NATURE

SATURDAY, NOVEMBER 7, 1925.

CONTENTS.

Editorial and Publishing Offices:

MACMILLAN & CO., LTD.,

ST. MARTIN'S STREET, LONDON, W.C.2.

Editorial communications should be addressed to the Editor.

Advertisements and business letters to the Publishers.

Telephone Number: GERRARD 8830.

Telegraphic Address: PHUSIS, WESTRAND, LONDON.

NO. 2923, VOL. 116]

The Coal Crisis.

IT would appear as though the British public had been awakened only quite recently to the fact that the coal industry of Great Britain, upon the well-being of which the very existence of the nation depends, is in a very critical condition; needless to say, those engaged in the industry have long been well aware of it. With the general realisation of the fact by the public at large, has come a flood of suggested remedies of all kinds, most of them from people outside the industry. Thus quite recently the Sociological Society has been discussing the subject in a series of papers, but it cannot be said that anything of value has emerged from that discussion. Most sensible persons are wise enough in cases of serious illness to call in a properly trained medical practitioner, who understands the nature and causes of diseases, rather than trust to the ministrations of laymen, however intelligent or however well meaning. The sociologists have done what people in the latter category are only too apt to do; they have suggested palliatives directed to the symptoms, but not one of them has even recognised the actual cause of the disease.

Something of the same kind may be said of other suggestions that are being persistently obtruded upon the public notice, none of which is being put forward more insistently than low-temperature carbonisation. Unfortunately, in many instances the advice, so far as this process is concerned, is not wholly disinterested; the serious needs of the situation are being exploited for propaganda purposes, particularly by those who have already invested money in one or other of the low-temperature carbonisation processes. Apart, however, from this aspect of the subject, careful consideration will show that this or any other method of utilising the coal when obtained cannot possibly touch the root of the evil. If it were granted that low-temperature carbonisation could do all that its most zealous advocates claim for it—a hypothesis which is unfortunately far enough removed from actual fact—no such process could bring any real help to the coal industry.

It is claimed that by the substitution of low-temperature coke for raw coal in our domestic fireplaces our cities would be clear of smoke, and it is hinted that our domestic coal bill might even be decreased. It seems, however, to be overlooked that it is quite possible to attain these desirable objects by methods which, instead of being as doubtful as those of low-temperature carbonisation are to-day, have stood the test of generations. We have only to turn to Germany, where we can see that these excellent objects are attained by the simple system of substituting the closed stove for the open fireplace. Every one who has been on the continent knows how relatively clear the atmosphere of the large towns is, whilst statistics show that, whereas in

Great Britain we consume 15 cwt. of coal per head of population per annum for domestic purposes, the consumption in Germany is only 5 cwt.

Here, then, is a proved method for attaining what low-temperature carbonisation claims to be able to do, though it has never shown that it can do it. The only difficulty lies in persuading the Englishman to do away with his open fireplace with its no doubt wasteful but certainly cheerful flaming fire! The persistence with which we in Great Britain cling to this method of heating is usually put down to innate conservatism, but it is just possible that there may be a sounder reason. Along with the many advantages of our island home we have to take the corresponding drawback of our insular climate with its mists, grey skies and dull days, and it may quite well be that the desire for light as well as heat in our rooms may be unconsciously based upon a psychological or even upon a physiological need. Apart from this consideration, it is quite clear that the substitution of the stove for the open fireplace would have the same results here as it has in Germany, where the winter climate is more severe than it is with us.

As regards the application of low-temperature carbonisation to industrial uses, we in Great Britain could reap no benefit therefrom; even if it be assumed that by means of this process considerable economies in the utilisation of coal might be effected, this would cause injury rather than an advantage to the coal industry. It is quite impossible under modern conditions that any such improvement in the utilisation of coal can be confined to any one nation, and it is surely clear that a nation which, like our own, depends so largely upon the export of coal, can gain no advantage by any process which makes for a decreased consumption of fuel. Our main source of existence is by the export of coal directly or indirectly; not only do we sell coal abroad, but also, whenever we import Spanish iron ore and export rails, or import raw cotton and export piece goods, we are exporting coal indirectly. If we learn to manufacture these products with a smaller consumption of coal, our competitors abroad will do the same thing, and the more the consumption of coal is decreased per unit of goods produced, the smaller is the advantage which we reap from our coal supplies. It would, therefore, seem tolerably clear that, wherever the remedy for the present critical condition of the coal trade is to be found, it will not be in low-temperature carbonisation or in any similar process having for its object the more economical use of coal for industrial purposes.

Another remedy which is being urged insistently in certain quarters is the nationalisation of the coal industry. A Bill was promoted in Parliament some time ago purporting to nationalise the industry, though its real effect would have been syndicalisation rather than nationalisation, or, in other words, the handing over of the collieries of the country to the Miners' Federation. We can only guess what the result would be from previous experiments along that line. It is now a good many years ago since the Yorkshire Miners' Federation made such an experiment by the purchase of Shirland Colliery—a colliery which had up to then been a profitable and prosperous concern. It would appear that in the first year after the purchase a small profit was made, in the next year a small loss, and in the third year a loss so considerable that the Federation was glad to dispose of its purchase at a loss.

The nationalisation of a highly speculative industry, as mining always must be, would appear to be foredoomed to failure. There are two examples of the nationalisation of coal-mining on any considerable scale; the first was in the Saar coalfield, the greater portion of which was, before the War, State-owned and State-worked by the Prussian Government, which was probably as well adapted as any Government in the world could be to obtain successful results; yet it was conclusively shown that Government-worked coal cost more to produce and yielded smaller profits than the coal produced by private enterprise in Westphalia. More recently we have the example of Soviet Russia before us, and it is possible to compare the results obtained in the Donetz Coal Basin in 1924 with those of 1913. Before the War the Russian coal-mines were self-supporting; in 1924 they received heavy subsidies from the State; in spite of this, wages were lower by 59·2 per cent. than they were in pre-War times, the output per man was 41·9 per cent. less than in pre-War times, and the total output was just under one-half of what it was in 1913. It would be difficult to show more clearly the disastrous effects of nationalisation upon the coal-mining industry.

It is frequently stated that the great development in the use of water power and of power generated from oil has seriously interfered with the demand for coal. On a subject like this it is impossible to obtain close figures, but approximate estimates would appear to show that the inroads made by these two sources of power have not as yet assumed very serious proportions. It may be roughly reckoned that the world's requirements of power are of the order of 160 million h.p. evolved continuously throughout the year; of this, according to the recent World Power Congress, the amount of the developed water power in the world supplies about 17 million h.p., whilst the power generated from oil is probably about 15 million h.p., so that these two together only produce about one-fifth of the world's power requirements, in addition to which we have the world's requirements of coal for metallurgical purposes, for which it can be replaced neither by oil nor by water power. On the other hand, it must be admitted that

the substitution of oil and water power for coal hits Great Britain particularly hard, because the former replaces the coal which we used to sell for bunkers, whilst the latter has in part replaced the coal which we used to sell to continental railways. In respect of the latter, however, we have ourselves largely to blame. The reason why some continental countries have developed hydro-electric schemes and electrified their railways is not because they hope to effect any very great savings in running costs in this way, but, as one of them put it, because they now have a source of power which will not go on strike.

It can be said with confidence that none of the remedies above mentioned, nor the many others urged upon the public mind, touch the real root of the trouble, but that everybody who has studied the economics of the coal industry would be found to be unanimous as to where the real trouble lies. The injury to our export trade due to continued threats of strikes is a subsidiary cause of our difficulties, but the main cause lies in the fact that our coal costs too much in wages; economies in other departments of the industry can no doubt be effected, but they must necessarily be insignificant compared to economies in wages, seeing that wages form something like three-fourths of the cost of producing coal. This statement does not mean that the wages per day of the coal-miner should be decreased (it may perhaps even mean exactly the opposite), but what it emphatically does mean is that there are more men engaged in the coal industry to-day than that industry is capable of supporting. This statement is particularly true of the off-hand men, the proportion of whom to hewers has increased enormously since pre-War days owing to a variety of causes, mainly perhaps to the seven hours Act.

Whilst the cause of our difficulties in the coal trade is thus tolerably well known, the means of remedying it are by no means so obvious, and it is to be sincerely hoped that the Coal Commission now sitting will find the proper remedy to apply. That there must be a remedy cannot be doubted, and that it could be produced if everybody interested were determined to find and apply it seems more than probable. The British coal industry has been through serious crises before now, and has survived them; the main difference between the present position and previous ones is that on all previous occasions everybody in the coal industry was labouring whole-heartedly towards the restoration of the industry, whereas to-day there is a party within the industry the main object of which appears to be to achieve its destruction. It is this tendency above all others which the Coal Commission will have to find means to combat, if it is to save the coal industry, and with it the nation, from ultimate ruin. HENRY LOUIS.

Mostly Animal Genetics.

(1) *Genetics in Plant and Animal Improvement.* By Donald Forsha Jones. (Wiley Agricultural Series.) Pp. viii + 568. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1925.) 20*s.* net.

(2) *Animal Breeding.* By Prof. Laurence M. Winters. (Wiley Agricultural Series.) Pp. x + 309. (New York: J. Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1925.) 13*s.* 6*d.* net.

(3) *Animal Genetics: an Introduction to the Science of Animal Breeding.* By Dr. F. A. E. Crew. (Biological Monographs and Manuals.) Pp. xx + 420. (Edinburgh and London: Oliver and Boyd, 1925.) 15*s.* net.

(4) *Experiments in Genetics.* By Dr. Charles Chamberlain Hurst. Pp. xxiv + 578. (Cambridge: At the University Press, 1925.) 50*s.* net.

SINCE the rediscovery of Mendel's now famous paper led to the creation of a science of genetics, there has been a steady flow of treatises dealing with this branch of biology, and it is not without interest to mark how the motives that have prompted the study of this science have been reflected in the stream of books that treat of it. The man of science, as was natural, was first in the field, partly in his delight over the workings of a beautiful new tool for the shaping of thought, partly because he was spurred on by the self-imposed duty of co-ordinating the new knowledge, and of suggesting the most promising lines of further advance. It is to impulses of this sort that we owe the existence of such books as those earlier ones of Bateson and of Baur, and the more recent ones of Morgan and his colleagues, fresh with the joy of discovery and recking little of possible applications. Then, as genetics makes good and is pushed into the academic curriculum, comes the demand for the student's text-book, less critical and more dogmatic, generally written by one of greater experience in teaching than in research. Later, as the significance of the science dawns upon the practical breeder and his immediate advisers, comes the output of books in which the dominant motive is the application of genetical discovery for purposes of ultimate commercial gain.

Such books, as might be expected, make their appearance more frequently in the United States than in Great Britain. For the genetical worker over there is generally supported by State funds, and naturally feels called upon to satisfy the clamour of democracy that it is getting its money's worth. Dr. Jones's book (1) on "Genetics in Plant and Animal Improvement" is a very favourable specimen of its class. It is clearly and interestingly written by one who has served a sound apprenticeship in research, and at the same time is

evidently in close touch and sympathy with the practical man. The author has a double qualification for writing the book he set out to write, and he has used those qualifications well. Especially good is his account of hybrid vigour and of the effects of inbreeding, as indeed might have been expected from one who is an acknowledged authority on these matters. Altogether the book should prove of high value to the considerable numbers of those whose teaching or practice concerns the betterment of domesticated animals and plants. At the same time, those whose interest in genetics is purely scientific will appreciate the freshness and sincerity of the author's account, and should gain not a little of value from the volume.

Though Dr. Jones deals ostensibly with the improvement of animals as well as of plants, it is chiefly from the latter that his illustrations are taken. Indeed, when dealing with animals he is apt at times to be misleading. Thus he points out justly that a population of self-fertilised plants, no matter how heterozygous to start with, tends with each generation to become more and more a collection of homozygous individuals —as was argued long ago by Mendel himself. But he then goes on to suggest that if a herd of Shorthorn cattle consisting of reds, whites and roans, were inbred, it would come to consist of reds and whites only (p. 333). The paragraph is puzzling, for surely Dr. Jones cannot believe that Shorthorns are self-fertilised! Possibly he is conscious of limited experience in animal genetics, since in his preface he suggests that his book should be supplemented by Prof. Winters' book (2) on "Animal Breeding," which is published in the same series. This is a pity, because Prof. Winters' book is about as poor a production as Dr. Jones's is excellent.

Prof. Winters has quite failed to grasp the significance of modern genetical discovery. He still talks about three distinct types of inheritance, Mendelian, blending, and prepotent; he refers to Galton's law of ancestral heredity as "one of the greatest, if not the greatest, of the practical contributions of biology to animal breeding"; and he attempts to measure the relationship of animals in terms of "blood," as they used to do before the science of genetics was invented. With these notions as a foundation, it can be understood that when the author comes to discuss such topics as inbreeding, crossbreeding, and selection, he is neither clear nor stimulating. For the rest, the book is of the "scissors and paste" type, lacking that unity of presentation which comes of sound and critical thinking.

(3) It is a relief to turn from it to Dr. Crew's "Animal Genetics." In writing this book Dr. Crew, a scientific worker, has his eye on the practical breeder most of the time. He wishes to enlist his sympathies in the direction of mutual co-operation which shall be helpful to both. He fully realises the impertinence of suggesting that the breeders of such stock as grace the show-yards of Great Britain do not know their business, and that it is for a geneticist to put them right. Nevertheless, he is aware of the mistakes that do not figure in the show-yard, and he feels that even in the light of present knowledge some of these could be avoided. With fuller knowledge would come greater certainty in getting the right animal; but the acquisition of that knowledge means the co-operation of the breeder, and the first step is to stimulate his interest. So Dr. Crew has written his book "in order to provide the breeder with a brief account of what has been and of what is being done by the geneticist," and it says something for the progress of research in animal breeding that he has been able to give a clear account of the process of heredity in its widest sense without having recourse to illustrations from the plant world.

Dr. Crew's book falls roughly into three parts, dealing respectively with the general mechanism of heredity, with the peculiar problems associated with sex, and with various special topics, such as prepotency, inbreeding, selection, sterility, etc. As might be expected, Dr. Crew is at his best in the part relating to the special problems of sex, such as are conveyed by the terms hermaphroditism, sex-reversal, intersexes, and the like. We do not know of any better general account of these phenomena. The workmanship is sound throughout, the material thoroughly up-to-date, and the book conveys the impression of having been written by a man who knows what he wants to say and goes straight to the point. The author has managed to pack an astonishing amount of stuff into a relatively small space, and this condensation does not always make too easy reading. However, the matter is always clear, though there are places where the reader must be prepared to make an extra effort. It can be safely said that there is no better book on animal genetics, and its excellent bibliography should prove invaluable alike to the student and the teacher. Whether it will greatly influence the present generation of stock-breeders is very doubtful, but if it succeeds in capturing the imagination of the younger generation it will have gone far towards achieving Dr. Crew's primary object.

(4) To pass from Dr. Crew's book to the stately volume wherein Dr. Hurst has enshrined his "Experiments in Genetics" is to pass from the atmosphere of a busy modern city to that of a quiet country town. In it Dr. Hurst has collected together and reprinted a series of papers dating back to the 'nineties of last century. His choice of material for experiment shows remarkable versatility, including, as it does, orchids, rabbits, poultry, peas, horses, pigeons, and snapdragons,

while some of the most interesting papers deal with original data on the inheritance of eye colour, musical ability, and other human characteristics. The reader will find here little or nothing concerning the later developments of Mendelism, whether of linkage, or non-disjunction, or lethal factors, yet those papers which deal with animals will probably appeal much more to the practical breeder than Dr. Crew's more scholarly account. Dr. Hurst makes heredity look very simple, perhaps too simple for the critical mind, and he presents his facts in a manner that can be readily grasped by the average untrained intelligence. Having started, too, as a practical horticulturist, he instinctively keeps the breeder's point of view in mind, and he has an eye for telling examples. In so far as science goes, the breeder must be taught to walk before he can run, and we believe that a stimulating elementary booklet on animal breeding could be culled from the contents of this rather ponderous volume. In any event, Dr. Hurst has conferred a boon on the geneticist who wishes to consult him by bringing together papers scattered in a number of different journals, some of which are not always easy to obtain.

Science in the Past and Future.

(1) *A Brief Outline of the History of Science.* By J. G. F. Druce. Pp. iv+151. (London: The *Chemical News*, Ltd., 1925.) 5*s.* net.

(2) *A School History of Science.* By J. A. Cochrane. Pp. 144+8 plates. (London: Edward Arnold and Co., 1925.) 2*s.* 6*d.*

(3) *Paris: or, The Future of War.* By Capt. B. H. Liddell Hart. (To-day and To-morrow Series.) Pp. 92. (London: Kegan Paul and Co., Ltd.; New York: E. P. Dutton and Co., 1925.) 2*s.* 6*d.* net.

(4) *The Future.* By A. M. Low. Pp. ix+203+8 plates. (London: George Routledge and Sons, Ltd., 1925.) 5*s.* net.

THERE are vogues in scientific literature as in other activities. There is evidence at the moment of an increasing interest both in the scientific past and in speculations as to what the future holds for us. As to the former, the influence of a new spirit of humanism in scientific teaching has brought into being on the theoretical side a History of Science Society in the United States, the membership of which extends to most European countries; and on the applied side we now have in England a flourishing, if young, Newcomen Society with a growing American branch. The movement, too, has spread to the universities. London has its new M.Sc. degree in the history and method of science, whilst many other universities, both in Europe and the United States, include various courses of lectures by eminent scholars upon different phases of the history of science. Naturally this new spirit has found its expression in literature. For some years now there has appeared a succession of books dealing with special and general historical studies in science. The specialist, the general reader, and the schoolboy are all being catered for.

What is the significance of this new tendency? The War had undoubtedly something to do with it, though it was not responsible for its initiation. The pioneers of the new movement were certainly pleading before 1914 for the breaking down of the barriers between science and the humanities. The intensive part played by applied science in the War has, however, brought widespread attention to many new problems. Whither are we tending? What has the future in store for us? The pace of scientific research is so rapid, inventions carrying with them revolutionary possibilities in our everyday lives crowd in on us with such persistence, that it is but natural to find the intellectual public a little bewildered and vaguely uneasy as to what lies ahead. It is still a vivid memory that eight million lives were lost between 1914 and 1918. Nor can the aftermath of the economical and political upset of values, and the new difficulties of life and livelihood resulting therefrom, do other than accentuate this natural tendency to speculation as to what is to confront civilisation in the years to come. Here again we meet problems that have found an outlet in a flood of literature of which the "To-day and To-morrow" series issued by Messrs. Kegan Paul is an example.

Very properly, the studies of "yesterday" and of "to-morrow" are related. We are past the stage when history was regarded as a mere enumeration of facts and dates. The problems of the future are the better considered in the light of the lessons of the past. This is particularly true of the history of science, in view of the inevitable bearing scientific progress must have, not only upon the methods of mechanical routine of the future as a result of the multiplicity of inventions yet to come, but also upon the more disciplined and ordered ways of thinking out social problems of peace and war on the part of the populace in general.

It is appropriate, therefore, that of the four volumes before us, two deal with the past and two with the future.

(1) Dr. Druce has undertaken a formidable task in essaying even a brief history of science within the limits of 140 pages. Such a work can only be successful if it frankly confines itself to the broader movements of scientific history at the expense of any details that are not relevant to the main purpose. Proportion is everything. From this point of view, Dr. Druce's

book shows many weaknesses. The influence of Greek science for many centuries was essentially due to the teachings of Plato, Aristotle, and Ptolemy, and it would have been better to enlarge upon these influences at the expense of the many other lesser Greek philosophers who in fact find prominence in this book. Ptolemy is dismissed with six lines on page 18, whilst on page 40 his theory is merely referred to as having involved "cumbersome assumptions." The chapter on Roman science is also unsatisfactory. It is largely confined to the Julian Calendar, to Galen, and to the metallurgical sections of Pliny. The wider aspects of contrast between the Greek and Roman attitude towards science are ignored, whilst the influence of Seneca, de Varro, and Vitruvius is not even mentioned. The best portions of the book, probably because the author is a chemist, are those dealing with the growth of chemical science. The book is well indexed and a bibliography is added.

(2) Mr. Cochrane's is a book of an entirely different kind. Its title is somewhat misleading in that it is not so much a connected narrative as a series of biographies of men of science. It is intended for schoolboys and girls and is very interestingly written. Part I. deals with the ancients, Part II. with physicists, and Part III. with chemists. As a stimulant to more serious study it should serve its purpose well.

(3) Of the remaining books, "Paris" is a thoughtful essay on the future of war. Capt. Liddell Hart attacks the current theory (a transmission to modern militarists of the teachings of Napoleon and Clausewitz, and involving in its application the dogma of the "nation in arms") that the national goal in war can be attained only by mass destruction. Such a theory carries its own penalties. "Of what use," asks the author, "is decisive victory in battle if we bleed to death as a result of it?" He states that the true aim of a nation at war is "to subdue the enemy's will to resist with the least possible human and economic loss to itself." From this point of view, Capt. Hart surveys the future rôles of air, land, and sea forces in relation to civilian and economic considerations as much as to the enemy's military forces. The author's point of view is well summarised in his closing lines. "Weapons, target, and aim will alike be civil. The future of war lies in the future of peace."

(4) Finally, we have Mr. Low's very interesting vision of the future in the light of scientific progress. It is indeed an encyclopædic vision. Within 200 pages we are hurried breathlessly through the whole gamut of the activities, habits, comforts, practices, and modes of thought of the human being and what is to become of them all. We have referred to the work as an encyclopædic vision; we might almost have called it a catalogue of future possibilities. Sound and silence, artificial light, planet communication, transport, wireless, sport, clothes, marriage and love, warfare, politics, art, crime, the occult—all these are here, and much more. Mr. Low may or may not be right in many of his forecasts, but neither to the man of science nor to the man in the street is it sufficient to tell the "what" of the future and to omit the "how" and the "why."

I. B. H.

Devolution in the Modern State.

A Grammar of Politics. By Harold J. Laski. Pp. 672. (London: George Allen and Unwin, Ltd., 1925.) 18*s*. net.

MR. LASKI has produced what is certainly the most comprehensive book on political theory that has appeared since the War. Written with all the knowledge and more than the authority displayed in Mr. Laski's earlier works, it is at once more human and more entertaining. Essentially moderate both in statement and suggestion, it insists on the difficulty of modern politics and scorns short cuts to the millennium as cloaks to disguise poverty of thought and devices to serve the ends of rhetoric; yet it succeeds nevertheless in conveying an urgent sense of the gravity of the situation.

A large part of the book is devoted to showing how political institutions such as the British Parliament are used as the instruments of the classes that have successively dominated them. A hundred years ago in England the landed class was dominant, and legislation reflected its interests; in the middle of the century the new property class, born of the industrial revolution, succeeded to power, and the doctrine of *laissez faire* with its corollary of unrestricted competition in the economic, and refusal of State action in the political field, gave countenance and support to the vast acquisitions of private wealth. Mr. Laski is particularly severe in his criticism of the social effects of the dominance of this class, effects from which we are still suffering:

"The commodities and services necessary to the life of the community are never so distributed as to relate to need or to produce, a result which maximises their social utility. We build picture palaces when we need houses. We spend on battleships what is wanted for schools;" and of the effect upon the governing class itself he writes: "Men may begin to acquire property to safeguard their lives from want, but they continue to acquire it because of the distinction which comes from its possession. . . . It enables them to attune the will of society to their own."

The phase of the propertied interests is, however, in Mr. Laski's view, passing away in its turn, and the

desire of the masses for a better standard of life, better houses and more education, though dimly and intermittently expressed, is beginning increasingly to set the direction of political activity. How far can the State secure the satisfaction of these demands? How far, in other words, is the popular remedy of Socialism adequate to the nation's needs?

Here Mr. Laski grows cautious. Like so many modern writers, he has an almost temperamental hostility to the State, and is far from wishing to see men's lives regulated by an increasing measure of public control. Reacting strongly against the Hegelian conception, Mr. Laski regards the modern nation State as by no means a final form of organisation; it is just one of the number of groupings into which mankind happens to have arranged itself, and it is becoming a question how far this particular form of grouping is best adapted to the changing needs of men.

In the last resort Mr. Laski seems to regard the State as an organisation largely federal in character. It is a complex of different organisations formed to carry out special purposes, and whatever authority it possesses must be based upon and drawn from them. Sovereignty in the modern State should be neither absolute nor uniform; it should, on the contrary, be distributed among a number of different bodies, on the principle that the right to make decisions should be vested in the interests chiefly affected. This means

"making the mining industry a unit of administration in the same sense as Lancashire. It means the abandonment of the sovereign State, in the sense which equates the latter with society and gives it thereby the right to dictate to associations within society."

