

Southampton Meeting of the British Association.

PROVISIONAL PROGRAMMES OF SECTIONS.

FROM the local arrangements outlined in our issue of August 15, p. 251, and from the provisional programmes of the sections, it is evident that all who attend the Southampton meeting of the British Association will find that the time is very fully occupied. The brief statements below of outstanding features of some sectional programmes, for which we are indebted to the respective recorders, will serve to indicate the fare which is to be set before the members of the Association.

SECTION A (MATHEMATICS AND PHYSICS).

The programme of Section A (Mathematics and Physics) presents some interesting and novel features. Under the presidency of Dr. G. C. Simpson, Director of the Meteorological Office, the subject of meteorology will naturally receive considerable attention, which is in keeping with the great present-day importance of this branch of science.

The business of the Section opens on Thursday, August 27, with a paper by Prof. Orstein of Utrecht, foreign guest of the Association, on the quantum theory of dispersion; he will be followed by several speakers on subjects in spectroscopy. The presidential address on Friday on the new ideas in meteorology will demonstrate the great strides which have been made in the subject in the last decade. The president will be supported by the leading meteorologists in Great Britain, several of whom have promised papers to which the Friday and a portion of the Tuesday sessions will be devoted. On Monday, August 31, there will be a joint discussion with Section C (Geology) on "Variations in Gravitational Force and Direction and its Relation to Geological Structure," a subject upon which a committee of the Section has been working for some time, and upon which many physicists will welcome information because of its considerable industrial import. On Tuesday, September 1, Prof. Appleton will discuss some problems in thermionic valves, and he will be followed by several speakers on allied problems.

An excursion to the Air Ministry Seaplane Station at Calshot has also been arranged.

SECTION B (CHEMISTRY).

One of the features of the meeting of Section B (Chemistry) will be a joint discussion with Section G on the ignition of gases. This will take place on the Friday morning, and will be opened by Prof. H. B. Dixon. Two other discussions have been arranged by Section B, one on Thursday morning, having for its subject surface catalysis, which will be opened by Dr. E. K. Rideal, and the other on Tuesday morning, on the alternating effect in carbon chains, to be opened by Dr. B. Flürscheim.

The presidential address to the Section will be delivered on the Monday morning, when Prof. C. H. Desch will take as his subject "The Chemistry of Solids."

Among other papers of general interest which will be submitted to the Section, mention should be made of a contribution by Prof. E. C. C. Baly entitled "Further Investigations on the Photosynthesis of Naturally-occurring Compounds," a paper by Prof. H. E. Fierz, of Zürich, on "The Liquefaction of Wood and Cellulose and some General Remarks on the Liquefaction of Coal," and a paper by Mr. E. A. Ollard, of the Metropolitan-Vickers Electrical Company, on "The Resistance to Corrosion of Electrodeposited Chromium."

SECTION E (GEOGRAPHY).

Owing to this year's meeting being held in Southampton, the home of the Ordnance Survey, Section E (Geography) will devote special attention to papers on survey and cartography. Col. Com. E. M. Jack will speak on the work of the Ordnance Survey and Captain J. G. Withycombe on its recent productions. Mr. O. G. S. Crawford will deal with archaeology in survey maps. Mr. A. R. Hinks is to devote his presidential address to the science and art of map-making. The relations between geography and anthropology are evident in a paper by Mr. H. Sumner on geography and prehistoric earthworks in the New Forest. The present state of the international map on the scale of 1/1,000,000 is to be described by Major M. N. Macleod, and the question of pronunciation tables for the British sheets by Mr. J. H. Reynolds. In exploration and field work, Prof. J. W. Gregory will discuss the problems of the Queensland Barrier Reef and the most suitable site for boring, while Mr. F. G. Binney will give an illustrated lecture on his recent travels in North-East Land, Spitsbergen. Dr. Vaughan Cornish introduces a new subject in his paper on subjective variations of magnitude in natural scenery. A paper of current interest will be that of Mr. F. J. Richards on the cultural geography of India. Prof. W. M. Hobbs will contribute a paper on the glacial anticyclone.

