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Normal and Supernormal Phenomena.

About two years ago a plea was made in our columns by Dr. R. J. Tillyard for a wider and more generous outlook on the part of science towards psychical research. The correspondence which followed showed that one of the reasons why scientific investigators hesitated to undertake research into these problems was the uncertainty that, however faithfully they might follow up clues, they were unlikely to be able to reach precise conclusions. There are so many unsolved problems in the natural world to attract the attention of scientific workers, and so many natural mysteries from which they may be able to lift a corner of the veil, that however willing they may be to enter into the field of supernatural or supernormal manifestations, the claims of normal facts and phenomena are too strong to permit them to do so. If few men of science devote themselves to "the scientific study of what are called supernormal phenomena" it must not be assumed, therefore, that they are altogether indifferent to observations and conclusions in that field, any more than it can be assumed that students of atomic constitution have no interest in the structure of the cell.

We ourselves preserve an open mind towards work for the advancement of knowledge and the acquisition of truth in all spheres of intellectual activity. It is on that account that we publish this week an article by Dr. R. J. Tillyard in which he presents evidence, regarded by him as sufficient, of the survival of a human personality. The search for evidence that human personality survives the shock of physical death, and that, after severance from the body, it can continue to function on some other plane of existence, will no doubt be prosecuted so long as man possesses that curiosity from which discoveries are born. Dr. Tillyard is one of those who, much to his credit, has decided to make his contribution to the problem by both a consideration of, and practical experience with, those obscure and hotly debated phenomena which form the subject matter of psychical research.

In his article published in this issue of Nature, he describes certain of his experiences, and as a result he has come to the conclusion that a certain human personality who parted from his body in 1912 has "fully proved *in a scientific manner*" that he has survived physical death. Now it is a little difficult to suppose that the experiences related by Dr. Tillyard have been the sole means of convincing him of the truth of such a momentous question. Such a supposition would scarcely be

fair to him. We must imagine that these experiences have been the culmination of a series of other incidents observed elsewhere, which, so to speak, have tipped the scale in favour of the hypothesis of survival. This assumption is made because, from a consideration of Dr. Tillyard's remarks, it is not easy to understand on what he bases the "*scientific proof* of survival" which he believes to have discovered in the evidence presented. It may be of interest to indicate a few of the points in his article which must occur to any one at all acquainted with the methods by which inquiries into 'psychical' phenomena are usually conducted.

Dr. Tillyard divides his experiences into two parts—(*a*) Supernormal Cognition of Unknown Objects, and (*b*) Supernormal Production of Thumb Prints. Now it would seem fairly clear that in the Margery mediumship we have the choice of two alternatives. Either the phenomena are 'supernormally' produced in the sense in which Dr. Tillyard uses that term; or they are the result of normal methods which have deceived the observers. In other words, Margery is either the instrument of some unrecognised 'Forces'; or she, and possibly others, are engaged in a mystification for some undisclosed purpose. There seems no doubt that Dr. Tillyard prefers the first hypothesis, which he has somewhat elaborated so as to include the survival of an active human personality.

Let us briefly examine his evidence. Dr. Tillyard tells us that for the alleged supernormal cognition of unknown objects he "proceeded to make the following preparations for supernormal tests." Now the inadequacy and oddity of these tests must strike even the most casual reader. We do not know who actually invented these tests, but it would seem probable that they were devised by the control 'Walter,' or, in other words, on the hypothesis of normal action, by the medium and her associates. If this were so, Dr. Tillyard and Mr. Evans were merely the instruments used in preparing experiments devised by others—not altogether a satisfactory beginning of a test for supernormal activity. Moreover, it is 'Walter' who arranges the sitting and tells Dr. Tillyard when preparations are complete for examining the calendar, the diagrams, or the magazine.

We find it difficult to imagine what possible reason Dr. Tillyard can have for supposing that anything supernormal was in progress during the acquisition of knowledge regarding these objects. We do not deny that supernormal activity *may* have been present, but we would submit that the experiments were unsuitable to demonstrate it. Had 'Walter' given the order of the calendar sheets before they left Dr. Tillyard's pocket it might have been more difficult to seek a normal explanation. Had he described Mr. Evans's diagrams in a similar way it might have been worth our careful attention. But he did neither of these things. He took away the calendar and the diagrams and returned them later. Doubtless Dr. Tillyard will say that he took them away in order to read them: others may think they were taken away for some one else to read them.

The difficulty of darkness is not one which even a moderate ingenuity could fail to surmount. All that is required, therefore, upon the hypothesis of normal procedure, is that someone saw the objects handed over by Dr. Tillyard and Mr. Evans, and that Margery, having acquired knowledge of them, wrote it down afterwards. It would seem that any one could produce the same 'phenomena' under the same conditions with some degree of practice, provided he desired to do so. Similarly, if we assume that Mrs. Litzelmann was willing to assist, why is it difficult to explain her knowledge of the calendar numbers? Dr. Tillyard says of the calendar sheet (May 8) torn from the block at the sitting that the 8 was "My number." It was nothing of the sort. It was 'Walter's' choice from a set of 31 sheets. By signing *all* the sheets of both months Dr. Tillyard and Mr. Evans themselves provided the means for prearrangement, and what we should like to know is whether or no they did this under instruction. Again, why did Mr. Evans make ten diagrammatic drawings instead of one? Because on the hypothesis of mystification the medium in Maine would be fairly safe in choosing a square and a circle, as it is unlikely that *both* of these would be absent in *ten* diagrammatic designs.

Lest it be thought impertinent to criticise a sitting at which one was not present, it should be understood that only a few of those factors have been indicated which, instead of suggesting that the so-called cognition of unknown objects belongs to the "category of normal impossibilities" as Dr. Tillyard avers, point rather to normal interference from internal evidence alone.

With regard to the thumb prints, Dr. Tillyard has not yet even *begun* to prove that the prints obtained at the sitting are identical with those of Walter Stinson in life. Certainly *if* it could be proved that a print was found on the razor, *and* that it was made by Walter on the morning of his death, then there would be some reason for suggesting that certain features of the prints

made on wax resembled, or were identical with, certain features of Walter's thumb print made when alive. But this is all that can be said, and until we have seen an untouched photograph of the print alleged to have been found on the razor, it way be as well to suspend our judgment on the resemblances between it and the wax impressions.

Apart from this, however, even assuming that everything occurs exactly as related by Dr. Tillyard, it is not easy to understand what possible connexion the thumb print has with Walter's surviving personality. For, we can scarcely suppose, as Dr. Tillyard appears to do when he speaks of Walter's "surviving voice", that Walter's *body* has survived and is living in some other world. The thumb is, if we understand Dr. Tillyard's theory correctly, built up afresh at each sitting out of 'teleplasm' produced from the medium's body. Since, according to this hypothesis, we grant such staggering powers to the medium, what reason have we to deny her the additional power of producing out of teleplasm the thumb prints of anyone, living or dead? Assuredly few of us could, without detailed study, make a rough drawing of our thumb prints while we have our thumbs: what conceivable reason have we for supposing that we could make accurate reproductions when the flesh of our thumbs has long since crumbled to dust? The problem has no longer any basis from which speculation is possible. If these be facts, then they prove nothing beyond the very remarkable powers of Margery.

Returning from our flights of phantasy we may well ask why Dr. Tillyard preferred a stranger to accompany him to the sitting, whilst his associate, Mr. Evans, was left outside the door. Moreover, from Dr. Tillyard's account it is clear that 'Walter' and not he was in control. As before, they are not Dr. Tillyard's experiments: he is merely a spectator at one of "Nature's shows." We cannot help asking ourselves whether, if he had been the experimenter, and not "the respectful audience," the show would not have been more like Nature—natural. We believe that Dr. Tillyard will have to bring much more convincing evidence of the actual existence of Walter's spiritual personality than that presented by him in his article before it can pass the critical bar of science. The existence alone of a spiritual voice capable of producing compressional waves in air, having a characteristic quality and capable of being recorded and analysed by suitable instrumental means, requires so many physical assumptions that only by demonstration under the most precise conditions could such a spiritual means of producing sound be established. We suggest that any further inquiries should be concentrated upon this point. Once it is proved that a spirit can mould a larynx and mouth cavity out of ectoplasm, and can force air through them so as to make sound and speech by such means, it would be easy to accept most of the other supernormal phenomena to which Dr. Tillyard has given attention.

Private and State Forestry.

THE position of private forestry in Great Britain was dealt with by Lord Clinton in an address delivered at the annual meeting of the Royal Scottish Arboricultural Society and published in a recent issue of the *Scottish Forestry Journal*. Lord Clinton pointed out that some 50,000 acres of woods had been felled during and immediately after the War, and that but a small proportion of this area had been replanted. "The causes," he said, "are quite easily seen. It is partly, but not wholly, owing to the War. It is mainly due to penal taxation during the War and later, which has made it impossible for many owners to replant their land. . . . It is very difficult indeed to get any exact estimate of this downhill progress, but we have estimates, for what they are worth, and it appears to us [the Forestry Commissioners] that there is being felled annually throughout the Kingdom a total of about 50 million cubic feet, representing perhaps 20,000 to 25,000 or even more acres, and we cannot ascertain that there is a larger area being planted than about 12,000 acres, obviously a quite insufficient replacement."

Lord Clinton anticipates that it is probable that the whole of the coniferous timber and almost the whole of the hardwoods (that is, broad-leaved species) now growing will have been felled by the end of the next seventy years. There has been little planting of hardwoods for a long time; many of the existing private woods have not been planted from the economic point of view, their *raison d'être* having been either sport, amenity, or protection; and the stocking therefore was in most cases very poor. If planting in one form or another is not carried on on a greater scale, by the end of seventy years there will be a smaller area of woodlands in Great Britain than the 3,000,000 acres present in 1914. On the Continent the State by no means owns the major part of the forested area, for example, Finland 43 per cent, Germany 25 per cent, and Sweden 20 per cent only. The remaining forests are either held in communal ownership or

belong to private persons; and both classes of owner receive certain assistance in remission of taxation and otherwise from the State, and have to obey certain laws and restrictions laid down on the subject of forest property.

Lord Clinton evidently does not think that forestry should be a purely State business in the future. Certainly the acts of the Forestry Commissioners themselves so far have given full cause for the belief—for they have been mainly confined to afforesting new land by planting conifers to the entire neglect of hardwoods. Moreover, but small progress has been made with the important work of replanting the areas felled during the War. These, it may be admitted, are in private ownership; but it should have been a first duty of a State forest department to devise some scheme under which these could have been reafforested at the earliest possible date in order to preserve the valuable forest soil which had been built up by the former crop of trees. For such areas will yield a higher return under good management than new lands which are now being afforested after a long period of degradation. On one point many will be in agreement with the present chairman of the Forestry Commissioners. It is stated fairly in the following: "I am not at all confident that the State can properly undertake the full duties of afforestation. I think the keenness of the general public—who in theory are very keen upon forestry—is likely to evaporate directly they begin to understand the great cost which will fall on them if the State shoulders the whole burden." This is a shrewd appreciation of the probable present position of public opinion in the matter, and would be endorsed by most forest officers who had had administrative experience in a properly organised forest service.

Television.

Practical Television. By E. T. Larner. Pp. 176+13 plates. (London: Ernest Benn, Ltd., 1928.) 10*s*. 6*d*. net.

WE welcome this work, which deals with the fundamental principles from which television is being developed. The reader will find it of interest, as sufficient scientific and mechanical details are given to satisfy his curiosity. We think that the young scientific worker will do well to study this latest branch of applied science, as it offers great possibilities. Some of us have seen the birth of telephony and watched the growth of a vast industry employing hundreds of thousands of skilled workers which has profoundly modified the conditions of modern life. In 1879 we remember Sir William Thomson getting one of his class to sing into a phonograph and the professor's efforts to make it reproduce the song. None of us imagined that the comic toy would develop into the gramophone as we now know it. Similarly, in watching the development of moving pictures and radio communication, few of us thought that they would so largely affect our everyday life. Television is the latest development of applied science. It will provide scope for research and development for years to come, but we feel certain that it will become part of our everyday life. Instead of merely listening to an expert describing the progress of a boat race or a football match, the younger generation may look forward actually to seeing them on a televisor as well.

Many years ago Prof. Ayrton made a remarkable prophecy; he said: "The day will come when we are all dead and forgotten and our electric cables have all rotted away. In these days a man who wishes to speak to a friend will call him with a world-embracing electric voice and his friend will reply, perhaps from the slopes of the Andes, perhaps from a ship in the midst of the ocean, or if there is no reply, he will know that his friend is dead." We are already within measurable distance of such an invention. Though the results now obtainable may be crude, they are decidedly promising and we can look forward with confidence to their improvement. In our opinion, therefore, those who belittle the work of inventors of television are not true friends to human progress.

The word television has now come into general use as a term describing the practically instantaneous transmission of the images of objects either by electric currents in wires or by radio waves. It must not be confused with the telegraphic transmission of photographs. This art is called phototelegraphy and has many commercial applications. If it were possible to transmit sixteen photographs per second, we could easily get kinematograph transmission, but this would not be television. In phototelegraphy a small picture takes about ten minutes to transmit.

As the action of the drum of the ear is imitated in a telephone, so in television the first steps were made by considering and copying the mechanism of the eye and utilising the phenomena associated with it, as, for example, the persistence of vision. The early inventors endeavoured to construct artificial telegraph eyes by substituting selenium for visual purple, and building, as the author says, an artificial retina out of a mosaic of selenium cells.

It was soon found out, however, that a drawback to the use of a selenium cell in television work was its time lag. After exposure to illumination it only recovers its resistance slowly.

The photo-electric cell which has been perfected by high vacua research has superseded the selenium cell. This cell is capable of detecting the light of a candle at a distance of two miles and responds to the flashing of light on it for the millionth of a second.

Promising attempts have been made by Belin, Dauvillier, and Campbell Swinton to devise television apparatus by utilising cathode rays. So far back as June 18, 1908, Campbell Swinton suggested this method in a letter to NATURE. In 1923 J. L. Baird in Great Britain and also C. F. Jenkins in America demonstrated the electric transmission of shadowgraphs. In 1926 the former gave the first demonstration of true television, real images being shown on a screen by diffusely reflected light. Since then he has made several remarkable advances. The American Telephone and Telegraph Company gave a successful demonstration of television in May 1927. Early last year also, Dr. Alexanderson described his system to the American Institute of Electrical Engineers.

The principle adopted by Baird in his televisor is one used by other inventors, the image reproduced being made up in parallel lines. The light proceeding from a brilliant source is reflected from the picture surface and focused on to a light-sensitive cell. The finely drawn lines of light are swept across the picture. The varying gradations of light and shade cause a varying electric current to be given out by the cell. These variations of current are thrown into the ether and, falling on the receiving set, control the light from a lamp placed behind an arrangement of revolving discs similar to an arrangement of revolving discs at the transmitting end.

One of the difficulties that had to be overcome was to make the two revolving systems rotate in exact synchronism with each other. Baird used two motor generators, each consisting of a direct current motor coupled to a 500-frequency generator. The waves due to the alternator and the fluctuating current from the light-sensitive cell fall on the receiving end where the two currents are filtered out. The alternating current after amplification is used to control the speed of the receiving alternating current machine.

A modification of this device was used by the American Telephone and Telegraph Company in recent experiments. Instead of using a d.c. motor to give the drive, a low frequency a.c. motor was used. This has the advantage of making it easier to get the two machines to work in step, but it has the serious disadvantage of requiring another synchronising wave-length. A very promising device has recently been invented by Marrison and Horton in the United States. They use quartz crystal oscillators, which they claim are capable of holding the rate of vibration constant to within one part in ten million. It is stated that, using this method, the image will not wander more than one-third of its width per hour and that it can be very easily held in place.

Baird's most recent success was to transmit on Feb. 8 images from his television laboratory in Long Acre to Hartsdale, a suburb of New York. The radio part of the transmission was from a transmitter at Purley to Hartsdale. Naturally, the images were crude and broken, but two of the three faces which appeared in succession on the screen were clearly recognisable. Transatlantic transmission is thus possible. It will be remembered that nearly thirty years ago Marconi and Vyvyan sent mutilated signals across the Atlantic. The success of this achievement is still doubted by some.

The photo-electric cell is sensitive to a much wider range of wave-lengths than the eye. By making use of this fact and using the invisible infra-red rays, Baird has demonstrated that vision is possible in total darkness. Persons sitting in what appears to be total darkness can be seen quite plainly at any distance away in a modified form of television apparatus called a 'noctovisor.' The colours of the images are wrong: red appears as white and blue appears as black. A further peculiar effect is that smoke is semi-transparent. The fog-penetrative powers of the infra-red waves are no new discovery. In aerodromes, neon tubes with their deep red glow are used to guide the airmen, as this light has great fog-penetrative powers. It looks as if the noctovisor would increase the range of vision through fog.

Baird has also shown how it is possible to 'can' an image by means of a phonograph and reproduce it at any subsequent time. He calls his device a 'phonovisor.' Before these various devices are perfected, there are many serious difficulties to be overcome, but physical science has made immense progress during the last ten years and its tools have been perfected in an almost incredible way. We agree with the author of this excellent book that television will give us electrical vision that will ultimately extend all round the earth.

Since writing the above review we have seen Baird's method of producing colour television.

The process consists of first exploring the object, the image of which is to be transmitted, with a spot of red light, next with a spot of green light, and finally with a spot of blue light. At the receiving station a similar process is employed, red, blue, and green images being presented in rapid succession to the eye.

The mechanism used at the transmitter consists of a disc perforated with three successive spiral curves of holes. The holes in the first spiral are covered with red filters, in the second with green filters, and in the third with blue. Light is projected through these holes, and an image of the moving holes is projected on to the object. The disc revolves at ten revolutions per second, and so thirty complete images are transmitted every second—ten blue, ten red, and ten green.

At the receiving station a similar disc revolves synchronously with the transmitting disc, and behind this disc, in line with the eye of the observer, are two glow discharge lamps. One of these lamps is a neon tube and the other a tube containing mercury vapour and helium. By means of a commutator the mercury vapour and helium tube is placed in circuit for two-thirds of a revolution and the neon tube for the remaining third. The red light from the neon tube is accentuated by placing red filters over the view-holes for the red image. Similarly, the view-holes corresponding to the blue and green images are covered by suitable filters. The blue and green lights both come from the mercury helium tube, which emits rays rich in both colours.

The coloured images we saw which were obtained in this way were quite vivid. Delphiniums and carnations appeared in their natural colours, and a basket of strawberries showed the red fruit very clearly. A. R.

Biography in American Science.

American Men of Science: a Biographical Directory. Edited by J. McKeen Cattell and Jacques Cattell. Fourth edition. Pp. viii + 1132. (New York: The Science Press, 1927.) 10 dollars net.

THE fourth edition of this great work—great in two senses of the word—must not pass unnoticed in NATURE, and we congratulate the editors on the completion of their heavy task of revision. The number of individuals dealt with is about 13,500, which may be taken to be an approximately close measure of the number of professional men of science in America. We say, advisedly, professional men of science, for of the first 'starred' 601 only a single individual is described as an 'amateur.' Roughly, 60 per cent of the leading American men of science are engaged in teaching, 16 per cent in research institutions, 12 per cent in government employ, 10 per cent in applied science, and 0·2 per cent is due to the single amateur. The remainder, 1·7 per cent, is accounted for by deaths.

Men of wealth in America employ their means, occasionally curiously, often most advantageously, in the establishment of universities and special research laboratories, but the number of men, even of moderate means, who spend them on their own scientific researches seems surprisingly small; at any rate in America such men fail to reach high distinction. Probably the 'amateur,' to whom we in Europe owe so much, is also becoming less frequent here, but we venture to think such a result is lamentable. A rapid scrutiny of the present list of Fellows of the Royal Society will scarcely produce more than the names of four men who may be rightly termed amateurs, that is, who have devoted much of their time to scientific work, without holding paid scientific posts. Of course, we do not use the term 'amateur' to denote that they have been without scientific training. Whether the work of those four men will rank with that of Darwin, Rayleigh, Galton, Huggins, Spottiswoode, Grove, etc., posterity alone can say. But it is fairly obvious that he who gives his life as well as his wealth to scientific work is a national asset, and may, if he be a man of leisure, achieve greater things than the professional man of science, who often has to give up too much of his time to teaching and executive duties. It is simply appalling to note the amount of time spent (largely unprofitably) in council, faculty, boards, and committee meetings in some modern universities!

To discover connotes having leisure to think, and accordingly not a small element of scientific research to-day is done almost as a routine task, without the investigator sitting down to *think*. Quantity, rather than quality, of publication, choice of popular topics for research, the being always 'on tap' to the newspaper man, are factors which determine in not a few cases the success of the professional man of science. The young man at the university is too apt, if he has done moderately well, to take up science as a livelihood, for it requires less of post-graduate professional training than many other callings. His choice arises not from pure devotion to science, but from the need for an immediate living; this is un-

doubtedly the factor which draws many young men and women into academic science to-day. Like not a few ministers of other faiths, they have not fully thought out their suitability to a high calling. Probably much the same statement is true of America. There has been not only a great increase in the number of colleges and universities, but also a still more rapid rate of increase in the number of undergraduate students. This has involved in both countries a very great rise in the number of subordinate scientific posts. Within the last quarter of a century in some universities these subordinate posts have increased by nearly two hundred per cent, and now stand at nearly five times the numbers of the professorial posts. While a few of these subordinate posts are just sufficiently well paid to enable a man to spend with rigid economy the working period of his life in them, the great bulk are not so, and, subordinate posts being so much more numerous than the professorial, it is only the exceptional few who can hope to rise to even those—often badly paid—first-rank positions. The general result is that the increased desire for university training has rapidly produced a class of subordinate teachers with little or no prospect in life, thoroughly discontented with their position, and incapable of doing in such circumstances the best scientific work.

It would have been of great interest if Dr. Cattell had felt able to carry his useful statistical analysis of American men of science somewhat further. The edition of 1910 contains about 5,500 names; that of 1927, 13,500; how has this increase been distributed? Have the subordinate posts been multiplying far more rapidly than the professorial, so that promotion can only be for the favoured few? Is it true that in America these subordinate posts are relatively as badly paid as in Great Britain? We cannot assert it, but we have heard rumours that would make matters as bad for the junior academic teachers in America as in Great Britain. It is therefore with a slight feeling of depression that we note these 13,500 biographies! Are we really facing a great army corps of enthusiastic and militant men of science, or only a list of those who in the bulk have engaged in the scientific profession as a source of livelihood? Dr. Cattell has provided a means whereby to some extent we can pick the approved grain from the chaff. He has endeavoured to select the 1000 leading American men of science, by a system in which specialist groups vote for the most distinguished of their colleagues. The system seems somewhat invidious, as the older men, chiefly the voters, are not unlikely to vote for each other, or to overlook novel lines of research opened up by the younger. Still, the present writer has done his best to test the efficiency of the 'starring' system, as far as it falls within his own knowledge. In recent years a number of young English chemists have gone to America; quite a number of these have already acquired the asterisk. Further in the course of his career having had a considerable number of American students, he was able to satisfy himself that the most able were also starred. Of course the star did not fail those American men of science whose names are as familiar here as those of our own leaders.