This plea for devolution is all to the good.

The chief defect of the modern State is its size. So vast is the stage upon which the drama of politics proceeds, so interwoven the complex strands which condition events, that the State assumes increasingly the aspect of a mechanism, while the procession of events gives countenance to a determinist attitude, if not to men's lives as individuals, at least to their affairs when taken in the mass. What happens in society seems less the result of human will and foresight, the embodiment of purpose and the effect of guidance, than the mechanical resultant of the interplay of forces the genesis of which escapes detection and the workings of which evade control. In such a society the individual feels helpless; he obtains the impression that he does not count, and that his will cannot be made to matter. From this sense of helplessness springs a political apathy, which tends to regard politics as a professional preserve with which the ordinary man has no concern, because its concern is so obviously not with him. Hence arises the paradox that amid all the forms of democracy man is as helpless as he ever was; though the battle of freedom has been won in theory, it still remains to give it effect in practice. "We still need to know," as Mr. Laski puts it, "what working hypothesis it involves and what institutions can effectively embody its purpose."

The conclusion at which Mr. Laski arrives is that the way to revive man's interest in politics is by taking a smaller unit for governmental purposes wherever a smaller unit is practicable. Different units are practicable for different purposes. Mr. Laski, cautious as ever, is by no means a wholesale devolutionist. "It is practicable to allow a town to decide for itself whether it wants municipal electricity; it is not practicable to allow it to decide whether it wants an educational system." Subject to provisos of this character, functional devolution and territorial decentralisation are recommended, because they create a corporate sense of responsibility, train men in self-government, and confide "the administration of powers to those who will feel most directly the consequences of those powers."

This book is a profound—in some ways it is a great—work; at times witty, at others learned, at others expository, at others a little dull, it rises to a nobility of outlook and an eloquence in expression which distinguish it as perhaps the finest contribution to the political thought of our times since Mr. Graham Wallas wrote "The Great Society." C. E. M. JOAD.

Our Bookshelf.

The Outline of History: a Plain History of Life and Mankind. By H. G. Wells. New edition, fully revised. (Complete in 24 fortnightly parts.) Part 1. Pp. 32. Part 2. Pp. 33-64. (London: Cassell and Co., Ltd., 1925.) 1*s.* 3*d.* net each part.

MR. WELLS'S world history was first written in 1918–1919 and revised in 1920 and 1923. Even in the short period which has since elapsed, discoveries of new material have been made in almost every part of the world, and, whether by accident or by design, new evidence is being brought to light almost daily which bears upon the early history of man upon this globe. It is, therefore, no matter for surprise that Mr. Wells, in preparing the new edition of his "Outline of History," should have found it necessary not merely to recast, but to rewrite a considerable part of it, especially in the earlier sections. It is inevitable that a work of this kind should be at the mercy of any new discovery which may at any moment throw doubt on a conclusion or necessitate a change in point of view. Mr. Wells has done his utmost to protect his readers from this danger by bringing his information fully up-to-date, and even so recent a discovery as that of the Galilean skull receives due mention.

The first two parts which have now been issued afford

an opportunity to test the quality of the work in its new form. They comprise from the beginnings of the earth down to Neolithic man in Europe, ending with an account of primitive trade. This, to many, will be the most interesting section of the whole work, as it deals with the earliest stages in the evolution of animal and human life and embraces so much that is new. It is inevitable that a writer of such strong individuality as Mr. Wells should at times run counter to accepted views; but he is always prepared to argue his case on good grounds. His dates for the late stages of the Palæolithic period on some views may appear too high, but this is of little moment beside the great advantage which his time charts and scales confer on the reader who is not an expert. To such a one they will be invaluable as an indication of perspective.

A special feature of this edition is the illustrations, which have been greatly increased in number and chosen with much discrimination and care.

Der Schädel des eiszeitlichen Menschen von Le Moustier in neuer Zusammensetzung. Von Dr. Hans Weinert. Pp. vi+54. (Berlin: Julius Springer, 1925.) 6·60 gold marks.

In 1908 the skeleton of a young man of the Mousterian or Neanderthal race was discovered by Otto Hauser in the lower cave of Le Moustier, in the Dordogne, and it was eventually purchased by the Museum für Völkerkunde in Berlin. The specimen seems to have been disinterred without sufficient skill, and the skull was broken into many fragments. It was first studied by the late Prof. H. Klaatsch, who reconstructed the skull without much success. This reconstruction was improved in two later efforts in the Berlin Museum. A final attempt has now been made by Dr. Hans Weinert, in the light of the latest knowledge, and the result is described in detail in a small volume just published in Berlin. The work is beautifully illustrated with both photographs and diagrams, and includes an exhaustive revised table of measurements.

The new reconstruction of the facial bones seems to have been rendered difficult by the breaking of the edges of the fragments during previous efforts. Dr. Weinert, however, with the aid of Prof. W. Dieck, who arranged the dentition, has now produced a face in conformity with other known examples of Mousterian man. The lower jaw is wider than in the previous reconstructions, and all the contours now agree well with those of the other skulls. The Le Moustier individual, if he had survived to maturity, would doubtless have had a skull essentially identical with that of La Chapelle-aux-Saints. Dr. Weinert concludes that he was probably contemporary with the latter, and finds no evidence to support the view of Klaatsch that the one is of greater geological age than the other.

A. S. W.

The Anthocyanin Pigments of Plants. By Muriel Wheldale Onslow. Second edition. Pp. viii+314. (Cambridge: At the University Press, 1925.) 21*s.* net.

After very favourable comments in these columns (vol. 99, p. 261, 1917), a good reception and nine years of support, the first edition is now replaced by a second containing all the admirable qualities of its predecessor. The accumulated findings of investigators in this period are incorporated in its text, and its admirable bibliography in consequence includes more than 200 new references, carefully chosen and critically summarised, so as to avoid, on one hand, omitting useful publications, and on the other, to guard against undue increase in size. The general arrangement is unaltered, and the new contributions are mainly to be found in those chapters dealing with the chemistry and biochemistry of the subject and in those on genetics, these latter being extremely numerous, but many of them not of fundamental importance.

The new edition serves to emphasise the fact that, in spite of advances into the chemical constitution of many anthocyanins, we are by no means clear as to the reactions involved in their origin, or as to the relation between their chemistry and their Mendelian factors. If the book were to serve no useful purpose other than this, it would still have done enough to compensate for the labours involved in its preparation.

Brazil after a Century of Independence. By Herman G. James. Pp. xiv+587+8 plates+3 maps. (New York: The Macmillan Co., 1925.) 17*s.* net.

There was room for a comprehensive work on modern Brazil in spite of the many volumes on Latin America which have appeared in recent years. Mr. James has produced a well-balanced volume, appreciative but yet critical, and written from the point of view of the student and not the globe-trotter or financier. It contains much of scientific interest, and has a useful physiographical introduction, which books of this nature too often lack. Special attention may be directed to the chapters on natural resources, agriculture, and transportation. In the chapter on population and vital statistics, we miss a discussion of the relative birth and death rates of the various immigrants and the adaptability of various races to the climatic and other conditions. No mention appears to be made of the Japanese, of whom there are now more than 25,000 in Brazil. The three maps are clear and useful, but scarcely adequate to a volume of this scope. The illustrations are few and of little interest.

L'Industrie des cyanures. Par P. Brun. (Encyclopédie scientifique: Bibliothèque des industries chimiques.) Pp. x+469. (Paris: Gaston Doin, 1925.) 20 francs.

This volume, which deals very fully with the various industries connected with cyanide production and utilisation, is divided into three sections: theoretical, industrial preparation, and finally, applications of the cyanides to various industries. The main section (2) is devoted to the extraction of the material from industrial residues and synthetic preparation.

A useful feature is the inclusion of lists of the patents and authors quoted in the text; its usefulness would have been still further increased if a reference had been given to the page on which they were described. It is unfortunate that the book is not provided with a suitable index. An interesting chapter is devoted to the toxicological effects of hydrocyanic acid and potassium cyanide and the researches on these poisons.

The volume is a useful addition to the literature of chemical industries.

Letters to the Editor.

The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, nor to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.*]

The Production of Oysters (*O. edulis*) on English Beds in Relation to New Observations on Breeding Phenomena.

THE present shortage of oysters (*O. edulis*) on all English, and apparently most European, beds is a suitable occasion to press for improved methods of production. The depleted state of the beds can be ascribed to an unusual mortality in 1920 and 1921 and the comparatively low yield of spat since 1921 owing to the poor summers. The spat-fall for 1925 is as yet scarcely determinable in the ordinary course of practical work. It is probably accurate to state that the majority of the oysters living on English beds in 1924 and 1925 were spatted (that is, settled from the free-swimming larvæ) in 1921.

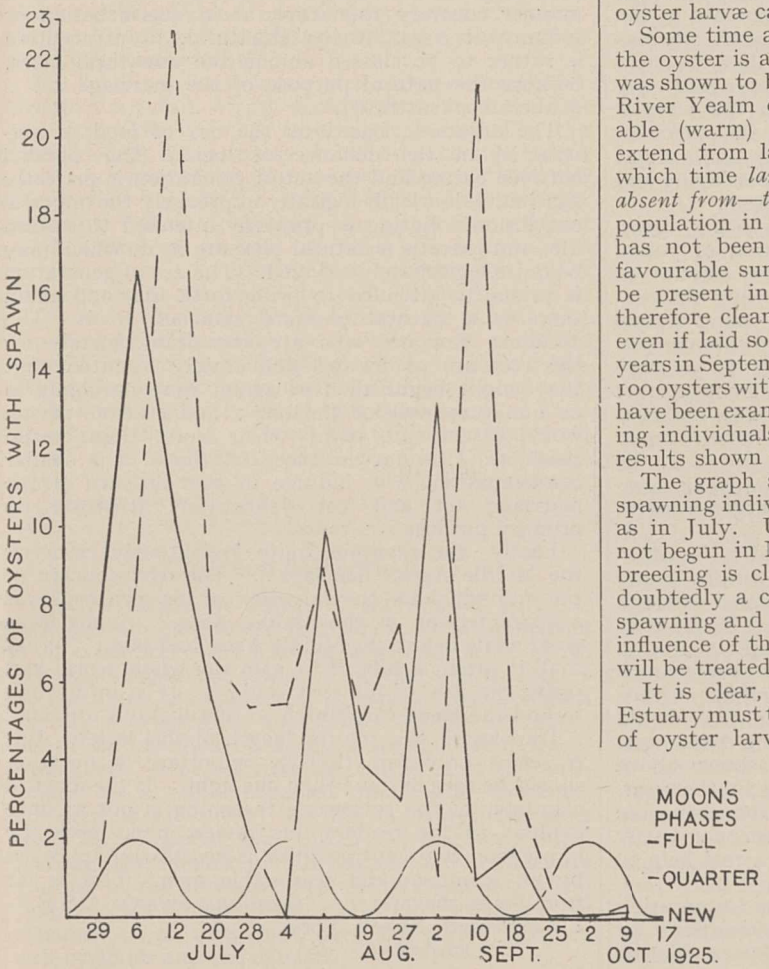

FIG. 1.—Graphs showing the weekly percentages of oysters with good shell-growth carrying embryos or larvæ in relation to the moon's phases from the Truro oyster beds (Fal Estuary) in July-October 1925; indicating an irregular correlation between lunar periodicity and breeding phenomena.

The continuous line graph shows oysters carrying embryos of an age upwards to about two days. The dotted line graph shows oysters carrying embryos mainly fully shelled or older than about two days. The continuous curve shows the moon's phases from Admiralty Tide Table data.

The chief method of catching—or rather obtaining—oysters in England is that of scattering clean shells or laying tiles on the oyster beds in the early summer, at the time the earliest batches of larvæ are judged ready to settle down from the free-swimming stage; in some localities the beds are also harrowed whereby buried shells may be turned over so that the soil can be washed off the recently embedded shells by the tidal current and a clean surface obtained in that way for the settling larvæ. Harrowing is also said to improve the growth of the older oysters. The clean shells, or cultch, are generally put out in mid-June, but may not be put out until a few weeks later if the summer is a late one and the oysters thereby delayed in spawning. The principles on which cultch is laid are that the oyster is an early summer spawner, that early spat grow to a larger size than late ones, that spat settle in numbers only in the warmer weather (when the temperature of the water is about 64° F.), that the surface on which the oyster larvæ can settle should be clean.

Some time ago the present writer pointed out that the oyster is a summer breeder (J.M.B.A., 1920) and was shown to breed from June until September on the River Yealm close to Plymouth Sound. In favourable (warm) summers, however, the period may extend from late May until October, during most of which time *larvæ are constantly present in—or rarely absent from—the sea*, being emitted from the parent population in batches. The significance of this fact has not been grasped by oyster-producers. In a favourable summer, oyster larvæ may be assumed to be present in the water all through the summer, therefore clean cultch may be expected to catch spat even if laid so late as August, or even in very warm years in September. During the past summer batches of 100 oysters with good shell-growth from the Fal Estuary have been examined weekly for the percentage of breeding individuals—amongst other characters—with the results shown in the accompanying graphs in Fig. 1.

The graph shows at once that the percentage of spawning individuals was almost as high in September as in July. Unfortunately the work this year was not begun in May. The rhythmical character of the breeding is clear from the graph, and there is undoubtedly a closer—but irregular—relation between spawning and the full moon than with the mere tidal influence of the moon, but this aspect of the problem will be treated more fully later.

It is clear, however, that the waters in the Fal Estuary must this year have borne an enormous amount of oyster larvæ, since from July 1 until September 23 there was a weekly average of the oyster population with seven per cent. containing mature or nearly mature larvæ ready to be shot or being shot into the water. There is every reason to believe that the breeding conditions on other beds were similar to those on the Fal, and yet oyster-producers rely for their catches on cultch laid about June. Indeed, on the public oyster beds in the Fal Estuary, the amount of cultch laid was almost negligible for the fine stretch of ground available, and it is probably true that oysters to the value of thousands of pounds have been lost to that fishery for the years 1928–30 from this omission. Probably no particular body or individual is responsible for this omission, *but there is no reason why it should recur.*

During the course of other investigations, the writer has conducted definite experiments on catching late spat, which give point to the remarks made above. On August 4, 1923, clean shells were put into the sea—long after the normal cultch had been put out—and

caught spat which grew to a size of only $\frac{1}{8}$ to $\frac{1}{2}$ inch by October 22, but in July 1924 these tiny spat had grown to well-shaped brood oysters $\frac{3}{4}$ to more than one inch in length and depth, while a few Portuguese oysters were obtained in the same experiment with dimensions $1\frac{3}{4}$ by $1\frac{1}{4}$ inches in a period of eleven months. Definite experiments made in early August 1924 showed that oyster spat were still settling in the sea at that time. In July 1924 fresh clean shells amounting in number to 1373 in various experiments were put in the sea for the purpose of catching spat. Rather more than 50 per cent. of these shells caught one or more spat; one shell caught 10 spat, and shells with 3 to 6 were not uncommon, and it is probable that only a small percentage of these spat would have been caught on cultch laid earlier. In July this year these year-old young had attained a size up to $1\frac{1}{4}$ inches and a beautiful normal shape. Cultch can, therefore, be laid with profit late in the season even in a poor or normal summer, whereas in a long warm summer it is probable that the yield of spat might be increased two- or three-fold over and above the larger increase due to the warmer summer. In the warmer waters of the southern European beds, a late summer laying of cultch might often be as productive as an early summer laying and result in doubling the production of oysters.

In oyster production, as in many other cases, success is accumulative, for the addition of young oysters to the beds soon increases the amount of larvæ set free in the water, as the following observation proves. On July 21 this year, 100 young oysters from the River Blackwater in their third summer (*i.e.* aged mainly about two years), and of an average length and height of only 40 by 42 millimetres (1·57 to 1·65 inches), yielded 10 individuals with embryos or larvæ within the shells, and 10 ripe females ready to spawn. In these spawning young, however, the number of larvæ produced is relatively small compared with the number produced by larger oysters; comparative figures will be given later.

Until the artificial production of oysters is established on an economic basis, and it will be many years before this desirable end is attained—though the proof given above that oysters breed in quantity throughout the summer will enable experiments on spat-catching in tanks to be carried on over a much longer period than at present and perhaps hasten success—it is important that more attention should be paid to improved methods of catching oyster-spat *in the sea*. The laying of clean shell, shown above to be economically effective even late in the year, may not in itself be the best means of increasing the stock of young oysters, and the problem may easily be one in which the naturalist can be a real help to the oyster-fishery in general.

Acknowledgment is due to the Truro Corporation for supplying the oysters for the observations on spawning, to the Tollesbury and Mersea Native Oyster Co. for the many facilities afforded for experimental work on their excellent grounds, and to Prof. Awati for valuable assistance at Mersea during July.

J. H. ORTON.
Marine Biological Laboratory,
Plymouth, October 13.

Ethics of Birth-Control.

As a constant reader of NATURE I should be very grateful if you will allow me to make public one or two criticisms of the review by Prof. J. S. Huxley of "The Ethics of Birth-Control," published in the issue of September 26.

One of the greatest societies ever known upon our planet, the Catholic Church, has denounced artificial birth-control as immoral, simply on the ground that it is against the natural law or our "human dignity." This surely is interesting from a purely scientific point of view, since the Catholic Church is composed of men of many nations, and is therefore more representative of human nature than the British "Special Committee of the National Council of Public Morals," the report of which is under discussion. I mention this in passing, in order to show that Canon Lyttelton is really representative of a strong and by no means negligible body of human opinion.

The reviewer objects to the use of the word "unnatural" as applied to birth-control. Moral theologians have adopted the use of the terms natural and unnatural to distinguish two kinds of vices. If an action is performed in the proper or natural way, but contrary to the moral law, as in fornication, it is said to be natural. If it is performed in a manner contrary to nature, as in masturbation or sodomy, it is said to be unnatural. Contraception is rather to be classed among the unnatural vices, because the natural purpose of the marriage act is deliberately frustrated.

The argument based on the use of food is constructed in the defiance of logic. The parallel between eating and the act of generation is perfectly legitimate, but leads logically to precisely the opposite conclusion. Eating is primarily intended to sustain life, and there is a natural pleasure in it, which may be quite legitimately enjoyed. The act of generation is primarily intended to bring forth life, and again there is a natural pleasure attached to it. The decadent Romans, who ate and drank merely for the pleasure of it and deliberately vomited that they might begin all over again, were indulging in an unnatural vice of gluttony; and no sane person would attempt to justify their worse than bestial conduct. How far do those fall short of a similar condemnation, who indulge in the pleasure of the marriage act and yet deliberately frustrate its primary purpose?

Lastly, the reviewer quite gratuitously criticises the Middle Ages. He says: "The over-concern of the individual for the salvation of his own soul was a characteristic of the Middle Ages." Someone, a great while before the Middle Ages, had said: "What shall it profit a man, if he gain the whole world and suffer the loss of his own soul?" It is interesting to find the Medieval Church so thoroughly Christian!

I apologise, Sir, for the length of this letter. But it seems only fair that so important a question should be seen in more than one light. If the illogical character of the reviewer's reasoning is not at once evident to his readers, his review must give the impression that contraception is necessarily approved by all scientists and reasonable men. This is far from being the case.

GREGORY SWANN, O.S.B.
Ampleforth Abbey, York,
October 16.

FATHER SWANN'S letter deserves a reply. (1) The whole of his argument as to whether birth-control is natural or unnatural (I gather it is in either case a vice!) depends on the prior assumption that the *sole* "natural purpose of the marriage act" is procreation. There are, however, a large number of people who would deny this, and say that its natural purpose (or better function) is dual—not only procreation, but also the increase of marital love and joy.

The great point of fact is that there is, *increasingly* with increased infant welfare and increased pressure of population, a large disharmony between the frequency of the nuptial act required for a sufficient family—say three to five children—and that which

is a satisfaction, on the most restrained and moderate scale, of our "natural" normal and healthy instincts. I still maintain that it is impossible to say whether the production of a family or the reasonable satisfaction of the sexual instinct is more "natural," in that this term merely introduces confusion into the question. There still seems to linger in some quarters the idea that the sexual act is *per se* evil.

In any case, it appears to me to be very dangerous ground for a representative of the Catholic Church to denounce contraception as unnatural while the same Church sanctions what the average man would regard as equally or more unnatural, namely, *coitus reservatus*, as a way out of the difficulty. It also sanctions intercourse during the (so-called) "safe period," which also, if I understand Father Swann, he would call unnatural (provided it were really "safe").[1] In any case, as shown clearly by Dr. Stopes ("Wise Parenthood," p. 55; and "Contraception"), union during this period is for most women definitely "unnatural."

(2) I will not waste space with comment on Father Swann's criticism of my analogy from food, save to say that if we only ate in order to sustain life, the most modest dinner-party would be excessive. And that his remarks on the ancient Romans and the *vomitorium* are off the point. The moral need for restraint remains whether one practises artificial birth-control or no, and whether one enjoys one's dinner or no. To assume that contraception must mean excess is a mere insult to those who practise it.

(3) As to the individual's concern for salvation, I was merely attempting to show that it could be pushed to too great lengths, which is undoubted. The same authority quoted by Father Swann also made a remark to the effect that those who lost their life should find it. Those who are over-concerned about their individual souls do not "lose themselves" in this way. J. S. HUXLEY.

October 21.

The Anti-trade Winds.

IN the article published in NATURE of July 18, p. 115, I am glad to see that Mr. L. C. W. Bonacina is in conformity—at least in a general sense—with my views upon the question of the anti-trades. I do not know the opinion of European meteorologists exactly in regard to the *fixity* of these currents; but if we examine books as those of Ferrel, Dove, Angot, etc., it seems that the existence of the anti-trades is a well-recognised fact. The evidence, however, is not clear; on the contrary, the facts seem to be against that theory. I find very much justified the remark of Sir Napier Shaw (Quarterly Journal of the Meteorological Society, January 1925) that he had "never been really able to prove the existence of an anti-trade over the region between anti-cyclones and the equator."

Do the south-west or westerly winds extend over the limits of the equator? I think they do not. Besides the observations of Bogota, those of Pasto in South Colombia (Lat. 1° 31′ N.), at the height of 2595 metres, show that the high winds blow from east and south-east.

The directions of the dust of volcanoes are frequently said to prove the existence of the anti-trades. As I wrote in the U.S. *Monthly Weather Review*, December 1923, the volcanoes Cotopaxi at Quito and Colima in Mexico do not prove the existence of such winds.

I know that Mr. Bonacina refers to mean conditions in the use of the terms *trade* and *anti-trade*. I do not see any objection in the use of the *trades*. They blow in the Atlantic quite constantly, but not so the anti-trades. My opinion is that the atmospheric circulation, as developed by Thompson, Ferrel, etc., is not in accord with observed conditions in tropical and equatorial countries.

S. SARASOLA, S.J.

Observatorio Nacional de San Bartolomé,
Bogotá, September 11.

FATHER SARASOLA'S observations are certainly out of harmony with the older ideas about the general circulation of the atmosphere as due to Ferrel, Dove, and others, but these are not nowadays accepted as anything more than a rough approximation, and the observations, in fact, lend most valuable local support to more recent views, according to which over the equatorial limits of the north-east and south-east trades the average direction of the wind is respectively south-east and north-east, becoming south-west and north-west respectively above the polar margins of the trades. A scheme involving this disposition of the anti-trades was, as I indicated in the article in NATURE of July 18, put forth by Blair (*Monthly Weather Review*, 1916), and various upper air observations in different localities certainly support it. In the vicinity of the Cape Verde Islands, lat 16° N., the "anti-trade" is, I believe, south-east, in conformity with the observations in Colombia, whereas in the vicinity of the Canary Islands in lat. 28° N. it becomes south-west. In a report of upper air observations at the Apia Observatory, Samoa (14° S.), during 1923–24, the anti- or counter-trade is very definitely established above the south-east trade, its base being between the altitudes of three to five miles according to season, the direction being north-east below and changing through north to north-west above.

It may, therefore, be suggested that, corresponding to what happens over the south-east trade in Samoa, the south-westerly wind may yet, with further observations, be found in Colombia above the south-easterly wind found by Father Sarasola overlying the north-east trade—which south-westerly wind would gradually descend with increasing latitude towards the polar margin of the north-east trade. It must, further, not be forgotten that the northern trade system is much upset by the monsoons, being locally subverted in summer, and reinforced in winter, and if the north-east trade is variable locally as regards regularity and other features, it were only to be expected that the counter-trade would be so too. But I fail to see that there is any evidence for doubting the existence of the "anti-trades," at all events, in a statistical sense, and theory surely necessitates some kind of average counter-flow *away* from the equator to balance the statistical "trades" *towards* the equator.