SECTION F (ECONOMIC SCIENCE AND STATISTICS)

Two matters of great importance at the present time, both to economists and to farmers, are to be discussed in a joint session of the Agriculture and Economic Sections. One is the question of farming costs in relation to farm management, on which a paper is to be read by Mr. J. Wyllie; the other will be raised in a paper by Mr. R. B. Forrester on the marketing of agricultural produce. In the present crisis in British farming these two papers are of especial interest.

At a time, too, when wages problems in our chief industries are pressing for solution, the address of the president, Miss Lynda Grier, on the meaning of wages is equally timely. This paper will be supplemented by one by Mrs. Stocks on the economics of family endowment, and another by Mr. R. F. Harrod dealing with trade crises and the distribution of wealth among the factors producing it. The problem of population is to be considered in two papers, one by Mr. G. F. Shove on the law of diminishing returns in agriculture and its bearing on population, the other by Mr. P. Sargent Florence on "Over Population and the Statisticians."

Two aspects of the financial situation will be considered. Mr. R. G. Hawtrey will deal with the gold standard and the balance of payments; and Mr. P. B. Whale with German finance and the Dawes report. In addition there are papers by Miss I. F. Grant on the enclosure movement and Scottish arable land, by Mr. Fabian von Koch on unemployment relief in Sweden, and by Dr. John Hulme on recent developments in Italy's textile trade.

A new feature this year is the Transport Sub-section. Six papers are to be read, dealing with the technical and economic aspects of transport by railways, roads, canals, and docks.

SECTION G (ENGINEERING).

The president of Section G (Engineering), Sir Archibald Denny, will deliver an address on "Fifty

Years' Evolution in Naval Architecture and Marine Engineering." During this period very remarkable developments have taken place in the construction and equipment of ships, and in this development science and scientific research have played a very important part.

After the presidential address Mr. Edwin R. Mumford will discuss the important question of the comparison between the speeds and powers of models and ships, and after an account of the pioneer work of Dr. William Froude, will show how the method has been applied to solve numerous problems of ship and propeller design; the problem of "cavitation" will also be discussed. Mr. Foster King will trace the development of the scantlings of modern steel ships and show the hindrance to development which resulted from strength calculations not having been used in wood construction. Mr. F. E. Wentworth Shields will describe the quay walls of Southampton, certain of which have been proved unstable owing to the nature of the foundations. He will give the history of the walls and discuss the various remedies adopted to render the walls stable. Mr. W. G. Turner will describe the electric power station at Southampton, and Mr. H. Wauchope will deal with the electric supply and plant of Southampton Docks. Mr. Stanley S. Cook will discuss the efficiencies of steam turbines for marine purposes and the problem of auxiliary machinery and fuel consumption, and Mr. Western Hutchinson will read a paper on "Sailing and Motor Craft, the Scientific Aspects of their Design."

At the joint discussion with Section B (Chemistry) on "Ignition of Gases," Prof. W. T. David will give some account of experiments on the spontaneous ignition of gases and upon the influence of nitrogen and other gases and also infra-red rays upon ignition temperatures and rates of ignition respectively. Mr. C. E. Le Maistre will read a paper on engineering standardisation, and Vice-Admiral Sir Robert Bland Dixon and Mr. T. Berry are to discuss the problem of technical training for naval constructors and engineer officers. Prof. David Ellis will give an account of an investigation into the responsibility of iron bacteria as constructive agents in the formation of incrustation in pipes. In the special case investigated, in spite of every appearance of bacterial responsibility, the incrustation in pipes was found to be due to other causes.