When, however, we have thus reduced our chief American men of science to the thousand starred, it is very difficult to get a grip on them! How are we to find out this select thousand scattered over 1100 unindexed pages? Let us suppose that a geneticist who has written what he holds to be an important paper on heredity in the skull shape of rats, wishes to communicate his results to his colleagues in America. He cannot look through the 1100 pages to find the zoologists with a star who are interested in genetics. Or, again, a bookseller who wishes to send his catalogue of rare mathematical books to those interested in the history of the subject, how can he rapidly find his clientele in this bewildering 13,500 distributed over 1100 pages? If the name of a man be known he can be looked up at once, but it is not possible rapidly to find those interested in a particular topic. Now on pp. 1103-9 we have the names of those who have died since the last issue, between 600 and 700 names, occupying about six pages. We venture to suggest that in the next edition of "American Men of Science" the 1000 selected men be given on about ten pages; their names to be arranged alphabetically under their broad categories, for example, mathematics, agriculture, palæontology, psychology, etc.; each surname to be followed by the initials of the christian names only, and one or two words denoting the branch of the broad category especially studied. Thus:

CHEMISTRY.

Rieman, W., *Emulsions.*
Chamberlain, J. S., *Agricultural.*

BOTANY.

Hottes, C. F., *Physiological.*
Houghton, A. D., *Genetics.*

These are only illustrations selected at random, and in the case of the selected 1000 they might be allowed to choose their own subheading, con-

fined, if feasible, to a single word. We feel sure this would increase the usefulness of the work and much aid the advantageous distribution of off-prints.

One of the general conclusions we may draw from the mere turning over of the pages of this volume is of extraordinary interest to the inhabitant of Great Britain. There occur foreign names, German, Slavonic, Italian, etc., indicating continental European extraction; but the vast majority of these American men of science bear familiar Anglo-Saxon surnames, which suggest that our race at the very least is making in the New World its full contribution to the scientific profession.

We congratulate the editors on the catholicity of this great work in its fourth edition, and if we have ventured to suggest a few additional pages to the next issue, it is because we believe they would add greatly to the usefulness, and with that to the sale of the work. We wish a like directory might be done as effectively for British men of science.

Deep Shafts and their Construction.

Vertical Shaft Sinking. By Edward Otto Forster Brown. (Benn's Mining Series.) Pp. 432. (London: Ernest Benn, Ltd., 1927.) 52*s.* 6*d.* net.

THE sinking of deep shafts is a branch of mining of such an occasional nature that it is unusual to find anyone having experience of more than a few sinkings in one or two localities, or of the continued application of one and the same system in several fields, so that a specialist in this subject is not easy to find. In addition, it would be difficult to find a less attractive side of mining, or one more arduous, difficult, and troublesome; but it can also be very interesting, testing as it does the technical ability, tenacity, and ingenuity of the engineer in charge in the highest degree.

At one time probably the greatest amount of knowledge of sinking was possessed by sinking contractors of great experience, to whom the management concerned would pass on responsibility for the sinking of a pair of shafts, supervising only to see that the contractor carried out the terms of his contract. Whilst the contractor is still useful for places where the difficulties are likely to be great, his place has largely been taken by companies employing specialists in the particular method they use, who are capable of carrying out work well beyond the reach of an ordinary contractor. It will be found that much information formerly in the possession of the contractor and of the specialist only, is included in this book.

It is divided into four parts. Part I. consists of two chapters, Chapter i. being introductory, and Chapter ii. a most complete account of the sinking of a large deep modern shaft, of circular form, in firm ground such as offers little difficulty. In this part, the sinking of a large rectangular shaft might have been included, though, as might be expected, rectangular shafts are referred to further on in the book, in the chapter on shaft linings. Considering the importance of shafts of this form, and how common they are outside Britain, the inclusion of one or two important examples from abroad, even were they dealt with second hand, would have enhanced the value of the work. Another important matter not referred to in this part is the disposal of the debris from the sinking. It may be argued that this is not a problem of any great magnitude, but if it is considered that most of the unsightly pit-heaps in the country had their origin in the careless dumping of the debris from the sinking, the desirability of using this material to level up the surface near the shafts is obvious.

On p. 57 a formula is given for the calculation of the sizes of sinking engines. It is a simple equation of moments, which appears to be true, and its apparent soundness is supported by the statement that one cylinder must be capable of starting up against the maximum possible load. Since it does not include the effects of friction and inertia, it is conceivable that it could fail. In the example which follows the author clearly had in mind that something greater than was given by the formula would be necessary in actual practice, a view that would be adopted by all experienced mining engineers without doubt; but because this book is likely to be much consulted by students generally, slight revision appears to be desirable.

Part II. deals with the special methods of shaft sinking. There are three chapters of which the first, or Chapter iii., consists of descriptions of drop shafts, caisson sinking, and piling. These methods are common to the work of the civil and mining engineer, and are confined to comparatively shallow depths. This is followed by a chapter on cementation and another on freezing. The systems of magnified boring, which were once such a feature in text-books on mining, are not included; their places have been taken by cementation and freezing, both in this book and in practice.

It simplifies the view of the difficulties which called these special methods of shaft sinking into being to say that water is the great enemy to safe, speedy, and successful sinking, as it converts ground which might otherwise be easy to deal with into difficult and sometimes treacherous ground. When in addition the water is acid, and therefore corrosive to the metal structures used as temporary or as permanent lining, the added difficulty and danger can be very great, and lead, as it did at Methley, to a frightful disaster.

Though they may not contemplate using the special methods, many mining engineers will read this section of the work with interest, probably more particularly the chapter on cementation. The use of cement in construction and repair work is assuming great proportions, and a detailed account of its use in sinking shows that mining engineers are not slow to take full advantage of anything useful, but the plan of the book, excellent as it is, interrupts the account of the use of cement, in that a most important part of it is found in a later chapter on shaft lining. In this case and in freezing, the lining is so much a part of the method that it spoils the exposition to separate them; though it is admitted that this view may not be shared by every one. The matter in Part II. is probably the most comprehensive contribution to literature on special methods of sinking added during the last twenty years or more.

Part III. is devoted to special departments of shaft sinking. In reality, however, it will be found that all sorts of matters are here taken up which require more detailed treatment, or which require addition of relevant matter. For example, Chapter vi. takes up excavation again, and gives a detailed account of compressed air drills, drilling, and blasting; and Chapter vii. is allotted entirely to shaft lining, a subject already discussed in an elementary way in Chapter ii. Hoisting in sinkings and everything connected therewith is dealt with in Chapter viii., and the succeeding Chapter deals with all sides of the dewatering of sinking shafts. The same attention to detail is to be found in Chapter x., which is on ventilation, lighting, and labour, but it would seem that part of the material of this chapter really belongs to Part IV. It is probable that Part III. will be used largely for reference on account of the large amount of detail given.

The economics of sinking is to be found in the single chapter which forms Part IV., a portion of immediate interest to all those mining engineers having shafts in the course of sinking, or contemplating the sinking of shafts. The appendices giving the different forms of sinking contract may be very useful.

By way of summary, it may be said that the book is a valuable addition to the literature of practical mining. The dimensioned line drawings will be especially useful to mining engineers in Great Britain and elsewhere, and also to teachers and students, whilst the inclusion of twenty-four tables of comparative matter is not the least useful feature of the book. As might be expected, the author has held to the view of the mining engineer engaged mainly in coal mining, and, as the title suggests, he does not deal with inclined shafts or with those shafts which are partly vertical and partly inclined, of which large numbers are to be found in metalliferous mining, so that the book is not exhaustive. It will, however, remain as a standard work on this branch of mining for some time. C. HABBERJAM.

Our Bookshelf.

The Lindley Library: Catalogue of Books, Pamphlets, Manuscripts and Drawings. Pp. viii+488. (London: Royal Horticultural Society, 1927.) To Fellows, 17*s*. 6*d*.; to Non-Fellows, 21*s*.

THE former edition of this catalogue, which was published in 1898, was scarcely more than a pamphlet. In the edition before us we have a volume of nearly 500 pages crowded with the titles, usually as brief as possible, of the books, pamphlets, manuscripts, and drawings—altogether about 12,000—comprised in the Lindley Library, which is controlled by a body of trustees for the benefit of the fellows of the Royal Horticultural Society and others, and is at present housed in the Society's hall in Vincent Square, Westminster. The Society now includes upwards of 25,000 fellows, whose privileges include access to this rich collection of literature at all times when the library is open, and the borrowing of books from it under certain restrictions.

While presumably some interest in horticulture influences so many to obtain fellowship of the Royal Horticultural Society, the trustees of the Lindley Library have provided much more for the fellows of the Society than the horticultural works which are now being produced in such bewildering profusion. Literature on practically every branch of botany is included in it. We notice a fair number of sixteenth-century herbals, amongst them "The Grete Herball" of 1526. Of the rarer or more costly works there are Sibthorp's "Flora Græca," Redouté's "Les Liliacées" and "Les Roses," A. P. de Candolle's "Plantarum succulentarum historia," Mary Lawrance's "Collection of Roses from Nature," Siebold and Zuccarini's "Flora Japonica," Roxburgh's "Plants of the Coromandel Coast," several of N. J. Jacquin's

illustrated folios, the six volumes of J. D. Hooker's "Botany of the Antarctic Voyage," Sargent's "Silva of North America," and Elwes and Henry's "Trees of Great Britain and Ireland." Most of the standard British colonial and Indian floras, such as Bentham's "Flora Australiensis" and Hooker's "Flora of British India," are available in the library, while European local floras are well represented.

The more important botanical periodicals noticed in the Catalogue are the *Annales des Sciences Naturelles* (*Botanique*), *Annals of Botany*, Engler's *Botanische Jahrbücher*, Just's *Botanischer Jahresbericht*, *Botanische Zeitung*, *Flora*, and the *Botanical Magazine*, while the publications of societies, academies, and institutions, which have some bearing on botany or horticulture, are very numerous. It will be seen that in the Lindley Library there is much to attract the attention of horticultural and botanical students who will welcome the useful guide to its contents which the Catalogue affords.

Comparative Ethnographical Studies. By Erland Nordenskiöld. Vol. 7, Part 1: Picture-Writings and other Documents. By Néle, Paramount Chief of the Cuna Indians, and Ruben Pérez Kantule. Pp. iv+94. (London: Oxford University Press, 1928.) 5*s*. net.

IN the present and succeeding volumes of his Comparative Ethnographical Studies, Baron Nordenskiöld is dealing with the results of his journey to Panama and Columbia in 1927. The investigations which he then carried out, as will have been apparent from preliminary and semi-popular accounts which have been published already, are likely to prove of singular interest to ethnography. This, the first, instalment deals with documents produced in part by a paramount chief of the Cuna Indians, in part by an educated Cuna Indian, who can both speak and write Spanish. The material consists for the most part of magical texts for the healing of disease, the majority in Cuna with Spanish translation, and a "Historia" in Spanish.

Baron Nordenskiöld supplies some introductory notes on the authors and on the magical and religious ideas of the Cuna. These are intended merely to elucidate the text pending more exhaustive treatment in a later study. Valuable as is this record by actual exponents of the magic art, its interest is surpassed by the picture writing, which the editor thinks probably represents or is descended from a system of writing to which reference was made by Martyr in the sixteenth century.

Radiation in Chemistry. By Dr. R. Alan Morton. (Industrial Chemistry Series.) Pp. xv+284. (London: Baillière, Tindall and Cox, 1928.) 15*s*. net.

THIS volume must be regarded as consisting chiefly of a digest of a well-known book on the chemical effects of ultra-violet light, of the recent symposium held by the Faraday Society, of photochemical action and of the work on carbon dioxide assimilation carried out by Prof. E. C. C. Baly at Liverpool. It contains a number of interesting technical points in connexion with light sources and their manipulation, with a great number of isolated observations on photochemical action each one not without interest; the chapters on the photographic plate and on the action of light on biochemical changes may be cited as excellent in this respect. From this point of view the book is not only interesting but also stimulating. On the other hand, the theoretical portions are not only slender but are also far from complete, and it is to be hoped that if ever a second edition is called for the opportunity of providing a really valuable monograph will not be lost. The book is well arranged and the printing good. ERIC K. RIDEAL.

From the Monotremes to the Madonna: a Study of the Breast in Culture and Religion. By Fabius Zachary Snoop. Pp. vi+143. (London: John Bale, Sons and Danielsson, Ltd., 1928.) 3*s*. net.

WE would commend this little book to lovers of bypaths in folklore. In this case the bypath leads to a highway, for, as the erudite author shows, the ideas which gather round the breast in popular belief, in art, and literature, lead ultimately to the fundamentals of religious belief and human behaviour. The author has drawn many interesting data from a variety of sources, but it is in his more general conclusions that his book is most suggestive. Not the least interesting of these is his view, tentatively expressed, that in the different attitude of man and woman towards certain conceptions in which sexual and secondary sexual characters are involved, may lie the cause of religious oppositions such as that between Roman Catholic and Protestant, and that these may therefore ultimately be incapable of adjustment.

The Structure and Properties of Matter. By Dr. W. A. Caspari. (Benn's Sixpenny Library, No. 143.) Pp. 78. (London: Ernest Benn, Ltd., 1928.) 6*d*.

DR. CASPARI'S modest little work is one which may be recommended to all interested in science. It contains a surprising amount of information in a small compass and is written in a very readable way. Only an author with a complete mastery of his subject, and fully abreast of the recent advances in research, could have written this book, but Dr. Caspari has added to this competence a real ability to tell his story in a most interesting way.

Qualitative Analysis. By Dr. W. Wardlaw and F. W. Pinkard. Pp. vii+166. (London: Longmans, Green and Co., Ltd., 1928.) 3*s*. 6*d*.

THIS book is sufficiently detailed to serve the requirements of students preparing for the intermediate and final degree examinations and for higher school certificate examinations. It is accurate and is clearly written, and a good feature is the concise explanation of the theory of the methods used. Practical difficulties are dealt with as they arise. The separations are those which have proved satisfactory for a number of years and are generally taught in Great Britain.

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.*]

Photographic Enlargement of Small Solid Objects and the Limitation of Definition obtainable on Gelatine Plates.

THE chief difficulty met with in taking enlarged photographs of small solid objects is, that unless the thickness of the object is small compared to the focal length of the lens, only a small part or zone appears in good focus at the same time.

The limit of attainable definition in terms of the thickness of the object and the focal length and diameter of the lens can be expressed very simply. Let D be the diameter and f_1, f_2 the conjugate foci of the lens; then if the thickness of the object is $2e$, a point at $f_1 + e$ will (so far as geometrical optics are concerned) be represented on the focal plane through f_1 by a circle of confusion the diameter of which is $\Delta_1 = eD/f_1$, or if $e = f_1/n$ by D/n. Also if the magnification (namely, f_2/f_1) is m, the circle of confusion on the focal plane through f_2 is $\Delta_2 = Dm/n$.

The image of a bright point, however, even if formed by a perfect lens, is itself a circular disc the diameter of which is of the order $f\lambda/D$, λ being the wave-length of the light employed. The best definition, therefore, of an object $2e$ thick is attained when $\lambda/D = D/n = \Delta/f$, or, in words, when the circle of confusion dependent on parts of the object being out of focus has the same diameter as that of the 'spurious disc,' as $f\lambda/D$ is often called when referring to star images.

This may be illustrated by an example. Suppose it is desired to form an image of an object a tenth of an inch thick covered with dots a thousandth of an inch apart, and that all these dots are to appear separate in the image. In the present case, since $e = 0{\cdot}05$ inches and $\Delta = 0{\cdot}001$ $D/f = 1/50$, to that the stop to be used is $f/50$. Also since e, λ, and D are the only linear constants in the problem, the ratio $f_1/e(=n)$ may be chosen at will provided that n is a large number. Assume that $n = 100$, then $f_1 = 5$ inches and $D = \frac{1}{10}$ inch. If it is desired that dots a thousandth of an inch apart should be easily distinguished by the unaided eye, the magnification should not be less than 20 diameters. Thus with $f_1 = 5$ inches, f_2 should not be less than 100 inches.

A camera eight or nine feet long is not a convenient form of apparatus: but were it practicable to make the enlargement in two stages, first taking a photograph of the natural size or thereabouts, and afterwards enlarging this picture (in which the thickness of the object does not count) lenses of ordinary focal length might be used. If the first picture were taken on a collodion plate or film, this method would be possible, but not with any form of gelatine-emulsion, because, so far as my experience goes, clear and separate dots or marks cannot be produced on such plates either by contact printing or in the camera when the distance between them is much less than 1/150 inch. With collodion plates, on the other hand, there is no difficulty in getting well-defined lines separated by 1/4000 inch or less.

In order to find out whether the expression $f\lambda/D$ gave a reasonably correct value for the diameter of the 'spurious disc,' trials were made with several photographic and other lenses, by focussing the image of an 'artificial star' in a microscope and measuring the diameter of the disc with an eyepiece micrometer. The star was the virtual image of the sun in a small mercury bulb and, as seen from the lens, subtended an angle of about $\frac{2}{3}$ of a second of arc—quite small enough to be taken as a print in connexion with lenses of the diameter used in these trials.

The results are given in the Table below.

From these results it appears that so long as f/D is large, the expression $f\lambda/D$ does approximately represent the diameter of the 'spurious disc,' but it must be noted that the disc itself is not sharply defined, but shades off gradually towards the boundary, so that the micrometric measurement is rather uncertain.

TABLE.

OBSERVATION ON THE IMAGE OF AN ARTIFICIAL STAR.

Lens.	Focal Length f_1.	Diameter D.	Stop No. f/D.	Diameter of Image by		
				Geometrical Optics.	Micrometer Measurement.	$f\lambda/D$.
Telescope (Troughton and Simms)	13	1·8	15·5	$\frac{1}{1300}$	$\frac{1}{2000}$	$\frac{1}{3200}$
Telescope from (Subcycle lens)	15	1·6	9·7	$\frac{1}{2000}$	$\frac{1}{3000}$	$\frac{1}{5250}$
Achromatic lens (maker not known)	2·5	2·0	3·8	$\frac{1}{4000}$	$\frac{1}{4200}$	$\frac{1}{13500}$
Anastigmat (Beck and Steinhill)	6·8	0·85	8	$\frac{1}{4400}$	$\frac{1}{2200}$	$\frac{1}{5900}$
Anastigmat (Beck and Steinhill)	6·8	0·27	26	$\frac{1}{4400}$	$\frac{1}{1650}$	$\frac{1}{1850}$
Concentric (Ross)	4·3	0·27	16	$\frac{1}{7000}$	$\frac{1}{3000}$	$\frac{1}{3150}$

With a perfect lens, the image of a bright point should appear as a bright circular patch surrounded by bright rings the intensities of which decrease rapidly with their order, and with a good lens not more than three should be visible. The number and intensity of the rings surrounding the central disc form a good test for spherical aberration (see NATURE, Oct. 8, 1891, p. 552).

When the image of the 'star' was photographed on gelatine plates, the diameter of the patch developed was anything from ten to several hundred times that of discs as measured by the micrometer, the rings being completely obscured. This spreading of the developed part of the film about a bright centre seems inseparable from gelatine emulsion, and indeed it is this property which renders possible the cheap reproduction of illustrations in newspapers. Whether the spreading is due to the direct action of light, or, in part, to some sort of contagion such as Abney found to occur in gelatine-bichromate films, I do not know.

I have tried many experiments, such as leaving exposed and unexposed films in contact under pressure, but have not been able to detect any sign of mutual interaction, though it seems not impossible that some action of the kind may take place in the closer contact between adjacent particles of bromide in the same film.

The great size of the developed patch compared to that of the 'spurious disc,' should be borne in mind when attempting to determine the position of a star from photographs or gelatine plates. A somewhat parallel case would be to attempt to determine the centre of a blank target six feet across to within half an inch, by taking the mean position of a group of shots fired at six hundred yards. The result might be right by accident, but it would show want of judgment to found any conclusion on it which depended on, or assumed an accuracy of, the order referred to.

A. MALLOCK.

9 Baring Crescent,
Exeter, July 7.

Laboratory Uses of Monel Metal.

MONEL metal is an alloy containing approximately 67 per cent nickel, 28 per cent copper, and 5 per cent other metals, which is made from a natural ore mined in Ontario, Canada. It is of great utility in cases where resistance to corrosion is important. Its chief properties and commercial uses are described in a booklet issued by G. and J. Weir, Ltd., Cathcart, Glasgow. Now, although monel metal is a well-known article of commerce, it does not appear to have found particular application in physical laboratories, and the object of this letter is to direct attention to its possibilities in this connexion.

In the first place, monel metal is ferromagnetic and possesses such a low magnetic critical temperature that it may conveniently be used for a laboratory experiment to illustrate the loss of ferromagnetism with rise in temperature. The magnetic critical temperature varies from specimen to specimen, and is stated to lie between 100° and 150° C. This appears to apply to specimens in the form of the stout bars supplied commercially, but specimens in the form of anchor rings of diameter 10 cm. and 1 cm. thickness supplied to us possess critical temperatures of 70° C. The induction of such an anchor ring may be measured by the ballistic method at different temperatures, the ring being immersed in a bath of B.P. paraffin, and good results are obtained if the magnetising current is not allowed to heat the specimen. The student must possess a certain amount of skill in order to obtain a satisfactory hysteresis curve by the ballistic method, as the temperature of the specimen must be kept constant. The retentivity of our anchor ring specimens was 670, and the coercive force 1·8 gauss.

Monel metal is also very satisfactory in the following experiment. The weight of a drop of liquid falling from the lower side of a horizontal flat circular tip may be represented by the equation $m = KrT$, where m is the weight of the drop, r is radius of the tip, and T is the surface tension of the liquid. It is well known that K is not a constant for any given liquid, but varies with r. The variation of K with r for a given liquid may be investigated by using tips of different radii. This was done by Rayleigh and others, and very carefully by Harkins and Brown (*Jour. Amer. Chem. Soc.*, vol. 41, p. 499; 1919), who used a series of brass tips and one tip of monel metal. The experiment forms an excellent demonstration of the fact, very often not made clear in text-books, that the shapes of drops hanging from tips of different radii are widely different.