Much of the difficulty which appears to exist about "trades," "anti-trades," "westerlies," and other *stereotyped* winds, as items in the general circulation of the atmosphere, undoubtedly turns upon the matter of definition. Any one who tries to frame an exact definition of a "trade," etc., to be applied to the actual currents of the atmosphere will soon discover that "trades," "anti-trades," and so forth, are really statistical abstractions, artificial categories, indispensable in enabling us to form a mental picture of the mean or average structure of the circulation, but a fatal snare the moment we lose sight of the fact that this statistical picture of the circulation represents not a fixed static system, but one in a perpetual state of perturbation—of distortion and subversion

[1] I quote from "The Morality of Birth-Control," by "A Priest of the Church of England," London, 1924.

of the average structure so depicted. It is not so much meteorologists dealing with day-to-day weather as geographers approaching meteorology through climatological normals that are liable to fall into the trap, but in any case it is time that the subject of "trades," etc., in text-books both of meteorology and physical geography, were presented in a manner more calculated to make the student think in terms of the *perturbability* rather than the *fixity* of the great wind-belts of the globe. Suppose the actual daily circulation, the interchange of air between the equator and the poles, did conform to anything resembling the cast-iron statistical model, what would be the result? All weather changes, as we know them, would cease, some regions would absolutely never see rain at all, others would literally never be dry, whilst in England, to judge from conditions when the actual distribution of wind and pressure *does* momentarily coincide with the statistical picture, we should have almost constant cloud and drizzle.

This is no doubtful inference; it is in absolute accord, not merely with common experience of daily weather sequences, but also with the principles of the modern theory of the Polar Front. Sometimes when a great wall of high pressure westward of Ireland interrupts our "westerlies" there occurs something which any one whose mind was fettered by the statistical picture would never allow for, namely, the passage of a northerly current all the way from the Arctic to the tropics, and current in sub-tropical latitudes has, so far as I can see, as much right to be called a "trade" as the shorter equatorward current prevailing when the controlling anticyclone takes up its more usual position about 35° N. The number of distortions, minor and major, of the mean or average statistical picture is such that there is no criterion for deciding in all cases whether a particular current of air is, or is not, a "trade," or "anti-trade," as the case may be.

L. C. W. BONACINA.

October 20.

Weather Prediction from Observations of Cloudlets.

THE simplicity of the following method of weather prediction is liable to excite incredulity. Nevertheless, our climate is so changeable that the method can be crucially tested on most days within five minutes by any one. I have used it during many years and on hundreds of occasions, and have found it at least as reliable as the, necessarily, belated weather reports given in newspapers. It is so simple that, as it seems to me, every one must know it; but, apparently, that is not so. In any case, I write only for the man who, perhaps knowing nothing about scientific meteorology, desires to ascertain for himself the kind of weather he is likely to experience during the next few hours.

Though clouds often condense during heavy downpours, they are popularly said to "dissolve in rain." Actually they disappear through evaporation. They "dry up," vanishing like steam out of a kettle, or like ground mist on the morning of a fine summer day. They climb from the horizon, but wax or wane on the way, condensing or thinning. If then the behaviour of the smallest and thinnest fragment of cloud that can be clearly isolated be watched, it is usually possible to predict very quickly and with fair confidence the state of the weather for the next few hours. If the cloudlet waxes visibly, rain is almost certain; if it wanes, fine weather is equally probable; if it neither waxes nor wanes, existing conditions are likely to continue. It is often much easier to be sure of the waning than of the waxing; for the total disappearance of the cloudlet eliminates the possibility of observational error.

This method is inapplicable only when the sky is cloudless, or when it is of a uniform grey. It is uncertain when a high wind prevails; for then continents of cloud, dissolving perhaps but still dropping rain, may drift up from below the horizon. Of course the nearer the cloudlet (the lower it is) the more closely do the conditions in which it floats approximate to those on the ground, and the more easily may it be observed; and, therefore, the more confident may be the prediction. I have often watched a cloudlet diminishing under a grey and dripping blanket of cloud, and made plans for fine weather. It is said that a lenticular cloud may, at the same time, wax at one end and wane at the other. This implies that unlike weather conditions prevail at the two ends—possibly the meeting of a warm with a cold current, or a heating by the sun of one end, but not the other. Personally, I have observed it only when a cold mountain peak causes to windward the formation of a cloud which drifts along its sides, and dissolves to leeward—a pretty phenomenon which, as in some human affairs, gives an appearance of bustle without real progression.

Linked with this matter is the truth that red in the morning usually presages rain, and red in the evening fine weather. It is common knowledge that our prevailing wind is from the west; that only a low sun paints the clouds; that, speaking generally, it paints only those which are somewhat between it and the observer; and only those on which it shines directly. Thus a cloud that lies in the shadow of another which is nearer the sun is not coloured. Given a westerly wind, then, it follows that red in the morning implies that the sun is shining from a wide clear area in the east on clouds that have drifted overhead from the west. That is, it probably means that clouds are gathering. A glance to the west should settle the matter. On the other hand, when the western clouds are painted, that implies that the sun is shining, and the wind blowing, from a clear area beyond, and, therefore, that the clouds are breaking. It follows again that, if the wind be in the east, red in the morning should indicate bright weather and red in the evening rain.

But no matter what the cloud colours, the surest quick weather test is that furnished by the behaviour of a cloudlet, which, very often, may be seen to wax or wane with surprising swiftness.

G. ARCHDALL REID.

20 Lennox Road South,
Southsea, Hants,
October 27.

Alleged Rhætic Crane Flies.

IN NATURE of March 7 last, p. 351, reference is made to the discovery of two species of Rhætic crane flies, described by Dr. G. R. Wieland, palæobotanist, in the January number of the *American Journal of Science*. Copies of Dr. Wieland's paper have only recently reached me, and I was astonished to find, from the very clear photographs and diagrams published therein, that these wings are not dipterous at all. Apart from beetle elytra, the most abundant wings found in the Upper Triassic beds of Ipswich, Queensland (age, Rhætic or a little older), are Homopterous tegmina, most of which belong to the extinct family Scytinopteridæ, ancestral to the Cercopidæ. These tough tegmina have the peculiarity of usually splitting, when fossilised, along the *vena dividens*,

which is a deeply impressed concave vein (Cu_2) separating the anal area or clavus from the rest of the wing (Fig. 1). When the wedge-shaped clavus has become separated, the remainder of the wing appears to be very narrow at the base, and this would suggest a resemblance to dipterous wings, though the thick and strongly arched costa is quite unlike that of any Diptera.

Another point of resemblance between the two, which evidently deceived the author, is the frequent presence of a closed median cell (discal or discoidal cell, *mc*); but such a cell is found in many orders. All primitive Diptera have the radial sector with four or three branches, and all Diptera, without exception, like their allies the Mecoptera, have the first cubitus unbranched. The Rhætic wings have a simple radial sector and a forked first cubitus, and in these and all other characters agree with the Upper Triassic Scytinopteridæ.

The problem of the ancestry of the Diptera is one of the greatest interest, and it is important that no inaccurate determinations of fossil wings should confuse our view of it. The oldest known fossil Diptera at present are those from the Upper Lias of Europe.

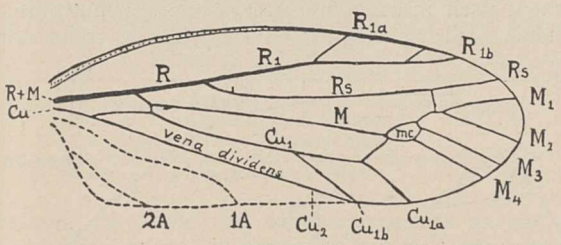

FIG. 1.—*Tipuloidea rhætica* (Tillyard) Wieland. Wing, with missing clavus restored by broken lines.

No Diptera are yet known from the Lower Lias. In the Upper Triassic beds of Ipswich, Queensland, the age of which is either Rhætic or a little older, the Diptera are replaced by their ancestral order Paratrichoptera, which had four wings and a venational scheme very much like that of the caddis-flies or Trichoptera, but with a simple instead of a forked first cubitus. I do not assert that true Diptera might not have existed in the Rhætic of South America, but it is certainly highly improbable, especially as the fossil record shows that Australia was ahead of the rest of the world in specialised insect types in the Upper Permian, and probably also in the Upper Trias. In any case, neither of Dr. Wieland's new genera is dipterous.

The generic name Tipuloidea given by Dr. Wieland to the larger and better preserved of his two fossils is an unfortunate one. There is already a genus of Tertiary fossils, Tipulidea, Scudder, and the word "Tipuloidea" has been used for years to indicate the *super-family* containing the Tipulidæ and their allies. Apparently if I choose to name a new genus Lepidoptera or Odonata or Blattoidea there is nothing to prevent me except my own sense of the fitness of things. Surely all names already in use for higher groups should be "taboo" for genera? Assuming that Tipuloidea, Wieland, is preoccupied by Tipuloidea, super-family name, I would suggest that the generic name of Dr. Wieland's new fossil be changed to Wielandia, in honour of its discoverer.

The accompanying illustration (Fig. 1) shows the fossil *Tipuloidea rhætica* with the missing clavus indicated by broken lines.

R. J. TILLYARD.

Biological Department,
Cawthron Institute, Nelson,
September 5.

Root-cap Development in *Calluna vulgaris*.

ONE of the characteristic differences between root-apex and stem-apex in a plant is that the meristem of the former produces a tissue in front of the apex known as the root-cap. In my experience this root-cap remains small even in roots

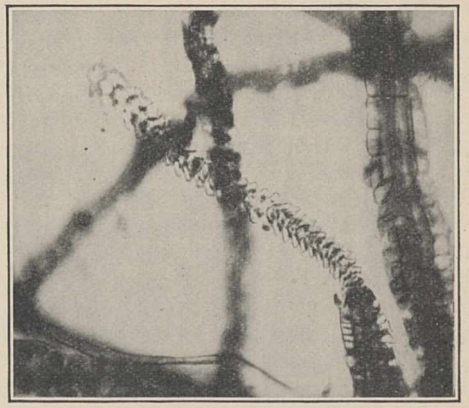

FIG. 1.—Root-cap development in *Calluna vulgaris*.

growing in water, owing to the disintegration of cells on the outside.

It is thought that the accompanying photograph (Fig. 1) of a root of *Calluna vulgaris*, grown for some months under controlled conditions as described in a recent paper (Rayner, *Brit. Journ. Exper. Biol.* vol. 2, 1925, p. 265) and showing the development of a root-cap of considerable length, may be of interest to botanists owing to its unusual character.

W. NEILSON JONES.

Botany Department,
Bedford College, London, N.W.1.

Rabbits in Africa.

THE common rabbit, I understand, is not indigenous to that part of Africa forming the Ethiopian zoological region, although it occurs in the Palæarctic part of the continent bordering on the Mediterranean.

It is interesting, therefore, to note the occurrence of a well-established colony at Masindi, which has been there for so long that its origin is unknown to the natives, who give the rabbits the same name as the indigenous hare. For a long while I thought they might be feral descendants of some domesticated rabbits at the missions in the neighbourhood, but a book which I have just been reading furnishes a clue. It is "Emin Pasha in Central Africa," published in 1888 by Messrs. George Philip and Son, and contains a collection of that great traveller's letters and extracts from his journals. In a small section headed "The acclimatisation of various domestic animals in the equatorial Nile region" Emin writes from Lado, December 25, 1881: "I have introduced rabbits which are doing well and promise to thrive." The actual locality into which the rabbits were introduced is not stated, but Masindi was included in Emin's travels, and possibly this statement may explain the occurrence of rabbits there. Lado is on the White Nile at about 5° north latitude; Masindi lies east of Lake Albert a little south of 2° north latitude. It is of considerable interest that rabbits should have been able to establish themselves firmly in a country abounding with carnivora, birds of prey, and snakes, not to mention native Africans!

G. D. HALE CARPENTER.

Masindi, Bunyoro, Uganda Protectorate,
September 23.

The London Skull.

By Prof. G. ELLIOT SMITH, F.R.S.

THE merit belongs to Mr. Warren R. Dawson of having recognised the importance of the fossilised fragment of a human cranium found during the excavation for Lloyd's new building in the City of London. I have to thank him for the opportunity of studying so interesting a specimen. Both of us wish to express our appreciation of the ready manner in which the members of the Committee of Lloyd's have placed the specimen at our disposal for scientific examination, and of their generosity in presenting it to the Anatomical Museum of University College, London.

Mr. Dawson has written the following account of the circumstances in which the fossil was discovered :

" During 1924 and 1925 the site bounded by Leadenhall Street, Lime Street, and Leadenhall Place in the City of London, upon which the historic East India House originally stood, has been excavated for the erection of a new building for the Corporation of Lloyd's. Before the erection of the steel-work began, the central part of the site was cleared by means of mechanical excavators; but as the stanchions and girders rendered the available space more and more restricted, part of the digging had to be done by manual labour. The chance of finding fossil bones was slight in that part of the area in which the steam excavator was used; for this apparatus raises large masses of earth at each plunge and deposits its burden bodily into iron skips, which are in turn hoisted by cranes and emptied into lorries. On such parts of the site as were dug out by manual labour, however, fossil bones have from time to time come to light.

" By the kind permission of the Committee of Lloyd's, facilities have been given for a scientific examination of these bones, and the clerk of the works, Mr. G. T. Murton, has in all cases carefully noted the exact depths and the nature of the soil in which the finds were made. In March 1925 I exhibited three specimens at a meeting of the Zoological Society. These comprised the head of a femur and some molar teeth of the mammoth, found in the river gravel at depths of 20 and 37 feet respectively, and the ulna of a rhinoceros, which in Mr. M. A. C. Hinton's opinion, may provisionally be referred to the species *antiquitatis* Fischer. This ulna came from the redeposited London clay, which at this spot underlies the gravel at a depth of 40 feet. It was actually found at a depth of 42 feet. These specimens have already been described and figured (Warren R. Dawson and M. A. C. Hinton, Proc. Zool. Soc., 1925, Part 2, p. 793. The rhinoceros bone has been presented to the British Museum by the Committee of Lloyd's).

" At a later stage in the excavations some further remains came to light. Amongst these were the antlers and some limb-bones of the red deer (*Cervus elaphus*) from the river gravel at a depth of 30 feet, and the greater part of the skull of an ox from another part of the site at the 26 feet level. The most interesting fossil, however, is part of a human skull, recovered from the blue clay, the same formation as that in which the remains of the woolly rhinoceros were found, and at exactly the same depth, 42 feet, but in the western portion of the site. The fragment of skull was broken into four pieces by a blow from the excavator's pick; but one of the pieces (a small triangular splinter from A in Fig. 1) was not recovered. The other three pieces were fitted together and exhibited at a meeting of the Zoological Society of London on October 20. On that occasion the erroneous statement was made that the skull was found at a depth of 26 feet from the surface; but a few days later the clerk of the works directed my attention to the error and informed me that the human fossil came from the blue clay in the 42 feet level.

" The misunderstanding arose from the fact that our inquiries concerning the ' skull ' were believed to refer to the remains of the ox found at a depth of 26 feet, and not to the flattened plates of bone, which were not recognised as parts of a skull."

This correction eliminates the difficulty that presented itself in attempting to associate a mineralised human skull revealing interesting primitive traits with the conditions that obtained in the gravel at a level 16 feet nearer the surface. The deposit in which the human remains were found forms part of the third (or lowest) terrace of the Thames containing the characteristic late Pleistocene fauna. While there is every reason for believing that the fragment of skull was naturally deposited and formed part of a human being who was a contemporary of the woolly rhinoceros, its presumptive age must be assumed to be later than the Mousterian phase of culture.

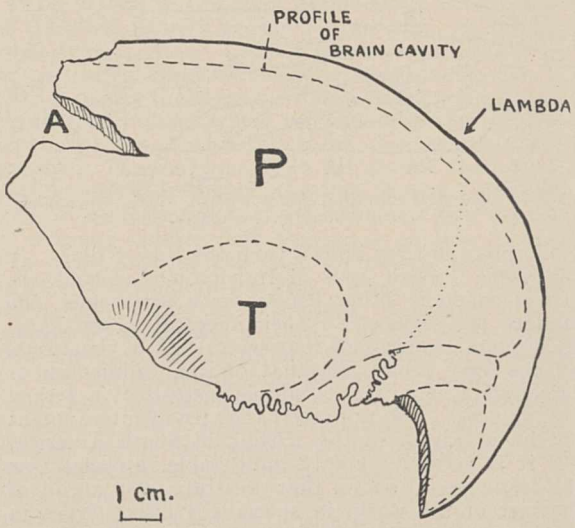

FIG. 1.—Orthogonal projection of the left side of the London skull.

The fragment includes the greater part of the occipital and left parietal bones and a portion of the right parietal. The whole of the masto-parietal and a considerable part of the squamo-parietal sutures are present (Fig. 1), and the position of the groove for the middle meningeal vein on the inner surface of the tongue of bone below A (Fig. 1) indicates that the latter reaches to within a millimetre of the coronal suture. In the figure the closed part of the lambdoid suture is indicated by the dotted line, and the form of the brain cavity is indicated by broken lines. The

area T represents the situation (on the endocranial cast) of the temporal boss, and P the singularly ill-developed parietal area.

The bones are completely mineralised and of a reddish-brown colour. The condition of the cranial sutures (lambdoid and sagittal) suggests an age of more than forty, but probably less than fifty years. The smoothness of the contour of the skull, and especially the faintness of the muscular impressions (Fig. 4), make it highly probable that the sex is female.

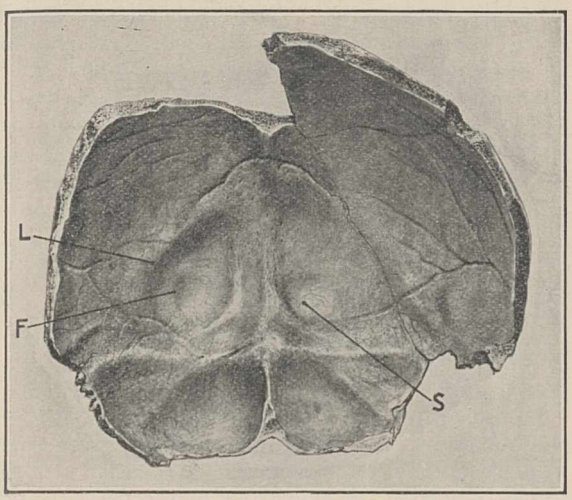

FIG. 2.—The inner surface of the cranium viewed from the front. Drawn by A. K. Maxwell.
L, crista lunata on right side (left side of figure).
F, fossa areæ striatæ (with a ridge concentric with the crista lunata).
S, diminutive fossa areæ striatæ on left side.

The distinctness of the large lunate crest (Fig. 2, L), and the deep fossa striatæ (F) on the right side of the occipital bone—a reversal of the normal asymmetry—affords, as I pointed out in 1908 (*Brit. Med. Journ.*, Aug. 29, 1908, p. 597), clear proof of left-handedness.

The special interest of the relic arises from the fact that a skull which, from the circumstances of its deposition, is probably more recent than the known occurrence of the Neanderthal species, should reveal features so closely simulating those of the female crania of the Neanderthal type (those of Gibraltar and La Quina), and differ so profoundly from those of her (presumed) contemporaries of the Upper Palæolithic period. The height of the cranium is no greater than that of the La Quina woman (and the restored Gibraltar woman's skull); and the maximum breadth of the cranium is intermediate between the measurements in these two members of the Neanderthal species. The greatest breadth of the endocranial cast of the London skull is 136 mm., that of the La Quina cast being 130 mm., and of the Gibraltar cast 140 mm.

The resemblances in the brain cases are indicated, however, not merely by the measurements of height and breadth, but also by the form of the endocranial casts, both their profile (Fig. 3) and the modelling of their surfaces (Fig. 5). The astonishing similarity of the size and shape in the profiles of the casts of the brain cases in the London, La Quina, and the Gibraltar skulls is brought out in Fig. 3. When one recalls that the London cast reveals a form suggestive of the short brain of the Gibraltar type rather than the long brain of the La Quina type (Fig. 3), and that the Gibraltar brain was wider than the Londoner's, it seems probable that the volume of the latter cannot have been much, if any, more than 1200 c.c.

In his memoir on the Neanderthal race (Roy. Soc. Phil. Trans., 1907) Prof. Sollas describes the skull of an aboriginal Australian that was no higher than the Gibraltar skull. On comparing a replica of the endocranial cast of this skull (S.A. in Fig. 3), which Prof. Sollas gave me some years ago, it is found to agree even more nearly in profile with the La Quina cast, the only significant difference being a greater fulness in the parietal area. The Australian skull is usually as lofty as that of the modern British woman, the outline of whose endocranial cast is represented in Fig. 3.

This serves by contrast to emphasise the remarkable similarity of the London skull with those of the Neanderthal group and the exceptional Australian (S.A.). The cerebellum alone reveals any marked contrast. The fulness of this part of the brain in the London skull differs from the flattened form (cerebell.) of the Neanderthal and closely conforms to the type found in *Homo sapiens*, as well as, curiously enough, in the Piltdown cast (Eoanthropus).

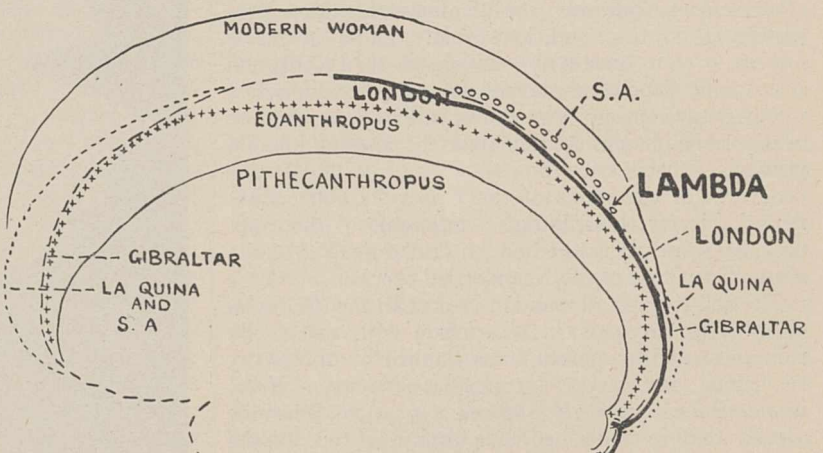

FIG. 3.—The outline of the endocranial cast of the London skull seen in profile from the left (thick line), compared with the Gibraltar and La Quina women and Prof. Sollas's Australian (S.A.), described in the Roy. Soc. Phil. Trans., 1907, p. 325, as well as those of Pithecanthropus, Eoanthropus, and a random sample of a modern woman.

The modelling of the surface of the cerebral hemisphere in the endocranial cast (Fig. 5) reveals features of special interest. The localised swelling in the posterior

part of the temporal area (the temporal boss marked T in Fig. 5) is clearly defined, as it is in casts obtained from the La Quina, Piltdown, and Java (Pithecanthropus) crania, in all of which its distinctness is due partly to the lack of fulness in the parietal area (P). Even in the flat endocranial cast of Prof. Sollas's Australian skull the parietal area is prominent and no localised temporal boss is apparent. Though the parietal area is

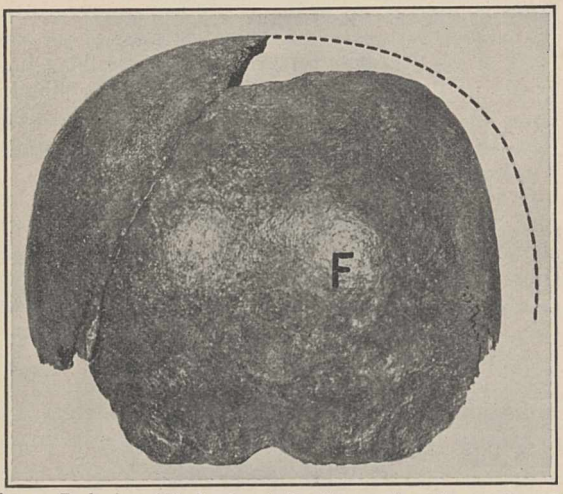

FIG. 4.—Back view of the London skull. The prominent boss on the right side at F is associated with the deep fossa striatæ (Fig. 2).

fuller in the London cast than in that of the La Quina skull, it resembles the latter more nearly than it does the Australian. The contour of the latter in Fig. 3 (S.A.) is merely one of the expressions of this increased parietal development. In this, and in fact in most other respects, however, the London skull differs profoundly from the condition usually found in *Homo sapiens*, even in such early examples as the Cromagnon and Combe Capelle crania, the brain cavities of which would, if the contours were shown in Fig. 3, much more nearly resemble the modern than the ancient London woman.