The problem of landslides will be dealt with by Mr. Edgar Morton, and Mr. Oliver E. Simmonds will describe the construction of modern seaplanes. Experimental demonstrations of flow of water in pipes are to be given by Prof. Eustice, and Prof. J. G. Gray is to give demonstrations with the gyroscope. Prof. J. J. Guest is to discuss the dynamics of motor cars. Visits are being arranged to the seaplane station, to Southampton Docks, to an Atlantic liner, to the railway works, aeroplane works, and to Agive oil works.

SECTION H (ANTHROPOLOGY).

In Section H (Anthropology), Dr. T. Ashby in his presidential address will deal with "Engineering in Ancient Rome." In view of his special interest in Romano-British studies, a survey will be made of our present knowledge of Roman Britain in a series of communications dealing with recent excavations in England, Wales, and Scotland. Not only will much of the material of these papers be described here for the first time, but a great deal will be the result of work carried on during the present summer.

In prehistoric archaeology may be mentioned communications by Miss D. A. E. Garrod on the Upper Palæolithic in Britain; on the Neolithic period by Mr. O. G. S. Crawford, who will deal with changes

of climate and megalithic migrations; by M. Z. le Rouzic on megalithic monuments in Morbihan, France; and by Mr. E. T. Nicolle, who will describe the important Bronze Age mound recently excavated in Jersey. Mr. H. J. E. Peake will raise the question of archaeological distribution maps. Certain aspects of the question of the antiquity of man will be discussed by Sir W. Boyd Dawkins, and Mr. W. P. Pyecraft will offer suggestions for a new classification of man. Sir Flinders Petrie's description of recent finds of relics of early man in Egypt is of special interest in view of the correspondence which followed the preliminary announcement of these discoveries in the Press. The Section will also have an opportunity of discussing recent results obtained by the American archaeological expedition to the city of Carthage, which will be described by Mr. Harden.

Other branches of anthropological studies will be well represented, as, for example, by Capt. Pitt-Rivers' account of the natives of the Island of Aua, New Guinea, and their customs and mode of life; and by Capt. Hilton-Simpson's description of the industries of the Shawiya of the Aurès Mountains, Algeria, which will be illustrated by cinematograph films taken by Mr. J. Haseler. Mr. Talbot Rice, a member of the Oxford expedition to Kish in Mesopotamia, will describe the physical characters of the modern Arabs in that area. Some interesting questions relating to heredity in man will be raised by Dr. R. N. Salaman's study of facial types in the Jewish community, which should give rise to a profitable discussion.

Exceptional interest attaches to Mr. Turville-Petre's account of his excavations on behalf of the British School of Archaeology in Jerusalem, in caves near the Lake of Galilee, which have brought to light important evidence bearing on palæolithic man in Palestine, and Sir Arthur Keith's report on the skull showing affinities with the Neanderthal type discovered there. These communications are the first detailed description of this important discovery to be given in England.

SECTION I (PHYSIOLOGY).

The programme of the Section of Physiology opens with three papers on carbohydrate metabolism; the first of these will be given by Prof. J. J. R. MacLeod, in whose laboratory at Toronto insulin was first prepared, and the second by Dr. C. H. Best, who, together with Dr. Banting, effected the preparation. Prof. MacLeod's communication deals with the carbohydrate metabolism of cold-blooded animals. Dr. C. H. Best will read two short papers on (a) the nature of insulin, (b) the mode of its action. A third paper of considerable interest will be that of Mr. H. P. Marks, who has made some striking observations in relation to the action of the thyroid gland in carbohydrate metabolism. He has found that after prolonged administration of thyroid gland by the mouth to rabbits, a condition ensues in which the injection of sugar produces the same train of severe symptoms as attends the injection of insulin. His results have an important bearing on the cause of the lowered sugar tolerance in hyperthyroidism.