Tips of monel metal can be prepared without much trouble, whereas glass tips require great care in grinding, and other metals suffer corrosion. A useful series of tips consists of seven with the following radii: 0·94, 0·87, 0·75, 0·60, 0·45, 0·30, and 0·13 cm. The hole in the middle of the horizontal face may conveniently be of 1 mm. diameter. As water does not wet polished monel metal, the surface must be suitably roughened. Harkins and Brown ground their metal tips with medium carbonundum powder, but the monel metal surface may be very rapidly prepared by immersing it for a few seconds in concentrated nitric acid, washing it in water for a few minutes, and then placing it in chromic acid, which attacks it slowly. The surface is then free of grease, and the liquid to be investigated should spread over the face of the tip but not upon its sides. The liquid is fed into the tip at such a rate that drops are not formed more quickly than about one in two minutes. It should be possible to level the tip, for its lower face must be accurately horizontal, particularly if the tip is large. Precautions should be taken against evaporation and the drops should be collected in a weighing bottle. The smooth curve reproduced here (Fig. 1) was obtained with water; for comparison, the

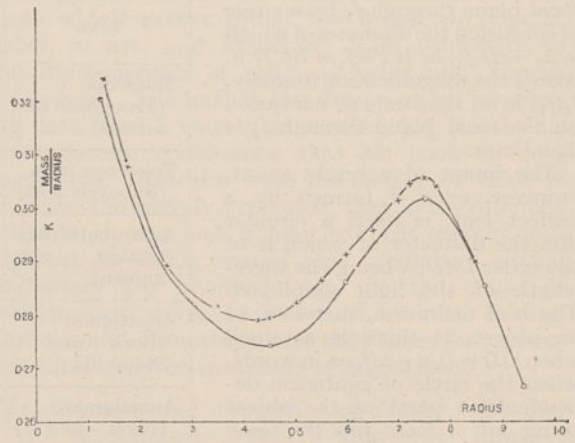

FIG. 1.

results of Harkins and Brown are also reproduced by the broken curve, the point common to both curves being obtained with their monel metal tip. Different liquids, of course, give curves of different shapes.

Monel metal may further be used in making jets for the determination of surface tension by Jaeger's method. It is particularly useful with mercury and molten metals which do not amalgamate with it. If glass is used, one is usually forced to rely upon a happy fracture in obtaining a satisfactory jet, but monel metal may be drilled and turned to any dimensions with precision. After a few bubbles have been released, the pressure required to release a bubble becomes quite constant in the case of mercury at air temperature, a value of 477 dynes per cm. being obtained for the surface tension, assuming that the bubble is formed on the outer edge of the jet. This value agrees well with that obtained by other observers using the same method. Moreover, it is possible with a monel metal jet to investigate the behaviour of the surface tension with temperature up to the boiling-point of the mercury.

L. F. BATES.
R. C. BROWN.

University College,
London.

The Occurrence of the American Oyster Pest *Urosalpinx cinerea* (Say) on English Oyster Beds.

IN NATURE of Nov. 5, 1927, one of us (J. H. O.) described experiments on the rate at which that rough whelk-tingle, which is abundant on the oyster beds in the River Blackwater, devoured young oysters. In continuing these experiments, it was suddenly realised that the whelk-tingle from this locality is undoubtedly not, as stated (loc. cit.), *Ocinebra erinacea* (= *Murex erinaceus*, L.), although it is a closely related form. It was, moreover, found impossible to identify it with any form described in literature on, or present in a representative collection of, British shells. When it was established with certainty that this common Blackwater shell is not a British form, Winckworth was soon able to identify it from radula and shell-characters as *Urosalpinx cinerea* (Say), the American oyster pest.

Therefore in the note in NATURE referred to above, the name *Urosalpinx cinerea* (Say) must be substituted everywhere for *Ocinebra erinacea* and Urosalpinx for Murex, except for the designation of the right-hand shell in Fig. 1, p. 654. *Urosalpinx cinerea* is a close ally of *Ocinebra erinacea* and lays egg-capsules very similar to those of the latter; moreover, the egg-capsules of both species turn purple when the embryos they contain are damaged. In the near future it is hoped to review all the forms which cause destruction of oysters on different English oyster beds. It has, however, been proved that *Ocinebra erinacea* from the Fal Estuary destroys oysters, but that it is probably not so voracious as *Urosalpinx cinerea*, and more readily feeds on barnacles in the absence of oysters.

There can be no doubt that Urosalpinx has been introduced into English waters from America on American oysters in the same way, and probably about the same time, as *Crepidula fornicata* (see Orton, *Proc. Roy. Soc.*, vol. 91, B, 1909). This species of Crepidula is extremely abundant in the same locality (that is, in the Blackwater River) as that in which the Urosalpinx now occurs also abundantly. It would seem that both Crepidula and Urosalpinx (and possibly other organisms) at once found congenial conditions of food and climate on introduction into the rich Essex oyster beds and rapidly established themselves. The embryos or adults of Urosalpinx will certainly have been carried already to the Whitstable and other beds in the Thames Estuary either on American or native relaid oysters, and may have spread even to more distant beds. As Urosalpinx is a much more dangerous enemy to the oyster-producer than is Crepidula, additional precautions will be necessary to prevent the introduction of foreign pests from the Thames Estuary oyster beds to other parts of the country.

It is now possible to review the economic conditions on the Essex oyster beds in a new light. In the note to NATURE (*loc. cit.*) it was recorded that in 1924 50 per cent. of an experimental spatfall was destroyed by what we now know is Urosalpinx, and that a similar amount of destruction occurred over the whole of the neighbouring beds at the same time. During the last twenty or thirty years, or possibly less, Urosalpinx has become an effective addition to the enemies of the oyster-cultivator, and must have increased the difficulties in rearing brood oysters, compared, say, with the conditions which existed thirty or forty years ago. It is hoped that local inquiries may reveal more information regarding the time of arrival and spread of Urosalpinx and its effects on oyster-culture.

J. H. ORTON.
R. WINCKWORTH.

Plymouth and London,
July 31.

The Afterglow in Mixtures of Nitrogen and Oxygen.

IN a paper published by J. Kaplan in the *Proc. Nat. Acad. of Science* (**14**, 258; 1928) there are described some experiments on the afterglow accompanying the passage of an electric discharge through air at about 5 mm. pressure. A point of interest is the observation of a blue glow when a condensed discharge with spark gap was employed, but a yellowish-green glow when the spark gap was not in operation. In this connexion I wish to mention a phenomenon which I observed some time ago, in the course of some experiments dealing with the afterglow in mixtures of nitrogen and oxygen.

The electrodeless discharge was used with a spark gap, and the limits of pressure were about 1·8 to 0·01 mm. In a given mixture, for example, air, there is a sharp minimum in the duration and intensity of the afterglow at about 0·53 mm. pressure, which separates the yellowish-green oxygen afterglow (at higher pressures) from the orange-yellow nitrogen afterglow (at lower pressures). See also a note to NATURE (**121**, 938; 1928). In a certain pressure region in the neighbourhood of this minimum, a long discharge ($\frac{1}{2}$ second or longer) gives rise to a blue afterglow. At a suitable pressure the nitrogen-bands also appear faintly along with the blue glow and can be observed with a spectroscope. However, with a very short discharge (not measurable) only the yellowish-green afterglow is visible (continuous spectrum). Thus, different types of afterglows may be excited in the same gas mixture at the same pressure merely by altering the period of discharging. The same phenomenon can be observed in mixtures containing other proportions of nitrogen and oxygen but at different total pressures.

At a pressure where the transition from the yellowish-green to the blue afterglow commences (using $\frac{1}{2}$ second discharge), the former glow is displaced as a wave along the tubing leading from the discharge vessel while the latter glow occupies the vessel. The blue glow falls off in intensity, but is soon brightened up again by the return of the yellowish-green wave. (Compare Majewska and Bernhardt, *Zeit. für Physik.*, **48**, 137; 1928, for observations on the progression of afterglow waves in air.)

BERNARD LEWIS
(National Research Fellow).

University of Minnesota,
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Analysis of the First Spark Spectrum of Sulphur (S^+).

A VERY thorough study of the spark spectrum of sulphur was made by Eder and Valenta in 1904 in the region λ3301 to λ5819. In 1907, Sir Norman Lockyer showed that some of the stronger lines of S^+ occur in the spectrum of Rigel (class B8), but not in the spectrum of α-Cygni (Giant Ao), or Sirius (Dwarf Ao).

The clue to the analysis was obtained in the following way. Taking the structure diagram of S^+ the possible transitions are:

$$3M_2 \begin{matrix} \nearrow 2M_2M_3 \\ \searrow 2M_2N_1 \end{matrix} \longrightarrow 2M_2N_2 \begin{matrix} \nearrow 2M_2N_3 \\ \searrow 2M_2O_1. \end{matrix}$$

The fundamental lines $3M_2 \leftarrow \begin{matrix} 2M_2M_3 \\ 2M_2N_1 \end{matrix}$ lie in the ultra Schumann region, and Millikan and Bowen's data in this region are rather incomplete. The next groups, $\begin{matrix} 2M_2M_3 \\ 2M_2N_1 \end{matrix} \leftarrow 2M_2N_2$, lie in the visible region.

The group $2M_2(N_1 \leftarrow N_2)$ was located at $\nu = 18000$, by following the extension of the irregular doublet law given by Saha and Kichlu, and by treating the spectrum as the mean between those of P^+ and Cl^+ both recently analysed by Bowen. An examination of the tables of Eder and Valenta revealed a group of strong lines in this region.

A further clue was obtained from the fact that of these groups of lines only λ5454 and λ5033 were traced by Lockyer in the spectrum of Rigel. Hence these two lines were regarded as the strongest lines of the group $2M_2N_1 \leftarrow 2M_2N_2$, namely, as $^4P_3 - {}^4D_4$ and $^4P_3 - {}^4P_3$. Both of these multiplets have been discovered, Δp_{12} and Δp_{23} of $2M_2N_1$ being respectively 270 and 437. The $4D$ differences are 151, 257, and 366.

With these multiplets as clues, the other strong groups identified by Lockyer at λ4142 – λ4174 with some lines in the spectrum of Rigel could be assigned to the $^4D - {}^4D$, $^4P - {}^4P$ groups of the transition $2M_2M_3 \leftarrow 2M_2N_2$. They are not reproduced here.

D. K. BHATTACHARYYA.

Patna and Allahabad,
May 8.

Fluorescence of Mercury Vapour under Low Excitation.

IT has, I believe, been generally supposed that the green band fluorescence of mercury vapour cannot be excited by optical frequencies much less than that of the mercury resonance line. Houtermans, working in Franck's laboratory, has put forward the view that this green fluorescence results from the excitation of the molecule to the 2^3P_1 state, differing but little in energy from the corresponding state of the atom.

I have recently found, however, that this high frequency is not necessary to stimulate the green fluorescence. The most effective arrangement tried so far is to focus an iron or copper arc, or an 'atmospheric' mercury lamp, on a bulb containing mercury at atmospheric pressure. A filter consisting of a bromine cell and a sheet of blue uviol glass is interposed to cut off visual light. Under these conditions a bright green track is seen marking out the path of the rays in the vapour.

The shortest mercury wave-length that can get freely through the blue uviol glass is λ3125, and experiments with a monochromator have shown that this line excites the fluorescence. The strong line at λ3650 is unable to do so.

These experiments are being developed in various directions, and will be published more fully in due course.

RAYLEIGH.

Terling Place,
Chelmsford, Essex,
Aug. 4.

Radium in Cancer.

IN NATURE of Aug. 4, the writer of the article on Cancer Problems, after stating that substantial practical advance has been made in treatment by radium, concludes by saying, "At the same time there is no justification for any talk about surgery being eliminated."

At the International Conference in question there were discussions upon the relative value of surgery and radiology in the treatment of cancer in four sites of the body. At these discussions four British surgeons spoke in the following terms: one advocated the use of radium in operable breast cancer; one stated that he had given up the Wertheim operation for cancer of the cervix uteri in favour of radium; one described a series of cases of cancer of the tongue where the primary growths were treated by radium in order to avoid excision; and one detailed a method of radium treatment of cancer of the rectum, in operable and inoperable cases during the last two years.

When statements like these are made by surgeons themselves, would it not be more correct to say that owing to the advances in radium-therapy there is some justification for believing that in certain sites of cancer, radium may with advantage replace surgery?

SIDNEY RUSS.

The Middlesex Hospital, W.1,
Aug. 6.

PROF. RUSS gives the more correct description of the proceedings of the Congress: the lay press translated them with inaccurate exaggeration.

THE WRITER OF THE ARTICLE.

The Spectrum of Tribly Ionised Antimony, Sb IV

IN the case of the isoelectronic system Cd I, In II, Sn III, Sb IV, the X-ray doublet laws have been found to apply even though these spectra consist of singlets and triplets. Continuing our previous work on In II and Sn III, we have been able to identify several groups in the spectrum of Sb IV. These are a $^3P^3S$ multiplet, lying between 805 A. and 861 A., a very strong $^3P^3D$ multiplet, lying between 873 A. and 940 A., a $^3D^3F$ multiplet, lying between 2077 A. and 2113 A., and a possible $^3P^3P'$ group between 1051 A. and 1193 A. The first ^3P separations are 5854 and 2261 cm.$^{-1}$. In addition to these, a $^1S^3P$ line and $^1S^1P$ line give an estimate of 340000 cm.$^{-1}$ for the lowest, ^1S, level corresponding to an ionisation potential of about 42 volts.

In addition, second members of series have been identified in In II, and we are now looking for additional combinations in Sn III and Sb IV. A complete report will be published elsewhere.

J. B. GREEN.

Columbus, Ohio.

R. J. LANG.

Edmonton, Alberta.

The Corpus Luteum and the Cause of Birth.

As I pointed out in the article referred to by Prof. Thomson Flynn in NATURE of June 30, p. 1020 (*Biol. Rev.*, **2**, 129; 1927), parturition is certainly due to several factors, of which the decline of the corpus luteum is probably one. Moreover, the enlargement of the pregnant uterus is also due to several factors. In the case of the sterile uterine horn in *Bettongia*, the partial regression of the corpus luteum in the absence of the fœtus may have been the main factor in the uterine involution. In the case of the other horn the enlarged condition of the uterine wall and the contained fœtus involve further factors in the continuation of pregnancy, and it may be that in their presence the regression of the corpus luteum was not sufficiently advanced to admit of the occurrence of birth at the time of the commencement of involution in the non-pregnant horn; that is to say, in order that parturition may occur, it may be necessary not only for the corpus luteum to be in a state of marked regression, but also for the uterine horn and contained fœtuses to be in a certain condition of development.

F. H. A. MARSHALL.

July 15.

Evidence of Survival of a Human Personality.

By Dr. R. J. TILLYARD, F.R.S.

"We are sitting in front of one of Nature's shows as a respectful audience. We are not to blame for the phenomena. We don't manufacture them. We don't have to defend them or explain them. Here they are for any honest man to behold."

Dr. L. R. G. CRANDON, *in litt.*

THE supernormal phenomena studied in the nascent science called psychical research are essentially phenomena associated with living organisms, and fall, therefore, within the limits of the wider science of biology. It has long been a reproach that biologists in general have refused to study them. For myself, I have been endeavouring, during the past five or six years to remove that reproach by studying them whenever opportunity presented itself. Two years ago, in the columns of NATURE, I pleaded for a recognition of the reality of the phenomena and asked that science should keep an open mind about them. At that time I was not convinced that the survival of a human personality, after the change which we call death, had ever been demonstrated, although I had to admit that there was much that was puzzling in the phenomena and much that could be most simply explained by accepting survival. As the result of further experiments with the remarkable Boston medium, Mrs. L. R. G. Crandon, I feel that a *scientific proof* of survival has at last been obtained, and it is the purpose of this article to set it before the reader of NATURE, who, one might venture to believe, would be interested in what appears to me to be, in Dr. Crandon's own words, "one of Nature's shows."

In submitting this proof, I desire to emphasise three things about it:

(1) The possibilities of fraud have been eliminated in two ways:

(*a*) By using such controls as the nature of each experiment clearly calls for if a charge of possible straight-out fraud is to be avoided.

(*b*) By devising experiments which, in their very nature, are either manifestly impossible to human beings in the flesh, or at any rate admittedly impossible under the conditions of actual performance.

(2) The experiments can be repeated time after time, and the same results obtained. In future, no scientist can level the charge of non-repetition against the experimenters of this particular group.

(3) The main proofs of survival obtained lie in phenomena which, whether of the so-called mental or physical type, are normally *impossible* of performance by human beings.

Before giving a condensed account of these phenomena it will be necessary for me to outline briefly the history of the mediumship which is now known widely in psychic circles as the 'Margery' mediumship. Margery's maiden name was Mina Stinson. She is now the wife of Dr. L. R. G. Crandon, a well-known Boston surgeon. She was born in Canada, and had a brother named Walter Stewart Stinson who was killed on Aug. 8, 1912, in a railway accident. There was a great affection between the brother and sister. The mediumship began in May 1923, with table-rapping and such-like familiar phenomena, but developed later into trance form, with a very striking characteristic, namely, the formation of an independent voice, not proceeding from the lips or throat of the medium, and claiming to be the voice of her dead brother Walter. This voice was quite strongly developed two years ago, and was tested very fully by me in two séances at the end of April 1926. The voice does not utter inanities or banalities, but shows a fully developed human personality, very masculine, forceful, and humorous, so that it tends to dominate the whole proceedings and clearly exercises an independent will of its own in relation to the other sitters. Many remarkable experiments have been performed through the agency of this control, which anyone may call 'Walter' without thereby committing himself to the belief that it is truly the surviving voice of Margery's dead brother.

Coming to Boston after an absence of more than two years, I had the privilege of attending and controlling four remarkable séances. The first two of these contain all that is requisite for a strict proof of the survival of the human personality of Walter Stinson. Even more remarkable were the results obtained in the third and fourth séances; but these logically form a portion of a series of experiments not yet completed, and therefore the account will be both simpler and clearer if I keep mainly to the first two.

The proof of survival lies along two well-marked lines, one of the mental type, namely, *supernormal cognition of unknown objects*, and one of the physical type, namely, *production of supernormal thumb-prints*. The former type clearly belongs to the category of normal impossibilities, while the latter is probably of the same type, and should appeal more especially to biologists.

SUPERNORMAL COGNITION OF UNKNOWN OBJECTS.

Séance held at Dr. Crandon's house, 10 Lime Street, Boston, Mass., 9 to 10 P.M., May 31, 1928.

PREPARATION.—Accompanied by Mr. J. W. Evans, B.A. (Cantab.), a young entomologist who had never before been to a séance and had no interest or belief in psychic phenomena, I arrived at Dr. Crandon's house and proceeded to make the following preparations for supernormal tests:

(1) *Calendar Tests.*—Mr. Evans and I each obtained a calendar with separate sheets for each day of the month, slung together, by two punched holes, on a pair of metal rings. Going alone into another room, I took all the slips for the month of May off the rings, turned them over and signed each separately on the back. I then shuffled

them face downwards, like a pack of cards, replaced them on their rings, and put them into my pocket.

Mr. Evans dealt similarly with his calendar, selecting the month of September 1927.

Neither Mr. Evans nor myself, nor any living person, knew the order of the arrangement of the dates on these two calendars when we took them into the séance room.

The object of the test was to see whether 'Walter' could select numbers from the calendars in the dark, impress his results on Margery's mind by telepathic hypnosis, and cause her to write them down accurately in bright light after the séance was over. In addition, we had arranged to test 'Walter' for supernormal results at a distance, by asking another medium, Mrs. Sary Litzelmann, to sit at the same time at a tiny village called Ogunquit in Maine, about eighty miles north of Boston, and to report her results to us later in the evening by trunk telephone.

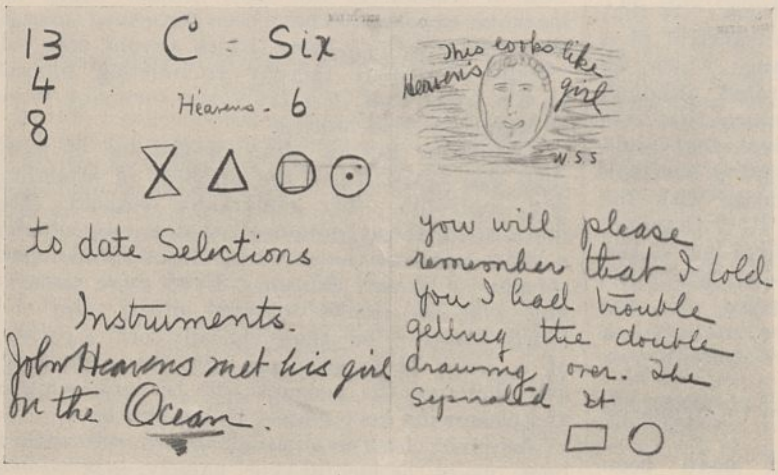

FIG. 1.—The two pages of script written by Margery in bright light in the drawing-room after the first séance. (Reduced to one-fourth natural size.)

(2) *Drawing Tests.*—In order to rule out the charge that I myself might be an accomplice of the Crandons, I entrusted this test entirely to Mr. Evans. He took some slips of paper and made a number of diagrammatic drawings on them, ten in all, which he then shuffled face downwards and tied together by string. These were taken into the séance room in his pocket.

Mr. Evans knew the diagrams, but not their order; nobody else knew what they were at all.

(3) *Magazine Tests.*—Mr. Evans went into Boston a few minutes before the séance began, having previously listed all the magazines which he could find in the Crandons' home, and bought one which had only just been issued and was not taken by the Crandons, viz. the "Radio Listeners' Guide and Call Book" for June 3, 1928. He slipped this under his coat and brought it secretly into the séance room.

Nobody but Mr. Evans knew the name of the selected magazine, and nobody in the séance room knew any of its contents.

As a full report of this and the succeeding séances would be out of place here, and will be published elsewhere later,[1] I will confine myself to a general statement of what actually happened at the first two séances.

The medium having been searched by one of the women sitters, the circle was formed, with the medium controlled by myself on her left side and by Dr. Crandon on her right side; lights were turned out, the door having been previously locked by myself and the windows barred and shuttered. The darkness was so intense that I could see no more at the end of an hour than at the beginning.