Several of the skulls of the Upper Palæolithic are remarkable for their flatness; but none of them approaches so nearly as the London skull does (Fig. 4) the shape distinctive of the Neanderthal species.

The Solutrean skull found in 1891 at Brünn (Moravia)—embedded in loess in association with the woolly rhinoceros and mammoth—was claimed by Makowsky to belong to a type intermediate between *Homo neanderthalensis* and *H. sapiens*. In 1906, Schwalbe argued that it conformed to a primitive type of the species *sapiens*, because the cranium was much higher than the Neanderthal form and lacked the distinctive type of eyebrow ridges. In spite of this, several anthropologists (see, for example, Stolyhwo in *Globus*, December 17, 1908, p. 363) refused to accept Schwalbe's view. The London skull affords much more definite evidence in support of these claims for the existence of an intermediate species than any of the Moravian specimens or Stolyhwo's Novosiolka skull reveals. In fact, the London endocranial cast (Fig. 5) reproduces the form of the Neanderthal type so nearly that the question of the possibility of the survival into Aurignacian times (in Britain) of a stray representative of the species *neanderthalensis* is forced upon our consideration.

In spite of these considerations, however, one is not justified in claiming, on the evidence of data derived solely from the posterior part of the skull, that the London skull belongs to the Neanderthal species or to an intermediate type. The front end of the cranium or the face would have provided decisive evidence for the determination of the species; but unfortunately these parts of the skull are missing. Hence, as the fossil was found in a deposit definitely later than that in which Neanderthal man is known, and taking into consideration the range of variation in modern man, as displayed in the Australian skull (S.A. in Fig. 3), it would not be justifiable to claim this fragment of a skull as conclusive evidence of the survival of a member of the Neanderthal species into Upper Palæolithic times.

The thinness of the cranium is not a certain criterion of identity with the species *sapiens*, for the London skull is quite as thick as that of the La Quina woman.

In support of these tentative suggestions, the size and fulness of the cerebellum must be given some weight as an indication of affinity or identity with the species *sapiens*. The filling out of the parietal area, slight though it be, may possibly be indicative of a rank above that attained by the Neanderthal brain.

As to the date of the London skull, perhaps the most relevant facts are provided by the excavations in 1892 for the New Admiralty Buildings in London (Lewis Abbott, Proc. Geol. Assoc., 1892, vol. 12, p. 346). The lowest terrace of the Thames provided evidence

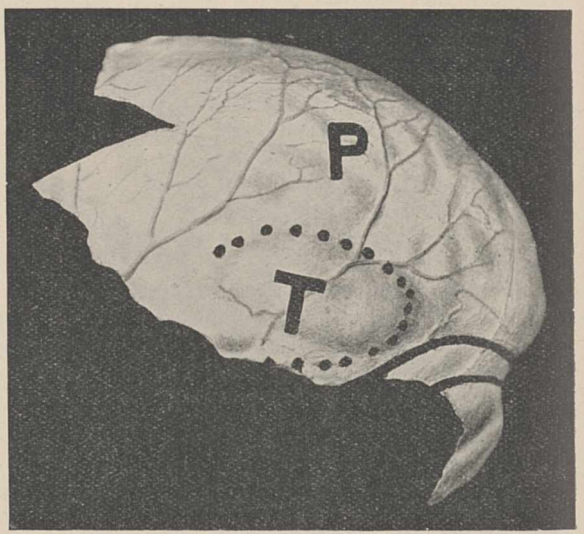

FIG. 5.—Left side of endocranial cast of the London skull.

of the association of the Pleistocene mammals with a Solutrean implement.

Whatever the fuller study of this remarkable skull may reveal, the fossil is certainly by far the oldest human relic yet found in the City of London and presents probably the nearest resemblance to the Neanderthal type ever found in a member of the species *sapiens*.

In the task of investigating this fossil I have had the benefit of the valuable advice of Profs. D. M. S. Watson and J. H. McGregor (of Columbia University).

Science in Russia.

By W. BATESON, F.R.S.

IN consultation with Sir Henry Miers and Prof. D'Arcy Thompson, who were among the British delegates, I have prepared the following account of our recent visit to Russia to the celebrations of the two-hundredth anniversary of the Russian Academy of Science. The celebrations began on September 5. We were to have six days in Leningrad, full of every kind of function both solemn and festive, to be followed by four more, similarly crowded with events, in Moscow. We came determined to see and hear all that we possibly could in the time; and aware that the gathering had been organised largely with an eye to its propaganda-value, I suppose that most of us with our curiosity combined a considerable measure of scepticism as to the real value of anything we might be shown.

Nothing could exceed the courtesy and hospitality with which we were received. Railway travelling in Russia was to be entirely free, and those who cared to do so were invited to visit any place in the country, Kieff, Odessa, etc., that could be seen before the end of September. At the frontier our baggage was passed in (and on the return journey passed out) unexamined, and we were authorised to send cables gratis. New motor omnibuses, specially sent from Moscow, met us at the station, and after we had been duly filmed, conveyed us to our hotel—a fine and well-appointed house. Rumour alleged that no other hotel could provide even reasonable comfort, but that may have been untrue. Of the ordinary charges we paid about half, but at Moscow, where we were distributed among several hotels, no charge at all was made.

If these preliminary symptoms inclined us to complacency we soon saw others of a different character. In the long drive through the streets of Leningrad the evidence of the empty and half-ruined buildings, the peeling walls, the dishevelled pavements, and the broken roadways—full of dangerous and neglected pits, above all the clothes of the population, with rarest exceptions, dingy and often improvised of coarse and unusual materials, were indications of troubles which no camouflage could conceal. Wherever we went in Leningrad, though in a slightly less degree perhaps in Moscow, we had the experience—to scientific persons novel and rather disconcerting—of finding ourselves conspicuously well dressed. It was indeed a little embarrassing to meet men of refinement and learning whose trousers were eked out with large and unrelated fragments, though almost worse to pass groups of artisans going home from work in rags which suggested the casual ward of a workhouse rather than decent employment. Readers of NATURE will not expect a report on social conditions, but some hint of the setting in which we saw what we did see can scarcely be omitted.

In preliminary announcements the numbers of foreign visitors expected had been given as about a hundred and fifty. We were not furnished with any list of those who did attend, but the highest estimate of our actual numbers which I heard was ninety-six. Of these perhaps half were representatives of mathematics and natural sciences in the stricter sense, the remainder being economists, historians, orientalists, and especially students of Slav languages, etc.

The proceedings opened with an evening reception in the rooms of the Academy. On this and on most other formal occasions our arrival was attended by a guard of honour with bayonets fixed, and we marched in under the lime-light of the ubiquitous cinema men. Here we found ourselves in an immense gathering assembled from all parts of Russia, representative of every kind of learning, and if several of the eminent foreigners whose presence had been promised failed to appear, there were no defects on the part of our hosts, for practically every one with whom we had acquaintance, direct or indirect, was there.

On the following Sunday we assembled for the first of several public seances, which both in Leningrad and Moscow constituted the formal business of the congress. Proceedings began—as always—with the singing of the International, which was followed by discourses of various kinds. After an introduction from the president, Karpinski, the secretary of the Academy, Oldenburg, gave an interesting history of its origin and activities, reminding us of the many distinguished men who had worked under its auspices. Other members of the Academy, especially Steklov and Lazarev, followed him, but alternating with them were speeches by members of the Government, giving their views on what science had done and might do for the people. At various times we were thus addressed by Kalinin, president of the Soviet, Krassin, Kameneff, Lunacharsky, minister of education—on several occasions—and other well-known leaders. At one of these seances Zinovieff, president of the Leningrad Soviet, gave a long and rhetorical address, developing an analogy between the aims of science and those of the revolutionists, which was afterwards printed.

Among much in all these speeches which of course escaped us, one conclusion very plainly emerged, that the revolutionary government is perfectly sincere in its determination to promote and foster science on a very large scale. Signs were not wanting that science, especially perhaps in its applications, is regarded by the present governors of Russia as the best of all propaganda. It was interesting to hear the faith that the advancement of science is a first duty of the State proclaimed by professional politicians. We ought perhaps not to inquire too closely whether they and we mean the same thing by the term science. Zinovieff, for example, speaks in the same breath of the "discovery" of Karl Marx and the "discovery" of Charles Darwin. Each of these men valued the work of the other, he told us, in a very high degree, and in evidence of Darwin's admiration of Marx he spoke of a letter, sent in acknowledgment of the book on capital, which was to be published. In an impassioned passage, which was enthusiastically applauded, he drew a parallel—derived from Lenin—between what science had done for the abolition of syphilis, patiently trying and discarding 605 reagents before 606 was reached, with what revolutionists were attempting for the abolition of capitalism. Capitalism was a scourge worse than syphilis, and if need be, not 606 but 6006 remedies must be tried so that the planet may be delivered once for all from its "yoke." Judging, however, from the

proportion of the population lost in the first experiments,[1] those who survive to benefit by the ultimate deliverance will be few.

Whether science will soon fulfil the many promises made in its name must be doubtful, yet not merely from what we heard, but also from what we saw, the failure we may be sure will not be for want of genuine effort. Next in importance after communism, the tenets of Leninism assert the doctrine that science is the basis of happiness. Religion is to be eradicated as a vice; science and the arts are to be promoted in its place. Those who regard this fervour for science as mere affectation for propaganda purposes miss an essential fact, and in our visits to laboratories and institutions, as related below, we found abundant and imposing evidence of the expression of this faith in material works. Of these new institutions we saw a great many, and though of course none of us could personally visit more than a part, we found on comparing notes that certain features were common to most of them. Palaces and great houses from which the owners have been dispossessed have been hastily adapted for the purposes of science. The effect was often incongruous. Though objects of value had been removed, we saw laboratory benches improvised among the remains of Empire furniture and statuary, and under Boucher ceilings representing nymphs sporting with amorini. Formerly each institution would have the Tsar's portrait and probably an occasional ikon. The modern analogue of these is the "red room," arranged as a sort of shrine of communism with the bust of Lenin, surrounded with copious literature of propaganda. Signs also there were that, in other and less innocent ways, not only the universities but also the various scientific institutions were utilised as agencies for the dissemination of communistic ideas.

Doubts might be entertained as to whether the best atmosphere for research has been created in the institutions, but no praise is too high for the zeal and vigour with which work is being conducted in the new circumstances. As typical of them may be mentioned the Institute of Zoological and Botanical Research under Prof. Philiptschenko and Prof. Dogiel, which has been set up in the house and parks of the Leuchtenberg family at Peterhof. Besides the permanent staff, many hundreds of students are there accommodated in the summer months, partly for instruction and in part co-operating in the experiments we saw in progress. The whole gave the impression of a very active and well-organised school, which has already done excellent work both in fundamental and applied biology. At Moscow Prof. Nawaschin and a band of cytologists trained by him are housed in a fine building and equipped with good instruments. His researches are of course classical, and we saw with satisfaction that in this case at least, one of the "purest" of biological sciences was not suffering through the competition of the applied branches.

Another very large house, also in Moscow, has been assigned to Prof. Koltsov as an Institute of Experimental Biology. This includes numerous departments, especially a genetical station under Prof. Serebrovsky, work in experimental morphology, hydrobiology, etc. At the old Agricultural School at Petrovsky-Razumovsky, we saw more genetical work in application to agriculture and the long-established researches of Prof. Prianischnikov on agricultural chemistry. The Darwin Museum, created by Prof. Coats and his wife in illustration of the theory of evolution, was a remarkable and I believe unique curiosity. It contains a quantity of valuable and largely unpublished material bearing on the incidence of variation and a great number of other novelties. We were invited to inspect many more institutions, especially various establishments connected with public health, but all these I had to forgo.

Among the new organisations of a biological character the most extensive is the Institute of Applied Botany and Plant Breeding. The immediate object is to provide breeds of cereals and other agricultural plants for the various parts of Russia. The work is in the hands of Prof. Vavilov, who has already built up a great establishment for this purpose, employing 350 people, of whom some 200 are trained workers. In his travels through Turkestan, Afghanistan, and neighbouring countries, and by a vast correspondence, collections of seeds of wheat, barley, rye, millet, flax, etc., have been brought together on a great scale. The central office is in Leningrad and occupies a very large building, which is in great measure a living museum of economic plants as represented by their seeds. Of wheat alone some 13,000 forms are here collected. In various parts of the country are twelve subordinate stations, and by sowings made once in about three years it is proposed to perpetuate most of the collection alive. Besides a cytological department under Prof. Levitzky, there are special sections for meteorology, statistics, etc. Exceptional opportunities have been provided for investigating the geographical distribution of cultivated plants, especially in its bearing on problems of origin, which have resulted in several novel suggestions. At Dyetskoe (formerly Tsarskoe) Seló is the home breeding-station of this Institute. The chief building on it is a pleasant house, originally intended as a villa for Queen Victoria, and adjacent to this a number of laboratories and additional accommodation have been provided.

Sir Henry Miers contributes the following notes on three great Institutes, indicating the scale on which scientific work is contemplated in Russia, and its concentration in Moscow and Leningrad.

"*The Geological Commission*, recently installed in a vast new building in the Vassili Ostrov, contains numerous rooms for the geologists who take expeditions to all parts of the country and generally work up their material in the winter months. There are no less than 200 geologists and a total staff of 400. All results are classified and co-ordinated in a central bureau; the relative abundance and distribution of minerals of economic importance are collected in a graphic form on special maps. The whole top floor is being utilised as a museum.

"*The Aero-hydro-dynamical Institute* at Moscow, approaching completion, at an estimated cost of three million roubles. A new wind channel, 52 metres in length, built in two sections, 3 metres in diameter at

[1] Though accurate figures are wanting, some estimates may be formed from the "Report on Epidemics in Russia since 1914," 2 Parts, by Prof. L. Tarassévitch, published at Geneva, 1922, for the League of Nations. On the basis of the statistics provided he estimated that "Russia may consider herself fortunate if she emerges from the present crisis with the loss of 20-25 per cent. of her population." Pt. 2, p. 44.

one end, 6 metres at the other, is nearly finished. An experimental tank, like the Froude tank at the National Physical Laboratory, 225 metres long, 12 metres broad, and 6 metres in depth, is being constructed. A large experimental tower for wind experiments has been erected.

"*The Institute of Applied Mineralogy* in Moscow is being built on a grandiose scale at an estimated cost of 1,800,000 roubles, with an area from 9 to 12 thousand sq. metres and cubic content of about 60,000 cubic metres. It will be equipped for research work on a vast mass of material from all parts of the country.

"Typical of the organisation of research in special directions is the *Institute of Biological Physics*, in Moscow, directed by Prof. P. Lazarev; the whole interior of a large building has been rearranged for work on many branches of applied physics, and includes investigations on such subjects as the ionic theory of nervous excitation, with a geophysical laboratory in which researches on the remarkable magnetic anomaly of Kursk have been conducted.

"As an example of the growth and reorganisation of scientific collections:

"*The Mineralogical Museum* of the Academy has been quadrupled in extent during the last twenty years and has just been established as a national public mineralogical museum, distinct from that of geology, and fully equipped with laboratories.

"A visit to any school would show how important and overwhelming a part is played by nature study and elementary science in the education of children, especially in reference to all the affairs of life under the Soviet system."

Of the old-established scientific institutions, the Museums of Zoology and of Palæontology and the Botanic Garden were the only ones which I managed to visit. The fine and largely unique contents of the two museums are of course familiarly known. One recent acquisition I saw with mixed feelings—the almost complete skeleton of the giant Indricotherium, a rhinoceros-like creature, standing about twelve feet high at the shoulder. These bones, the collection of which has taken three years, were found exposed at Chalkar Tengiz, a remote and little known locality, but from the photograph of the site I saw that in 1886 I must have passed within a few yards of the very spot. The Botanic Garden alone still showed signs of the hardships through which it had come.

Great provisions are being also made for the development of art, archæology, and ethnology. Though unable to visit the Musée Russe, in which the collections illustrative of the history of the races included in the Soviet are preserved, I heard continually of its extraordinary excellence. Though it is the work of several decades, its recent extension has been much assisted under the new regime. Of the new developments at the Hermitage, Sir Martin Conway lately published an account. Among later novelties I was shown the astonishing collections brought from East Turkestan by M. Kozlov's recent expeditions. From tombs originally constructed at a depth of twelve metres below the surface and permanently immersed in water, have been brought a vast series of textiles, both woollen quilts and silks in admirable preservation, together with ornaments of various kinds and domestic objects, the whole belonging to a civilisation previously unknown. The decorations representing stylised animals, especially reindeer (possibly elk) and oxen, are evidently Sassanian in affinity, as M. Orbeli demonstrated. Some of the designs in the silk fabrics are of incomparable beauty, and very striking also are fragments of a curious red and black lacquer showing the utmost delicacy of taste and workmanship. These remains have not as yet been dated with certainty, but are presumed to cover a long period belonging chiefly to the sixth-seventh century A.D., but in part probably to a much earlier epoch.

Of all the things seen I suppose the interior of the Usspensky Sobor, the great Cathedral of the Coronations, exhibited the greatest break with past traditions. Until lately the whole was plastered with gold leaf and paintings rising little above the *objêt de piété* type of art, giving an effect certainly solemn and gorgeous but tasteless and oppressive. The archæologists have declared the whole of this display of orthodoxy to be modern and debased. The process of stripping has been begun and is steadily proceeding under scholarly and skilful guidance. The ancient pictures are being slowly recovered and will be seen before long as they were intended to be seen upon the original white of the walls. The most famous and venerable of all ikons, the Korsun Madonna, traditionally ascribed to St. Luke, has already been cleaned. I remember it looking like a piece of black leather. Seven layers of paint have been removed and a most remarkable original picture has been displayed in its entirety. Terrible judgments were expected by the common people to follow these impieties and the opening of the reliquaries by which they were accompanied. Time alone can show whether their anticipations will be justified, but meanwhile there is no gainsaying the fact that in the restorations which are to be extended throughout the Kremlin churches, and carried out upon every ikon of importance, the history of religious art in Russia will be revealed.

Of the banquets, lordly, if indeed the term princely were not more appropriate, graced, as that in Moscow at least was, with Imperial porcelain and madeira; of the operas, of the ballets and the sumptuous production at the Arts Theatre, where several of the courtly costumes were real brocades—lately somebody's "properties" in the fullest sense—one I verily believe lent from the Kremlin collection itself—this is not the place to speak at length.

We left with no clear conception of the principles or practice of communism; and in particular as we looked round at the 1200 persons assembled for the Moscow banquet, in a city teeming with beggars, we tried in vain to conjecture any system by which admission to the table, or exclusion from it, may have been determined. Of liberty we saw no sign. We here are accustomed to think of science and learning as flourishing best in quiet places, where they may come to slow perfection, under systems providing a reasonable measure of personal independence and security. Present conditions in Russia have brought about the very contrary, and among the grave indications of disharmony, which every visitor observes, the want of freedom is by far the most serious.

Obituary.

MR. J. S. GAMBLE, C.I.E., F.R.S.

A FEW weeks ago the Indian Forest Service and British forestry had to deplore the loss of Sir William Schlich, who may be said to have been the doyen of British Empire forestry. Following shortly on the death of his friend, the Indian Service has now lost another great forester in the person of James Sykes Gamble, who, on his departure from India in 1899, left a great reputation behind him both as a scientific forester of the first calibre, an educationist, and a great botanist. Gamble went out to India when the botany of the forest was imperfectly known for the practical forester's purpose and the Indian timbers were quite unknown. Before he left the country he placed in the hands of the Indian forester a manual the value of which received immediate recognition.

Gamble was the second son of Dr. Harpur Gamble, R.N., and was born in London on July 2, 1847. He was educated at the Royal Navy School, New Cross, and at Magdalen College, Oxford, where he took firsts in Mathematical Moderations and in the Final School of Mathematics. The following year, 1869, he was selected by the Secretary of State for India to undergo training on the Continent for the Indian Forest Service. This scheme had been recently inaugurated by Sir Dietrich Brandis, at that time the first Inspector-General of Forests in India. Out of the seven selected in that year, Gamble and three others were deputed to the Nancy Forest School, the rest going to Germany. Gamble had many stories of the interesting life he led at Nancy, where he was trained under some of the greatest foresters of the day. He was under M. Clément de Grandprey in the fine forest of Haguenau before he went to the School. At the latter place at the time there were some of the best known names in French forestry, Nanquette being director. In the jubilee number of the *Indian Forester* (July 1925) Gamble wrote: "Personally, I can testify to having started my interest in wood-structure under the auspices of Professor Mathieu and with the help of the well-arranged collection in the wood-chalet in the School Garden." The Franco-Prussian War interfered with the English students' studies at Nancy and they were transferred to Scotland under Dr. Cleghorn, who had made a great name in Indian forestry annals and had been associated with Brandis in the first organisation of the Forest Service (1863–64). In the spring of 1871 Gamble returned to Nancy, and in November he sailed for Calcutta, taking out with him some Wardian cases of Ipecacuanha for the Botanic Gardens. It was this commission, received from the India Office, which took Gamble to Kew, where, under the guidance of Sir Joseph Hooker, he paid his first visit to the Gardens and Herbarium, thus starting an association with the Gardens which was to continue in later years and to last until his death. With these cases in his charge he landed at the private ghat (landing stage) of the Calcutta Gardens on the Hoogly River, and it was from the same ghat that he took his departure from India twenty-eight years later.

Gamble was posted to Burma and, like every man who goes first to that fascinating country, fell in love with it and with the forests. His stay in Burma was short, for in August 1872 he received orders to report in Bengal, orders he was very reluctant to comply with. In those days forest organisation in Bengal did not exist. Towards the end of the year Schlich was sent to Bengal as Conservator, and the friendship which was to last through life commenced between these two men. Before Schlich left Bengal he had placed forest administration on a firm basis, and Gamble afterwards carried on the work, as also the editorship of the *Indian Forester*, which Schlich founded in 1875. For a time Gamble was Conservator in Madras, and in 1890 he was transferred to the North-West Provinces (now United Provinces) as Director of the Imperial Forest School at Dehra Dun and Conservator of the School Circle, comprising an area of forests in the lovely Dun and Siwaliks and neighbouring Jaunsar Himalaya. Gamble proved himself one of the best directors the School has ever had. In connexion with the School he planted a small arboretum, which the writer had the good fortune to visit for the first time in his company, and saw once again in April last during a visit to India.

The Indian forest officer owes a great debt to Gamble on the score of the valuable botanical work he accomplished; but it should be recorded that the latter was a thoroughly efficient forest officer and in his day carried out some remarkably fine work. He was an indefatigable research worker and a patient cataloguer. In his early days in Bengal he prepared a list of the trees, shrubs, and climbers of the Darjiling district, a second edition of which was published in 1895. As an outcome of his work in Madras he compiled a flora of that Presidency. He drew up a list of the Bambuseæ of British India, published in the Annals of the Royal Botanic Garden, Calcutta.

It was while he was associated with Brandis as Assistant Inspector-General of Forests that he commenced the research work on Indian timbers, which resulted in the publication of his great work "A Manual of Indian Timbers," for which generations of Indian forest officers have blessed the name of Gamble. This first appeared in 1881, was soon out of print, and for a decade the young Indian forest recruit was almost helpless in the forest in the absence of such an essential handbook. A second edition, much amplified, appeared in 1902, and a third three years ago, the latter an improvement even on the second.

In the year of his retirement Gamble was made a C.I.E., and in the same year was elected a fellow of the Royal Society. In 1900 he was put in charge of the organisation of the forestry exhibit at the Paris Exposition of that year. The whole of the objects were assembled and arranged and tabulated in Calcutta by Mr. F. Manson, to whom the writer acted as assistant on what proved an extremely interesting piece of work. Gamble was awarded the Jury Medal and Diploma of the Exposition for this work; he also received the Barclay Medal of the Royal Asiatic Society of Bengal. He was elected to the Athenæum in 1902.

Gamble collaborated with the late Sir George King in materials for a flora of the Malay Peninsula, work which he afterwards carried on by himself. He was also associated with Schlich at Oxford in the training of Indian forest probationers and lectured on Indian

forest botany. He settled at Highfield, Liss, in Hampshire, and married, in 1911, Gertrude, daughter of the Rev. A. S. Latter.

To the Indian Forest Department and his many old friends Gamble's death will come as a great blow. He has left behind him an enduring memorial by which many a young forest officer who never met him will revere his name. E. P. STEBBING.