Prof. A. V. Hill, whose work on the mechanism of muscular contraction was rewarded by a share of the Nobel prize for medicine for 1922, will deliver his presidential address on the physiological basis of athletic records on Monday, August 31, and the address will be illustrated by cinematograph. He has analysed the factors limiting muscular effort, and, as a result of observations on the isolated muscle of the frog, has been able to deduce what athletic records should be in man. Work recently carried out in Prof. Hill's laboratory, in which the processes

taking place during continuous activity of the isolated muscle of the frog and of human muscle are directly compared, will be described in a paper by Prof. K. Furusawa on Thursday morning, August 27.

A lecture will be given on Friday afternoon by Mr. J. E. Barnard on the microscopic observation of small bodies. Mr. Barnard's name has, of course, recently been associated with reports of the observation and photographic reproduction by means of ultra-violet light of a cancer virus, the existence of which was demonstrated by Dr. W. E. Gye. The size of some of the bodies has been closely determined and is believed to be 0.072μ , so that Mr. Barnard's achievement is considerable.

On Thursday afternoon there will be a joint discussion with Section D (Zoology) on the functional significance of size, to be opened by Mr. J. B. S. Haldane. On Tuesday morning there will be a joint discussion with Section J (Psychology), to be opened by Prof. T. H. Pear, on the acquisition of muscular skill.

Sectional excursions have been arranged for Monday and Tuesday afternoons, the first to the Anti-Gas School at Tipnor and to the Diving Tank at Portsmouth, and the second to the Fort Grange aerodrome, where some of the tests applied to candidates for the Royal Air Force will be demonstrated.

SECTION J (PSYCHOLOGY).

Differential methods have a prominent place in the programme of Section J at Southampton, where the term "differential" is applied either to a comparison of the reactions to a constant stimulus of two groups differing in one condition, or else to a comparison of the reactions of a group (or two equivalent groups) to two or more different stimuli. Thus a study has been made of special abilities in arts and science, where "special ability" is meant to apply to a facility developed through special environmental influences and individual interests acting over a number of years and the terms "arts" and "science" stand for the work involved in preparing for first degrees in the corresponding faculties.

Similarly the results of testing physically defective children at the Lord Mayor Treloar Hospital and elsewhere lead to the conclusion that physical defect, if widespread and of sufficiently long duration, produces the symptoms of some degree of amentia; and further, that this mental deficiency resulting from physical defect would appear to be appreciably alleviated by exposure to ultra-violet rays.

In another study, on the discrimination of wool fabrics by the sense of touch, an attempt has been made to define the differences in judgment between members of the wool trade and the consuming public, and the result suggests a method of measuring the wool-trade sense of touch. It is also suggestive of the times that the relationship between buyer and seller is studied psychologically in another paper, where an individual valuation is regarded not as a single price at which the individual concerned will be willing to complete his share of the transaction, but as a whole class of possible prices between which the probability of him completing his share ranges from zero to one.

Our final example is a study of the responses of children when taught by various methods, such as the cinema and oral lessons. The essays written after the various lessons differed in arrangement of material and also in mode of expression or style.

Prof. Spearman will open the sessions with his presidential address on "Mental Law of Diminishing Returns." Two joint discussions will be held, one

with Section L (Educational Science) on "Recent Investigations upon Vocational Guidance," and one with Section I (Physiology) on "The Acquisition of Muscular Skill."

SECTION K (BOTANY).

The presidential address of Prof. Lloyd Williams will deal with the Phaeophyceae and their problems. The investigation of this group of seaweeds has been comparatively neglected, and the conclusions of Prof. Lloyd Williams, who has devoted a life-study to these plants, are looked forward to with keen interest. The study of Algæ will also receive prominence by the communication of several papers on seaweeds.

The only joint discussion in which Section K is participating this year is one with Section E (Geography) on "The Evolution and Colonisation of Tidal Lands," to be opened by Prof. F. W. Oliver, who will speak principally upon the stabilisation of these migrating soils by various types of vegetation. On the geography side, Prof. J. W. Gregory will deal chiefly with the mode of formation of new land areas by the action of the sea. Other speakers in this discussion will be Prof. R. H. Yapp, Dr. Vaughan Cornish, Dr. E. J. Salisbury, and Prof. S. Mangham.