Under these conditions, the first phenomenon which occurs is always the production of 'Walter's' psychic voice. This voice is objective, as it has been recorded on the dictaphone; it does not proceed from the medium, but from a point in the air outside her, sometimes near, sometimes quite a considerable distance away. By means of the Richardson Voice Cut-off Machine, now almost too well known to need description, it is possible to wake the medium up and block her mouth completely, also those of all the other sitters at the same time, yet 'Walter's' voice is still produced as loudly as ever under these conditions, and has been tested by me a number of times, and by many other investigators. I have also heard it speak in bright red light, while watching the lips and larynx of the medium carefully, and I have noted that the normal position from which the sound issues is a point about eight to ten inches in front of the medium's upper abdomen. The voice is masculine, fairly loud, slightly hoarse, and its possessor has a really remarkable power of whistling.

With running humorous comments by this voice, the next phenomena noticeable are movements and the handling of objects placed on the table within the circle. On presenting my calendar by laying it on the table just in front of my face, 'Walter' at once handled it and tore a number out; soon afterwards he returned it to me by neatly placing it between my thumb and the medium's left hand which I was holding. Three numbers were similarly torn from Mr. Evans's calendar, one of these being stated by 'Walter' to be 'Heaven's special number.' Four drawings were also torn from Mr. Evans's set and given to me, and finally six pieces were torn from the pages of the magazine which had been presented to 'Walter.' All these, returned by him to me in the same way, were carefully put aside, some in my own pocket, some by Mr. Evans, and one or two passed to other sitters.

During the séance, 'Walter' several times asked for quiet and said he was off to Ogunquit. On the

[1] *Proc. Nat. Lab. Psychical Research*, vol. i. part 2, to be issued about September 1928.—R. J. T.

third occasion, after announcing his return, he appeared worried, and said that he had not been able to get 'Sary' to reproduce a drawing properly; it was a double drawing, and "she had separated it."

The dark séance ended at 10 P.M., the medium woke up and we all adjourned downstairs to the drawing-room. I went down with Margery; Mr. Evans brought up the rear, seeing that all the other sitters came into the room within a very short time. Nobody spoke to the medium. I sat down beside her on a sofa, with the telephone close by on the mantel-piece, and pencil and paper handy, in bright white light. Soon Margery said she wished to write, and I handed her the paper and pencil. She wrote the two sheets reproduced in Fig. 1. We then produced all the numbers, drawings, and magazine pieces which Walter had handed to me during the séance, and found that they corresponded exactly with what Margery had written. The '8' was my number; 'Heaven's special number' was the '6'; and the other two from Evans's calendar were '13' and '4.'

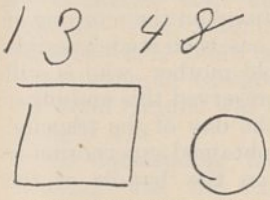

FIG. 2.—Portion of the script written by Mrs. 'Sary' Litzelmann at Ogunquit, Maine, 80 miles away from Boston, during the time of the first séance. (Reduced to one-fourth natural size.)

We did not fully understand the allusion in Margery's writing about the double drawing until about ten minutes later, when I took a trunk call on the telephone and found it was from Mrs. Litzelmann at Ogunquit. She dictated her results

FIG. 3.—Four of the magazine pieces torn out by 'Walter' during the first séance.

through the telephone to Mr. Evans, and also posted them, signed by all her circle of sitters, the following day. Though not so fully accurate as Margery's, it will be seen from Fig. 2 that she had some remarkable successes, getting three out of the four numbers, and also reproducing the very drawing, which 'Walter' and Margery both commented on, as a square alongside a circle instead of a circle inside a square.

It does not seem necessary here to reproduce the calendar numbers or Mr. Evans's drawings, but Fig. 3 shows the four most striking of the magazine selections, which should be carefully compared with Margery's writings.

The remark, written by Margery, that "John Evans met his girl on the Ocean," refers to the fact that he had become engaged on the voyage across the Pacific the previous month. This fact was not known to anybody in Boston.

In case anybody should direct attention to the fact that Dr. Crandon had control of his wife's right hand and leg during this séance, I must mention that, two evenings later, I replaced Dr. Crandon by a stranger, Capt. Fife. Under these conditions, equally good results were obtained.

This article cannot be extended to discuss the results. It seems to me that they speak for themselves.

SUPERNORMAL PRODUCTION OF THUMB-PRINTS.

Séance held at Dr. Mark Richardson's house, 117 Lake Avenue, Newton Centre, Boston, Mass., eight miles from Dr. Crandon's house, 9.30 to 10.15 P.M., June 1, 1928.

PREPARATION.—The venue was changed in order to eliminate possible charges of fraud connected with apparatus or fittings in the Crandon's séance room. Dr. Crandon also agreed to my desire for a séance at which he and all the usual members of his circle should be absent. The only other sitter besides myself was Capt. Fife, the finger-print expert of the U.S. Navy Yard.

I took an unopened box of the dark-red dental wax called 'Kerr,' opened it myself, counted eight pieces inside, took out three and gave them to Mr. Evans, and kept five myself. Each piece was then marked secretly on the back by us, a number given to it, and a piece broken off from the side. The eight smaller pieces were placed in a box, for purposes of verifying the counterparts later. The eight larger portions were placed in the original box and carried out to Dr. Richardson's house in my pocket.

The room selected for the séance was a small annex of a larger room, only opening from the latter by a door, and with a high barred window. In this room we arranged a small table, three chairs, and a red shade over the electric light. No cabinet or gramophone. For the purpose of making thumb-prints, a kettle of hot water had to be provided, also a jug of cold water, a folded cloth, and two dishes. The procedure is to pour hot water into one dish until the temperature is about 140° F., the cloth being placed in the dish of water. The plate of 'Kerr' is then placed on the cloth under the hot water until it is sufficiently soft, when the cloth is drawn out on to the table. One can then press one's thumbs into the wax, which sticks tightly to them until it is quite cooled down.

With only the medium, Capt. Fife, and myself present, Mr. Evans guarding the door outside, and with red light frequently turned on to verify the position of the pieces of 'Kerr,' to remove each one from the cold water when Walter reported it done, or to put in a new piece into the hot water when he asked for it, we had a most extraordinarily quick and accurate performance by 'Walter' of the technique of making thumb-prints. In taking

Margery's, Capt. Fife's, and my own thumb-prints, which I did in bright light within a few minutes of the end of the séance, considerable difficulties were met with, especially owing to the wax melting too much if the water were too hot, and sticking closely to the thumb until the water was quite cool. I timed Capt. Fife, a finger-print expert, taking one of his own thumb-prints, and it took him ten minutes. 'Walter' did seven good prints in the dark in about half-an-hour, remarking, *en passant*, that it was easy for him, as he "carried his cold about with him."

FIG. 4.—Margery's (Mrs. Crandon's) right thumb-print.

The procedure for each thumb-print was as follows: When the hot water had been poured into the dish by Capt. Fife, and the cloth suitably arranged in it (the medium being asleep and with her two hands and legs fully controlled by us), the red light was turned out by myself. 'Walter' would wait until the water had cooled to the requisite temperature, and would then ask me to put a cake of 'Kerr' into the dish. When I had done this, we could hear movements in the water, and soon the cloth would be dragged out of the dish and the 'Kerr' removed to the cold water. 'Walter' would then tell me to put the light up, and I would take the 'Kerr' out of the dish, examine it, note the presence of a thumb-print, put it aside into my box, and get ready for another.

By inadvertently failing to follow Walter's directions, I twice caused him to talk in bright red light. On one occasion he said "No," in a loud voice, as I was about to put some 'Kerr' into the dish. On the second occasion, while I was looking straight at the medium, he said, "Go ahead, put it in." I noted that neither the medium's lips nor her larynx moved at all.

FIG. 5.—Captain Fife's right thumb-print.

When doing the fourth print, 'Walter' said that it would prove to be a mirror-image of his ordinary thumb-print. This we verified as correct later.

During the séance I was frequently touched and stroked by 'Walter's' teleplastic terminal, and water was several times sprinkled over me.

An examination of the prints showed that there were seven clear right thumb-prints in all, two of them being on No. 6. No. 4 differed from the rest, and a later examination showed that it was a positive mirror-image.[2] All the rest were negative. All seven belonged to the same thumb and were markedly different from the thumb-prints of Margery, Fife, and myself. The next evening I took the thumb-prints of all the usual circle of sitters, including Dr. Crandon, and these also were found to differ from 'Walter's.' A comparison of the 'Walter' thumb-print with a portion of the ulnar area of his actual thumb-print made during life, and found on his razor (used on the morning of the fatal accident in 1912), has been made possible through the fact that his old mother, who is still alive but very infirm, had preserved this and other treasures untouched since the day of the tragedy. The ulnar area of the prints obtained supernormally agrees exactly with that on the handle of the razor.

The eight smaller pieces of 'Kerr' were then produced by me, and six of them were easily fitted to the six retrieved from the cold water in the séance. The secret marks, numbers, etc., were also verified, though some of them were more or less obliterated through flowing of the wax in the hot water.

FIG. 6.—'Walter's' right thumb-print. Normal negative.

I should like to summarise the results of the above two séances as follows:

The *personality* of 'Walter' is shown to be independent of that of the medium by the possession of a distinct, masculine voice and strong whistling powers, these never proceeding from the mouth or larynx of the medium; by his alert mental powers, tendency to impatience and the use of swear words, by a marked sense of humour, a Canadian accent, and many other qualities which cannot fail to produce in a sitter the definite feeling that he is dealing with an independent personality. Besides this, 'Walter' shows that he has the power of smell, can see in the dark, can handle delicate objects and place them accurately in the dark without doing any damage. He can select and cognise objects not known to any living person in the world, thus proving that he does not depend on telepathy or knowledge stored up in any person's subconscious mind. He can hypnotically influence the medium to write down his selected results, and can also influence mediums sitting at a great distance to do the same. Finally, he can produce his thumb-prints in dental wax in the dark more quickly than an ordinary man can do them in the light.

Experiments closely similar to the above are now being done twice a week regularly by 'Walter,' and it is therefore within the power of any man who wishes to do so to verify the phenomena stated in this article. My own conclusion is that Walter Stinson, who died in 1912, has fully proved *in a scientific manner* his claim that his personality has survived physical death.

[2] A *negative* impression is the same as would be obtained by pressing a normal human thumb on wax. A *positive* is the same as the actual pattern on the thumb itself.—R. J. T.

The Glasgow Meeting of the British Association.

LOCAL ARRANGEMENTS.

THE preliminary organisation of the British Association's impending visit to Glasgow is being greatly facilitated by the very unusual circumstance that two out of the three local officials—Prof. Magnus McLean and Sir John S. Samuel—held office at the last meeting of the Association in Glasgow twenty-seven years ago: Sir John Samuel was indeed acting secretary then as he is now.

An outstanding feature of the last Glasgow meeting was the excellent and comprehensive handbook in three volumes prepared in connexion with it, and still in use, so far at least as its biological sections are concerned, as a standard work of reference. The possibility of anything on a similar scale for this year was unfortunately ruled out by the greatly increased cost of book production, but a handbook on a small scale, composed of lightly written articles on local topics likely to be of interest to scientific visitors, has been prepared under the editorship of Prof. Graham Kerr, and will be distributed to members at the commencement of the meeting along with topographical and geological maps of the district.

In one respect, namely, as a centre for excursions, Glasgow is probably without a serious rival amongst all the cities in which the British Association holds its meetings, and the visitor who has only the Saturday available may find himself seriously embarrassed by the richness of choice before him. A detailed programme of excursions has been prepared, and prospective attenders at the Glasgow meeting will do well to peruse this as soon as it is received and to take the precaution of indicating at once to the local secretaries their order of preference as between the various excursions. This will facilitate the organisation of the various parties, which are for the most part limited to a certain number.

Another outstanding attraction of the Glasgow meeting will be the opportunity it affords of paying visits of inspection to industrial concerns on a large scale, such as shipyards, engineering works, iron and steel works, printing works, biscuit factories, etc., the owners of many of which have kindly offered facilities for viewing their works. To the scientific visitor it is of remarkable interest to witness the workings of, say, a modern biscuit factory: in the multiplicity and specialisation of its parts, all functioning in smooth co-operation with one another, it irresistibly recalls to his mind the impression of a highly evolved living organism.

Glasgow is a city of wide distances, and although the official business of the Association will be concentrated in an unusually small area, visits to works and other sights will involve a considerable amount of travelling. The free transport granted by the Corporation upon their trams, buses, and subway will consequently be much appreciated; for river transport—to make it possible to view the harbour of Glasgow with its fringe of shipyards—the Clyde Trustees have arranged that one or other of their vessels *Comet* and *Clyde* shall leave the Broomielaw at 2.30 on most days during the meeting, for a two-hour voyage of inspection.

In the Queen's Dock on Sunday, Monday, and Tuesday, Sept. 9, 10, and 11, the Scottish Fishery Board's research vessel *Explorer* will be open for inspection by members of the Association interested in oceanography or marine biology.

As befits the city the ancient motto of which reads, "Let Glasgow flourish by the Preaching of the Word," there will be ample opportunities open to the churchgoer on Sunday, Sept. 9. The official sermon will be preached by Dr. MacLean Watt, minister of Glasgow, in the ancient Cathedral Church of St. Mungo. At St. Mary's Cathedral a large congregation will doubtless be attracted by Father Waggett, while in numerous other churches belonging to different denominations the sermon will relate more or less directly to the British Association and its work.

The daily interval between the afternoon session of the various sections and the evening functions is being taken advantage of by various public bodies for providing hospitality in the form of 'At Homes.' Amongst these are the Royal Technical College, where visitors will have the opportunity of inspecting one of the most important establishments in Britain devoted to technical education; the great Training College at Jordanhill with its magnificent buildings and grounds; the Roman Catholic Training College, Dowanhill, conducted by the Sisters of Notre Dame, and of high repute alike for its efficiency and for the quality of its research output; the College of Domestic Science; the Royal Faculty of Physicians and Surgeons; the Institution of Engineers and Shipbuilders; and the Trades House—an ancient incorporation which does noble work behind the scenes in secretly extending help to the less fortunate.

A large proportion of the well-to-do citizens of Glasgow are away from home during early September, and this is likely to be a limiting factor as regards private hospitality, but of more public hospitality there will be much. Glasgow has a number of admirable clubs, and the majority of these are generously admitting non-resident members of the British Association as honorary members for the period of the meeting, and the same applies to numerous golf clubs in the neighbourhood.

The importance should again be emphasised of members who propose to attend the Glasgow meeting sending in their names at once if they have not already done so, alike as a help to those who are organising the meeting and as a precautionary measure against finding themselves crowded out from excursions or other functions which they may desire to attend.

Obituary.

Dr. Finn Malmgren.

DR. FINN MALMGREN, who, after the wreck of the airship *Italia* in the Polar regions in May, lost his life in a brave effort to cross the ice on foot with two companions to North-East Land, Spitsbergen, was a Swedish meteorologist of considerable achievement and great promise. Educated at Upsala University, he became assistant to Prof. Hamberg at the high altitude observatory at Portetjäkko, whence he returned to Upsala to work at the meteorological observatory. Later he served at Pettersson's Hydrographic Institute at Bornö.

Dr. Malmgren's first polar experience commenced in 1922, when he became assistant scientist under Dr. Sverdrup in Amundsen's expedition in the *Maud* during the two years' drift in the polar ice. Returning to civilisation in 1925, Dr. Malmgren was soon engaged again in polar work, for he was one of the small body of men which crossed the north pole in the airship *Norge* during the Amundsen-Ellsworth expedition from Rome to Alaska in 1926. This year he responded yet again to the call of the polar regions, when, on the invitation of General Nobile, he became meteorologist on board the airship *Italia*, in which Nobile intended to carry out flights over the polar basin for scientific purposes from a base at King's Bay, Spitsbergen. After flying from Milan to Spitsbergen, two flights were carried out in the direction of Nicholas II. Land, and it was during the return from the north pole on the third flight that the accident happened to the airship which led to Dr. Malmgren's tragic end, at the early age of 32 years. The airship had, however, reached the pole, and Dr. Malmgren was therefore one of the few men who have been there twice.

Of Dr. Malmgren's contributions to scientific literature, perhaps that best known is the work summarising his observations of humidity and hoar frost in the *Maud*, for which special instruments were devised in view of the small water content of the air at the low temperatures experienced.

Dr. Malmgren was not unknown personally in England, for during the call of the *Norge* at Pulham on her way to the north pole an opportunity was afforded of appreciating his vivid personality. In the meteorological office at Pulham many interesting discussions took place, especially those relating to the weather conditions for the next stage of the flight.

Dr. Malmgren's death is to be deplored, not solely on account of his promise of brilliant scientific work in the future, but because much of his extensive scientific experience of the polar regions must now go unrecorded. M. A. G.

Mr. Frank Castle.

THE death of Mr. Frank Castle on Aug. 4, at seventy-one years of age, will be regretted by a wide circle of friends and by thousands of artisan students who have profited by the courses of instruction in his text-books of practical mathematics and related subjects. Mr. Castle was born at Dewsbury, Yorkshire, and served his apprenticeship with a firm of engineers and tool-makers there. After working at his trade and introducing several improvements in grinding machinery, he became in 1883 an assistant in the mechanics and mathematics division of what is now the Royal College of Science, South Kensington, and he occupied that position for twenty-six years. Hundreds of students who passed through the College during that period will remember his retiring nature and are grateful for the assistance he was ever ready to afford them on either the mechanical or the mathematical side of their work. When Prof. John Perry, who was appointed professor of mathematics and mechanics at the College in 1896, was carrying on there his campaign for the teaching of everyday or practical mathematics, Mr. Castle became an enthusiastic exponent of the reform, and in quick succession produced his "Practical Mathematics for Technical Students" (1899), "Practical Mathematics for Beginners" (1901), and "A Manual of Practical Mathematics" (1903), all of which became standard text-books and remain so even now. He was the author also of "Machine Construction and Drawing," "A Manual of Machine Design," and several useful books of mathematical tables. His success as an author and a teacher was due to his early workshop training and an instinctive appreciation of the difficulties of elementary students. He was for many years lecturer in mathematics at the Morley College, London, and at the time of his death was lecturer in practical mathematics, machine construction and drawing, building construction and applied mechanics at the Municipal Technical Institute, Eastbourne.

WE much regret to announce the death on Aug. 12, at sixty-eight years of age, of Dr. Charles Chree, F.R.S., superintendent of the Kew Observatory from 1893 to 1925 and a leading authority upon terrestrial magnetism, atmospheric electricity, and related subjects.

News and Views.

THE bicentenary of the birth of the great navigator Captain James Cook is to be celebrated in the Cleveland district of Yorkshire on Sept. 8 and 9. Cook was born in the village of Marton, Yorkshire, on Oct. 27, 1728, and though as a boy he was apprenticed to a haberdasher near Whitby, he gained his first experience at sea in a Whitby collier. At the age of 27 he joined the Navy as a volunteer, and as such soon attracted attention. He was present at the capture of Quebec, surveyed the St. Lawrence from Quebec to the sea, and was made marine surveyor of Newfoundland and Labrador. His three great voyages of exploration occupied the years 1768–1771, 1772–75, and 1776–79. The primary object

of the first was to observe the transit of Venus of 1769 at Tahiti; that of the second to discover the boundaries of the lands of the Antarctic; that of the third to discover a passage from the North Pacific to the North Atlantic. His work not only added immensely to geographical knowledge, but it whetted the public appetite for further discoveries. He did more than any other explorer to extend our knowledge of the Pacific and the Southern Ocean, and an interesting feature of the forthcoming celebrations will be the presence of the High Commissioners of New Zealand and Australia.

ON July 29, M. Herriot, Minister of Education, unveiled at Lyons a monument to Chardonnet, the inventor of artificial silk, who, he said, was worthy to rank between Pasteur and Berthelot, and had deserved well as a savant and a philanthropist. Chardonnet's invention was the result of a long and laborious research carried out at his laboratory at Besançon. Born on May 1, 1839, Comte Hilaire de Chardonnet received his scientific training in the École Polytechnique. He then travelled abroad, and after settling down strove for many years to realise Réaumur's suggestion that silk might be made artificially. It was on May 12, 1884, he took out his first patent "Sur une matière textile artificielle ressemblant à la soie," and by so doing took the decisive step towards the creation of an entirely new textile industry. The result of his work was made known in 1889; in the Paris Exhibition of that year he exhibited specimens of his material, with the result that money was found for erecting a 'Chardonnet Silk' factory at Besançon. Chardonnet died at Rome in 1924.

VARIOUS references have been made in the technical press to the fact that it is just fifty years since Sidney Gilchrist Thomas and his cousin Percy Gilchrist brought to a successful issue their experiments on the elimination of phosphorus from mild steel, and thus laid the foundation of the basic steel industry. In 1878 all steel, whether produced in the Bessemer converter or the open hearth furnace, was acid steel, the world's output being about $2\frac{3}{4}$ million tons. During 1927 the world's production of steel ingots and castings was about 99 million tons, and this enormous increase is largely due to the basic steel manufacture, more than 84 per cent of the total being basic steel. Thomas was led to his researches by a remark of a lecturer at Birkbeck College, and his experiments were made while he was still a clerk in a Stepney Police Court. He began studying the problem of the dephosphorisation of pig-iron in 1870 at the age of 20. Eight years later he announced his success at the Iron and Steel Institute. Seven years afterwards, while still under 35 years of age, but regarded as "the most promising light of the steel world," he died in Paris and was buried in Passy Cemetery.

IN recent years all the world has become interested in tales which illustrate certain mental traits of the Aberdonian; many of these stories, it is alleged, emanate from the city of Aberdeen itself. However this may be, it is quite clear from a paper which Dr. James Ritchie, of the Royal Scottish Museum, himself a distinguished native of Aberdeenshire, contributes to the *Aberdeen University Review* of July, on "The Genius of the Aberdonian," that the native of the North-East of Scotland has other gifts than those of parsimony. Havelock Ellis, in his "Study of British Genius," found that Scotland produced an unfair share, and that among Scottish counties, Aberdeenshire came out almost at the top of his list. Dr. Ritchie cools this compliment by pointing out that if its former population is taken into account, Aberdeenshire sinks to the tenth position, but "still stands far above the average of Scotland's production of genius." What is the characteristic mentality associated with the genius of the North-East? Dr. Ritchie asks. His answer is: "It is a bent for minute, detailed work; for accuracy in small things. And having laid this sound foundation, it exhibits itself in the logical piling up of premises and the deduction of laboriously won conclusions. Lofty imagination is foreign to the nature of the North-East."