PROF. W. WRIGHT SMITH has sent us the following brief notes on Mr. J. S. Gamble's botanical work:

Gamble was associated with the late Sir George King on a very extensive publication entitled "Materials for a Flora of the Malayan Peninsula." This was started by Sir George King, who was responsible for Nos. 1-13; then King and Gamble appear as the authors for Nos. 14-21. These papers appeared in the Journal of the Asiatic Society of Bengal for the years 1903–1909, and the last numbers contain chiefly the Gamopetalæ. On the death of King, Gamble completed the work to the end of the dicotyledons. This constituted Nos. 22-25—published 1912–1915—and represented the orders Nyctagineæ up to Salicaceæ. One or two of the families were done by other authors.

On the completion of this very large work—I should perhaps have noted that Ridley had already done the monocotyledons of the area—Gamble turned his attention to the flora of Madras, and during the years 1915–1924 he published six parts of the "Flora of the Presidency of Madras," from Ranunculaceæ down to Plantagineæ. At the time of his death he was busily engaged on the Urticaceæ and had hopes of bringing out another part at an early date.

The very many new species which came to light during the work on the flora of the Malayan Peninsula, and also on the flora of Madras, appeared in numerous short papers scattered throughout the *Kew Bulletin* during the last twenty years.

PROF. E. H. BARTON, F.R.S.

THE scientific world has lost a very able and steadfast worker in the person of Prof. Edwin Henry Barton, professor of physics in University College, Nottingham, who died suddenly on Wednesday, September 23, when starting, in apparently perfect health, for a day's walk. He leaves a widow and two sons.

Prof. Barton was born in Nottingham in 1859, and lived there all his life except for two years spent in study: the first under Sir Arthur Rucker in the Imperial College of Science, London; the second under Hertz at the University of Bonn. The recognition of his talent, or perhaps the opportunity to develop it, came to him comparatively late in life; for he was a trained engineering draftsman when, at the opening of the University College, Nottingham, he commenced a course of study, and at the age of thirty-one years passed the London matriculation. His career as a student was brilliant, and he was awarded an 1851 Exhibition Research Scholarship. On returning to Nottingham in 1893 after his training in London and Bonn, he became lecturer in physics, and in 1906 professor and head of his department. His published scientific work was recognised in 1916 by election into the Royal Society.

Prof. Barton was the author of some very useful books for students; the best known being his "Textbook on Sound." This book from its scope and careful treatment may be held to complete a trilogy with Preston's "Light" and "Heat," so well known to advanced students. Prof. Barton's other works were "Analytical Mechanics" and "Introduction to the Mechanics of Fluids." At the time of his death he was well on the way with an advanced treatise on "Properties of Matter." To Glazebrook's "Dictionary of Applied Physics" he contributed the article on "Sound." His published papers, about sixty, were mostly in the *Philosophical Magazine*. When with Hertz, he commenced research on electric vibrations, and his earlier papers dealt with the transmission, damping, and reflection of waves along wires. In later years he turned rather to acoustic and other mechanical vibrations. In the sound experiments he adopted optical levers attached to the various parts of the moving wire or plate to amplify the vibrations, which he then recorded photographically.

As most of Prof. Barton's papers were collaborations, a great number of students and colleagues had the benefit of his inspiration in these researches. In particular, in the last eight years he published a series of no less than fourteen papers with Dr. H. Mary Browning, who was first his student and later his colleague. In this series the author used coupled and triple pendulums to illustrate the close analogy existing between electrical, optical, and mechanical vibrations, in all cases bringing the mathematical theory into relation with the physical action.

We have good authority for saying that the best early training for a would-be physicist is either mathematics or engineering. Prof. Barton, as we have seen, began life as engineer, and in his student career showed great mathematical ability, so he may be said to have happily combined both the desiderata specified. By nature a student, he was conversant with most branches of his very progressive subject with its voluminous recent addition of the "new" physics, relativity and quantum. When lecturing he handled his subject with a thoroughness which carried conviction and with a wealth of illustration which sustained the attention of his audience.

Prof. Barton was well known as an expert in sound, and as such was consulted by musicians and experimentalists in sound in various parts of the world. As regards the practice of music he was a *virtuoso* and could perform on many instruments. This faculty served him for demonstration in lectures and for his researches; so that the physics wing at Nottingham often resounded to the merry strains of cornet, trumpet, harmonicon, or other kinds of music. He was a very popular head of his department at Nottingham, where his great ability and invariable courtesy will not soon be forgotten.

His special talent may be held to pass on to the next generation, as his two sons both had brilliant careers in physics at Cambridge.

DR. GEORG SCHWEINFURTH.

GEORG AUGUST SCHWEINFURTH, who was born at Riga, of German parents, on December 29, 1836, and died in Berlin on September 20 last, was a naturalist

who gained great distinction by his travels and discoveries in East Central Africa. A trained botanist, he was chosen at the age of twenty-seven to classify and arrange the Barim and Hartmann collections brought from the Sudan. In 1863–66 he studied on the spot the flora of Egypt and adjacent regions from the Delta to Khartum and from the Red Sea along the slopes of the Abyssinian highlands to the Blue Nile. In 1866, with funds provided by the Humboldt-Stiftung, he set out for the Bahr-el-Ghazel province of the Sudan.

Schweinfurth's journey, which lasted three years, was one of the most fruitful ever carried out by a traveller in Africa. Undertaken primarily for the purpose of botanical investigation, it took on a much wider scope. Schweinfurth studied not only the flora but also the fauna and the orography of the country. He did a great deal to elucidate its puzzling hydrography. Crossing the Nile watershed he discovered the Welle. This great river, one of the chief tributaries of the Congo, he believed at the time to belong to the Lake Chad basin. This detracted little from the value of his discovery, which won for him the award, in 1874, of the Founder's Medal of the Royal Geographical Society. Above all, however, Schweinfurth studied the people, and to him we owe almost the first accurate account of the Diur, Dinka, Bongo, and the cannibal Azandeh (or Niam-Niam) and Mangbettu. His discovery of the Akka pygmies settled conclusively the then vexed question as to the existence of dwarf races in Central Africa.

In regard to fauna, Schweinfurth's most notable discovery was that of an aberrant type of chimpanzee (*A. troglodytes schweinfurthi*) in the Azandeh country. The existence of the chimpanzee in the Nile basin was previously unknown; Schweinfurth also found the grey parrot and other West African types in the Nile regions. His botanical work was extensive; he revealed the eastward extension of the great equatorial forest and vividly described the remarkable "gallery" formations it contains; avenues of gigantic trees "like the colonnade of an Egyptian temple," and "aisles and corridors" in the innermost recesses of apparently impenetrable woods. (This formation, as Schweinfurth carefully acknowledged, had been previously reported by Carlo Piaggia.) The account of his journey, "The Heart of Africa," first published in 1873, abounds in passages in which the character of the scenery is clearly depicted, and the description is aided by reproductions of his own drawings—for to the gift of careful observation Schweinfurth added that of a capable artist. Taken in all, with its attractive style, its fullness of information concerning the people, the country, and its flora and fauna, and remembering that the period dealt with was one when slave-raiding and ivory hunting were the chief industries, "The Heart of Africa" is scarcely exceeded in interest by any other work on African travel.

Schweinfurth never returned to Central Africa, but made many other shorter expeditions. In 1873–74 he was in the Libyan Desert with Gerhard Rohlfs, and between 1876 and 1888 he visited south-west Arabia several times, adding considerably to the knowledge of that region. In the intervals he lived at Cairo, where, in 1875, he founded, under Ismail Pasha's auspices, the Société Khédiviale de Géographie. He also continued his botanical and geological investigation of the lower Nile valley. In 1889 he took up his residence in Berlin, where, save for visits to Eritrea (1891–94), he remained. His interest in Africa never ceased, and a new edition of "The Heart of Africa," with much new material, appeared in 1918. His botanical and geological collections are now exhibited in the Berlin Museum.

Mr. William Welsh.

Mr. William Welsh, whose death occurred on September 12, was born at Edinburgh in 1859. After being educated at George Watson's College he went, at fifteen years of age, to the University of Edinburgh, where he worked under Tait and Blackie. From there he proceeded to Jesus College, Cambridge, where, under the guidance of Routh, he secured the senior position in the Mathematical Tripos of 1882 and in the Smith's Prize examination in the following year. Elected to a fellowship in 1883, he remained on the active staff of his college until his death.

By the death of Welsh, Cambridge has lost one of the best of her mathematical teachers. The ability he possessed for getting at the essence of a subject, and in reducing its analytical cloak to a minimum, always enabled him to present it in a form which for lucidity, elegance and thoroughness could scarcely be equalled. He treated his subjects as such, and not as a means to solving a large number of tricky problems—an art in which he himself specially excelled—and he was a strong advocate of that part of the reform incorporated in the new Tripos in 1910 which forced a more uniform adoption of the practice of subject-lecturing.

Welsh was a member of the small Cambridge board which drew up one of the first syllabuses of reformed geometrical teaching for schools. But, like so many of the prime movers in this matter, he afterwards regretted his part in the work, on account of the rapid decline of geometrical teaching which resulted from it. Not that he ever felt that the reform was not an improvement, but because events proved the impropriety of making it without a great deal of previous preparation.

Welsh was a man of an extraordinarily retiring nature, always anxious to avoid publicity in any form. He was, however, possessed of a singular charm of character, and he will be greatly missed in a small circle of intimate friends and in the larger sphere of mathematical teachers at Cambridge. The spirit of his genius will live for a long time in the generations of younger mathematicians who had the good fortune to come under his influence. G. H. L.

We regret to announce the following deaths:

Mr. Francis Jones, senior chemistry master of Manchester Grammar School from 1872 until 1919, and the author of numerous text-books on chemistry, on October 22, aged eighty years.

Prof. W. Kilian, professor of geology and mineralogy in the University of Grenoble and member of the Paris Academy of Sciences, aged sixty-three years.

Sir John Struthers, K.C.B., formerly Secretary of the Scottish Board of Education and a trustee and sometime vice-chairman of the Carnegie Trust, on October 25, aged sixty-eight years.

Current Topics and Events.

AT the annual statutory meeting of the Royal Society of Edinburgh held on October 26, the president, Sir Alfred Ewing, delivered an address on some of the modern aspects of physical research. He said that the functions of a scientific society are to provide (1) facilities for intercourse, formal and informal; (2) a library of reference; and (3) a means of publication. The records of scientific research are not a readily marketable commodity and would fare badly if they were left to depend on the laws of supply and demand. Looking back through the old publications of the Royal Society of Edinburgh would disclose many papers by Kelvin and others which may without exaggeration be described as marking epochs in the history of discovery. The urge towards scientific research is not mainly utilitarian, but arises from a special type of intellectual curiosity. A scientific society is, consciously or not, propagandist in that it extends an interest in science beyond the bounds of the scientific workers. There is, in fact, a greatly changed attitude now towards science and the scientific method. Research has now found a place not only in manufacture and in industry, but even in the budgets of the politician. The foundations of the older physics have been rudely shaken, with a notable effect on the mental attitude of the scientific expert. The old positiveness is gone. We are faced with dilemmas from which there is apparently no way out. For example, how to reconcile the facts of interference and diffraction with the equally well-established facts of absorption and photo-electricity, we simply do not know. Hence, along with the pride of achievement in all this notable progress, there is mingled a consciousness of mystery and humility. The widening of the circle of light has made wider the circumference of darkness which, for the moment at least, seems curiously impenetrable.

THE Therapeutic Substances Act which was recently passed provides for the regulation of the manufacture, sale, and importation of vaccines, sera, and other therapeutic substances, and requires that these substances shall comply with standards to be prescribed for their strength, quality, and purity. In order to provide facilities for carrying out the necessary tests, the Pharmaceutical Society of Great Britain decided to establish and equip laboratories for that purpose, and has appointed Dr. J. H. Burn as the Director. Dr. Burn was educated at Barnard Castle School, and gained an open scholarship in natural science at Emanuel College, Cambridge, afterwards obtaining a first class in the Natural Science Tripos. With the exception of two and a half years' war service, Dr. Burn has devoted himself mainly to research work in physiology carried out under Prof. Joseph Barcroft, Sir F. G. Hopkins, and, at the National Institute of Medical Research, under Dr. H. H. Dale. In this Institute he directed his attention chiefly to the examination of the methods for testing biological products the activity of which cannot be determined by chemical assay. Dr. Burn has published, chiefly in the *Journal of Physiology*, numerous papers on the testing of pituitary extract, neo-salvarsan, etc. It is intended that the new laboratories shall be used not only for routine testing by biological methods, but also for carrying out researches in pharmacology, and it may be confidently expected that, under Dr. Burn's expert guidance, they will play an important part in the scientific development of organotherapy, to which increasing attention is now being devoted.

IN an address given on October 21 before the British Commercial Gas Association meeting at Plymouth, on the "Conservation of the Nation's Store of Solar Energy," Prof. J. W. Cobb dealt with the relative economy of alternative methods of utilising our coal supplies. Our requirements of artificial heat exceed what can be obtained directly from the sun or indirectly from the growth of "fuel crops" from year to year, or even from century to century. We depend on an accumulated store of fossilised fuel. In the use of coal we are actually drawing on a wasting store. The conversion of coal into electricity involves a loss of 80-90 per cent. in the power station itself, and this loss must be regarded as an extravagance where the distribution of heat for most purposes is concerned. The loss is much reduced when the coal is first carbonised and the gaseous and solid carbonisation products are used as fuel. The initial loss is then some 20 per cent. only, and this loss is compensated by the increased value and efficiency in use of the products. The carbonisation of coal at lower temperatures than customary now, is beset with difficulties both technical and commercial, the nature of which was indicated, but it seems probable that the gas and coke industries will adapt themselves to supply the smokeless fuel which public opinion is demanding ever more insistently.

THE first annual report to the Court of Governors and the report on the work of the Tropical Division for the year ended July 31, 1925, of the London School of Hygiene and Tropical Medicine, describe the progress made under the directorship of Dr. Andrew Balfour in the foundation of this new school. On August 1, 1924, the London School of Tropical Medicine became an integral part of the new school and its first working division. Mr. Morley Horder has been appointed architect, and it is expected that the foundation stone of the School will be laid on the site in Gower Street during the session 1925–1926. The Trustees of the Rockefeller Foundation have generously agreed that the promise of two million dollars made in February 1922 shall be interpreted as 460,830*l.*, the value in sterling of the sum promised at the time of the original undertaking. Of this, 52,610*l.* has been expended by the Ministry of Health on the purchase of the site. Concurrently with the preparation of plans for the new building, the Education Committee and the Director have drawn up a provisional scheme of studies. The Board has recognised the necessity for taking early steps to secure the services of the prospective heads of Divisions,

and to this end, and in order to supplement the teaching for the Diploma of Public Health, the University Grants Committee has made provision for a grant of 5000*l.* for the year ending July 31, 1926, supplemental to the grant of 2200*l.* made in the past to the London School of Tropical Medicine. This sum of 7200*l.* is available for the work as a whole, apart from the sum of 4000*l.* provided annually by the Rockefeller Trust for the general work of administration. The steps taken by the Board as a result of the Treasury grant of 5000*l.* will include application to the Senate of the University of London to set up Boards of Advisers for the appointment of professors, and in the meantime the securing of advice and assistance from competent authorities in regard to planning, equipment, and organisation. Arrangements will also be made for lectures in physiology as applied to hygiene, and in bio-chemistry, and for progress in the equipment and organisation of the Museum.

THE Director's report on the work of the Tropical Division of the London School of Tropical Hygiene and Medicine sets forth the activities of the various departments and the extent of the research work undertaken. Arrangements have been made with the Government of Southern Rhodesia for the prosecution of medical research in that colony. A Research Fellowship in Comparative Pathology has been established, and the holder has assumed the duties of pathologist to the Zoological Society. A Research Fellowship in Spirochætosis has also been founded, while there are hopes that an Entomological Field Station will be set up at the Air Ministry's Camp at Halton, Bucks. In regard to the instructional courses given in this Division a notable change has been made. Owing to the increasing congestion of the courses of study it has been decided to conduct only two courses each year in place of the three previously held. It is anticipated that this change will increase the educational value of the teaching, and enable more attention to be paid to the subject of tropical hygiene.

IN the *World's Health* for October an interesting account is given by Captain Reuterskiold of the aerial ambulance in Sweden. There are vast districts with comparatively large populations which are totally deprived of means of locomotion during part of the year. In winter the roads are obstructed by snow-drifts, and in summer many villages may be isolated by floods caused by the melting snows. In these circumstances it was decided to make a trial of aerial transport, and the Government in 1923 agreed to share the expense of purchase of an aeroplane with the Swedish Red Cross. A Bréguet biplane was chosen, with a 300 H.P. 12-cylinder water-cooled Renault engine, capable of carrying two stretcher cases with one attendant. Wheels were impracticable and were replaced by skis, and a pair of floats were added to facilitate landing on water. Military airmen piloted the machine, and the service began in December 1924. During the winter eleven patients were transported. One patient, suffering from hæmorrhage and living in a very isolated district, was transported to Boden in an hour and a half, whereas the journey by sledge would have taken twenty hours, thus gaining eighteen and a half valuable hours.

THE first article in the Journal of the Franklin Institute for September, entitled "The Way of the Wind," is contributed by Dr. W. J. Humphreys, of the United States Weather Bureau. In it he discusses, mathematically and physically, the main factors that cause the wind to blow apparently "where it listeth," the mathematical treatment dealing with what must happen, if the initial assumptions made are both accurate and complete, and the physical considerations seeking to elucidate what actually does happen. Recent advances in the theory and practice of wireless propagation are ably summarised by Dr. A. S. Eve, and a technical paper on the action of hydrogen peroxide on photographic plates containing a single layer of silver halide is communicated by Dr. C. E. K. Mees, of the Eastman Kodak Company. Such plates are only very slightly attacked by hydrogen peroxide, and the investigation tends to uphold the view that the action of this reagent on ordinary plates is due to chemiluminescence. Irregularities in the variation of certain properties of zinc with the temperature are frequently ascribed to the existence of allotropic modifications of the metal, and this hypothesis has been studied in the research laboratory of the New Jersey Zinc Company by means of X-ray analysis and re-determination of the lattice structure of pure zinc. As no change was observed in the X-ray spectrograph at atmospheric pressure and between 20° and 400° C., it is concluded that no allotropic transformations occur within this range of temperature. As usual, the Journal also contains a number of excellent abstracts of publications issued by the Bureau of Standards and other government departments, and reviews of recent scientific publications.

DR. C. G. ABBOT, director of the Astrophysical Observatory, Washington, and secretary of the Smithsonian Institution, will deliver a popular lecture before the Royal Meteorological Society on November 11. The title of the lecture will be: "Measuring the Sun's Rays."

THE Huxley Memorial Lecture of the Royal Anthropological Institute will be delivered on Tuesday, November 24, at 8.30, at the Royal Society, by Sir Arthur Evans, who will speak on "Early Nilotic, Libyan, and Egyptian Relations with Minoan Crete."

A CONFERENCE on recent developments in the manuring of potatoes will be held at the Rothamsted Experimental Station on Friday, November 20, at 11.30 A.M. The speakers will include: Sir John Russell, Mr. J. C. Wallace, Mr. R. W. Wheldon, and Mr. T. Eden. Those intending to be present are requested to communicate with the Secretary, Rothamsted Experimental Station, Harpenden.

WE are officially informed that in view of the large number of overseas exhibits which are to be trans-

ferred to the Imperial Institute from Wembley, and of the extensive reorganisation which this will involve, it has been decided to close the Institute Galleries entirely from November 1 for three months. The lectures to the public and to school parties, usually given in the galleries, will also be suspended for that period. While the temporary closing of these important galleries—the permanent exhibition of Empire resources—and the interruption of their educational work are to be regretted, we are sure that the decision will be amply justified in the greatly enhanced interest and attractiveness of the collections.

A NEARLY complete skeleton of a new species of the Iguanodont Dinosaur Trachodon has just been mounted in the museum of the Geological Committee at Leningrad. The specimen was found in an Upper Cretaceous conglomerate on the Amour river, a little below the mouth of the Ayan, and is now being studied by Dr. A. Riabinin, who has published a preliminary note on it, with a photograph, in the Committee's Proceedings. The backbone measures nearly 8 metres in length, and when walking the reptile would be about 4½ metres high. The species seems to be closely related to the *Trachodon* (*Claosaurus*) *annectens* described by Marsh from a corresponding geological formation in Wyoming, U.S.A.

APPLICATIONS are invited from natural-born British subjects of either sex of not more than 30 years of age for the Harrison Memorial Prize, the value of which is about 150*l*. The prize if awarded will be to the candidate who, in the opinion of the selection committee, during the previous five years has conducted the most meritorious and promising original investigations in any branch of pure or applied chemistry and published the results of those investigations in a scientific periodical or periodicals. Applications should be made by, at latest, December 1 to the President, The Chemical Society, Burlington House, Piccadilly, W.1.

NOTICE is given by the Chemical Society that a meeting of the research fund committee will be held in December. Applications for grants must be made on or before Tuesday, December 1, on forms obtainable from the Assistant Secretary, Chemical Society, Burlington House, Piccadilly, W.1. The income arising from the donation of the Goldsmiths' Company is more or less especially devoted to the encouragement of research in inorganic and metallurgical chemistry, and the income from the Perkin Memorial Fund is applied to investigations relating to the problems connected with the coal-tar and allied industries.

THE following officers have been elected for two years by the Australian National Research Council: *President*, Sir David Orme Masson; *Vice-Presidents*, Sir Edgeworth David, Sir Baldwin Spencer, Sir George Knibbs, Mr. J. H. Maiden; *Hon. Secretary-Treasurer*, Mr. R. H. Cambage; *Joint Hon. Secretary*, Prof. A. C. D. Rivett. At the annual meeting held in Sydney in August it was decided to endeavour this year to obtain from private sources a substantial permanent endowment in order to place the Research Council on a firm and independent financial footing. It was resolved also to retain membership of all the International Unions. In the case of the Union of Pure and Applied Chemistry, the Australian Chemical Institute will co-operate with the Research Council in conducting all local activities of the Union.

THE Leeds Philosophical and Literary Society is one of the oldest institutions of its kind in Great Britain, having recently celebrated its centenary. The Society helped effectively to bring the University of Leeds into existence, and is now in close association with the University. It is appropriate, therefore, that opportunities should be provided for the communication and publication of original papers, and arrangements have been made for these purposes. There is now a section for mathematics and the various natural sciences, and its programme, as well as the issue of a revived "Proceedings," are in the hands of a special committee, consisting this session of Prof. P. F. Kendall, Dr. Harold Wager, and Prof. R. Whiddington. The 106th session of the Society was opened on October 20 with a presidential address by Prof. W. Garstang on "Wordsworth Interpretation of Nature." There was a meeting of the scientific section on November 3, and there will be another on January 27. On February 10 next, Prof. D'Arcy W. Thompson will lecture on "The Labours of Hercules and their Astronomical Significance."

ELECTROPLATERS and electrodepositors have long felt the need for a society in London in which they could discuss problems arising from their work and could come into contact with scientific electrochemists, particularly those engaged in research work on electrodeposition. At the suggestion of the Council of the Faraday Society, a small provisional committee was recently formed to take steps to found an Electroplaters' and Depositors' Technical Society, and a meeting to inaugurate this Society will be held on Wednesday, November 11, at 8.15 P.M., at the Northampton Polytechnic Institute, Clerkenwell, London, E.C.1. All actively engaged in some responsible position in electroplating, or in the art of electrodeposition, are to be eligible for membership, and it is suggested that there should be two types of meeting: (1) Meetings at which lectures will be given, or papers read, followed by discussion. The papers presented would be offered for publication to some suitable technical journal. (2) Informal discussions opened by a short paper. The latter meetings would be attended by members only and no report would be published. In view of the desire of the electroplating trade to have a link with a scientific body and to be associated with the name of Faraday, the Council of the Faraday Society has agreed that the new Society be described as "Associated with the Faraday Society," provided that it has representation on the committee. The acting honorary secretary of the provisional committee is Mr. F. S. Spiers, secretary and editor of the Faraday Society, 90 Great Russell Street, London, W.C.2.

