theory form the