THERE are traits which have been traditionally ascribed to the German men of science. It is a remarkable fact that in the second millennium before Christ, a 'beaker' people, a peculiar breed of round-headed folk, of short stature, began to settle in the north-east corner of Scotland. All the evidence at present at our disposal leads us to trace these people to a home in a part of Europe which is now held by a German-speaking population. There is much to be said for the thesis maintained by Dr. Ritchie that the modern Aberdonian owes much of his mental outfit to these 'beaker' ancestors. Whether Dr. Ritchie owes his lucidity of statement and charm of style to his beaker ancestry or to his University, is a moot point; they are certainly not Germanic.

THE reports of the council and of the director (Mr. J. F. Marshall) of the British Mosquito Control Institute, Hayling Island, Hampshire, record the continued development of the work. Advice has been sought at the Institute by correspondents from more than five hundred localities in Great Britain, and at the request of local health authorities or of private individuals a number of localities have been visited by the director or by his assistant and appropriate control measures suggested, which in every case have been followed by satisfactory results. Reference may be made to the following educational work—instructional courses for two or three days in laboratory and field work have been arranged to begin on the first Tuesday of each month; a handbook on "The Principles and Practice of Mosquito Control" was issued in June 1927; a series of fifty-three lantern slides (obtainable from Messrs. Newton, Museum Street, W.C.1) has been prepared to illustrate the various species of British mosquitoes and the methods employed in their control; and sets of microscopic slides (about 1*s.* 6*d.* each at the Institute) made to show the life-history of the different species of mosquitoes. In September 1927

the staff investigated a serious mosquito annoyance in a North London suburb and found it to be due to *Ædes vexans*, a species which, though common in many parts of the world, is very rare in Britain, for only about a dozen specimens had previously been found. The council points out that the Institute is the only existing institution entirely devoted to mosquito control research and that it affords the only opportunity available in Great Britain for the practical study of a mosquito control scheme in actual and continuous operation. The council records its high appreciation of the devoted services rendered by the director and adds that he continues to bear the chief cost of the Institute. It is to be hoped that subscriptions from those interested, and grants from scientific or other public bodies, will be forthcoming so that the Institute may approach a more satisfactory, self-supporting position.

IT is announced that the exhibition of last season's finds at Ur at the British Museum is to remain open until a late date in the autumn. This is a welcome addition to the facilities which have been afforded the public to view one of the most remarkable collections of objects which have yet been brought from Mesopotamia or perhaps from any area of archæological exploration at one time. It places beyond question the artistic and technical pre-eminence of Mesopotamia at as early a date as 3000 B.C. In this connexion it may be noted that although Dr. Hall's lecture on Ur before the Royal Society of Arts, which is printed in the issue of the Society's *Journal* for July 27, was a survey of past work which did not attempt to throw fresh light on the results, one or two interesting points emerged both in the lecture itself and in the discussion which followed and is reported with the lecture. Mr. J. W. Wilson, formerly Director of Public Works and Antiquities in Iraq, pointed out the value of the explorations for the history of architecture: Babylonia shows evidence of early town planning; while the history of the brick can be followed from its earliest beginning as an unbaked lump of natural clay. He himself as officer in charge of public works had been responsible for the making of bricks, but for some reason he had not been able to ascertain, whether owing to some change in the nature of the soil, or the loss of some secret process which the ancient brickmakers possessed, he had been unable, even with the assistance of modern machinery, to manufacture a brick which equalled that of Hammurabi or Nebuchadnezzar.

DR. HALL gives some interesting figures relating to the cost of the work in Mesopotamia. His own work of excavation in 1919, which turned out to be more than a preliminary recognizance, cost £600. The expenses of a good season's work to-day are not less than £4000. The charges for the work being carried on at present are borne equally by the British Museum and the University Museum of Philadelphia. The British Museum, which has other calls upon it, is strictly limited in the amount which it can place at the disposal of the Ur expedition without assistance from the public. It will be remembered that last year Mr. Woolley had to close down for lack of funds when he had barely touched one of the most interesting and important finds of the whole of the work yet carried out. Material of priceless value, as was shown by the first turn of the spade in the next season, was exposed to the risk of plunder for months. This in itself should be enough to convince the public of the desirability of supplementing the Museum's funds in carrying on what Dr. Hall characterises as "the most important archæological investigation in the world at the moment."

An exhibition case to illustrate the fluorescence of minerals (and some other substances) in ultra-violet rays has been fitted up near the entrance to the Mineral Gallery in the Natural History Museum at South Kensington. This is probably the first public exhibit of the kind, and during the August Bank Holiday week it attracted thousands of visitors. Marvellous changes in colour effects are produced by simply pressing a button outside the case. The specimens are first seen in ordinary light with inside electric lighting ('linolight'). When the button of the two-way switch is pressed, this changes over to ultra-violet rays, which are produced by a Hanovia 'artificial sunlight' mercury-vapour lamp fitted with a dark screen to cut out all the visible light rays, allowing only the dark ultra-violet to fall on the specimens. Large groups of fluorspar crystals shine up with a wonderful bluish-violet glow, willemite and autunite with a brilliant green, black zinc-blende with a golden yellow, and white calcite with a rose-red. When the spring-switch is released this fairyland of glowing colours suddenly vanishes. In the adjoining wall-cases a display has been made with a series of large specimens of well-crystallised spar, from the Snailbeach mine in Shropshire, recently bequeathed to the Museum by the late manager of the mine. The largest slab measures $5\frac{1}{2} \times 3\frac{1}{2}$ feet, and weighs over $8\frac{1}{2}$ cwt. With inside electric lighting ('linolight') and a dark grey background a striking effect has been obtained. A description of this new exhibit appears in the *Natural History Magazine* for July.

IN the *Times* of Aug. 7 is an account of the nomadic companies of market gardeners of Bulgaria which is of considerable interest to geographers and economists. These gardeners live in Tirnovo and the adjacent areas in the rolling country lying between the Balkan Hills and the Danube, where there is a long tradition of efficient practice in market gardening. As, however, the district is too thickly populated for the volume of local agriculture, it is the custom for small bands of twelve to fifteen to migrate for the season to less densely occupied land in Rumania, Russia, Turkey, Serbia, and elsewhere. Hiring land, they prepare the ground and raise a crop, of which they dispose in the market which they had in view in choosing their land, at a considerable profit to themselves. Even among the more primitive peoples, agriculture is normally a sedentary occupation, unless it is combined with the pastoral life and a seasonal migration as among some of the peoples of the mountainous areas of

Asia Minor. Something analogous to the Bulgarian practice occurs among peasant populations, for instance, Ireland and Brittany, who leave their own country to seek employment in the harvest elsewhere. This, however, is merely a special, if not too common, instance of the mobility of labour, whereas the extension of the principle of mobility in agriculture in search of suitable ground to such a degree as to justify the term 'migratory' in the Bulgarian instance is probably unique.

IN an article entitled "Chaucer's Physician and his Forbears" in the current number of the *Nineteenth Century*, Dr. H. H. Bashford deals with the physician who figures in the prologue to the "Canterbury Tales" and his predecessors, particularly Gilbert the Englishman and John of Gaddesden. Chaucer's physician, though apparently of an avaricious disposition, is described as 'a verrey parfit practisour' and well versed in old medical lore. Although Bald's Anglo-Saxon "Leech Book," the earliest medical treatise composed in Great Britain, was written soon after the death of Alfred the Great, no great figure emerged from Anglo-Saxon medicine, and Gilbert, who was born about a hundred years after the battle of Hastings, was the first Englishman to acquire a European reputation as a physician. After study at Salerno, Montpellier, where he is said to have been chancellor, and Paris, he returned to England, where he acquired fame by his "Compendium" or "Laurea Medicinæ," which covered the whole field of medicine and contained a certain amount of original observation and research. He was the first, for example, to recognise the contagious nature of small-pox, and also emphasised the importance of surgical treatment for cancer and of a fruit diet for sea travellers. John of Gaddesden, who was born in 1280, fifty years after Gilbert's death, studied at Oxford, which since the time of Gilbert had possessed a medical school, and settled in London, where he composed his treatise entitled "Rosa Medicinæ," which rapidly obtained a great success. He became court physician, in which capacity he cured one of the royal family of small-pox by the first application of red light treatment, resuscitated centuries later. It is noteworthy that both these physicians had a belief in magic. Gilbert, for example, included in his treatise an impressive list of legendary antidotes, while John of Gaddesden, like his successors for many subsequent centuries, had a firm belief in the efficacy of the royal touch.

A BEET-SUGAR factory has recently been found polluting the River Barrow at Carlow and fouling the machinery of a local miller, who is entitled under his lease to a supply of uncontaminated river water. The case is of interest to readers of NATURE, as it is the first time, in Ireland at any rate, that a *biological*, as distinct from a chemical, analysis has been accepted in a court of law as evidence of pollution. Dr. T. Johnson, of Dublin, found the two *indicator* organisms—*Sphærotilus natans* and *Leptomitus lacteus* in the filter bed, the effluent, and the mill premises. They are microscopic fungi living on nitrogenous matter. 'Lambs' tails' may be used as a common name for them, as in mass they look alike.

MR. H. KEIJSER, of the Koninklijk Nederlandsch Meteorologisch Instituut, has forwarded a barogram obtained on board the Dutch steamer *Sapœræa* when passing through a typhoon about 400 nautical miles east of Luzon. The barogram was of the extremely sharp 'V' type usually obtained on such occasions, and pressure fell so much that the pen quickly passed off the chart. Readings of a mercurial barometer were accordingly made, and the lowest pressure was observed to be 665·1 mm. (886·8 millibars) after correction for temperature, gravity, and height above sea-level. This reading was checked by several persons, and there seems to be no reason for not accepting it as correct, in which case the previous lowest reading of 918·9 m.b. obtained on Sept. 22, 1885, at False Point, Orissa, India (NATURE, vol. 35, p. 344), no longer constitutes a 'record' for tropical cyclones. It should, however, be pointed out, that in tornadoes much lower pressures occur, but since a severe tornado usually destroys all buildings that lie directly in its path, we have no exact knowledge as to how low pressure may fall.

IN a letter entitled "Pleochroic Haloes and the Age of the Earth," Dr. Franz Lotze (Göttingen) expresses the view that, even when we use the determinations of the range of the α-particles from uranium I and uranium II recently carried out by G. C. Laurence, there still exists a slight discrepancy between the theoretical and observed ranges in biotite. He interprets this as indicating a change in the medium produced by the radiation, rather than an alteration in the radioactivity of the contained uranium during geological time. The second possibility cannot be accepted in the absence of unequivocal evidence in its favour, and Dr. Lotze feels that his suggestion of an alteration in the cohesion properties of the mica (NATURE, Jan. 21, 1928, p. 90) is ample to meet the case. He considers that Prof. Joly's criticism (NATURE, Feb. 11, 1928, p. 207) of the letter cited is scarcely justifiable in view of the uncertainty of the relevant experimental evidence, and explains the fact that such anomalies are not observed with thorium and emanation haloes as being due to the smallness of the effects to be expected, as pointed out in his previous letter. Dr. Lotze sees confirmation of his own views in the recent work of Dr. J. H. J. Poole and of Dr. K. C. Bailey. Chemical and physical changes undoubtedly occur in the region of the inner haloes, and further work on this subject is much to be desired, so that quantitative effects can be predicted, and compared with observational data on the haloes. Such altered minerals may be attacked more readily by rock moisture and suffer a partial loss of their mineral constituents. Finally, Dr. Lotze advocates a thorough investigation of the medium in which thorium as well as uranium haloes occur, with the object of determining whether similar anomalies are to be found in minerals other than in biotite.

DR. L. DE BROGLIE has accepted the invitation of the British Association to attend the Glasgow meeting as a foreign guest and to take part in the discussion in Section A on the scattering of electrons from crystals.

THE Secretary of the Department of Scientific and Industrial Research informs us that he understands from the Spanish Ambassador in London, that the National Association of Olive Growers of Spain have extended until Oct. 31, 1928, the period for acceptance of entries for the international competition for oil analysis organised by that Association. Particulars of the competition will be found in NATURE of June 2, p. 880.

THE appointments to scientific and technical departments made by the Secretary of State for the Colonies during the month of July include two agricultural officers, Mr. A. H. Savile, and Mr. N. V. Rounce, to Tanganyika Territory; one government veterinary surgeon, Mr. J. F. Timoney, to the Straits Settlements, and one veterinary officer, Mr. H. A. Hay-Barclay, to the Agricultural Department of Kenya; an assistant cotton botanist, Mr. H. R. Hosking, to Uganda; a plant breeder, Mr. E. R. Guest, to Iraq; an entomologist, Mr. R. W. E. Tucker, to Barbados; and a produce inspector, Mr. H. G. Pudney, to the Agricultural Department of Nigeria.

APPLICATIONS are invited for the following appointments, on or before the dates mentioned:—A full-time assistant for the engineering department of the West Hartlepool Technical College—The Secretary, Education Offices, West Hartlepool (Aug. 20). An assistant lecturer in the department of zoology of the University of Leeds—The Registrar, The University, Leeds (Aug. 27). A woman demonstrator and assistant lecturer in the department of chemistry of the Royal Holloway College—The Principal, Royal Holloway College, Englefield Green, Surrey (Aug. 30). An aircraft and engine inspector under the Government of India—The Secretary to the High Commissioner for India, General Department, 42 Grosvenor-gardens, S.W.1 (Sept. 1). The Maybury (part-time) professorship of highway engineering at the City and Guilds College—The Academic Registrar, University of London, S.W.7 (Sept. 11). A general secretary of the Society of Chemical Industry who shall also have the position of general manager of the society's affairs—The President, Society of Chemical Industry, Central House, Finsbury Square, E.C.2 (Oct. 11). A Macleay bacteriologist of the Linnean Society of New South Wales—The Secretary, Linnean Society of New South Wales, 16 College Street, Sydney, N.S.W. (Nov. 30). A science master, with special qualifications in chemistry and qualifications in metallurgy desirable, at the Scunthorpe Modern School and Technical School—H. S. McIntosh, 14 Wells-street, Scunthorpe, Lincs. A petroleum chemist for Silvertown Lubricants, Ltd.—The Chief Chemist, Silvertown Lubricants Limited, Silvertown, E.16. A lecturer to deal with farm engineering and estate management subjects at the Harper Adams Agricultural College—The Principal, Harper Adams Agricultural College, Newport, Shropshire. A junior assistant for a Government establishment—The Commandant, Experimental Station, Porton, Wilts. A junior chemical assistant in the Laboratories of the Research Association of British Flour-Millers—The Director of Research, Research Association of British Flour-Millers, St. Albans. Two junior assistants under the directorate of Ballistics Research of the Research Department, Woolwich—The Chief Superintendent, Research Department, Woolwich, S.E.18.

Our Astronomical Column.

THE SPECTRUM OF MIRA CETI.—In 1924 the maximum magnitude reached by Mira was exceptionally low, and on that occasion some new bands hitherto unknown in stellar spectra were noticed in its spectrum by Dr. A. H. Joy. The origin of these bands is discussed in the *Monthly Notices of the Royal Astronomical Society* for June by Mr. F. E. Baxandall, who attributes them to aluminium oxide. They were treated by Dr. Joy as wide, bright lines, and he gave the wave-length measurements of their centres. By correcting these wave-lengths to the junction of the bright and dark regions, Baxandall has produced evidence which appears to be conclusive that the origin is to be found in aluminium oxide. Some enlarged spectra of Mira, accompanied by laboratory spectra of aluminium oxide as comparisons, show striking agreements of stellar bands with those of aluminium. A further examination of other spectra of Mira shows that aluminium oxide bands are probably normally present, and that all recorded bands other than those of titanium oxide may be attributed to this source.

INTERSTELLAR CALCIUM.—The problem of 'stationary' calcium lines in stellar spectra still presents difficulties in the way of an adequate explanation; but the recent work of Dr. Otto Struve has helped considerably to reduce these difficulties. In a paper in the *Astrophysical Journal*, vol. 67, p. 353, Dr. Struve gives the results of intensity measures of non-stellar Ca lines in 2056 stars (mostly of early spectral type). He finds that there is a marked increase in the intensity of the detached [K] line for fainter stars and for earlier spectral types, though there is no evidence of any such relation with luminosity. After a thorough examination of the data for possible sources of error, he shows that the intensity of the detached Ca lines is a function of the distance. This is in accordance with Prof. Eddington's theory of a large calcium cloud diffused throughout space (as opposed to localised clouds)—a theory which is becoming increasingly favoured. In explanation of the objection that detached Ca lines have not been found in stars of type later than B3, Dr. Struve suggests the comparative nearness of most of the late-type stars examined and the difficulty of distinguishing a blend of the true stellar line with the detached line. In the case of Novæ, which are usually admitted to be of very small parallax and in which the radial velocities are so great as to separate these two components with ease, the detached Ca has been found to be of great strength.

Research Items.

BETH-PHELET.—The chief work in Palestine of the British School of Archæology in Egypt during the past season is described by Sir Flinders Petrie in *Ancient Egypt* for June. The expedition has been at work on Tell Fara, 9 miles south of Gerar and 18 miles from Gaza. The thickness of the stone walling showed its importance. Overlooking the chief water supply on the road to Egypt, it became a place of escape from the desert and from the Bedawy, as its name signifies. Last season's work reached as far as eighteenth-dynasty levels. Other levels remain for future excavation. The tombs, where most of the digging was done, go back through the Jewish occupation. It was probably the town of the Pelethites, David's bodyguard. The hill is accessible only on the west, where it was guarded by a brick wall of fifteen feet thick. The bricks are of the date of Rameses III. Towards the south there was a Jewish fort. In the plain to the north were the cemeteries. All had been attacked anciently ; but one tomb held a bronze bed of Mesopotamian type and a silver bowl with a ladle, also of silver, of which the handle was a girl swimming. Many beads were found, and numerous scarabs indicated the Egyptian connexion. A bronze figure of a bear and a calendar board with pegs for thirty days were among the other objects found. Much pottery, including painted Philistine ware of the twentieth-twenty-first dynasties, was in perfect condition.

SOLUTREAN SCULPTURES FROM LA CHARENTE.—In *L'Anthropologie*, t. 38, Nos. 1-2, Dr. Henri Martin continues his account of his discoveries in the cave in the Valley of the Roc in Charente from which were obtained the human remains of Chancelade type which he has recently described (See NATURE, June 16, p. 963). The discovery of several engraved objects had led to an expectation of further and more developed signs of artistic activity. The investigations of last year produced definite evidence previously lacking of Solutrean sculpture in relief. A blast brought to light on the under part of a mass of rock resting on the archæological floor, some magnificent sculptures in relief of unquestionably Solutrean age, as is shown by objects in the hard breccia still adherent to the face of the block of stone. Five masses of rock, each with sculptures, were removed. On the first was the figure of a horse and of one of the Bovidae, the head of the latter being missing from the first but found on the second stone. Two other pieces of rock carried representations of the horse, each of about the size of a dog of medium proportions. On the last block were a number of sculptures which at first were scarcely distinguishable owing to adherent matter. On clearing the stone it was found to bear a number of carvings. These exhibit a number of peculiarities of design and technique, such as a clever utilisation of a boss of stone to secure the effect of relief. A human figure has a mass of hair, in the midst of which nose and eyes can just be discerned.

EVOLUTION OF THE HUMAN FOOT.—A paper which appears in vol. 19 of *Contributions to Embryology*, (Publication No. 380, Carnegie Institution of Washington, D.C.), has a bearing on man's relationship to anthropoid apes. The author, Mr. William L. Straus, Jr., of Johns Hopkins University, has made an intensive study of the embryological changes undergone by the human foot, and finds clear evidence of its evolution from one which had been arboreal and prehensile. He finds that in the fœtus of the third month the great toe or hallux is "highly divergent, and somewhat opposable," and that the tarsus is short and the phalanges are long, as in all arboreal primates. He finds that at an early stage of development, primates have feet of a common type, and from this common type, specialised forms are produced by divergent growth. The foot of the human fœtus, "in many if not in most respects, is not unlike that possessed by the adult gorilla, although in some points even more primitive than that of the largest of the anthropoid apes."

HENSEN'S NODE AND THE ORIGIN OF THE NOTOCHORD.—In an important paper published in vol. 19 of *Contributions to Embryology* (Publication No. 380, Carnegie Institution of Washington, D.C.), Dr. George L. Streeter, Director of the Department of Embryology, Carnegie Institution of Washington, discusses certain fundamental problems relating to the growth of the early vertebrate embryo. He confirms the experimental observation made by the late Dr. Richard Assheton in 1896 that the first part of the vertebrate body to become differentiated on the embryonic shield is the mid part of the head, and from this initial area of differentiation the process of growth proceeds in a backward direction. Cervical, dorsal, lumbar, and sacral regions are thus progressively intercalated between the cephalic area and the anterior end of the primitive streak. He finds it advisable to recognise only two primary layers in the embryo, the ectoderm and entoderm, applying the term 'mesoblast' to the middle layer, which may be derived from either or from both of the primary layers. Hensen's node, which appears at the anterior end of the primitive streak, is a mass of mesoblast of ectodermal origin. Dr. Streeter finds that Hensen's node produces the notochord much in the same way as a seed produces a stem. The incorporation of the notochordal plate in the roof of the archenteron is a secondary phenomenon.

LOBSTER REARING IN NORWAY.—A very interesting account of experiments in rearing lobsters is given by Mr. Alf Dannevig in his paper entitled "The Rearing of Lobster Larvæ at Flødevigen" (*Report on Norwegian Fisheries and Marine Investigations*, vol. 3, No. 9 ; 1928). These experiments have been going on for some years in the Flødevig Sea Fish Hatchery, and have now given very successful results. The following conditions are found to be obligatory: (1) quick renewal of the water, (2) cleanliness, (3) suitable food. Berried lobsters are placed in wooden boxes divided into compartments on a slight slope, so that there is a gentle flow of water from one to the other, the larvæ being collected in the last compartment with a silk bottom. Before the larvæ are hatched the lobsters are fed on fresh fish, and twice a week are lifted out and the compartments scrubbed. Whilst hatching her eggs the mother puts her head down and tail up, and sets up a current with her pleopods, so that the young are naturally whirled away to the surface, where they are caught by the current and carried down to the collecting box. For rearing, boxes of cement and iron are used, with special circulation directed in such a way that the water mass will circulate round a horizontal axis without forming eddies in the corners. The water is let out through celluloid filters. The boxes are divided so that there is a spare room for the larvæ when the main compartments are being cleaned, into which they are automatically carried by a special current at that time. These are cleaned (scrubbed) at least three times a week. The food previously given was *Cancer pagurus*, but supplies of this crab

failing, *Mytilus edulis* and boiled egg were tried, but without success. Finally, beef liver was given, with good results, the larvæ being fed every two hours day and night. From 160 berried lobsters nearly 200,000 larvæ were collected, out of which 154,455 were used for rearing experiments, the rest being liberated when hatched or preserved for investigations. Out of those used for rearing experiments, 21,290 were reared to the fourth (lobsterling) stage, and liberated into the sea. In the most successful experiments where liver was used as food, 25,110 larvæ gave 8087 lobsterlings.