In the issue of NATURE of October 17, p. 574, Fig. 4 of Major Burnett's letter on "'Bordered' Squares of Fifth Order and their Magic Derivatives" was erroneously not magic in one of its diagonals. The square should be

24	14	18	1	8
(17)	(6)	(15)	20	7
(16)	(10)	(12)	23	4
(5)	(22)	(11)	2	25
3	13	9	19	21

APPLICATIONS are invited for the following appointments, on or before the dates mentioned: An experimental officer in the Acoustical Experimental Section of the War Office—The Secretary, Royal Engineer Board, 16 Grosvenor Gardens, S.W.1 (November 8). A travelling lecturer in electrical engineering under the Glamorgan Education Committee—The Chief Education Official, County Hall, Cardiff (November 10). A lecturer in the department of mathematics and mechanics of the Technical College, Sunderland—Chief Education Officer, 15 John Street, Sunderland (November 17). A lecturer in the department of education of King's College, London—The Secretary, King's College, Strand, W.C.2 (November 18). A senior and a junior investigator in the department of metallurgy of the University of Sheffield for work on the electrodeposition of metals—The Registrar, University, Sheffield. A lecturer and demonstrator in the mechanical engineering department of the Borough Polytechnic Institute—The Principal, Borough Road, S.E.1. A commercial assistant to the director of the Electrical Research Association—The Director, B.E. & A.I. Research Association, 19 Tothill Street, S.W.1.

Our Astronomical Column.

COMET 1925*a* (SCHAIN, COMAS SOLA).—Prof. J. Comas Sola, of Barcelona, one of the discoverers of this remarkable comet, has now succeeded in detecting it in the morning sky on its emergence from the sun's rays, which have concealed it for several months.

The position is as follows:

	U.T.	R.A. 1925·0.	S. Decl.'	Mag.
Oct. 18d	4h 38m 25s	10h 22m 10·6s	5° 48′ 22″	12·5

The correction to his ephemeris is −20s., −4′·6, which is satisfactorily small. This has been applied to the following ephemeris (for 0h).

	R.A.	S. Decl.	log r.	log Δ.
Nov. 9.	10h 17m 33s	8° 17′	0·6288	0·6560
17.	10 13 59	9 13	0·6299	0·6428
25.	10 9 4	10 10	0·6312	0·6286

The comet, which has the largest perihelion distance known, is now slowly receding from the sun, but approaching the earth fairly rapidly. There is reason to hope that it will be followed for another year, perhaps longer, which should permit accurate determination of the departure of the orbit from a parabola.

LARGE DETONATING FIREBALL.—Mr. W. F. Denning writes: "On October 22 at 10 h. 44 m. P.M. a brilliant fireball was observed at many places in Ireland. As observed from Co. Waterford, its path was from west to east from a few degrees below Polaris towards a point a few degrees below Castor and Pollux. The nucleus at first displayed an intense electric-blue colour and then burst into a strong, red, egg-shaped mass. As seen from Antrim, the meteor with its glare lit up the whole country and apparently had a disc as big as the full moon. Six and a quarter minutes after the object had disappeared, the observers distinctly heard two heavy thuds like the distant report of heavy artillery, followed by a prolonged rumble akin to thunder. The duration of flight was about five seconds, but the observer at Waterford did not listen for any sound, while at Antrim it was specially awaited so that the time interval given (6¼ minutes) may be depended upon as being correct. This estimate corresponds to a distance of about 75 miles. It is hoped that further observations will come to hand so that the real path of this fine object may be computed."

WOLF'S NOVA IN AQUILA.—Dr. W. H. Steavenson gave an account of this remarkable object at the October meeting of the British Astronomical Association. A slide was shown from a plate of the region taken at Königstuhl about a year ago. This showed stars as faint as mag. 16·5, but there was no trace of the supposed Nova, which is not found on any plates taken there until September 1925. It is possible, however, that study of the Harvard plates may reveal more about the circumstances of its rise. It has been well observed in England by the B.A.A. Variable Star Section. Since discovery, its magnitude has fluctuated between 8·6 and 9. There seemed to be a tendency to decline, but this was followed by a slight recovery.

The spectrum has been studied with an objective prism at Babelsberg Observatory, Berlin. It was continuous, apparently without visible lines, bright or dark; from the distribution of intensity of light, its spectral type was concluded to be approximately G. The star is outside the main stream of the Milky Way, but in one of its faint extensions.

THE TURKISH CALENDAR.—The Turkish Calendar has hitherto been a very singular one. It simply consists of 12 lunations, or 354¼ days. There is no intercalary month, such as was inserted (seven times in nineteen years) by most of the ancient nations which used lunar months; consequently the beginning of the year travels right round the solar year in about thirty-three years.

The following data are quoted from the Nautical Almanac:

Year.	Turkish Year begins.	Ramadan begins.
1922	Aug. 24	Apr. 28
1923	,, 14	,, 17
1924	,, 2	,, 6
1925	July 22	Mar. 26

These are not the dates of new moon, but about two days later, since they await the visible crescent.

The *Times* of October 26 contains the welcome announcement that a bill for the adoption of the Gregorian Calendar will shortly be laid before the Grand National Assembly. Its adoption would render the use of the Gregorian Calendar general through Europe. It will be remembered that Greece recently adopted a calendar practically identical with it, though it was decided to use the true moon instead of the ecclesiastical moon in computing Easter.

Research Items.

JAPANESE BATTLEDORE AND SHUTTLECOCK.—Mr. Stewart Culin, in the *Brooklyn Museum Quarterly* for September, illustrates and describes a number of Japanese battledores and shuttlecocks, which are used in the shuttlecock play of girls in the streets on New Year's Day, according to an old custom universal among high and low all over Japan. The battledore (*hagoita*) is a flat wooden bat brilliantly painted, or covered with crape pictures in relief. Those much sought by collectors are old ones used by girls of rich families, and they are covered with conventional pictures on a plaster ground and bear family crests. The pictures on many of these of archaic design are conventionalised and broken down court scenes which are connected with the Sagicho ceremony. This was one of the most important annual celebrations in the Japanese Court, occurring on the 14th, 15th, or 18th day of the first month, when the New Year decorations were burned. Comparison of a number of designs shows that the battledore as it now exists was derived from similar objects used in court ceremonial. The shuttlecock is now a seed with feathers attached to a bamboo splint stuck in the seed or with the feathers stuck directly into the seed itself. It clearly suggests a plum blossom. In a catechism published in 1544 the shuttlecock is said to be a charm against mosquito bites, and it is compared in its flight and appearance to the dragon fly, which catches and eats the mosquito.

A GEBER DISCOVERY.—In the *Archiv für Geschichte der Medizin* (Bd. 17, Heft 4, 1925) Dr. Ernst Darmstaedter announces an extremely interesting and important discovery in connexion with what has come to be known as the "Geber problem." The identity of Geber with Abū Mūsā Jābir ibn Ḥayyān (about A.D. 750–800) has already been sufficiently proved; the outstanding question is whether the Latin works of Geber are translations from Arabic works of Jābir. Arabic influence in the *Summa perfectionis* and in the other books is very obvious, but no Arabic originals have hitherto been discovered. In a thirteenth-century manuscript at Florence, however (Cod. Riccardianus 933, L iii 9), Dr. Darmstaedter has been fortunate enough to find a Latin translation of the Book of Mercy (*Kitāb al-Raḥma*), which is an expansion of one of Jābir's books by a follower of his, and of which the Arabic text has been published, with a French translation, by Berthelot (*La Chimie au moyen âge*, tome 3, Paris, 1893). The importance of this discovery lies in the fact that the manuscript contains also, and in the same hand, the *Summa perfectionis* of "Geber" and the *Liber Geberis de investigatione perfectionis magisterii*. It is thus clear that the celebrated *Kitāb al-Raḥma* existed in a Latin form more than 600 years ago, and the association of it with the *Summa* and *De investigatione* in the same manuscript is at least strong presumptive evidence that these too may well be, in the main, authentic translations from the Arabic, as they were for so long considered to be. Dr. Darmstaedter's discovery raises even higher the hope that a diligent search may yet bring to light the Arabic texts of the Latin treatises.

PRESERVATIVES FOR NATURAL HISTORY SPECIMENS.—Prof. Gordon E. Gates, professor of biology in the University of Rangoon (Judson College), asks for information on the use of a tincture of calabar bean as a preservative for natural history specimens, referred to by a correspondent in NATURE so long ago as October 20, 1881 (vol. 24, p. 583). Major E. E. Austen, Natural History Museum, South Kensington, has been good enough to favour us with the following information upon the subject: "The use of a tincture of calabar bean as a preservative for entomological and other natural history specimens, although strongly urged by the writer of the note to which Prof. Gates refers, would seem to be nowadays practically, if not entirely unknown. The seeds of the calabar bean (*Physostigma venenosum*, Balf.) are highly poisonous, the alkaloid physostigmine, which constitutes the active principle, having a depressant action on the spinal cord. As a preservative from the attacks of destructive insects, for use in museums and entomological cabinets, the strength of the tincture was given as 'one part of the bean to eight of (rectified ?) spirit,' the mode of employment being, in the case of Lepidoptera, to place a drop of the fluid on the body of the specimen. As regards entomological collections in the tropics, especially during the rainy season, *mould* is often a more formidable foe than even ants, book-lice (Psocidæ) or certain beetles. The risk of mould as well as damage by insects may, however, be entirely prevented by thoroughly rubbing the inside of the box into which the specimens are pinned with a piece of sponge, or swab of cotton-wool, soaked in a saturated solution of naphthaline in chloroform, mixed with an equal quantity of ordinary medical (beechwood) creosote. The inside of the box should be rubbed with the mixture until the cork-lining shows through the paper, but the fluid must not be allowed to touch the specimens, or they will be injured."

HERMAPHRODITISM IN DECAPOD CRUSTACEA.—Until recently it was believed that all decapod Crustacea were of separate sexes. Wollebaek described the occurrence of normal functional hermaphroditism in the deep-sea thalassinid Calocaris in 1909 and Spitschakoff in the prawn Lysmata in 1920. Sven Runnström (Beitrag zur Kenntnis einiger hermaphroditischen Dekapoden Crustaceen. Bergens Mus. Skr., ny Raekke, Bd. 3, No. 2) has now made a detailed study of Calocaris, and describes the histology and cytology of the gonads in all the phases of development. At first no difference can be observed between the germinal cells, but at an early stage the anterior and posterior ends of the gonad begin to show the development of oocytes while the middle part assumes the character of a testis. The development of the ovarian regions lags behind that of the testicular portion, which grows out into numerous follicles within which spermatozoa are produced. When the male phase has been passed through the follicles dwindle and oocytes begin to appear in the middle part of the gonad, the whole of which in the final phase functions as an ovary. It is noted that, in the middle part, oocytes are produced from germinal cells which have lain dormant while neighbouring cells, at first indistinguishable from them, have gone through the stages of spermatogenesis. The author has also investigated certain other decapods, especially the crayfish Parastacus, in which rudimentary non-functional hermaphroditism occurs constantly. The general structure of Calocaris shows no preponderance of the characters of either sex. It is a true hermaphrodite, a mosaic of the two sexes. Many interesting details are given of the habits of the animal as observed in an aquarium. Calocaris appears to feed exclusively on the mud in which it burrows. It was found to seize fragments of mussel offered to it, but, instead of eating them, it buried them inside its burrow, where their decay speedily enriched the surrounding mud with swarms of Infusoria. No doubt the culture so manured served later as food for the crustacean.

BACTERIOPHAGE AND PLANT DISEASE ORGANISMS.—According to a recent paper by G. H. Coons and J. E. Kotila, plant bacteriologists have also to take into account the d'Herelle phenomenon, and lytic principles may be demonstrated which have an inhibiting effect upon the growth in pure culture of organisms responsible for various plant diseases (*Phytopathology*, July 1925). These lytic principles may be increased in effectiveness by "growth" upon the cultures they destroy, the filtered extract of these cultures, sterile as regards contained organisms, proving more efficient as a lytic agent than the original extract used to inoculate the culture. The authors suggest that such lytic principles may be widespread in Nature and may account for the disappearance of a pathogen from a heavily infected soil. By smearing such a lytic principle over sterile slices of carrot they protected these slices against the rotting effects of the well-known *Bacillus carotovorus*. Such organisms are so readily experimented with in culture that if further work should confirm these results, we may anticipate a considerable study of the d'Herelle phenomenon by experimental investigation with the organisms causing "soft-rots" in vegetables.

CROWN GALL IN PLANTS AND CANCER.—It will be recalled that Erwin F. Smith has directed attention to the secondary gall-like growths sometimes formed in plants after infection by *Bacillus tumifaciens*, and suggested that they owe their origin to the permeation of the normal tissue by "tumor strands," growing from the original gall in an analogous manner to that in which human cancer may spread. Furthermore, E. F. Smith, in an account of his recent tour round European centres of cancer research (*Science*, April 17 and June 12, 1925), has briefly indicated that German workers upon cancer are now obtaining very interesting results in work upon animals inoculated with an organism which is said to be indistinguishable from that found in the crown gall of the plant. The Manchester workers Robinson and Walkden (NATURE, June 23, 1923, p. 858) were unable to confirm Smith's account of the origin of these secondary tumours in the case of crown gall on plants, and now Michael Levine publishes (in *Phytopathology*, August 1925) the results of extensive studies of crown gall, in which he finds that secondary tumours and strands are only formed in very young tissues and result from the growth and elongation of these immature tissues. They begin to form simultaneously with the crown gall at the seat of inoculation, and are in no sense the result of the permeation of normal tissues by subsequent strands of "malignant" tissue.

THE SYSTEMATIC POSITIONS OF THE PTERODACTYLA AND CHELONIA.—In the Bulletin of the Geological Institution of the University of Upsala, Vol. 19, 1925, appear three papers of great interest, two by Prof. Wiman on the Pterodactyla and one by Dr. Zdansky on the Chelonia. Prof. Wiman, writing on Dorygnathus and other pterodactyles, gives a full description of the skeleton together with illustrations. In discussing the systematic position of the group he is unable to accept its usual derivation from some form in the neighbourhood of the Pseudosuchia and considers that the Pterodactyla, although having two temporal vacuities, are not really diapsid in skull structure since the arrangement of the bones surrounding the vacuities is not strictly comparable. As to the real ancestry of the group, apart from a mention of Araeoscelis, the author prefers to take a non-commital and waiting attitude. Prof. Wiman's second paper deals with the probable life habits of the pterodactyles. Dr. Otto Zdansky's paper, also with numerous figures, deals with the temporal region of the skull of the Chelonia in support of his thesis that the skull structure of the Chelonyidea is a secondary condition.

VARIATIONS OF SEA TEMPERATURE AND SALINITY.—In the *Bulletin Hydrographique* for 1924, recently issued by the Conseil Permanent pour l'Exploration de la Mer at Copenhagen, there are published tables showing variation in salinity and temperature of the sea with position, season, and depth, being the data collected by the participating countries in the Atlantic, North Sea, and Baltic. The region between North Ireland and the African coast, including the English Channel, is dealt with in the *Rapport Atlantique*. The degree of saturation with oxygen and the hydrogen ion concentration of the water is given for a number of positions. The lowering of the hydrogen ion concentration in the upper layers to which light penetrates, owing to the utilisation of carbon dioxide by diatoms, is very clearly shown. No deductions, drawn from the collected data, are published in the *Bulletin* concerning the flow of the ocean currents, their seasonal variations or fluctuation year by year. Such fluctuations are of particular interest in fishery research. A bibliography of the year's publications by workers in the different countries is included, and of these a fair share now comes from Great Britain.

PRODUCTION OF LOW FREQUENCY OSCILLATIONS.—We recently published in NATURE (vol. 116, p. 244) a letter from Mr. C. Constançon describing a device for obtaining low frequency oscillations. He used a three-terminal thermionic valve and instead of varying the inductance in the ordinary way by altering the position of the iron core, he varied it by means of direct current excitation. One obvious advantage of this method is that we maintain the symmetry of the inductance of the circuit. In connexion with this method we have received a letter from Prof. D. Mazzotto, of Modena University (Italy), in which he describes an invention which he calls "le triode melodique." This device, which was described in *Scienza per tutti* for May 1, 1924 (p. 134), and March 1, 1925 (p. 76), enables us to get variable low frequency oscillations even more simply. He uses the same kind of valve and a low frequency transformer with an iron core. By touching the plate wire to the various terminals of the high-tension battery, various notes are heard in the telephones. Instead of using the terminals of the battery it is better to make a potentiometer arrangement, so that the sound can be continuously altered. By using a suitable key any piece of music can be produced in this way. The principle of the method seems to be the same as that described by Constançon.

ELASTIC HYSTERESIS IN ROCK SALT.—Experiments have been recently carried out by Messrs. M. Polanyi and G. Sachs on rods of rock salt supported at the ends and weighted at the centre (*Zeitschrift für Physik*, August 22). The load was applied by means of a float in a vessel from which the water could be allowed to run off slowly; and simple polished rods of rock salt and others which had been heated to 600° C. were employed. With the polished rods the first observable permanent deformation took place with less than 500 gm. per sq. mm., and the rods broke with more than 1000 gm. per sq. mm. With the heated rods the deformations were larger, and the elastic limit was certainly below 200 gm. per sq. mm., but in both cases it was found that the more accurate were the methods of measurement the lower were the loads with which permanent alterations of form could be shown to exist. When the load on either kind of rod is slowly removed, and then slowly reimposed,

the load deformation curve does not repeat itself, and if this process is repeated several times between the same load limits, the curve forms a hysteresis loop somewhat similar to that observed in magnetisation, but with the difference that the "elastic" alterations of form on loading are proportional to the tension, but not when the load is reduced step by step. It is also shown that, when the surface layers of the plastically bent crystals are dissolved in water, movements result which show the existence of internal stresses.

THE DEBYE-SCHERRER RINGS OF DEVELOPED PHOTOGRAPHIC PLATES.—Messrs. R. Blunck and P. P. Koch, in the *Annalen der Physik* for September, describe a series of measurements of the Debye-Scherrer rings produced by a practically monochromatic beam of X-rays, using a preparation formed by exposing a photographic dry plate in strong daylight and developing it. The film was separated from the glass and fifteen discs were cut from it and superposed so as to form a little plate about 0·23 mm. thick. This was placed at the centre of the camera in the path of the X-ray beam, and a well-defined ring system was obtained indicating a face centred cubic lattice, with 0·403 Å.U. for the edge of the elementary cube, in good agreement with Vegard's value for silver. An inner ring was shown to be due to gelatin. Measurements of the broadening of the rings due to the fineness of the particles showed that the silver crystals were not smaller than 24 Å.U. It was possible to calculate the amount of silver in a single layer from the absorption of the X-rays; it amounted to 0·00065 gm. per sq. cm. The value obtained from the blackening, using the formula of Hurter and Driffield, was 0·00080 gm. per sq. cm.

UTILISATION OF FISH REFUSE.—An account of the uses of fish by-products in industry is given by A. C. Hopper in the *Chemical Trade Journal* of October 2. Fish meal which has been freed from oil is used for feeding live-stock, as a fertiliser, and as the basis of a plastic for making small moulded articles. Fish glue is widely used on account of its heat-resisting qualities, but freedom from chlorides and protein matter is essential for a good quality glue. Fish oils are used in tanning and in medicine. Oil tanning of skins requires an oil which is easily oxidised, having a high fatty-acid content. Fish oil yields excellent heat-resisting paints when used with tungate driers; drying is rapid if the oil is properly treated and has a low fatty-acid content. Fish oil free from sulphur can be hardened by hydrogenation, giving fats for soaps, candles, and margarine. Fish skins are used in the manufacture of a high quality leather. Further uses for fish products are the manufacture of printers' ink, enamels, lubricants, tool-hardening oils, and tarpaulins.

THE TRANSMUTATION OF METALS.—In NATURE last year (vol. 113, p. 459), Prof. Nagaoka, of Tokyo, gave his reasons for believing it possible by subjecting mercury to an intense electrostatic field to drive off from the nucleus of the atom a hydrogen nucleus and to add an electron and in this way produce gold. Since then (NATURE, July 18, 1925, p. 95) he has outlined his preliminary results. In the July issue of the *Journal de Physique* he describes his experiments in more detail. The mercury purified in the usual way was distilled two or three times in vacuo at 200° C. before use. It formed the lower electrode in a porcelain flask containing paraffin oil into which the upper electrode of iron dipped. The discharge was obtained from an induction coil giving a spark of 120 cm., and the author estimates the field above the mercury as of the order of 150,000 volts per cm. The discharge was maintained for 4 hours, and the black paste produced in the flask analysed for gold, which was found in minute particles. On heating small pieces of glass in the paste, they became ruby glass identical under the microscope with the ruby glass obtained from gold in industry.

PLATINUM.—A survey of the platinum metal industry by G. Malcolm Dyer appears in the *Chemical Age* of October 3. Most of the commercial platinum is obtained by careful washing of alluvial deposits; the material obtained in this way contains in addition, palladium, osmium, iridium, rhodium, and ruthenium. Tasmanian ore consists almost wholly of the alloy osmiridium. The anode slime from copper refining is another source of the platinum metals. The method of cupellation is no longer used in their separation, but the ore is treated with aqua regia, when platinum, palladium, rhodium, and some ruthenium and iridium dissolve, leaving the osmiridium. The osmiridium is alloyed with zinc and the product dissolved in aqua regia. Osmic acid is distilled off in superheated steam and the remaining acid liquor treated with ammonium chloride, and on standing, ammonium chloroiridiate is precipitated, leaving ruthenium. The platinum liquor is treated with ammonium chloride, the chloroplatinate filtered off, and on standing the chloroiridiate is precipitated. These salts yield the metals on heating. The remaining liquor is treated with zinc, the black mud filtered off and treated with dilute acid. On treatment with dilute aqua regia, only palladium dissolves, leaving rhodium with a trace of ruthenium. The residue is fused with barium peroxide, treated with aqua regia, and separated by means of the ammonium salts. The fusion of the metals is carried out in a furnace of lime in the oxyhydrogen blowpipe flame.

CONSTITUTION OF BINARY ALLOYS.—In a recent paper by K. Honda and T. Ishigaki (Science Report of the Tohoku University, vol. 14, No. 3, p. 219), on the depression of the freezing point of a metal by the addition of a second, an attempt has been made to extend the pioneer work of Heycock and Neville. The present research appears to have been very carefully carried out and affords valuable information in two directions. In the first place the authors offer good reason for the belief that, at any rate in the binary systems which they have studied, the solute metal is always in the monatomic state both where a eutectic and also where a solid solution is formed. In the iron-carbon system it is not clear whether the authors are correct in believing that the same state of affairs holds, since an unassociated iron-carbide, such as Fe_3C, would not be excluded by the results given. The second portion of the work deals with an investigation of the agreement of observed depressions of the solidification point with Planck's formula. The lowering of the freezing points of pure metals is shown to be proportional to the concentration of the added metal, so long as the solution is dilute. The atomic depression is independent of the nature of the solute, and of whether it forms a solid solution or not, and Planck's equation is shown to hold. The latter expression is used to obtain values for the latent heat of fusion of the solvent metal, and results are obtained in good agreement with those of direct observation. Since the latter are not always easily measured, it is possible that the new values are more reliable than older ones. The means of all the results recorded are:

Ag	Al	Bi	Cd	Cu	Pb	Pt	Sb	Ni	Sn	Zn	Au
24·0	81·3	12·5	12·2	41·7	5·85	26·7	38·7	51·9	14·3	26·0	15·3

The New Statutes of the University of Cambridge.

THE statutes of the University of Cambridge proposed by the University Commissioners were made public about a week ago. They occupy no less than sixty-nine pages of the *University Reporter*. Throughout they afford ample evidence of careful drafting, the final result of much deliberation and discussion.

We are not here concerned with such changes as the institution of a house of residents, or with the fact that in future the vice-chancellor is to be elected for a period of two years in the first instance, but rather with such proposals as will affect the various departments of science in the University. In many ways the proposed organisation will change scientific faculties far less than others. Each science school has been a financial unit for a long time; it has in practice organised all formal teaching in its own subject, and the more junior appointments (that is, demonstratorships) have been made by the professor. In most other branches of study, however, much has in the past been done by the colleges. They have financed and appointed their own lecturers, professors having no direct control in the matter. Until recent years many courses of college lectures were not immediately available to members of all colleges. Under the new scheme all formal teaching will be directly controlled by the University.

In the past the General Board of Studies was the co-ordinating body, and it worked through a system of special boards. Membership of the latter might be *ex officio* as in the case of professors, readers, and examiners, or upon nomination by the Council of the Senate, or by grouped junior members of departments. In the future there is to be a general board of the faculties with the powers of the old board, and in addition (presumably subject to the approval of the financial board) control of the salaries of the junior appointments. Eight of its thirteen members are to be elected by the faculty boards. Special boards are to be replaced by faculty boards, membership of which, *ex officio*, is limited to professors or heads of departments. Elected members are to be chosen by ballot at a general meeting of the faculty concerned.