Within Section K there will be a discussion on the interpretation of "Adaptive Characters," which will be opened by Prof. F. O. Bower and contributed to by Prof. J. H. Priestley, Dr. D. H. Scott, and Mr. G. E. Briggs. The argument to be outlined by Prof. Bower will deal principally with certain characters in ferns, to which he has devoted special attention. Prof. Dame Helen Gwynne Vaughan will introduce another discussion on "Deviation from the Normal Course of Sexual Reproduction in Plants," on which Dr. K. Blackburn and Dr. M. Knight also will speak. Recent work has shown that apogamy is of such common occurrence in the plant kingdom that it is time again to take stock of the position.

Most branches of botany will be well represented in other parts of the programme, including physiology, genetics, cytology, plant pathology, morphology, palæobotany and systematic botany.

The popular lecture this year will be given by Dr. D. H. Scott, who will take as his subject "The Transformations of the Plant World in Geological Time." A full programme of excursions has been arranged.

SECTION L (EDUCATIONAL SCIENCE).

On August 27 Section L (Education) opens its annual meeting under the presidency of Dr. W. W. Vaughan, headmaster of Rugby, with a discussion on "The Training of Teachers." Although inspired by the recent Government report, the discussion is expected to include the training of teachers for secondary schools as well as that for elementary school teachers.

Public attention is to be directed to those conditions of boarding-school dietary (institutional feeding), which experience has shown to be necessary for the health of the growing child. It is hoped to arouse general interest in the need for more careful attention to the many factors involved other than those of cost and calorific value of foods.

The disciplinary value of subjects taught in schools is to form the theme of a discussion immediately following the president's address on "The Warp and Woof of Education." Later on in the session a strong attack is to be made on those schemes of school science that do not include the study of living things; the biologist and zoologists are combining to represent the urgent need of a broader basis for science teaching than exists in the majority of schools,

in order to emphasise the educational value of a study of animal life as well as that of botany.

The psychologists and educationists, led by such practical observers as Prof. Cyril Burt and Messrs. Cox, Earle, and Salter Davies, are meeting in joint session to hear and discuss the latest results of research on vocational guidance. The education of the industrial worker and expert will be reviewed by Sir Robert Blair, who will open a discussion on "The Conditions of Success of Technical Institutions." Mr. Wickham Murray will deal with the handicap

imposed by the present narrow spirit of university matriculation requirements on technical students, and Dr. W. M. Varley will speak for the claims of the "Local College" as a centre of educational activities for adolescents and adults, providing not only technical instruction but also opportunities of wide cultural study.

A lecture will be given by Dr. Ernest Barker on "Growth of National Character," and another by Mr. Percy Scholes on "Musical Education by means of Player-piano, Wireless, and Gramophone."

Catalysis and Oxidation.¹

By Prof. HENRY E. ARMSTRONG, F.R.S.

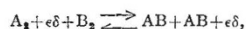
THE treatment of the subject must depend upon the definition that is given of the term. Is or is not *catalysis* to be regarded as the synonym of *chemical change in general*? Berzelius, the author (1835) of the term, who developed the conception, included among catalysts agents so diverse as sulphuric acid (*e.g.* the production of ether and the hydrolysis of starch); platinum, especially in the spongy form (*e.g.* the formation of water from hydrogen and oxygen and the oxidation of alcohol); and enzymes (*e.g.* the hydrolysis of starch by diastase). Such agents have, in common, the power of acting reversibly, so that they may eventually be recovered, if not soiled by some secondary change.

The need of a clear definition and limitation is obvious from the frequent use of the expression *contact catalysis*, as if there were several forms of catalysis. Such use of the adjective *contact* is superfluous, to say the least—as all chemical interactions necessarily involve *contact* of the substances concerned, whatever their character: if the expression have any meaning, it can only be that of chemical change in general, for which we need no other specific term.