THE IDENTIFICATION OF BRITISH CRABS.—No attempt has been made for many years to simplify the identification of British crabs, so that shore-collectors or workers at marine stations might be able easily and rapidly to determine their captures. A key provided by Michael Perkins (*Scottish Naturalist*, 1928, p. 53 and p. 87) provides by simple dichotomous characters such an aid. It follows the practice adopted by Mortensen in his recent work on British echinoderms, of including far more than the Brachyura which have actually been found within the British area. The lack of definite boundaries in a sea area and the possibility of invasion by individuals belonging to species outside but bordering the area, have led the author to include all the crabs which have been found in the north-east Atlantic from Gibraltar to the Arctic Circle. The British species, however, are specially indicated. The key, which has been constructed so far as possible on non-technical lines, should prove a boon to the shore naturalist.

INSECTS OF NEW YORK.—*Memoir* 101 (published January 1928) of the Cornell University Agricultural Experiment Station is a bulky publication of 1121 pages devoted to a list of the insects, spiders, and certain other allied groups found within the confines of New York State. In his introduction Mr. M. D. Leonard, the editor-in-chief, states that the memoir is the outcome of a project originated about twelve years ago by a committee of specialists, and we may add that all concerned in the production of this laborious and valuable catalogue must view its completion with evident satisfaction. Dr. W. T. M. Forbes contributes a general account of the faunal districts of the State and an elaborate map accompanies the memoir, which thereby enables the numerous localities quoted to be found. The list comprises 31 orders, 430 families, 4797 genera, and more than 16,000 species of insects, Arachnida, Chilopoda, and Diplopoda—no less than 15,449 of these species being insects. The different sections of the work are the result of the energies of more than 150 specialists and collectors, and under each species the known localities and dates of appearance are given wherever possible. In point of view of species the Coleoptera head the list with 4546 representatives, Diptera following second with 3615. Some orders such as the Thysanoptera, with only 77 species, are evidently, as yet, only but little worked out. It is difficult to estimate to what degree the list approximates to the actual number of existing species of the various groups dealt with. As is pointed out in the introduction, in many parts of the State but little collecting has yet been done, and it is not unlikely that more intensive observations will increase the total by at least 25 per cent.

WEST AMERICAN SPECIES OF THE GENUS *PHASIANELLA*.—A review of the West American species of the molluscan genus *Phasianella*, derived from a large number of sources, is presented by A. M. Strong (*Proc. Calif. Acad. Sci.*, Ser. IV, vol. 17). The author summarises the previous literature bearing on the subject and describes 11 species, of which one is supposed to be new, while one receives a new name. There is a plate of illustrations from photographs so taken by Dr. G. Dallas Hanna as to represent, he says, the true black and white values of the colours of the objects, which, alas, is not the same thing as a good coloured plate would have been.

NEW OLIGOCENE MOLLUSCA FROM MEXICO.—Mr. C. Wythe Cooke describes a series of fossil mollusca from the Alazan Clay at, and near, the type locality on Rio Buena Vista in Vera Cruz, Mexico (*Bull. U.S. Nat. Mus.*, vol. 73, art. 10). Although the Alazan Clay has hitherto been placed in the Upper Eocene, the author is convinced from a study of its molluscan fauna that it is of Vicksburg (Oligocene) age and doubtless equivalent to the Mint Spring Marl member of the Marianna limestone. Brief notes on the localities at which the fossils were obtained by Dr. T. Wayland Vaughan in November 1920, are followed by descriptions of 17 new species and one new genus, *Protonema*. These new forms are figured on two clear plates from retouched photographs.

ATMOSPHERIC POTENTIAL GRADIENT.—In No. 38 of the *Geophysical Memoirs of the Meteorological Office* (1928, London: H.M. Stationery Office. 1*s*. 6*d*. net) R. A. Watson discusses the "Electric Potential Gradient Measurements at Eskdalemuir, 1913–23," covering a complete sunspot period. The three parts of the memoir deal with the method of measurement, the potential gradient on quiet days, and the connexion between the wind and the potential gradient. In the second part it is shown that, contrary to L. A. Bauer's conclusion from the first eight years' data from Eskdalemuir, there is no significant indication of a connexion between sunspot numbers and the departure of the mean potential gradient in any month from its eleven-year mean for that month. The last part is an attempt to elucidate the close but intricate connexion of the potential gradient with purely local meteorological events. It is concluded that the gradient depends largely on the wind speed, high gradients being generally associated with light winds, and conversely; but though very high gradients never coincide with strong winds, low gradients sometimes occur with light winds. Special cases of this are considered in detail. A theory of the connexion between gradient and wind is outlined, and it is shown that neighbouring masses of air of different history may have very different electrical contents; one can in fact speak of 'electrical fronts' in the atmosphere by analogy with cold or polar fronts.

ROCKETS FOR UPPER AIR EXPLORATION.—The March issue of *L'Astronomie* is wholly devoted to an exposition by M. R. Esnault-Pelterie of his researches on the exploration of the upper atmosphere by means of rockets, and on the possibility of inter-planetary voyages in the same way. The matter was the subject of a lecture on June 8 of last year before the Société Astronomique de France, the president of which, General Ferrié, contributes a commendatory preface to the printed report. The subject, which M. Esnault-Pelterie has studied for twenty years, has also been independently investigated more recently by Oberth, Hohmann, Valier, and Goddard; the latter had in mind particularly the projection of a small mass of magnesium powder to the moon, and has made experiments on the propelling power of various explosives. M. Esnault-Pelterie considers the conditions of ejection, both neglecting and taking into account the resistance offered by the earth's atmo-

sphere. Like Goddard, he concludes that it is already practicable to send exploratory apparatus of small mass to heights of some hundreds of kilometres, but that it is not at present practicable to eject enclosures large enough to contain human beings, with all the necessaries for their existence on a journey outside the earth's region of attraction, together with a sufficient supply of the propellant explosive to ensure their safe return. One principal difficulty is that the necessary initial mass is so many times the 'useful' mass; the ratio is 300-600 for small 'useful' masses, and far greater for habitable projectiles. The power required consequently increases with enormous rapidity as the useful mass is raised.

TIME CONSTANTS OF BRANCHED CIRCUITS.—In the issue of the *Faraday House Journal* for the summer term, Dr. A. Russell extends the idea of the time constant T of a circuit of self inductance L and resistance R where $T=L/R$, to the general case in which there are n branches in parallel with self inductances L_{rp}, resistances R_p, and mutual inductances L_{pq}. The generalised time constant of the branch p is then

$$T_p=\frac{L_{1p}}{R_1}+\frac{L_{2p}}{R_2}+\ldots+\frac{L_{np}}{R_n}$$

and the quantity of electricity prevented by induction from passing through the branch p during the growth of the current in that branch from zero to its final value $E/\Sigma(1/R)$ is T_pE/R_p. It will be seen that T_p may by suitable choice of the resistances be either positive, zero, or negative, and that the transient current in a branch may be made to reverse, a property which may be of use in radio telegraphic circuits.

ELECTRIC PROPULSION OF SHIPS.—In discussing the merits of the electric drive of the propellers on board ship, engineers have usually been content to give merely the relative efficiencies of the mechanical and electrical drive. The mechanical drive being some five per cent more efficient than the electrical, it is concluded that it is the best to use in all cases. In *World Power* for July, Mr. Regnauld points out that many other factors have to be taken into consideration. For example, the simplicity with which reversing and manœuvring can be effected in an electrically propelled ship is a very great advantage. In small craft like harbour tugs the entire operation of the propelling motors can be controlled from the bridge. This eliminates the risk of error and the time lag essential when dual control is employed. It is well known that in order to obtain the last knot to a vessel's speed it is necessary almost to double the propelling power. As the efficiency falls off rapidly with the load, the vessel is only running economically at her maximum speed. When electric propulsion is used and there are several turbo-alternators, then by shutting down some of them the remainder can run at maximum efficiency. It is significant that the P. and O. Company have recently placed an order for a 19,000-ton twin-screw passenger liner which will be equipped with electrical propelling machinery. The vessel will be employed on the London-Bombay mail service, for which two distinct speeds are required. From London to Marseilles, where the mails are taken on board, the speed is 16 knots. From Marseilles to Bombay it is 18 knots. The use of the electrical drive enables the maximum economy in fuel consumption to be obtained at both speeds. Another advantage of electricity is the superior economy with which the auxiliary machinery on board can be operated. On some types of ship, such as a refrigerated cargo boat, an oil tanker, or a dredger, the auxiliary load is appreciably in excess of that required for the propulsion of the ship. In this case the doubling of the size of the electric generators would increase their efficiency.

SELENIUM TETRAFLUORIDE.—By the action of fluorine on selenium Lebeau (1907) prepared two compounds, a gas, SeF_6, and a colourless liquid which he considered to be SeF_4. The composition of this liquid was not altogether certain, since it closely resembled the oxyfluoride $SeOF_2$, and the mixture SeO_2+4HF in some of its properties. Selenium tetrafluoride has now been obtained by the interaction of selenium tetrachloride and silver fluoride and an account of its properties is given in the *Journal of the Chemical Society* for June by E. B. R. Prideaux and C. B. Cox. The tetrafluoride strongly attacks glass, but has practically no action on clean copper. It reacts directly with silicon and red phosphorus and is completely hydrolysed by water.

NEOCYANINE.—The cyanine group of dyes are remarkable for their properties as photographic sensitisers. The constitutions of fifteen of the sixteen types so far described are known, and in the *Journal of the Chemical Society* for June, F. M. Hamer gives an account of the properties and preparation of the remaining one, neocyanine, and suggests a formula and the probable mechanism of its formation. Three neocyanine dyes have been prepared, and each has a higher melting-point and smaller solubility than the corresponding 4 : 4′ carbocyanine kryptocyanine, indicating a greater molecular weight. This conclusion is further supported by the fact that the neocyanines sensitise further into the red than the kryptocyanines.

DETERIORATION OF STRUCTURES IN SEA WATER.—The eighth Interim Report of the Committee of the Institution of Civil Engineers on this subject has been issued by the Department of Scientific and Industrial Research (London: H.M.S.O.). In addition to the periodical examinations of immersed specimens, the report contains a final examination of the first series of specimens of iron and steel exposed at Halifax and at Auckland for five years. The series exposed at Plymouth and at Colombo for the same period have also been removed, but have not yet been reported on. In general, the agreement between the Halifax and Auckland series is good. There is little difference between wrought iron and mild steel, although the appearance of the bars after corrosion is, as might be expected, decidedly different, the fibrous structure of the wrought iron being strongly brought out. Bars which had the mill scale produced in manufacture left on the surface were found to be much less pitted than bars which had been cleaned, although the loss of weight was sometimes higher and sometimes lower. This fact emphasises, as the facts contained in previous reports have done, the comparative worthlessness of loss of weight tests, observations of the manner of corrosion being much more valuable. On the whole, the attention given to the mechanism of corrosion in the report is disappointing. In the light of modern knowledge as to the effects of differential aeration and other factors, a more scientific study of the observations should be possible. Moreover, conclusions based on comparisons between single bars are rarely trustworthy, the erratic nature of corrosion being well known. The most interesting fact among the observations on timber is the indifference of *Limnoria*, on account of the construction of its stomach, to arsenical poisons used to impregnate the wood, so that a means of defence against this destructive organism is still unknown.

The Growth of Vegetable Plankton in the Sea.

THE changes in the plankton and their relationship to chemical and physical factors has long been a subject of inquiry, which is now being actively prosecuted along several lines. At the moment of writing, two research vessels on cruises round the world are investigating the distribution of manurial salts in the ocean waters and their relation to the quantity of planktonic life; the *Meteor* expedition in the South Atlantic has collected numerous data, and investigations are in progress on the Norwegian coast, off Heligoland, in the English Channel, and will shortly be instituted on the Great Barrier Reef upon varying facets of the same question.

Until recently it was only in isolated cases that more than a general relationship has been made out. The work of Marshall and Orr[1] in Loch Striven, on the west coast of Scotland, during 1926 and previous years, has afforded a noteworthy addition to our knowledge of the physical and chemical conditions which accompany the outbursts of diatom growth in the sea—complementary to the work of Gran and his co-workers, and to that of Screiber, which were proceeding at the same time from a similar biological viewpoint.

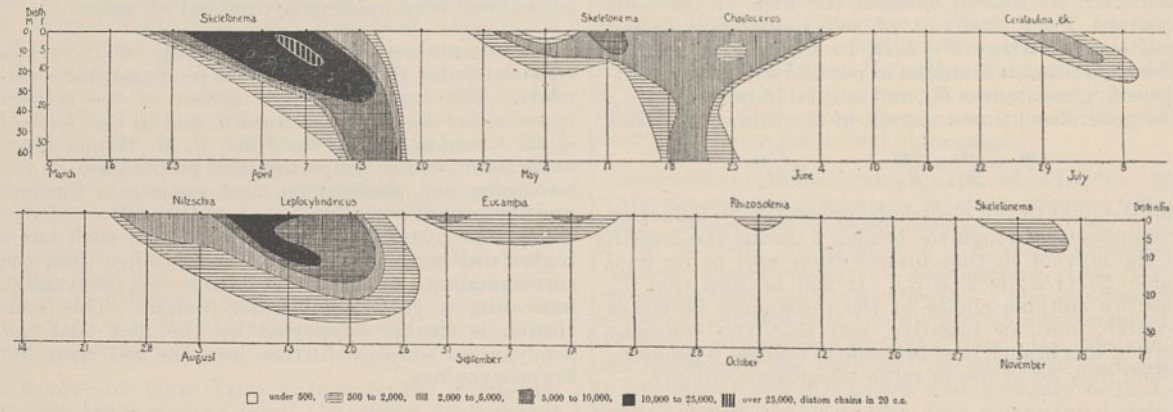

FIG. 1.—Diagram of the Diatoms at Clapochlar in 1926.

Loch Striven lent itself readily to such an investigation, since it was found, from general surveys, that the outbursts of diatoms were similar in kind and in time to the outbursts in other positions in the Clyde sea area. The water is not polluted by any village on the shore, and the land area draining into it is only twice the area of the loch itself. The loch was visited weekly during 1926, when the diatoms occurring at various depths were ascertained, together with the phosphate, oxygen, and salt content of the water, its temperature and hydrogen ion concentration. Nitrate and nitrite were always found in the water, but the presence of iron oxide in the water, washed down from the hills, was thought to vitiate the method of nitrate analysis employed.

The successive growths or 'flowerings' of diatoms is clearly shown in Fig. 1. They commenced near the surface, extending into deeper water and then dying out, to be followed by a succession of further flowerings. Each outburst was accompanied by an increase in oxygen, a fall in carbon dioxide—lowering the hydrogen ion concentration—and a fall in phosphate content of the water in the upper layers. A noticeable lag occurs between the commencement of a flowering and a fall in phosphate, and was also apparent with the changes in oxygen and carbon dioxide content of the water.

It is remarkable that the April outburst dies away and a week elapses before the second outburst starts in May, although phosphate available for growth remained in the upper layers. Again, the paucity of diatoms from June 4 until June 29 is not accompanied by a complete lack of phosphate.

Provided there was also nitrate available for their growth, these intervals indicate that the diatoms require some other factor besides light and nutrient salts, or possibly that they excrete some substance inimical to their future growth, as was suggested by Nathansohn in 1909, but for which there is no definite evidence.

The succession of outbursts in the loch during summer are more numerous than the 'usual' outbursts in the open sea, and this is attributed to vertical mixing during the summer months, caused by strong winds blowing up or down the loch, and refreshing the phosphate-depleted upper water stratum.

Another point of difference from the open sea is that the spring outburst of diatoms has been shown to depend largely upon the amount of sunshine in the early part of the year in the English Channel and near the Isle of Man, whereas in Loch Striven during the years investigated it actually occurred latest in the year with most early sunshine.

Dinoflagellates occurred irregularly but were never numerous, except in the surface layers during the summer months, appearing and disappearing suddenly. They were most numerous near the head of the loch and their development was apparently related to changes in temperature and dilution with rain-water. They caused no noticeable change in carbon dioxide or oxygen content of the water.

H. W. H.

[1] "The Relation of the Plankton to some Chemical and Physical Factors in the Clyde Sea Area," by S. M. Marshall and A. P. Orr. *Jour. Marine Biological Association*, vol. 14, pp. 837-868; 1927.

Wool and Wool Fibres.

RECENT activities of the British Research Association for the Woollen and Worsted Industries have included a visit by two members of its staff to certain of the textile centres of Belgium, France, and Germany. The Association has by this means endeavoured to secure first-hand information of the scientific work in connexion with wool and wool fibres which is being undertaken in those countries. It has also sought certain statistical information relating to the industry.

A report recently published by the Association gives an account of the institutions which were

visited and of the statistics which were obtained. The statistical portion of the report would lay no claim to completeness. Similar but more extensive information is included in the very useful appendices to the Survey of the Textile Industries published by Sir Arthur Balfour's Committee on Industry and Trade. Such statistical reports, in view of the somewhat meagre information which has hitherto been available, are of considerable value to the industry itself.

The report makes special reference to the work on the constitution of cellulose upon which Dr. R. O. Herzog and his colleagues are engaged at the Kaiser-Wilhelm-Institut für Faserstoffchemie, Berlin-Dahlem. Their work, which is based on the crystalloid theory of the structure of the wool fibre, has involved the considerable use of X-ray methods. The crystalloid theory of the wool fibre is not, of course, new. It does, however, provide a useful application of the relatively new conception of colloids of definite volume. Dr. Herzog gave a complete exposition of this work and of his own investigations in this connexion, at the spring conference of the Textile Institute, which was held in Cologne. A full account of the work appears in the *Journal of the Textile Institute*. Amongst other important investigations upon which Dr. Herzog is engaged, is the examination of the elastic properties of fibres. This work is of obvious importance to wool textile technologists.

Dr. Paul Krais, who directs the Deutsches Forschungsinstitut für Textilindustrie at Dresden, has devised an apparatus by means of which the evenness of stretch of fibres is being automatically recorded, apparently with rapidity and precision. He is also experimenting with a machine designed to measure felting properties. He appears to be able to secure that standard squares of cloth woven in different manner are subjected to uniform felting action under standardised conditions.

The portion of the report devoted to the activities at the Institut für Tierzucht at Hanover, and at Verviers and Roubaix, is likely to be of special interest to those actually engaged in the industry. At Hanover some three hundred students are being trained in animal husbandry under Dr. H. C. C. Kronacher, who is, of course, well known for his work on sheep breeding problems. At Roubaix and Tourcoing special attention is being given to the classing and sorting of wools. In its reference to this matter, the report contains the statement that the initial operation of wool sorting in England differs fundamentally in principle from that performed in France. In particular it asserts that "while in Bradford wool is sorted according to length of fibre, in Roubaix and Tourcoing it is sorted according to fineness." This statement appears to be misleading, as it does not represent entirely the current trade practice in Bradford wool-sorting warehouses.

The Association intends to continue the survey which it has initiated through these continental visits, by sending a member of its staff to Australia, New Zealand, South Africa, and Canada. The cost of this projected survey is to be met by the Empire Marketing Board, which has made a special grant of £2000 a year for two years to the Association. The survey is to include a study of sheep populations, of systems of management and marketing, of the relationship of wool to mutton production, of the distribution of breeds and types, and of the effect of climatic conditions and nutrition. The analysis of the various wools from the different colonies will form a complementary piece of work which will be undertaken in the laboratories of the Association.

The Fossil Redwoods of the Manchurian Coal Deposits.

IN recent issues of *Science News-letter*, issued by Science Service of Washington, D.C., Dr. R. W. Chaney discusses his discoveries of fossil redwood remains in the Manchurian coal deposits, and describes some investigations carried out in the arid region of the Gobi in Mongolia. It will be remembered that it was in this region that the expeditions of the American Museum of Natural History discovered the famous dinosaur eggs.

Dr. Chaney's investigations afford some light on the botanical and climatological conditions of the Gobi in geological times. He has been unable to find that the Gobi region has ever supported a rich forest of the Manchurian redwood type, or indeed any extensive forests at all. During the Cretaceous period, which was the time of the dinosaurs, the dominant trees were Araucarias, modern forms of which are known in cultivation as the monkey-puzzle tree, Norfolk Island pine, and by other names. They are now native only to lands in the southern hemisphere, especially in South America. The living Araucaria species all prefer cool, rather dry habitats, and independent geological evidence connected with the dinosaurs indicates that the Mongolian species of these great lizards were dry land, cool climate animals. Thus we have two lines of evidence that the Gobi of two million years ago was more or less like the Gobi of to-day; not so dry, perhaps, but certainly not a moist country, and subject to a rather cool climate.

Other fossils of a later date, the Tertiary, when the dinosaurs had become extinct, show that the Gobi had still much the same kind of climate. At present there are no trees at all in the Gobi proper, but in the canyons of the Altai Mountains, which extend out into it, there are numerous cotton-woods and shrubby junipers. These species, growing under conditions of low rainfall which make life possible for most woody growth, may be supposed to reflect the environment in Mongolia during the Tertiary, a suggestion which is amply supported by the associated fossil animals. These are almost entirely of types found in the plains, including none of the forest animals which should be preserved in the rocks had there been widespread forests in Mongolia during that period.

From the point of view of former tree distribution in Manchuria the work of Dr. Chaney unfolds a fascinating page. The forests that grow in northern California to-day, it is said, are so much like those Manchurian forests of millions of years ago that only an expert professional botanist could tell them apart. The track of the 'march of the redwoods,' as the author expresses it, was found associated with the great Manchurian coal deposits, some of which are already being worked. Mixed with the fossil records of the redwoods, though in far smaller amounts, were alder, oak, maple, and fern.

Dr. Chaney postulates the question: What was their line of march? Did they originate in the Old World and cross over to the New by way of the Bering Straits region, as the human race is assumed to have done? Or did they evolve first in America and go west until they reached Asia? He wisely refrains from giving an answer at present, until further research work has been undertaken in connexion with this absorbing problem. He refers to a hint, from the distribution map of the finds of redwood fossils, of a possible third alternative. These finds are spotted away up in the Arctic: in Spitsbergen, on the west coast of Greenland, on the waste tundras of northern Canada, and one find far up amongst those desolate islands north of Baffin Land

where Peary used to go when he turned his face towards the then unconquered Pole. Geologists have good evidence that these icy lands once had temperate climates, with at times even sub-tropic conditions. "May it not be that the nursery of the redwoods was in a lost polar paradise, now buried under the groaning glaciers of Greenland, or perhaps even sunk beneath the Arctic Ocean?"