These changes are important, because the powers of the new bodies are considerably greater than those of their predecessors. In addition to routine work, they will elect members of the new appointments committees which will appoint lecturers and demonstrators; they will have the power to institute and appoint to probationary lectureships, and to make recommendations to the general board on the subject of the salaries of the junior members of the staffs. From this system an increased uniformity in the scientific departments should result. In the past, the larger and less embarrassed departments have often been able to grant their staffs higher emoluments than have some of those the finances of which were more straitened. There is a prospect that the co-ordinating general board will now be in a position to ensure for equal work a reasonably uniform standard of remuneration in all faculties and departments.

It is difficult to forecast future events, but the intention of the Commissioners has evidently been to frame a constitution by which the junior members of a faculty can have the opportunity of securing reasonable representation on their board. Past experience has shown that, in the matter of nominating members of special boards, the junior staffs are often as apathetic as is the ordinary man in electing guardians of the poor. The Commission proposes to ensure that the machinery shall be there. They can do no more.

It may appear that undue stress has been laid on the financial powers of various bodies; but the strength of the University largely depends on its retaining the younger men most fitted for its purposes and in the past this has sometimes, for financial reasons, been difficult. The stipends of junior members of staffs are usually small, and unless accompanied by fellowship dividends are scarcely sufficient to allow a man to marry unless he happens to have private means. Outside work of some kind or other is usually obtainable, but frequently so much of it has to be done that there is little time left for the all-important research. The Commissioners are endeavouring to avoid this evil by making colleges reserve a proportion of fellowships for University officials, and further by permitting extra remuneration to be made to non-fellows. Time will show whether there is enough money available to implement these policies.

If the necessary funds are lacking, some non-fellows will be in a difficult position, as the University Commissioners, in their endeavour to avoid "sweating," have laid down a maximum number of hours of private teaching which may not be exceeded by university officers. A probationary lecturer giving one course of lectures, for which he will be entitled to draw a "basic" salary of about 160*l*., will, if he is not a fellow of a college, find little by way of gilt on his gingerbread. The whole financial situation is obscure; faculties controlling few students will presumably have to be subsidised from the University exchequer, as are some scientific departments at the present time. It will be interesting to observe if any faculty can provide a surplus. Expected surpluses have a way of failing to materialise.

The conditions of tenure of various offices are to be changed. Professors are to retire at the age of sixty-five. This decision has been arrived at after several changes of policy. The original commission advocated it. The present one, after publishing an interim account of its intentions, in which it stated that it would increase the retiring age to seventy in certain circumstances, has now reverted to the first proposal. This change of plan threatens to do an injustice to any recently appointed professors who, assuming that seventy was the final decision, on accepting their new posts agreed to come under the provisions of the new statutes. Presumably adjustments will have to be made in such cases.

Lectureships are to be tenable for three years in the first instance, but on reappointment they are in general to continue until the retiring age. There are some who consider that this security of tenure may lead to doubtful efficiency, but as a lecturer's stipend will in the future depend chiefly on the amount of work he does in the department, their fears are probably groundless.

Demonstrators are to be appointed for three years, and are in no case to hold office for more than eight years. The underlying idea is that at the end of the latter period the faculty board will have to face the necessity of creating a new lectureship for a man if it wishes to retain his services. This will mean that each case will be carefully scrutinised; men of uncertain value will be sorted out on the one hand, and on the other, those of ripe middle age and undoubted distinction will no longer have to carry the somewhat juvenile title of demonstrator. On paper it seems as

if the whole scheme should work satisfactorily provided that it is not beyond the limits of the University chest.

A change is contemplated in the organisation of biological faculties. The old special board of biology and geology consisted of twenty-eight members. Under the new scheme there will be two faculties, namely, Biology "A," including anatomy, botany, genetics, geology, parasitology, and zoology, and Biology "B," comprising biochemistry, pathology, physiology, with experimental psychology added. For certain purposes a "School of Biological Sciences" will be formed. It seems a little doubtful if any good result will be achieved by this splitting of what was a fairly natural grouping, if a large one.

The primary duty of the Commission was to adjust the relations of the University and the colleges; this has been done not only in the provision of reserved fellowships and in the centralisation of teaching activities, but also in the matter of contributions from the colleges to the University chest. In the past, the colleges together have had to pay such a percentage of their combined incomes as provided the sum of 30,000*l.* per annum. In the future, definite rates of taxation are proposed by which the poorer colleges will pay less and the larger ones will pay more than heretofore. On the other side, the colleges are relieved from paying contributions on income derived from students. There are adjustments to be made during the transition period, and a rough calculation suggests that at first the sum due from collegiate sources will not greatly exceed the 30,000*l.* As the new order comes in, there should be an increasing sum available, and further, as colleges become more wealthy owing to benefactions or husbanded resources, the University will in its turn be able to expand its activities. It is too much to hope that the University will ever cease to be an active beggar, but the anomaly of the underpaid university officer serving through a university organisation the requirements of colleges, some outstandingly wealthy, should be removed.

International Meteorological Research.

THE Meteorological Section of the International Union of Geodesy and Geophysics met at Madrid at the beginning of October 1924, and the proceedings of the Section edited by the secretary, Prof. Eredia, have now been published. Some doubt had been felt by those familiar with international meteorological organisation as to whether the Meteorological Section of the Geophysical Union could find a broad enough field of operations without encroaching upon the proper domain of the International Meteorological Committee. The report of the work of the Section at Madrid which is contained in the present volume ought to remove any doubt of this kind. There are points where the work of the Section touches the work of the International Meteorological Committee, and under the guidance of a president less familiar than Sir Napier Shaw with international meteorological organisation, the Section might have wasted a certain amount of time in the unprofitable discussion of questions belonging to the field of official administration. The minutes of the five meetings, one of which was held conjointly with the Sections of Hydrology, Oceanography and Terrestrial Magnetism, show that the Commission confined itself to the encouragement and development of experimental and exploratory work in meteorology.

One of the most important decisions, afterwards confirmed by the Union in general session, was to provide for the issue of a specimen volume of the observations of the upper atmosphere for a single year, collected from all the world. It is understood that this volume is now in course of preparation, and will represent a great advance not only in regard to the number of observations included but also more especially in regard to their presentation for scientific discussion.

Another important decision arose out of a discussion on the question of the establishment of an International Bureau. It was decided to make a subvention to an existing meteorological service for the execution of a piece of work of the kind that an International Bureau might be expected to undertake. Mr. la Cour, director of the Danish Meteorological Institute, was entrusted with the work selected, which consists in the preparation of an atlas of daily or twice daily synoptic charts for as large a portion as possible of the Northern Hemisphere for the third quarter of the year 1923.

The appendices to the proceedings contain some interesting proposals and some valuable data. The American delegates presented, among other things, a proposal to adopt Dr. Marvin's suggestion for improving the Gregorian calendar. The suggestion is, briefly, to have a year of 13 months and a quarter of 13 weeks. There would be an odd day to dispose of in ordinary years and 2 days in leap years. The Commission approved of having 52 weeks in the year, one of the weeks being a week of 8 days, and decided to recommend the Advisory and Technical Committee on Communications and Transit of the League of Nations to take into consideration as soon as possible the simplification of the Gregorian calendar. In a matter of this kind there does not appear to be special need for urgency; the need appears to be rather for discussion and deliberation. A change in the calendar is, and ought to be, an infrequent event, but when a change is made it ought to be as much of an advance as humanity can stand. It seems a pity that the Commission did not tackle the question of the length of the week; it is fundamental. There appears to be no reason why the 7-day arrangement which commended itself to pastoral oriental people 3000 years ago should be suited to western urban civilisation of to-day. Many facts indicate that it is not. A break at the end of 6 days is too soon for the man who has a piece of work in which he is really interested; it is too late for the man who is not specially interested in his work. Consequently the latter, nowadays, usually has a mid-week half-holiday. A 10-day week with a secular mid-week holiday might be better for all concerned. It would save us from the numerical inconvenience and the ill omen of 13 months in the year.

Another appendix deals with the subject of radiation in relation to meteorology. A table giving the radiation of black earth at various temperatures will prove most useful for reference by all students of meteorology and ought to find its way into all standard collections of meteorological tables. The tabulated values of actual radiation recorded at various places, given on pp. 94-121, provide the first systematic collection of observations of radiation, and their issue should lead to the adoption of an international form for the publication of such records in future. The variety of forms and units now in use is an obstacle to research which might well be removed.

E. GOLD.

Suggestion and Personality.

A PAPER with the above title was read by Dr. William Brown before the Psychological Section of the British Association at the recent meeting at Southampton. Dr. Brown holds that the two forms of theory and practice in the field of psycho-therapy, namely, suggestion and auto-suggestion on one hand, and mental analysis (including the special Freudian system of psycho-analysis) on the other, can be harmonised, and that a sound system of psycho-therapy should satisfy the more moderate claims of both.

Different views are held by psychologists as to the relationship of suggestion to hypnosis. According to the Salpêtrière School (Charcot, Janet), hypnosis is an artificial hysteria or mental dissociation. According to the Nancy School (Bernheim, Coué, Baudouin), hypnosis is a state of artificially increased suggestibility. According to the Freudian School, suggestion is explained in terms of "transference," and when symptoms are removed by suggestion treatment, no real cure has been produced, but the symptoms have merely been replaced by another symptom, namely, psycho-sexual dependence of the patient upon the physician.

Dr. Brown, as a result of his experiences with hundreds of shell-shock cases, agrees with the definition of the Salpêtrière School, as he found that his patients were readily hypnotisable and in direct proportion to the degree of their mental dissociation. Further, the suggestibility, though certainly increased in milder degrees of dissociation, was often conspicuous by its absence in more pronounced degrees of dissociation. Dr. Brown also holds the view that the Freudian theory is refuted by the facts of auto-suggestion as well as by the working of suggestion in very early life, before the fact of transference could have any validity. It was admitted, however, that the question of whether suggestion is always a libidinal relationship is not entirely free from doubt, especially in view of an original and important theory by Dr. Ernest Jones, who explains all suggestion in terms of narcissism.

In conclusion, the relation of suggestion and auto-suggestion to the will was considered. It has been noted that in the attempt to recall a forgotten name, anxious effort to remember generally brings failure. Coué would explain this by his so-called Law of Reversed Effort. "When the will and the imagination are in conflict the imagination always wins." Dr. Brown's view is that such a formulation is only true of states of incomplete will where fear of failure has prevented the full development of volition. Most cases of successful auto-suggestion are characterised by avoidance of thoughts and fears of failure, and may therefore be considered as instances of supplementation and completion of the volitional process by means of adequate control of the imagination.

Finally, auto-suggestion must be supplemented extensively by what Dr. Brown terms "autognosis." In the course of mental analysis the patient obtains a more and more objective view of the past course of his mental life. He understands more clearly in what respects he has failed in the past to adjust himself adequately to the demands of life and to the peculiarities of his own nature. This process of intellectualisation of the mind is one of the most important factors of cure in the course of mental analysis. By such a course the patient is rid of complexes and other dissociations and is thus enabled to face the world with a unified personality.

University and Educational Intelligence.

CAMBRIDGE.—Mr. A. B. Ramsay, lower master of Eton, has been appointed master of Magdalene College in succession to the late Dr. A. C. Benson.

The General Board of Studies has approved that the degree of doctor of science shall be conferred on Mr. H. Hamshaw Thomas, lecturer in botany, who has for some years been engaged in investigating fossil angiosperm plants of Jurassic age from the Yorkshire coast.

Prof. V. H. Blackman, of the Imperial College of Science and Technology, has been appointed an elector to the chair of botany in succession to the late Sir Francis Darwin.

Permission has been given for the sealing of the conveyance of the site for the new University Library. Plans for the proposed building have been exhibited for some time past, but very generous benefactions will have to be forthcoming before they can be carried out.

EDINBURGH.—Prof. J. A. S. Watson has intimated his desire to resign from the chair of agriculture and rural economy at the end of the autumn term, as he has been appointed to the Sibthorpian chair of rural economy in the University of Oxford.

LONDON.—By the will of the late Sir Rickman Godlee, Bart., after the death of his wife, one moiety of his residuary estate is given to University College, and the other moiety of his residuary estate to University College Hospital. By a bequest from the late Miss L. S. Gibbs, 150*l.* per annum is to be devoted to the establishment of a studentship in memory of her mother, to be called "The Laura de Saliceto Studentship," for the advancement of cancer research either on the physiological or the chemical side.

The following doctorates have been conferred:—D.Sc. (*Chemistry*), Mrs. E. H. Ingold (Imperial College—Royal College of Science and the Royal Holloway College) for a thesis entitled "Tautomerism"; D.Sc. (*Geology*), Mr. A. K. Wells, for a thesis entitled "The Geology of the Rhobell Fawr District (Merionethshire)," and other papers.

MANCHESTER.—Through the generosity of Mr. Ernest A. Knight, honorary treasurer of the University, a selected medical graduate will be enabled, this winter, to visit the United States, where he will study and, eventually, report upon the methods used in approved institutions, and investigate the part played by mental factors in the development, treatment, and cure of mental disorders. The competition was open to those who had obtained or had entered upon a course for the Diploma in Psychological Medicine of the University. The purpose of the fellowship is that of the Knight Prize, which is offered annually in the University, to encourage the study of psychological factors in the causation and cure of mental disturbances.

The following appointments have been made: Mr. F. G. G. A. Marraine to be assistant-lecturer in mathematics; Mr. R. J. Cornish to be assistant-lecturer in engineering; Mr. C. J. Polson to be demonstrator in pathology.

THE new buildings of the Swansea University College, which include the engineering laboratories referred to in these columns last week (October 31, p. 662) were opened by Lord Eustace Percy, president of the Board of Education, on October 31. The principal of the College, Dr. T. Franklin Sibly, referred in his opening remarks to the fact that all the students are now concentrated at Singleton, whereas previously many had to work at the Technical College, Mount Pleasant. Lord Eustace Percy said the opening of the new buildings marked "an attempt by the

university colleges to see that the system of higher education served the great industries of the country, so that skilled recruits could be drawn from the whole-time system of higher education, rather than that the industries should have to fall back on part-time technical training." The new engineering laboratories are provided with up-to-date electrical equipment including compound motors, alternators, rotary converters, an oscillograph outfit, certified standards of electromotive force and resistance, and so on. The courses in electrical engineering aim at giving a good general knowledge of the subject with a bias towards power generation, transmission and distribution.

NEW engineering laboratories at the Derby Technical College were opened on Friday, October 30, by the Hon. Sir Charles A. Parsons. For many years past the work of the College has been hampered by the inadequacy of its building. As an extension on the original site is not feasible, new buildings have been provided a short distance away. They include laboratories for mechanics and heat, for more advanced work in applied mechanics and for heat engines respectively, as well as an engineering workshop. The rooms vacated in the main building enable additional provision to be made for physics, electrical engineering and metallurgy. Valuable gifts of plant have been received from local manufacturers, and local firms have assisted in the erection of the machines. In particular, Messrs. Rolls-Royce, Ltd., have presented and fitted up completely a motor-car engine with a Heenan and Froud brake, while the Derby Gas Co. have presented a Crossley gas engine coupled to a dynamo. Sir Charles Parsons referred to the remarkable progress of engineering during the last half-century, and to the consequent change which had taken place in the education necessary for engineering students. He emphasised the importance of practical as well as theoretical training, and offered his congratulations on the completion of the new laboratories.

UNIVERSITY COLLEGE, London, has issued an appeal for 500,000*l.* in order to mark the centenary, in 1927, of the laying of the foundation stone of what was then known as the University of London. The name was changed later to University College, and the College was incorporated in the University of London in 1907, so the celebrations will be of unusual interest as marking the beginning of the second century of university education in London. The activities of University College have increased widely, particularly during the past twenty-five years, and the appeal now sent out is for funds for building developments, equipment and endowment. Among the items set out are a Great Hall, completion of the Gower Street front, electrical equipment for the new chemical laboratories, new buildings for the Departments of Zoology and Comparative Anatomy and Chemical Engineering, the reconstruction of the Departments of Applied Mathematics, Physics, Engineering, and of the General Library, while the Science Library is not yet completed. With regard to the endowment of teaching, the aim is to establish funds which will enable the College to offer the remuneration necessary to attract and retain a teaching and research staff of the highest rank. At present, the chairs of geography and engineering (civil and mechanical), among others, are without endowment, while the chairs of applied mathematics and mechanics, mathematics, botany, geology, physics and zoology are not in receipt of adequate support. Half the sum which it is hoped to raise will be devoted to endowment, thereby releasing general funds for other purposes. The appeal is under the patronage of Prince Arthur of Connaught; the treasurer is Sir Robert Kindersley, to whom donations should be sent, at University College, and the secretary is Dr. W. Seton.

Early Science at Oxford.

November 8, 1687. Mr. President shewed the Society the edition of *Aristarchus de magnitudinibus & distantijs Solis & Lunæ*, in Greek and Latin, the care of which he had taken at the desire of this Society. Then Dr. Smith gave an account of what mathematical manuscripts were in Magdalen College Library.

November 9, 1683. Dr. Plot was pleased to shew some leaves, acorns, and a large branch, of an English Cork-tree, which grows at Abingdon in Cambridgshire; after which, ye Doctor showed a peice of white marble, which he had stained to a dusky black; ye colour entering ¼ of an inch or more. He then acquainted ye Company, with ye severall methods, ye smiths use at Wolverhampton, in Staffordshire, in hardening, and softening, their Iron.

They harden Iron with burnt hoofs, horn, fountain salt, bay-salt, sublimat, urine, and old burnt leather, and tartar, all mix't together, and reduced into a powder, in which they roll ye Iron red hot, to which it will stick, and so put it into ye fire again to harden; which it does only on ye outside to ye thickness of a shilling. They have two sorts of hardening in this town, tough-hardening, and brittle-hardening, which they use according as ye Instruments they make, require. Dr. Plot was told by another, as a secret, that ye toughest hardening was made by ye juice of nettles, mans urin, and linseed oyl, and ye highest by quenching Iron red hot in ye juice of mous eare.

Dr. Smith has undertaken to procure a new Chart, made by a gentleman, (whom ye Doctor knew at Constantinople,) who has lately travelled from Muscovy to China; by this chart it appears, that those two countries are not so far distant from one another, as our maps commonly make them.

November 10, 1685. A Caconut was presented ye Society by Dr. Plot, which, being opened, yielded ye milk, ye white kernell encompassed by a hard shell, (of which drinking cups are frequently made) and a loose cortex over that an inch and ½ thick, of which linen is frequently made.

Mr. Bobart shewed a very curious collection of leaves and seeds of plants lately brought from St. Christopher's, of which he promises a more full account in writing.

November 11, 1684. An account of the preparation of Tartarum Vitriolatum was communicated by Dr. Plot, and also an account of ye weather here at Oxford the last moneth.

A letter from Mr. Cole, dated from Minehead, October ult: 1684, was read; it contain'd more of his observations concerning ye dying shellfish.

Mr. Charles Leigh communicated severall curiosities observ'd by him in Lancashire; particularly of Barnacles, which he takes to be a Shellfish, not a bird; of Caterpillars, concerning which he is of opinion, that ye old ones are killed by the younger; of worms in apple-kernells almost as large as ye kernells, which he urges as an argument against *omnia ex ovo*; unless perhaps ye egg rises with ye juyce of ye tree; of a peice of chalk ot ye shape and bigness of a muscleshell, taken out of ye bladder of a hog. Of waters impregnated with Latrôn. Of a Water in that Countrey, which, by falling on wood, turns into a substance which rings like a bell. Of a water from a white marl 2 ounces in a quart lighter then common water usually is.

Mr. Vice Chancellor communicated to ye Society severall stones, all of a cubicall form, but of several sizes; all *pyrites aurei* found plentifully at St. Davids in Pembrokeshire: whereof Dr. Plot said that they were the true *Ludus* of Paracelsus.

Societies and Academies.

MANCHESTER.

Literary and Philosophical Society, October 13.—W. W. Haldane **Gee**: (1) John Dalton's spectacles. The vision of John Dalton was very abnormal. He was colour-blind and also short-sighted. We have now definite knowledge of the extent of this defect, for the Misses Taylor of Manchester have given the Society a pair of Dalton's spectacles. The frames are of blued-steel, hand-made, and were originally furnished with swinging arms to fit round the ears, as seen in the portraits of Dalton. The lenses are of the periscopic concave type with a power of 5 diopters. The use of such strong lenses proves that Dalton was very short-sighted, and he would be obliged to wear his spectacles to see objects at a distance, though it is very possible he would be able to read the smallest print at a distance of 8 or 9 inches without any glasses. (2) John Dalton's pupil's note-book. The Misses Taylor of Manchester have also presented on loan to the Society a note-book used by a relative, who was a pupil of John Dalton. It contains notes relating to mathematics, natural philosophy, and meteorology. Two of the entries under the last-named head are of general interest in connexion with the weather. It is noted that "the mean annual temperature at Manchester for 47 years is 48·8," also that the "rain in the first six months of the year is to that of the last six months as 2 to 3." The Stonyhurst College Observatory records give for the mean annual temperature for the last 77 years 47° Fahrenheit, which does not differ much from that noted by Dalton's pupil, for Manchester. The rainfall there for the last six months of the year divided by that for the first six months gives the number 1·491, a most remarkable verification of Dalton's corresponding number of 1·50.—W. L. **Bragg**: The sizes of atoms. The atoms cannot be regarded as incompressible bodies occupying a definite volume. The limit to the approach of two atoms appears to be set by the action of a repulsion between them, which rapidly increases as the distance between the atomic centres lessens. This field sets in so rapidly, however, that we may form a picture of the packing together of atoms by supposing them to be spheres nearly constant in size, but slightly elastic and compressible. This picture helps to explain the form of many compounds, though it breaks down entirely in other cases and its limitations must be carefully considered. A chief constituent of many inorganic compounds is oxygen. The repulsive force between oxygen atoms assumes a large value when their centres are 2·7 Å. ($2{\cdot}7 \times 10^{-8}$ cm.) apart. The size of other atoms is in general much less, so that in many inorganic crystals the scale and shape of the whole structure are determined chiefly by the oxygens. A number of models may be made to illustrate this peculiar importance of oxygen. In some of them the structure may be regarded as a closely packed assemblage of oxygen atoms with other atoms in the chinks between them acting as a cement to bind the whole together.—J. M. **Nuttall** and E. J. **Williams**: β-rays associated with X-rays. The β-rays associated with homogeneous X-rays have been studied by the Wilson cloud expansion method, the required wave-length being sorted out by reflection from a crystal. The relative numbers of recoil and photo-electron tracks (in various gases) have been determined for a series of wave-lengths of primary X-rays. Several hundred tracks have been counted and the numbers are in general agreement with the quantum theory of X-ray scattering as advanced by Compton. The results show that the fraction of scattered X-ray quanta which give sufficient energy to the recoil electron to enable it to leave the atom and produce a track, increases with decreasing wave-length of primary X-rays and approaches unity.

PARIS.

Academy of Sciences, September 7.—Jacques **Chokhatte**: A general formula in the theory of polynomials of Tchebycheff and its applications.—F. **Baldet**: The presence of the red cyanogen spectrum in Daniel's comet (1907*d*). A photograph of the spectrum of Daniel's comet, taken in August 1908, shows a red band not previously noted by any observers of this comet. By comparison with the carbon arc spectrum, taken with the same prism objective, it has been found that the comet band coincides with a band in the carbon spectrum, not only in position, but also in the relative intensities of corresponding points. These bands have been identified by Fowler and Shaw with the red spectrum of cyanogen.—V. **Nechville**: A relation between the mean proper motion and stellar magnitude from the first negatives of Henry.—A. **Duboin**: The application to chromium of a general method of synthesis of fluorides and silicates. The oxide or fluoride of chromium is added to fused acid potassium fluoride, the mass raised to a red heat and silica added. After slow cooling and extraction with water, the silica is found well crystallised as tridymite, the chromium as the crystallised double fluoride, $3KF \cdot CrF_3$.—— **Viret**: The rodent fauna of Saint-Gérand-le-Puy (Allier).—C. T. **Popeso**: Comparative sleep and awakening of the primordial leaves in grafted and non-grafted beans.—E. **Ducloux** and Mlle. G. **Cordier**: The pancreatic extract of *Acanthias vulgaris*; its action compared with that of ox insulin.

September 14.—André **Blondel**: A modulometer arrangement for the control of radiotelegraphic emissions.—Alfred **Rosenblatt**: Algebraic varieties of three dimensions of which the types satisfy the inequality $P_g \leqq 3(p_g - p_a - 3)$.—Rolf **Nevanlinna**: Some properties of meromorph functions in a given angle.—Michel **Samsoen**: An anomaly of the expansion of glass. The case of boric anhydride. At about 250° C., the coefficient of expansion of boric acid undergoes a sudden increase, from 15×10^{-6} to 200×10^{-6}. This result was obtained by two different experimental methods.—L. **Daniel** and E. **Potel**: Grafts of the sweet almond on roots of belladonna. In the graft there is a reduction in the amounts of cellulose and of atropine.—Alfred **Labriet** and Raoul **Husson**: The principles of vocal education by the realisation of vocal agreement.