I would urge that the term catalysis be limited to actions *at and influenced by solid surfaces*: in other words, the catalyst is either an extended solid surface or a finely divided, particulate agent—in suspension, not in solution. I have specially developed this view in my recent Messel Lecture to the Society of Chemical Industry (Journal, 1922).

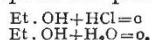
Since 1885, my contention has always been that chemical change is an electrolytic process. On this assumption, whilst electrolytes, in solution, may interact directly, chemical action between non-electrolytes is an indirect process, determined by the presence of an electrolyte compatible with the substances ultimately brought into interaction through its agency, because of its power of linking them in a conducting circuit. This agent I would term the *determinant*; it is necessarily an electrolyte.

In general terms, the equation of interaction may be written



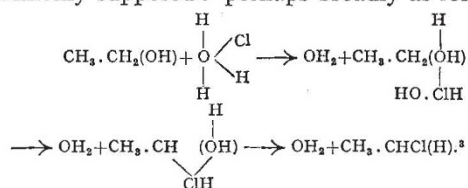
where $\epsilon\delta$ is the electrolytic determinant.

I have specially considered the formation and nature of electrolytes in numerous communications to the Royal Society and elsewhere.² To give a specific illustration: alcohol and hydrogen chloride do not interact, except in the presence of water:



Hydrogen chloride and water together, however, form an electrolyte. The process of interaction, in their presence in association (as a composite electro-

lyte), may be less direct and more complex than is commonly supposed: perhaps broadly as follows:



Having the postulate referred to above in mind, I was able, in 1885, to predict not merely that oxygen and hydrogen cannot interact but that water alone would not suffice as determinant—that the water must be impure, *i.e.* an electrolytic conductor. The forecast has been verified by H. B. Baker. The criterion is a simple one. Over and over again, the correctness of this postulate has been verified experimentally, especially by H. B. Baker, whose masterly, long-continued inquiries are in no way appreciated as they should be. It has led me to affirm that gases cannot interact—except in the presence of a liquid determinant, if not of a catalyst. Aitken's work on the condensation of hydron, $x\text{OH}_2$, to water, $(\text{OH}_2)_x$, may be interpreted from this point of view.

At least the chief distinction to be drawn between changes influenced by catalysts and those which occur in a wholly liquid medium is, that whereas, in the latter, the extent to which change takes place diminishes as the concentration is diminished, in the presence of a catalyst the rate of change is constant over a considerable period and apparently independent of the concentration *in the solution*: because of the attractive influence exercised by the catalyst and the consequent uniform and continued concentration of the hydrolyte at its surface.

I have long thought—and the evidence in favour of the interpretation is increasing daily—that so-called gaseous interactions always take place at the surfaces with which the nominally interacting gases (plus the necessary determinant) are in contact—the surface playing the part of catalyst, by serving to attract and hold the determinant. It may be questioned whether Moureu's refined studies of oxidation do not furnish complete evidence of this view. In some instances the substances which he has successfully used as inhibitors of the oxidation of acrolein have been of such low volatility that they can scarcely have been present, except in most minute proportion, in the gas above the liquid: if so, it may be legitimate to suppose that oxidation is confined to the liquid state. All turns on the proportion of inhibitor that is necessary.

We are not entirely clear, however, as to the function of the catalyst—whether or no it be included

³ The H in brackets is that which may be supposed to take the place of (OH) originally in the alcohol. Some such process as this may be at the root of the Walden inversion.

¹ Address delivered at the second of the triennial conferences of the Institut International de Chimie Solvay on April 22.

² Proc. Roy. Soc., 1886, 40, 268; A, 78, 264, 1907; A, 79, 586, 1908; A, 81, 80, 1910; A, 84, 1912; A, 86, 604, 1914; 90, 73. British Association Report, 1885; J. Chem. Soc., 1895, 1122.