Some idea of the climate of Manchuria of this geological period is obtained. The redwood fossils found were like the Californian coast redwoods, rather than the 'big trees' of the more inland mountains. The present Californian coastal forest enjoys an equable climate, without freezing temperatures, a rather humid atmosphere, and a rainfall of from forty to fifty inches, distributed fairly evenly throughout the year. This is a much milder climate than Manchuria has had during historic times, and probably than it has had since the Pleistocene, or glacial period. The existing Manchurian forests consist of oaks, maples, elms, and other species, but nothing resembling the redwood forests.

This investigation has opened up a most fascinating chapter in former tree distribution, and the results of Dr. Chaney's further researches will be awaited with interest.

Electrical Heating of Metals.

THE increasing interest which is being taken in electrical heating in connexion with heat-treatment of metals is exemplified by a pamphlet received from the Integra Co., Ltd., 183 Broad Street, Birmingham, as agents for the Leeds and Northrop Co., of Philadelphia, Pa., U.S.A. The necessity for the accurate heat treatment of expensive engineering steel parts is emphasised, the advantages of electric heating for this purpose, coupled with the exact control which is thus rendered possible, being probably ideal. The specific advantages possessed by electrical heating for hardening tools, dies, and similar articles are, in many cases, an increase of life due to accurate control of the time of heating and of the quenching temperature, reduction to a minimum of tools broken in the hardening and in distortion, and the possibility of treating the steel under conditions which do not lead to decarburisation. The equipment is flexible in the sense that it can be added to from time to time, and possesses the very marked industrial advantage that, since little heat escapes from the furnace into the room, the hardening plant can be put in the "line of production." The working conditions can also be made very much more pleasant than is often the case with other methods of heating. Electrical heating lends itself to accurate pyrometric, and often automatic, control, with a decrease in the amount of skilled labour required.

These advantages are possessed by Messrs. Leeds and Northrop's apparatus, but are, of course, inherent in electrical heating generally, when the apparatus is well designed, and are not possessed uniquely by the plant under review.

A pamphlet, also issued by the Leeds and Northrop Co., dealing with the electric furnace tempering of steel, describes their 'homo' furnace, which is suitable for the tempering of hardened steel parts. The outstanding feature of this apparatus is the reversible air current which is passed through the charge during the whole time that it is being heated up to the tempering temperature. The steel to be treated is contained in a basket which is lowered inside a cylindrical wall that forms the inner surface of the furnace. The basket is open at the top, and is closed at the lower end by a heavy grid. Below the basket is a fan driven by an external motor that reverses automatically, driving the heated air alternately up through the charge and down through an angular space between the basket and the wall of the furnace, and then in the opposite direction. Between the inner wall of the furnace, which closely surrounds the basket and the heavily insulated outer wall, is this air space in which the heating coils of nickel chromium wire are situated. A very uniform heating is claimed for the method, together with the impossibility of over-heating the charge in the basket.

The Relationship of Crop Yield and Weather.

IN the *Monthly Weather Review* for February last, Messrs. J. B. Kincer and W. A. Mattice give examples of the practical application of a method of showing the relationship between the yield of a crop and various meteorological factors affecting it during its period of growth. The figures relate to wheat in North Dakota and Ohio. The method may be described as a modification of ordinary partial correlation suitable to cases where so many factors are involved that full treatment by the ordinary methods of partial correlation would involve an excessive amount of computation. The final result takes the form of a regression equation between the yield x and a limited number of such weather factors as are found to have significant simple correlation with x. In each of the examples given these factors combined are equivalent to a single meteorological variable giving a correlation coefficient of 0·93 with x.

The method of calculation is as follows:

(1) Correlation coefficients are worked out between each weather factor and x. These are lettered in the order of their absolute magnitude, a being the largest.

(2) The partial correlation coefficient (or 'multiple coefficient' as it is called here) between a and x, eliminating the influence of b, is worked out, and similarly for c, d, e, etc.

(3) From the highest of these partial correlation coefficients the value of x for each year is computed from the appropriate regression equation.

(4) The quantity so obtained is designated a, and if we suppose that e is the weather factor that was eliminated in the partial regression equation, then e and a are not considered any further, the cycle of operations being repeated with a_2 in place of a, and the remaining factors b, c, d, f, etc.

(5) A fresh set of calculated values of x, arrived at from a_1 and another weather factor, give the values of the new quantity a_2, and, as before, another weather factor (c, say) drops out of the cycle, leaving a_2, b, d, f, etc.

(6) Up to a certain point the value of the highest partial correlation coefficient increases with each application of the process. When this point is reached a partial regression equation is formed involving the various factors used in the partial regression equations for a_1, a_2, a_3, etc., and the remaining factors are rejected.

The coefficients found indicate that about 86 per cent of the standard deviation of the yield is accounted for by the weather factors, which referred to temperature, sunshine, rainfall, and humidity, for the period April to July in the case of North Dakota, and late April to late September for Ohio. It is evident that the method may be applied to any variables, and could be used for forecasting. E. V. N.

University and Educational Intelligence.

CAMBRIDGE.—The abstracts of dissertations approved for the Ph.D., M.Sc., and M.Litt. degrees in Cambridge University for the year 1926–27 are interesting, if only for the light they cast on the use that is made of these junior research degrees to encourage research among the younger graduates of Cambridge and other Universities. The comparative abstention of the literary faculties remains as marked as before. Only 14 out of 55 degrees were awarded in the literary faculties and only 2 of these went to Cambridge graduates! Of the 41 science degrees, 15 were awarded to students trained wholly at Cambridge. The difference between different faculties is shown by the following figures for the different departments:—Physics 10, Mathematics 6, Biochemistry 5, Physiology 4, Botany 4, History 4, while Fine Arts, Music, Law, Moral Science, Geography, Architecture, and Anthropology are all unrepresented in the list. The difference is reflected also in the Colleges:—Trinity with 10, Emmanuel and Caius with 9 each, and St. John's with 7, head the list, while Magdalene, Pembroke, Peterhouse, Queens', St. Catherine's, Selwyn, and Trinity Hall are absent. Of the graduates educated elsewhere who came to Cambridge only for post-graduate work, 13 came from other Universities in England, 5 each from Canada and Scotland, 4 from India, 3 each from the United States and Wales, 2 each from Australia and Ireland, and 1 from New Zealand.

THE Trustees of the Ray Lankester Fund have appointed Mr. A. D. Hobson, of the Zoological Department in the University of Edinburgh, as Ray Lankester Investigator for the year 1928–1929.

THE fourteenth annual report of the Carnegie United Kingdom Trust contains little of outstanding interest. The policy of the Trust in respect of the Central Library for Students has, it is true, been endorsed by the Departmental Committee on Public Libraries, but so far the Treasury has not accepted the liability. Hence the future of the Central Library for Students still hangs in the balance. The reluctance of the Treasury is not without justification, for it is admitted in the report (p. 31) that it is impossible to estimate what the eventual cost of its administration will be. Our own view is that the matter is one for the county education authorities, and that the State contribution should be limited to a subsidy to the railways in return for reduced rates on the carriage of books. The growth of the Central Library for Students is slow, but the expenditure upon the 'outlier' libraries in former years is now bearing fruit. They supplied during the year 1927, 1361 volumes out of 1576 demanded. This is an astonishingly good result, and it is pleasant to think that it has been rendered possible by the re-organisation of the specialist libraries subsidised by the Trust. In the report for 1926 a new borough library policy was announced, which took the form of subsidising certain municipal libraries accepting the Trust's conditions. These generally involve the imposition of a higher library rate. The stimulus of the proffered grants appears to have been effective, for the boroughs competed keenly for the grants, and good results were obtained as a result of the improved conditions.

FROM the Universities Bureau of the British Empire we have received a report of the proceedings of the annual conference of the universities of Great Britain and Ireland, held this year at Liverpool on May 12. The only subject discussed was "The contribution of the universities to the preparation of teachers for their vocation," considered under the heads—What is the essential service which a university can render to the education of the intending teacher, and What should be the relation of universities to the specialised professional training of teachers. The discussion revealed striking diversities of opinion. Sir Charles Robertson (Birmingham) maintained that not merely should there be nothing vocational whatever in the degree courses of would-be teachers, but while studying for their degrees these aspirants should forget their intention to become teachers. Mr. Culverwell (Dublin), on the contrary, held that they should all along realise the bearing of the degree course on their future work, and Prof. Strong (Leeds) urged the institution of a degree course having a more definite relation to the work of teaching than any at present provided. Mrs. Simon (Manchester) proposed the abolition of university training departments, Prof. Nunn (London) that they should confine themselves to the field of adolescent education; whilst Mr. Boyd (Glasgow) upheld the Scottish ideal of a university degree course for every teacher, and suggested "a rethinking of our training system along the lines of the medical analogy." There was a marked cleavage between the speakers who accepted and those who rejected this analogy between training for the medical profession and training for teaching. In answer to criticisms of the present system of training grants, Lord Eustace Percy said he would be glad to receive from any university a definite scheme for a change-over from a grant for intending teachers to something in the shape of an additional State scholarship scheme.

THE Carnegie Foundation for the Advancement of Teaching, which has recently published its twenty-second annual report, administers an endowment of more than thirty million dollars, devoted mainly to the provision of retiring allowances and pensions for members of the staffs of universities and colleges in the United States and Canada. The annual reports review not only the work of the Foundation, but also pension systems, in whatever part of the world, which throw light upon the problem of teachers' pensions. With twenty years of experience and research to guide them and give authority to their opinions, the trustees, who are wholly opposed to non-contributory systems, have been able to secure a fairly general recognition of a principle which is of great importance to the cause of academic freedom—the principle, namely, that the accumulation arising from the joint payments of the college and the teacher is not liable to forfeiture on migration to another college or on discontinuing college work altogether. During the year under review, the University of Alberta in Canada was admitted to the list of institutions associated with the Foundation—"in recognition of its remarkable development and unusual promise." The Foundation interests itself not only in questions connected with pensions, but also with fundamental educational problems, and especially questions concerning professional education. Its publications during the year included a bulletin, the result of a five-years' study in close co-operation with the professional associations concerned, on dental education in the United States and Canada. Commenting on this and on the unsatisfactory relations between the medical and dental schools, the former belittling the efforts of the latter, and the dental students receiving inadequate instruction in oral medicine, the report says that in the medical as in the dental curriculum there is need for a readjustment of medical teaching in the direction of greater simplicity and a more direct contact for the medical student with the hospital and with the patient.

Calendar of Customs and Festivals.

ADDENDA.

August 5.

LAMMAS SUNDAY. GARLAND SUNDAY.—In Ireland this is a survival of a pagan festival in honour of the earth about to yield up its fruits. The farmer feeds his family on the first fruits. No potatoes may be dug before this day and no flower or fruit placed on the altar. The day was also devoted to solemn rites in honour of the dead. A garland was decorated the night before with coloured ribbons. Early in the morning maidens gathered flowers to decorate the garland, but no married woman might either gather flowers or touch the garland lest it should wither and bring ill luck. The procession to the churchyard was headed by the finest young man of the village, who bore the garland. If any of the apples which hung on the garland fell while they were on the way to the churchyard, it portended prosperity and long life for the bearer. But if an apple fell after the garland had been hung up in or near the churchyard it brought bad luck to all who were dancing at the time.

August 15.

In the Highlands of Scotland the Assumption of the Virgin Mary marks the middle day of autumn; it is known as the Big St. Mary, and is held in even greater veneration than the Little St. Mary of spring. It also marks the height of harvest, for, as the popular saying has it, it is the time of "Harvest, sheaf and binding, and men with their coats off."

In Ireland the Assumption of the Virgin was one of the great festivals of the year and was observed from a remote antiquity. It was mentioned by Ængus in his compilation of the Irish Saints at the beginning of the ninth century. A curious and obscure note to the passage points to a tradition other than that of the Church. "Mary is called 'Mother of Mœlruain,' because Mœlruain was her doctor, or because she was Mœlruain's sister." Again it may be noted a remarkable association of a male character with the Virgin.

'Ladyday in Harvest' is in Ireland the time of fruitfulness. An ancient Irish quatrain refers to 'the apple soft and yellow,' 'the berry black on the branch,' and 'the bellowing of cows and calves.'

The pilgrimages to which the name of patron was given were numerous on this day, and the wells dedicated to the Virgin were many. At Agadha, near Cloyne, Co. Cork, the people assembled to perform their stations and pray in the middle of a marshy field. A solitary tree near the well was covered with pieces of cloth tied to the tree by the pilgrims who had benefited by the waters—the familiar form in which the pagan offering or sacrifice survives, especially at holy wells. A patron at Our Lady's Well at Ballyhea was, by the influence of the clergy, converted into a cattle-fair.

August 24.

ST. BARTHOLOMEW'S DAY.—By an ancient custom of Croyland Abbey, little knives were given to all comers on St. Bartholomew's Day. In the north of England it was one of the days on which rush-bearing took place. At Dorrington, in Lincolnshire, a number of maidens went in procession to a chapel, where they strewed the floor with rushes and then went to a piece of ground known as the 'play-garths,' where they were followed by most of the inhabitants and the day spent in wrestling and other athletic sports.

In England, St. Bartholomew is perhaps most noted for the fair held for over seven centuries at Smithfield, London, until its abolition in 1855. It is said to have been constituted in 1133 by Henry I. as a grant to the monk Rahere, who had been his jester, and had founded the Priory of St. Bartholomew. It therefore was originally closely associated with the Church and was the occasion of the presentation of plays—mysteries, miracles, and moralities. It is to be noted, however, that traditionally the first proceedings of the fair after it had been opened by the Lord Mayor of London consisted of wrestling matches. After they were over, rabbits were let loose to be chased by the boys. Similar athletic sports, and especially wrestling matches, are the characteristic feature of the Lammas and other August celebrations, especially of the traditional type, of which some unquestionably go back to pagan times. The monastic character of the fair survived in the dialectical and grammatical disputations between the boys of the London schools which took place in the priory as recorded by Stow.

Many records, besides the famous 'Bartholomew Fair' of Ben Jonson, bear witness to the degeneration of the fair into a licence which led to its restriction to the original limit of three days, and its final abolition. Cases of dispute over debts and contracts and offences such as "slander of goods," which in the ordinary course would have been referred to the jurisdiction of the law, were settled within the fair by "the Court of Piepowders" held within the priory, and composed of a jury of traders formed on the spot, and the prior as president. Similar independence of jurisdiction within the fair is recorded in other cases. This is not entirely a privilege arising out of the ecclesiastical origin of the fair or its location on or within the bounds of church property—many fairs were held in churchyards—but is to be regarded rather as akin to the neutrality of the markets of primitive peoples. Where the trading is a by-product of a religious feast, the appeal to arms which in the ordinary course would settle a dispute between members of different tribes is taboo, and the sacred character of the occasion places it outside the usual jurisdiction. In Ireland, where the great national and provincial Games, such as the Tailltean Games revived in 1924, long antedate the introduction of Christianity, elaborate precautions were taken that the sacred peace of the Games should not be disturbed.

ST. OUEN.—A saint of N. France, who attained high office under Clothaire and Dagobert I. and became archbishop of Normandy, the author of many miracles. His shrine at Rouen was sanctuary and on one day in each year it procured the pardon of one criminal condemned to death in the prisons of the city. The criminal touched the shrine and his pardon was immediate.

August 25.

ST. MAELRUBA, MOURIE OR MOURY.—The saint whose feast day in the ecclesiastical calendar falls on April 21 (*see* St. Maelrubius, NATURE, April 14, p. 605) in Scotland was traditionally assigned a feast day on August 25. He has superseded a deity whose cult once extended over a wide area in the north of Scotland and culminated in a great festival in August. Both ritual and belief belonging to the earlier worship long survived in association with the saint. Down to A.D. 1678 bulls were sacrificed on this day on the island of Inis Maree, and milk was poured on hills as an offering. In the seventeenth century it is recorded that certain persons were indited for sacrificing a bull on the island of S. Rufus or Ellan Moury for the recovery of a woman from illness. Maelruba was frequently called the God Moury by the people of the area of which he was patron.

Societies and Academies.

LEEDS.

Philosophical and Literary Society, June 19.—J. Ewles: A torsion magnetometer. A new instrument for laboratory use based on the principle that the couple required to hold a magnet of moment M at right angles to a field H is MH. Magnetic forces are removed by balancing against the torsion in a phosphor bronze strip supporting the 'needle.' All the experiments usually performed with both the deflection and vibration magnetometers may be performed with this instrument.—**F. A. Long:** Note on the behaviour of a neon-tube under heavy discharge. When using a neon ('Osglim') lamp in parallel with the coils of an electromagnet, the discharge through the lamp on breaking the current was of bright bluish-violet colour instead of the usual pink glow, and included two or more flashes. An examination of current voltage during the discharge shows that at the commencement a current of several amperes passes, while the voltage falls much lower than the usual extinction value.—**C. W. Shoppee:** On the possibility of ring-chain valency tautomerism and of a type of mobile-hydrogen tautomerism analogous to the Wagner-Meerwein re-arrangement. Part 5: Pinacolic electron displacement as an explanation of various intramolecular transformations. A discussion and an attempted correlation of various intramolecular transformations on the basis of tautomeric change. The general mechanism proposed gives a satisfactory explanation of many known changes, and where divergences occur between theory and fact, reinvestigation confirms the theoretical prediction.—**L. R. Johnson and A. Wormall:** Potassium thiocyanate and the diastatic action of saliva and plant-diastases. Potassium thiocyanate exerts an activating influence on the diastatic action of human saliva, and this effect is significant, even with concentrations of the salt which may be present in the saliva. The thiocyanate appears to accelerate the first stages only in the hydrolysis of starch, and the rate of formation of reducing sugars is not markedly increased. The stimulating effect of this salt on the germination of potatoes and barley is discussed in relation to its influence on diastatic action.—**R. G. S. Hudson and F. W. Anderson:** On the Lower Carboniferous corals. *Hettonia fallax*, gen. et sp. n. The genus *Hettonia*, a member of the Clisiophyllidæ, is characterised by a solid central column built of an axial rod surrounded by tabular thickening. *Hettonia fallax*, the only species as yet described, is remarkable in that it possesses a distinct gerontic stage in which there is no columella, and therefore simulates *Caninia*. In addition, dedifferentiation is a common occurrence in this species. Certain new and undescribed structures are recognised in the ephebic stage of the corallite, and are attributed to calicular gemmation. The prototheca and part of the brephic structure are built while the young corallite is still attached to the parent individual, and remain there after separation of the young form.—**Lorna I. Scott and Ada B. Whitworth:** A structural peculiarity of the exodermis of the root of *Pelargonium*. In the root of *Pelargonium* the hypodermal cells develop a convex band of thickening, which runs round each cell on the radial and transverse walls. At maturity, the bands consist of lignified cellulose, with traces of silica, and show characteristic optical properties, which disappear on treatment with cellulose solvents.—**W. Garstang and Margery I. Platt:** On the asymmetry and closure of the endostyle in *Cyclosalpa pinnata*. The authors describe from sections the structure of the closed endostyle of *Cyclosalpa pinnata*. They confirm the absence of the left marginal band, and confirm it as due to the development of an interlocking mechanism by which the endostyle is firmly closed as a tube. The missing band, however, is present at both extremities with normal relations. The endostyle possesses a posterior growing point (cf. larval *Amphioxus*).

PARIS.