September 21.—P. J. **Myrberg**: The simultaneous reduction of two quadratic forms.—A. **Kovanko**: A class of points of non-uniform convergence of series of functions.—— **Mandelbrojt**: The best approximation of analytical functions and their singular points.—B. **Galerkin**: A plate, in the form of a rectangular isosceles triangle, placed on its contour, submitted to the action of forces acting normally to its surface on the axis of symmetry.—R. de **Mallemann**: The diffusion of light by active and inactive molecules. A criticism of some conclusions of Gans relative to the diffusion of light by active molecules.—René **Wurmser**: The activity of various radiations in photosynthesis.—Const. A. **Kténas**: The eruption of the volcano of Santorin.—A. **Poli-**

card and A. **Paillot**: Study of silk secretion with the aid of filtered ultra-violet rays (Wood's light). Examined in Wood's light, certain parts of the silk-worm, especially the blood, show a brilliant yellow fluorescence. The method is of some practical interest, as the appearance of the silk-worm in filtered ultra-violet light is modified by bad nutrition or by disease.—R. **Legendre**: A tortoise (*Sphargis coriacea*) caught in the bay of Concarneau.—J. Roger d'**Ansan**: Ocular gymnastics applied to the treatment of amblyopia ex-anopsia and the strabism derived from it.—Charles **Lebailly**: The reappearance of foci of foot and mouth disease and the continuity of the virus in Nature. Experiments on six farms were carried out with the view of testing the theory that the virus was carried in cavities in the hoofs of cattle recovered from the disease. Sixty-two cured cattle in all were placed in contact with 450 fresh beasts, but the results were all negative, no return of the disease taking place. The author considers that these experiments definitely disprove the theory of virus latent in the feet of cattle after recovery from foot and mouth disease.

ROME.

Royal Academy of the Lincei: Communications received during the vacation.—Leonida **Tonelli**: The absolute convergence of Fourier's series.—F. **Zambonini** and R. G. **Levi**: Investigations on the isomorphism of molybdates of the rare earth metals with those of calcium, strontium, barium and lead. In view of the fact that a compound such as $CaMoO_4$ forms mixed crystals with $Ce_2(MoO_4)_3$, it is proposed to examine by röntgenographic means the structure of such crystals.—F. **Zambonini** and V. **Caglioti**: Neodymium thallous sulphates. The double sulphates having the formulæ $Nd_2(SO_4)_3,4\cdot5Tl_2SO_4$, $Nd_2(SO_4)_3,Tl_2SO_4,8H_2O$ and $Nd_2(SO_4)_3,Tl_2SO_4,3H_2O$, are described.—L. A. **Herrera**: Additional figures illustrating various communications. The figures deal with the blastomere of the trout, the imitation of cell-division by means of collodion and ultramarine, and karyokinesis figures in crystals of metaformaldehyde.—Giuseppe **Levi**: Autonomous growth, by amœboid movement, of fragments of neurites separated from the trophic centre.—Gabriele **Mammana**: A new method of studying linear differential equations.—B. **Marzetti**: A deviation from Poiseuille's law. The non-linear relationship between the velocity of flow of rubber from a tube or orifice and the pressure to which it is subjected is considered.—Luigi **Rolla** and Giorgio **Piccardi**: Chemical statics of electronic phenomena.—G. **Bargellini**: $\alpha\beta$-Diphenylcoumarins.—Lorenzo **Fernandes**: Isomorphism between quadrivalent uranium and zirconium.—A. **Ferrari**: The crystal structure of lead dioxide examined by means of X-rays. Crystalline lead dioxide has a tetragonal structure of the rutile type, the elementary cell containing two molecules of the dioxide.—G. **Scagliarini** and G. **Tartarini**: Products of the oxidation of complex sulphites of tervalent cobalt.—Adriana **Stolfi**: The behaviour of lead containing RaG in the formation of formaldehyde according to Thunberg's theory.—Francesco **Vercelli**: Theory of the propagation of radiant energy through water.—E. **Onorato**: The epsomite of the north-west mine of Idria.—G. **Checchia-Rispoli**: Cainozoic echinids of Cirenaica collected by Camillo Crema.—G. **Campanile**: Contribution to the study of the systematics of the genus Cuscuta (section "Clistogrammica" Englm.).—Alberto **Pirovano**: Observations on electric mutations and on the process of ionolysis in gametes.

Official Publications Received.

Bulletin of the Terrestrial Electric Observatory of Fernando Sanford, Palo Alto, California. Vol. 2: Summary of Observations on Earth Potential, Air Potential Gradients and Earth Currents, September 1923–December 1924. Pp. 35. (Palo Alto, Calif.)

Field Museum of Natural History. Publication 224, Zoological Series, Vol. 14, No. 3: The Brains of the South American Marsupials Cænolestes and Orolestes. By Jeannette Brown Obenchain. Pp. 173-232+plates 24-36. Publication 225, Botanical Series, Vol. 4, No. 3: The Taxonomy of Poison Ivy, with a Note on the Origin of the Generic Name. By James B. McNair. Pp. 53-76+plates 14-24. Publication 227, Report Series, Vol. 6, No. 4: Annual Report of the Director to the Board of Trustees for the Year 1924. Pp. 265-383+plates 47-62. Publication 230, Museum Technique Series, No. 2: New Uses of Celluloid and similar Material in Taxidermy. By Leon L. Walters. Pp. 20+7 plates. (Chicago.)

Smithsonian Institution: United States National Museum. Bulletin 130: Life Histories of North American Wild Fowl; Order Anseres (part). By Arthur Cleveland Bent. Pp. x+376+60 plates. (Washington: Government Printing Office.) 90 cents.

Department of the Interior: United States Geological Survey. Water-Supply Paper 522: Surface Water Supply of the United States, 1921. Part 2: South Atlantic Slope and Eastern Gulf of Mexico Basins. Pp. iv+72+2 plates. 10 cents. Water-Supply Paper 526: Surface Water Supply of the United States, 1921. Part 6: Missouri River Basin. Pp. vii+331+2 plates. 30 cents. Water-Supply Paper 534: Surface Water Supply of the United States, 1921. Part 12: North Pacific Slope Drainage Basins. C: Lower Columbia River Basin and Pacific Slope Drainage Basins in Oregon. Pp. vi+171+2 plates. 20 cents. Water-Supply Paper 544: Surface Water Supply of the United States, 1922. Part 4: St. Lawrence River Basin. Pp. iv+140+2 plates. n.p. Water-Supply Paper 548: Surface Water Supply of the United States, 1922. Part 8: Western Gulf of Mexico Basins. Pp. iv+124+2 plates. 15 cents. (Washington: Government Printing Office.)

Smithsonian Institution: Bureau of American Ethnology. Bulletin 78: Handbook of the Indians of California. By A. L. Kroeber. Pp. xviii+995+83 plates. (Washington: Government Printing Office.)

Thirty-Ninth Annual Report of the Bureau of American Ethnology to the Secretary of the Smithsonian Institution, 1917–1918; with Accompanying Paper, The Osage Tribe: Rite of Vigil, by Francis La Fresche. Pp. 636+17 plates. (Washington: Government Printing Office.)

Department of Commerce: Bureau of Standards. Miscellaneous Publication of the Bureau of Standards, No. 56: Tables and Graphs for Facilitating the Computation of Spectral Energy Distribution by Planck's Formula. By M. Katherine Frehafer and Chester L. Snow. Consisting of 7 sheets (5 charts). Text (sheet 1); Graphs: 1000 to 5000° K. (sheets 2, 3, 4: charts 1, 2, 3); 5000 to 8000° K. (sheet 5, chart 4); 8000 to 24000° K. (sheet 6, chart 5); Tables (sheet 7). (Washington: Government Printing Office.) 35 cents.

Transactions of the Royal Society of Edinburgh. Vol. 54, Part 2, No. 2: Contributions to the Study of the Old Red Sandstone Flora of Scotland. 1: On Plant-Remains from the Fish-Beds of Cromarty; 2: On a Sporangium-bearing Branch-System from the Stromness Beds. By Dr. W. H. Lang. Pp. 253-279+4 plates. (Edinburgh: R. Grant and Son; London: Williams and Norgate, Ltd.) 5s.

Statens Meteorologisk-Hydrografiska Anstalt. Årsbok, 4, 1922. Pp. xii+183. (Stockholm.) 10 kr.

Abisko Naturvetenskapliga Station. Observations météorologiques à Abisko en 1916: Meteorologiska iakttagelser i Abisko år 1916. Rédigées par Sammanställda av Bruno Rolf. Pp. iii+76. (Stockholm).

Meddelanden från Statens Meteorologisk-Hydrografiska Anstalt. Band 2, No. 4: Vattenstånden vid rikets kuster åren 1887–1921. Av Folke Bergsten. Pp. iii+85. 6 kr. Band 2, No. 5: Untersuchungen über die Elemente des Nebels und der Wolken. Von Hilding Köhler. Pp. 73+3 Tafeln. 4.50 kr. Band 3, No. 2: De Svenska vattendragens Arealförhållanden. Del 3: Luleälv m. fl. Av Gustaf Wersén. Pp. 14+1 karta. 1.50 kr. Band 3, No. 3: Synoptiska vaderlekskartor i navigationens Tjänst. Av F. Lindholm. Pp. ii+16. 1 kr. Band 3, No. 4: Karta över den årliga nederbördens fördelning på Skandinaviska halvön. Av H. W:son Ahlmann. Pp. 8+1 karta. 1.50 kr. (Stockholm.)

Diary of Societies.

SATURDAY, NOVEMBER 7.

ROYAL SOCIETY OF MEDICINE (Otology Section), at 10.30 A.M.—A. R. Tweedie: The Otolith Reactions.

GILBERT WHITE FELLOWSHIP (at 6 Queen Square, W.C.), at 3.—G. W. Young: The Yellowstone Park, U.S.A. (Lecture).

MONDAY, NOVEMBER 9.

ROYAL IRISH ACADEMY, at 4.15.

ROYAL SOCIETY OF EDINBURGH, at 4.30.—Prof. J. W. Gregory: (*a*) Scottish Drumlins; (*b*) The Scottish Kames and their Evidence on the Glaciation of Scotland.—J. M. Wordie: Notes on the Geology of Jan Mayen.—Dr. G. W. Tyrrell: The Petrography of Jan Mayen.—Dr. M. A. Peacock: The Geology of Videy, S.W. Iceland: a Record of Igneous Action in Glacial Times.

INSTITUTION OF MECHANICAL ENGINEERS (Graduates Section), at 6.—E. B. Ball: Some Engineering Features in connexion with Irrigation in South Africa (Lecture).

INSTITUTION OF ELECTRICAL ENGINEERS (Informal Meeting), at 7.—E. S. Ritter and others: Discussion on Modern Developments of Telephone Cables.

INSTITUTION OF ELECTRICAL ENGINEERS (North-Eastern Centre) (at Armstrong College, Newcastle-upon-Tyne), at 7.—P. Dunsheath: Dielectric Problems in High-Voltage Cables.

INSTITUTE OF METALS (Scottish Local Section) (at Institution of Engineers and Shipbuilders in Scotland, 39 Elmbank Crescent, Glasgow), at 7.30.—Dr. J. A. Cranston: Binding Forces between Atoms.

SURVEYORS' INSTITUTION, at 8.—J. D. Wallis: Presidential Address.
MEDICAL SOCIETY OF LONDON, at 8.30.—Dr. R. Hutchison and others: Discussion on Obscure Pyrexia in Childhood.
ROYAL GEOGRAPHICAL SOCIETY (at Æolian Hall), at 8.30.—Dr. Knud Rasmussen: From Greenland to the Pacific.
CAMBRIDGE PHILOSOPHICAL SOCIETY (in Botany School, Cambridge), at 8.45.—Prof. B. M. Jones: Wings.
BIOCHEMICAL SOCIETY (at King's College).—J. A. Hewitt and H. G. Reeves: (*a*) Tautomerism of Glyceric Aldehyde; (*b*) Constitution of Glyceric Aldehyde.—Prof. C. Lovatt Evans: Lactic Acid Formation in Plain Muscle.—Dr. Elizabeth S. Semmens: The Hydrolysis of Starch in the Guard Cells of the Stomata of a Monocotyledon.—J. Gordon, J. W. McLeod, and B. Wheatley: The Importance for the Bacteriologist of Differentiating between the Amino-acids which Favour and those which Inhibit Bacterial Growth.—J. R. Marrack and G. D. Thacker: The Influence of Ionic Strength on the Equilibrium of Calcium Ion in Bicarbonate Solutions.

TUESDAY, NOVEMBER 10.

ROYAL COLLEGE OF PHYSICIANS OF LONDON, at 5.—Dr. A. Shadwell: Medicine in Ancient Egypt, Assyria, and Palestine (FitzPatrick Lectures, I.).
INSTITUTION OF PETROLEUM TECHNOLOGISTS (at Royal Society of Arts), at 5.30.—Ing. L. Steinschneider: The Principles of the High Vacuum Distillation of Mineral Oils.—Dr. W. R. Ormandy and E. C. Craven: (*a*) The Determination of Unsaturateds in Petroleum Spirit; (*b*) The Determination of Molecular Weight of Petrol.
INSTITUTION OF AERONAUTICAL ENGINEERS (at Junior Institution of Engineers), at 6.30.—M. L. Bramson: Practical Flying.
INSTITUTE OF MARINE ENGINEERS, at 6.30.—E. F. Spanner: Construction of Ships: A Proposed Method of Minimising Risks due to Collision.
INSTITUTE OF TRANSPORT (Midland Graduate Centre) (at Imperial Hotel, Birmingham), at 6.30.—A. Jackson: Passenger Fare Charges on Urban Tramway Services.
INSTITUTION OF ELECTRICAL ENGINEERS (North Midland Centre) (at Hotel Metropole, Leeds), at 7.—S. D. Jones: Chairman's Address.
ROYAL PHOTOGRAPHIC SOCIETY (Scientific and Technical Group), at 7.—T. Thorne Baker and G. E. Pearce: Modern X-Ray Installations and their Work.
INSTITUTION OF ELECTRICAL ENGINEERS (Scottish Centre) (at Royal Technical College, Glasgow), at 7.30.—Prof. M. Maclean: Chairman's Address.
PHARMACEUTICAL SOCIETY OF GREAT BRITAIN, at 8.—Lt.-Col. Sir David Prain: Some Useful Plants of India (Lecture).
ROYAL ANTHROPOLOGICAL INSTITUTE, at 8.15.—J. P. T. Burchell: The "Shell-Mound" Industry of Denmark as represented at Lower Halstow, Kent.

WEDNESDAY, NOVEMBER 11.

ROYAL INSTITUTE OF PUBLIC HEALTH, at 4.—Dr. H. Gilford: The Prevention of Cancer and Allied Neoplasias.
ROYAL METEOROLOGICAL SOCIETY, at 5.—Dr. C. G. Abbot: Measuring the Sun's Rays (Lecture).
ROYAL COLLEGE OF SURGEONS OF ENGLAND, at 5.—J. Sherren: Gastro-jejunostomy (Bradshaw Lecture).
INSTITUTION OF CIVIL ENGINEERS (Informal Meeting), at 6.—Sir E. Owen Williams: The Relative Economy of Different Classes of Reinforced Concrete Work.
INSTITUTION OF ELECTRICAL ENGINEERS (South Midland Centre) (at University, Birmingham), at 7.—W. R. Barclay: The Development of Alloys of Nickel and Chromium for High Temperature Work and Electrical Resistance Heating.
ROYAL SOCIETY OF ARTS, at 8.30.—Sir Cecil Harcourt-Smith: The Modern Note in Industrial Art (Trueman Wood Lecture).
EUGENICS EDUCATION SOCIETY (at Royal Society), at 8.30.—Rev. J. C. Pringle: The Merx-plas Labour Colony in Belgium.
INSTITUTION OF CHEMICAL ENGINEERS.

THURSDAY, NOVEMBER 12.

ROYAL SOCIETY, at 4.30.—Sir William Bragg and R. E. Gibbs: The Structure of α and β Quartz.—Lord Rayleigh: The Light of the Night Sky: its Intensity Variations when analysed by Colour Filters.—Prof. W. A. Bone and G. W. Andrew: Studies upon Catalytic Combustion. Part I.—Prof. O. W. Richardson and F. C. Chalklin: The Excitation of Soft X-Rays.—R. Campbell Thompson: On the Chemistry of the Ancient Assyrians.—J. E. Lennard-Jones: On the Forces between Atoms and Ions.—*To be read in title only*:—F. G. Mann and Sir William Pope: $\beta\beta'\beta''$ Triaminotriethylamine and its Complex Metallic Derivatives.—K. R. Ramanathan: The Structure of Molecules in relation to their Optical Anisotropy. Part II.—Dr. E. V. Appleton and M. A. F. Barnett: On some Direct Evidence for Downward Atmospheric Reflection of Electric Rays.
LONDON MATHEMATICAL SOCIETY (at Royal Astronomical Society), at 5.—Annual General Meeting.
ROYAL COLLEGE OF PHYSICIANS OF LONDON, at 5.—Dr. A. Shadwell: Medicine in Ancient Egypt, Assyria, and Palestine (FitzPatrick Lectures, II.).
ROYAL AERONAUTICAL SOCIETY, at 5.30.—H. B. Howard: Some Problems in Aeroplane Structural Design.
CHILD-STUDY SOCIETY (at Royal Sanitary Institute), at 6.—M. Yearsley: The Development of Speech in the Normal Child.
SOCIETY OF CHEMICAL INDUSTRY (Bristol Section) (at Bristol University), at 7.30.—Dr. E. Vanstone: The Rôle of Phosphorus in Agriculture.
INSTITUTION OF ELECTRICAL ENGINEERS (Dundee Sub-Centre) (at University College, Dundee), at 7.30.—I. Sclar: A Comparison of Electrical Wiring Installations and Analysis of their Costs.
INSTITUTE OF METALS (London Local Section) (at Royal School of Mines), at 7.30—Dr. R. S. Hutton and Dr. O. F. Hudson: Science and Industry: Some Impressions from the Early Experiences of the British Non-Ferrous Metals Association.
OPTICAL SOCIETY (at Imperial College of Science), at 7.30.—S. A. Emerson: Some Recent Improvements in Modern Ophthalmic Lenses.—W. Swaine: Relation of Visual Acuity and Accommodation to Ametropia.—Irregular Astigmatism of the Eye:—E. F. Fincham: Effect of Size of Pupil; H. H. Emsley: Effect of Correcting Lenses.—Exhibition and Description of the Zeiss Refraction Meter by J. W. Atha and Co.
INSTITUTION OF ELECTRICAL ENGINEERS (Irish Centre) (at Trinity College, Dublin), at 7.45.—G. G. Sutcliffe: Underground Telephone Construction.
INSTITUTION OF CHEMICAL ENGINEERS (at Institution of Mechanical Engineers), at 8.—Hon. H. Fletcher Moulton and others: Discussion on Scientific Research Workers and Industry.
INSTITUTION OF MECHANICAL ENGINEERS (South Wales Branch).—Eng. Lieut.-Commdr. W. H. Reynolds: Chairman's Address.
OIL AND COLOUR CHEMISTS' ASSOCIATION.
INSTITUTION OF THE RUBBER INDUSTRY (Manchester Section).—Short Papers.

FRIDAY, NOVEMBER 13.

ROYAL ASTRONOMICAL SOCIETY, at 5.—
PHYSICAL SOCIETY OF LONDON (at Imperial College of Science), at 5.—T. G. Hodgkinson: Valve Maintained Tuning Forks without Condensers.—R. G. Edwards and B. Worswick: The Viscosity of Ammonia Gas.—Dr. C. Chree: The Times of Sudden Commencements (S.C.'s) of Magnetic Storms: Observations and Theory.—Demonstration of the Kinetic Properties of a Gas Jet by Dr. J. S. G. Thomas.
MALACOLOGICAL SOCIETY OF LONDON (at Linnean Society), at 6.—W. A. Lindholm: On a Neglected Work containing Typifications of Molluscan and Brachiopodan Genera.—E. Ashby: The Acanthoid Chitons of New Zealand with Descriptions and Figures, including several New Species and Photographs of Previously Unfigured Types.—A. W. B. Powell: Description of Two New Gastropods from Whangaroa, New Zealand.—A. S. Kennard and B. B. Woodward: Nomenclatorial Notes relative to British Non-Marine Mollusca. IV.—Rev. E. G. Alderson: The *Ampullaria swainsoni* of Philippi, Hanley and Reeve.—Exhibitions of Illustrations and Photographs, taken from the Type Specimen in the Senckenberg Museum, of *Palaina mirabilis* Mlldff., by B. B. Woodward, and Specimens of Shells and Radulæ illustrating a New Molluscan Family, and Genera, by J. R. Le B. Tomlin and Lt.-Col. A. J. Peile.
INSTITUTION OF ELECTRICAL ENGINEERS (London Students' Section), at 6.15.—Lt.-Col. K. Edgcumbe: Some Controversial Problems.
JUNIOR INSTITUTION OF ENGINEERS, at 7.—Annual General Meeting.
INSTITUTE OF METALS (Swansea Local Section) (at University College, Swansea), at 7.15.—L. B. Pfeil: Effect of Crystal Size on the Mechanical Properties of Metals.
INSTITUTION OF ENGINEERING INSPECTION (at Royal Society of Arts), at 7.30.—Dr. W. H. Hatfield: Modern Developments in Steels resistant to Corrosion.
INSTITUTE OF METALS (Sheffield Local Section) (at Sheffield University), at 7.30.—S. Field: Recent Advances in Electro-Deposition.
NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS (Middlesbrough Branch, Graduate Section), at 7.30.—A. T. Abernethy: Wireless Transmission and Reception.
ROYAL SOCIETY OF MEDICINE (Ophthalmology and Surgery Sections), at 8.30.—Joint Discussion on Plastic Operations on the Face in the Region of the Eye.
INSTITUTION OF MECHANICAL ENGINEERS (Leeds Branch).—Sir John A. F. Aspinall: Some Railway Notes Old and New (Thomas Hawksley Lecture).

SATURDAY, NOVEMBER 14.

ASSOCIATION OF MINING ELECTRICAL ENGINEERS (North of England Branch) (at Newcastle-upon-Tyne), at 3.—J. A. B. Horsley: The Selection, Lay-out, and Maintenance of Electrical Equipments at Collieries.
INSTITUTE OF TRANSPORT (North-East Centre) (at Newcastle-upon-Tyne), at 3.—C. J. Allen: British Main Line Passenger Train Services.
PHYSIOLOGICAL SOCIETY (at Cardiff).

PUBLIC LECTURES.

SATURDAY, NOVEMBER 7.

HORNIMAN MUSEUM (Forest Hill), at 3.30.—R. A. Smith: Aspects of Roman London. I.

MONDAY, NOVEMBER 9.

KING'S COLLEGE, at 5.30.—Dr. W. T. Gordon: Geology and Civilisation (Swiney Lectures). (Succeeding Lectures on November 13, 16, 20, 23, 27, 30, Dec. 4, 7, 11, 14, and 18.)

TUESDAY, NOVEMBER 10.

KING'S COLLEGE, at 5.30.—Miss Hilda D. Oakeley: The Philosophy of Aristotle: Theory of Mind and Soul.
SURVEYORS' INSTITUTION, at 5.45.—E. H. Shaughnessy: Post Office Wireless Stations.
GRESHAM COLLEGE (Basinghall Street), at 6.—W. H. Wagstaff (Geometry). (Succeeding Lectures on November 11, 12, and 13.)

WEDNESDAY, NOVEMBER 11.

UNIVERSITY COLLEGE, at 5.30.—Prof. G. Elliot Smith and the late Dr. C. F. Sonntag: The Evolution of Man. (Succeeding Lectures on November 18, 25, December 2, 9, and 16.)

THURSDAY, NOVEMBER 12.

BEDFORD COLLEGE FOR WOMEN, at 5.15.—C. C. Baker: Italian Painting: its Place in Art.
KING'S COLLEGE, at 5.30.—Sir Arthur Newsholme: The Community and Social Hygiene.
UNIVERSITY OF LEEDS, at 8.—Lt.-Col. W. R. Mansfield: New Light on Christopher Columbus.

SATURDAY, NOVEMBER 14.

HORNIMAN MUSEUM (Forest Hill), at 3.30.—R. A. Smith: Aspects of Roman London. II.