Academy of Sciences, June 25.—Gabriel Bertrand and Georges Nitzberg: α-Glucoheptulite. This alcohol is obtained by the action of reducing agents on α-glucoheptulose. It has the composition $C_7H_{16}O_7$ and is strongly lævorotatory. Details of the chemical and physical properties are given.—**J. Constantin:** Notes of Alpine pathology. Study of a parasite of *Picea excelsa*. The attack on the tree is more serious the greater the height above sea-level.—**A. Calmette, J. Valtis, and A. Lacomme:** New experimental researches on the tuberculous ultravirus. Proofs of the existence of tuberculous infection in infants of tubercular mothers. A distinction is drawn between true bacillar heredity, resulting from the direct transmission of the normal forms of the Koch bacillus, which is rare, and infection by the ultravirus, which is very frequent, and which does not appear to have grave consequences for the health of the infant provided the risk of reinfection is removed. Prophylactic measures suitable for the latter type of infection are suggested.—**André Blondel:** The yield of translucid diffusing globes and the principle of the conservation of the luminous flux.—**P. Helbronner:** The deviations from the vertical in Corsica.—**G. Friedel:** Remarks on a memoir of W. G. Burgers on uniaxial crystals possessing rotatory power.—**Edmund Wilson** was elected a Foreign Associate in the place of the late M. Lorentz: **Frédéric Swarts** was elected Correspondant for the section of chemistry.—**R. Coenen:** Isothermal surfaces.—**G. Vranceanu:** The absolute differential calculus of congruences.—**Alfred Rosenblatt:** The conditions of unicity of a solution of ordinary differential equations.—**Miécislas Biernacki:** Suites of holomorph functions.—**V. A. Kostitzin:** An integro-differential equation.—**Raphaël Salem:** The determination of the order of magnitude at the origin of certain trigonometrical series.—**André Roussel:** A pseudo-differential of a function.—**Alexandre Ghika:** The square functions capable of summation along the contours of their domains of holomorphism.—**R. Tambs Lyche:** The convergence of the series $\sum_{r=0}^{\infty} \begin{bmatrix} x \\ r \end{bmatrix} z^r$.—**Nikola Obrechkoff:** The summation of Taylor's series on the contour of the polygon of summability by the method of M. Borel.—**Georges Valiron:** A generalisation of a theorem of M. Landau.—**E. Cartan:** Closed Riemann spaces admitting a transitive continued group of displacements.—**J. Haag:** The calculation of certain elastic deformations, with application to the inertia of spirals.—**Jean Baurand:** The determination of the profile of a circular wave of small amplitude at the surface of a liquid.—**Mme. E. Chandon:** The variation of the latitude of the Paris Observatory.—**A. Danjon:** The photometric study of Algol with the visual cat's-eye photometer. The results of the obsèrvations are shown graphically.—**P. Lejay:** A method of recording the oscillations of a free pendulum and its applications to measurements of gravity. A modification of a method making use of Hertzian waves described in a previous communication. With photographic

oscillographs it is possible to read the record to 0·0001 second.—**Marcel Chopin**: A new method for measuring the temperature of a gas. The readings of a thermometer or a thermo-couple placed in a gas in motion are not exact owing to the radiation from the surrounding walls, the resulting error being considerable at high temperatures. The method proposed is based on the known relation between the weight of gas which passes through an orifice in a thin wall, the section of the orifice, the difference of pressure on the two sides of the wall, and the temperature. An outline is given of the application of this apparatus to the determination of the specific heat of gases at high temperatures.—**Emmanuel Dubois**: The Volta effect. From the experiments described it is concluded that water vapour plays an important part in the Volta effect.—**P. Daure**: Study of the secondary radiations observed in the molecular diffusion of light by fluids (the Raman effect).—**A. Blanc**: The photo-electric current as a function of the field in air at ordinary pressure.—**Mlle. C. Chamié**: The phenomenon of grouping of atoms for emanations and for mixtures of radioelements. The emanations of the radioelements given out to the air or dissolved in mercury form groups of atoms. With mixtures of radioelements heterogeneous groups are formed to a certain extent, but at the same time there are groups formed by members of the same family.—**A. Tian**: A reaction of double decomposition between saline vapours: fumes produced with gaseous salts.—**René Wurmser** and **Jean Geloso**: The limiting potential of solutions of glucides.—**Aubel** and **Bourguel**: The passage of pyruvic acid to alanine. A mixture of pyruvic acid and ammonia, in presence of colloidal palladium stabilised by starch, absorbs hydrogen very slowly: the completion of the reaction requires continuous shaking for six days. Pure alanine was extracted from the product of the reaction.—**E. Tassilly, A. Belot**, and **M. Descombes**: The use of solid caustic alkalies for the saponification of esters. The method detailed is shown to be of general application and is especially useful in the case of esters difficult to saponify or giving abnormal results by the ordinary method.—**Mme. Ramart-Lucas** and **F. Salmon-Legagneur**: The comparative stability of isomers according to their absorption spectra. Transpositions in the series of glycols and aldehydes.—**P. Brenans** and **Ch. Girod**: The triiodophenol obtained with the 5-iodo and 3·5-diiodosalicylic acids.—**Ch. Mauguin**: Study of the chlorites by means of the X-rays.—**E. Roch** and **C. Tingry**: The western termination of the Moroccan Haut-Atlas.—**Daniel Chalonge**: Study of the nocturnal variations of atmospheric ozone. The upper atmosphere does not contain less ozone at night than during the day. No seasonal variation was shown by the nocturnal proportion of ozone.—**Henryk Arctowski** and **Edward Stenz**: Study of the dusts which fell in the centre of Poland between April 26 and 28, 1928. Analyses of the dusts exclude the hypothesis of volcanic or Saharan origin and suggest that the dust came from Southern Russia.—**V. Hasenfratz** and **R. Sutra**: The immediate principles of the seeds of two species of Combretum.—**Philippe Fabre**: Chronaxy by cathode vacuum tubes.—**E. Huguenard** and **A. Magnan**: The production of electricity by the electric eel.—**Tahir Ertogroul**: The use of Wood's light for the early diagnosis of *grasserie* in silk worms. Silkworms in the early stages of this disease can be readily distinguished from healthy specimens under Wood's light.—**Paul Rossi**: Tuberculous ultravirus can exist in milk obtained from a tuberculous teat.—**Ch. Hruska**: The rôle of traumatism in the infection of the goat by anthrax through the alimentary canal.

Academy of Sciences, July 2.—**P. Helbronner**: Details concerning the measurement of the arc of the meridian in the French Alps.—**André Blondel**: A general method for measuring the absorption of a diffuser specimen.—**Pierre Weiss**: The specific heat of nickel above the Curie point. The atomic heat of nickel above the Curie point shows the same slow increase as copper. Their difference is constant and is equal to the part of the atomic heat corresponding to the kinetic energy of one degree of freedom.—**Léon Guillet, Galibourg**, and **Ballay**: The critical points and the martensitic tempering of nickel and nickel-chromium steel castings. A study of the changes in transformation temperatures produced by the addition of silicon, manganese, nickel, and chromium.—**Ch. Laforest-Duclos**: The prediction of cyclones in the Caribbean Sea and the Mexican Gulf.—**B. de Kerékjártó**: An elementary demonstration of the last theorem of Poincaré.—**Alfred Haar**: The unicity of solutions of partial differential equations.—**Hadamard**: Observations on the preceding communication.—**R. Guillery**: A recording manometer with a permanent control of its readings. The instrument described and indicated is designed to remove errors due to friction, can be altered in range by changing the spring, and can be easily calibrated.—**Th. de Donder**: Relativist thermodynamics of electromagnetic systems in motion.—**F. Pasteur**: The thermal utilisation of the solar radiation.—**Mario A. da Silva**: Electrons and positive ions in pure argon. From the experimental results given it is concluded that, within the limits of the sensibility of the measuring apparatus used, all the negative ions are electrons, starting with a mean effective field of 40 volts/cm.—**Mlle. Paule Collet** and **Francis Birch**: The paramagnetism of iron in potassium ferricyanide. For temperatures between 0° C. and 200° C., the atom of iron carries 12 magnetons.—**M. Ponte**: Absorption by excited mercury vapour and the reversal of the green line and its satellites.—**Edmond Rouelle**: A new category of ferro-magnetic frequency multipliers.—**C. Marie** and **P. Jacquet**: The hygroscopic and catalytic properties of electrolytic copper deposited in the presence of gelatine. These copper deposits contain small proportions of gelatine, copper sulphur, and water. Some peculiarities in the drying are detailed, and it is noted that the presence of these impurities confers catalytic properties on the copper, which, from the point of view of synthesis of water from hydrogen and oxygen, correspond with the action of finely divided copper reduced from the oxide at 220° C.—**Mme. Irène Curie** and **Frédéric Joliot**: The number of ions produced by the α-rays of radium C′ in air.—**Mlle. Jeanne Lévy** and **J. Sfiras**: The passage from a C_6 ring to a C_5 ring with molecular transposition by isomerisation of the oxides of phenylcyclohexene and of 1-phenyl-4-methyl-cyclohexene. The isomerisation of these compounds by distilling with a trace of anhydrous zinc chloride gives two isomeric oxygen products for each oxide. One is a ketone produced without molecular transposition, the other is an aldehyde containing the C_5 ring.—**Albin Marty**: The hydrogenation of the ether oxides.—**J. O. Haas** and **C. R. Hoffmann**: The geothermic situation of the petroleum bearing basin of Péchelbronn. A summary of the results of a series of thermometric determinations in the Péchelbronn oil region. It does not appear possible, as yet, to give a full explanation of the data. It is, however, certain that the rises of temperature cannot be explained by the presence of oil accumulations.—**Paul Corbin** and **Nicolas Oulianoff**: Contact metamorphism produced by the protogin of Mont Blanc.—**E. Rothé** and **Mme. A. Hée**: The magnetic properties of the stratigraphic

zones of the Rhine valley. The interpretation of the results of magnetic surveys requires a knowledge of the magnetic susceptibility of the underlying minerals, and these are frequently lacking. The magnetic susceptibility of over forty specimens from the Rhine valley are given.—**R. Esnault-Pelterie**: The law of the variation of the density of the atmosphere as a function of the height.—**M. Bridel, C. Charaux, and G. Rabate**: Ameliaroside, a new glucoside from the bark of *Amelanchier vulgaris*.—**Lucien Daniel**: The formation of thylles in grafted plants.—**Mme. L. Randoin and R. Lecoq**: The water soluble vitamines of group B. The probable existence of a thermostable and alkali stable factor necessary to life.—**Georges Bourguignon and André Walter**: Technical simplifications in the measurement of chronaxy in man with condensers. Description of the apparatus.—**A. Gourvitch**: Specific dynamic action in the cockroach.—**Marcel Avel**: Castration in Lumbricus does not prevent the evolution of the secondary sexual characters, anatomical and physiological.—**G. Guittonneau**: A spore-forming bacillus acting as a lactic ferment at high temperatures. No lactic organism hitherto described possesses a notable activity above 55° C. The organism now described, named *Thermobacillus tarbellicus*, multiplies most rapidly at 68° C., and survives exposure to a temperature of 100° C. for half an hour.—**G. Marinesco**: The rôle of autolysis in the pathogeny of Charcot's disease.

GENEVA.

Society of Physics and Natural History, May 24.—**Arnold Pictet and Mlle. Ferrero**. Heredity in the tufted guinea-pig. Dissociable conditional and localisation factors. The authors have proved the production of two types by crossing tufted guinea-pigs with smooth guinea-pigs. These types follow Mendel's law.—**R. Wavre**: The rigorous solution of the problem of figures of equilibrium. Starting with data more general than hitherto, the author gives a simpler demonstration of the impossibility of a distribution in homothetic surfaces of layers of equal density of a heterogeneous fluid in rotation.—**E. Rod and G. Tiercy**: Note on the rate of the chronometer *Nm* of the Observatory of Geneva. The authors have carried out a series of observations which show that the rate of this chronometer, during two months, remains between +1·01 seconds and +1·32 seconds. The pressure effect is normal: some anomalies appear to arise from accidental temperature variations.—**E. Joukowsky**: The cementation of the quaternary gravels. A working hypothesis. The author applies the well-known fact of the reduction in the solubility of calcium carbonate in the presence of carbon dioxide when the temperature is raised between 0° C. and 50° C., and admits that cold waters have, other conditions remaining the same, a greater incrusting power than warm waters. He shows that the cementation, in a given spot, in the peripheral portions of a glacier, should be stronger during its retreat than during its advance.

LENINGRAD.

Academy of Sciences (*Comptes rendus*, No. 7).—**N. G. Chetaiev**: The equations of Poincaré.—**A. Tsvetkov**: The spontaneous movements of *Paramecium caudatum*. Quantitative studies on movements of *Paramecium* show that the movements are due to some disturbances of intracellular chemical equilibrium.—**L. Berg**: The origin of northern elements in the fauna of the Caspian Sea. The Caspian fauna includes a series of northern forms, like *Stenodus leucichthys*, gull., *Limnocalanus grimaldi* de Guerne, *Chiridothea entomon caspia* Sars, etc. Hypotheses offered by previous authors are analysed, and it is concluded that these northern forms reached the Caspian Sea by way of the Volga, the basin of which has been, during the postglacial period, in connexion with a large lake basin adjoining the Baltic Sea.—**B. Gorodkov**: The work done by the expedition of the Academy to the sources of the River Gyda (Yenisseisk Province). A preliminary account of the expedition, which has done some geographical, botanical, zoological, and ethnographical work in the regions hitherto unexplored.

Comptes rendus, No. 8.—**K. Sapozhnikova**: Respiration of wheat seeds in ionised air. Results of the experiments indicate that ionised air exercised an inhibitory action on the respiration of seed, and the inhibition is due to the presence of free ions not only of oxygen, but also of nitrogen and of other gases of the air.—**S. Arcybyshev and J. Parfianovich**: The radio-activity of springs and minerals in the vicinity of the River Sludanka. Determinations of radio-activity of natural waters and minerals.—**K. Matvejev**: Tungsten deposits in the Southern Ural. A mineralogical and chemical study of the deposits.—**L. Sturm and T. Simakova**: Microbiological examination of some specimens of sulphur from the Crimea and Turkestan. Specimens of sulphur from various deposits showed different bacteriological characteristics. In some of these only bacteria oxidising sulphur were found; in others, desulphurating bacteria were also present.

SYDNEY.

Royal Society of New South Wales, June 6.—**A. R. Penfold**: The chemistry of Western Australian sandalwood oil (Part 1). Although it has been proved equivalent, if not superior, to the East Indian oil in pharmacology, the chemical composition of Australian sandalwood oil has been the subject of much controversy during recent years. It is very complex in composition, much more so than the East Indian. Various sesquiterpene alcohols, which constitute 95 per cent of the oil, have been identified and a simple colour reaction for distinguishing the two types of oils devised.

VIENNA.

Academy of Sciences, May 10.—**W. Leithe**: The natural rotation of polarised light by optically active bases (1). The influence of the solvent on the rotation of *d*-*a*-pipecolin and its chlorohydrate.—**K. Menger**: The metrics of Hilbert's space.—**O. Dischendorfer and E. Nesitka**: Nitrated *ms*-phenyldinaphtho-pyranes (3). Condensation of aldehydes with phenols.—**O. Richter**: Sodium, a necessary nutrient element for a marine aerophilic luminous bacterium. Sodium chloride has a double task, nutrient and osmotic. The minimum quantity of sodium chloride to be added to a stock solution of peptone and to fulfil both tasks is about 0·5 per cent, the maximum 5 per cent, the optimum 2·3 per cent. But other sodium salts or salts containing minute traces of sodium will do. Sodium is essential, sodium nitrate being the most effective sodium salt.

Official Publications Received.

BRITISH.

Journal of the Society for the Preservation of the Fauna of the Empire. New Series, Part 8. Pp. 137. (London: H. F. and G. Witherby.) 3*s*. 6*d*.

Transactions of the Royal Society of Edinburgh. Vol. 56, Part 1, No. 1: The Igneous Intrusions between St. Andrews and Loch Leven. By Dr. Frederick Walker and John Irving. Pp. 17+1 plate. 2*s*. 6*d*. Vol. 56, Part 1, No. 2: Size in relation to Internal Morphology. No. 3: The Vascular System of Roots. By Dr. Claude W. Wardlaw. Pp. 19-55. 4*s*. 6*d*. (Edinburgh: Robert Grant and Son; London: Williams and Norgate, Ltd).

The Journal of the Royal Anthropological Institute of Great Britain and Ireland. Vol. 58, January to June, 1928. Pp. 303+24 plates. (London.) 15*s*. net.

Transactions of the Optical Society. Vol. 29, No. 4. Pp. 149-196. (London.) 10s.

Department of Scientific and Industrial Research. The Investigation of Atmospheric Pollution. Report on Observations in the Year ending March 31st, 1927. Thirteenth Report. Pp. iv+54. (London: H.M. Stationery Office.) 6s. 6d. net.

Memoirs of the Geological Survey of India. Palæontologia Indica New Series. Vol. 10, Memoir No. 3: Les couches à *Cardita beaumonti*, Par Prof. Henri Douvillé. Pp. ii+25+4 planches. 2.12 rupees; 5s. Vol. 10, Memoir No. 4: A Supplement to the Molluscs of the Ranikot Series. By the late E. W. Vredenburg. Edited with Notes by Dr. G. de P. Cotter. Pp. iv+75+9 plates. 6.12 rupees; 11s. Vol. 11: Revisions of Indian Fossil Plants. Part 1: Coniferales (a. Impressions and Incrustations). By Prof. B. Sahni. Pp. iii+49+6 plates. 3.12 rupees; 6s. 6d. Vol. 12: The Fauna of the Agglomeratic Slate Series of Kashmir. By the late H. S. Bion. With an Introductory Chapter by C. S. Middlemiss. Pp. iv+42+8 plates. 6.8 rupees; 10s. 6d. Vol. 13: The Artiodactyla of the Eocene of Burma. By Dr. Guy E. Pilgrim. Pp. iii+39+4 plates. 3.12 rupees; 6s. 6d. (Calcutta: Government of India Central Publication Branch.)

Survey of India. Geodetic Report. Vol. 1, From 1st October 1922 to 30th September 1925. Pp. xii+323+16 plates. (Dehra Dun.) 6 rupees; 9s. 9d.

Department of Agriculture, Madras. Bulletin No. 89: The Conduct of Field Experiments. By R. O. Iliffe and B. Viswa Nath. Pp. vii+51. (Madras: Government Press.) 1.4 rupees.

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The Scientific Proceedings of the Royal Dublin Society. Vol. 19 (N.S.), No. 4: Influence of Temperature on Response to Electrical Stimulation. By Prof. Henry H. Dixon and T. A. Bennet-Clark. Pp. 27-38. (Dublin: Hodges, Figgis and Co.; London: Williams and Norgate.) 1s.

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FOREIGN.

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Ministry of Public Works, Egypt: Physical Department. Meteorological Report for the Year 1922. Pp. xiii+170. (Cairo: Government Publications Office.) 40 P.T.

Annales de l'Institut de Physique du Globe de l'Université de Paris et du Bureau central de Magnétisme terrestre. Publiées par les soins de Prof. Ch. Maurain. Tome 6. Pp. iv+153. (Paris: Les Presses universitaires de France.)

Bernice P. Bishop Museum. Bulletin 45: The Ecology of an Hawaiian Coral Reef. By Charles Edward Edmondson. Pp. 64. 1 dollar. Bulletin 47: Land Snails from Hawaii, Christmas Island and Samoa. By Henry A. Pilsbry, C. Montague Cooke, Jr., and Marie C. Neal. Pp. ii+49. 1 dollar. Bulletin 49: Hawaiian Shallow Water Anthozoa. By Addison E. Verrill. Pp. 30+5 plates. 1 dollar. Memoirs, Vol. 9, No. 5: The Morioris. By H. D. Skinner and William Baucke. Pp. 44+8 plates. 2 dollars. (Honolulu, Hawaii.)

Department of Commerce: Bureau of Standards. Miscellaneous Publication No. 84: Standard Time Conversion Chart. Prepared by R. E. Gould. (Washington, D.C.: Government Printing Office.) 10 cents.

Publications of the Kapteyn Astronomical Laboratory at Groningen. No. 42: The Proper Motions of 2292 Stars derived from Plates taken at the Radcliffe Observatory. Measured and discussed by Prof. Dr. P. J. van Rhijn, Dr. W. J. Klein Wassink and B. J. Bok. Pp. iv+18+T25. (Groningen: Hoitsema Bros.)

Reports of the Imperial Industrial Research Institute, Osaka, Japan. Vol. 9, No. 3: Dispersoidological Investigations. 22: Jellies and Gelatinous Precipitates; their Classification, Conditions of Formation, Structure and Industrial Application. By Prof. Dr. P. P. von Weimarn and collaborators. Translated from the Russian by Mrs. P. P. von Weimarn. Pp. 196+12 plates. (Osaka and Tokyo: Koseikai Publishing Department.) 4.35 yen.

Department of Commerce: U.S. Coast and Geodetic Survey. Special Publication No. 142: Tides and Currents in Boston Harbor. By Paul Schureman. Pp. iii+116. (Washington, D.C.; Government Printing Office.) 30 cents.

Reprint and Circular Series of the National Research Council. No. 81: First Report of the Committee on Photochemistry. Pp. 481-575. (Washington, D.C.: National Academy of Sciences.) 1 dollar.

Iowa Geological Survey. Vol. 32: Annual Reports, 1925 and 1926, with Accompanying Papers. Pp. 557. (Des Moines, Iowa.)

The Academy of Natural Sciences of Philadelphia. Special Publication No. 2: Crystallographic Tables for the Determination of Minerals. By Victor Goldschmidt and Samuel G. Gordon. Pp. 70. (Philadelphia, Pa.) 1.50 dollars.

Proceedings of the United States National Museum. Vol. 73, Art. 8: A Revision of the American Parasitic Flies belonging to the Genus Belvosia. By J. M. Aldrich. (No. 2729.) Pp. 45. Vol. 73, Art. 9: The Scorpions of the Western Part of the United States, with Notes on those occurring in Northern Mexico. By H. E. Ewing. (No. 2730.) Pp. 24+2 plates. (Washington, D.C.: Government Printing Office.)

Smithsonian Institution: United States National Museum. Bulletin 144: The American Bats of the Genera Myotis and Pizonyx. By Gerrit S. Miller, Jr., and Glover M. Allen. Pp. viii+218. (Washington, D.C.: Government Printing Office.) 55 cents.

Year Book, The Academy of Natural Sciences of Philadelphia, for the Year ending December 31, 1927. Pp. 106+9 plates. (Philadelphia, Pa.)

Proceedings of the Academy of Natural Sciences of Philadelphia. Vol. 79, 1927. Pp. iii+334+229-583+26 plates. (Philadelphia, Pa.) 6.25 dollars.

American Institute of Weights and Measures: Scientific Papers. A Precision Value for the Inch. By Luther D. Burlingame. Pp. 9. (New York City.)

Bernice P. Bishop Museum. Bulletin 46: Tales and Poems of Tonga. By E. E. V. Collocott. Pp. 169. Bulletin 48: Ancient Tahiti. By Teuira Henry. Based on Material recorded by J. M. Orsmond. Pp. iv+viii+651. (Honolulu, Hawaii.)

U.S. Department of Agriculture. Farmers' Bulletin No. 1557: Insects attacking the Peach in the South and how to Control Them. By Oliver I. Snapp. Pp. ii+42. (Washington, D.C.: Government Printing Office.) 10 cents.

Proceedings of the United States National Museum. Vol. 73, Art. 5: Two common Species of Parasitic Crustacea (Sacculinidae) of the West Indies. By H. Boschma. (No. 2726.) Pp. 10. (Washington, D.C.: Government Printing Office.)

Proceedings of the Academy of Natural Sciences of Philadelphia, Vol. 80. Mexican Mollusks. By Henry A. Pilsbry. Pp. 115-117. (Philadelphia, Pa.)

Conseil Permanent International pour l'Exploration de la Mer. Rapports et Procès-verbaux des Réunions. Vol. 47: Rapport Jubilaire (1902-1927). Pp. iv+273. (Copenhague: Andr. Fred. Høst et fils.)

CATALOGUES.

British Chemical Balances and Weights. Pp. 24. (London: L. Oertling, Ltd.)

Electro-Medical Apparatus. (Bulletin No. 99.) Pp. 60. (London: Watson and Sons (Electro-Medical), Ltd.)

Diary of Societies.

SATURDAY, AUGUST 18.

NORTH OF ENGLAND INSTITUTE OF MINING AND MECHANICAL ENGINEERS (Newcastle-upon-Tyne), at 2.30.—Annual General Meeting.

CONGRESS.

AUGUST 20–25.

INTERNATIONAL CONGRESS AGAINST ALCOHOLISM (at Antwerp).—Sir Arthur Newsholme: The Alcohol Question and Social Hygiene.—Prof. Firket: The Concentration of Alcohol in the Blood and the Diagnosis of Drunkenness from the Medico-legal and Insurance Aspects.—Prof. Laitinen: Recent Experiments on Alcohol and Heredity.—Dr. Puusep: Changes in the Endocrine Glands in the Descendants of Alcoholics, the Endocrine Glands and Inebriety, the Permeability of the Meninges in Alcoholics, and the Excitability of the Cerebral Tissue in the Descendants of Alcoholics.—Prof. H. Emerson: Results of American Prohibition from the Hygienic Aspect.—Drs. Vervaeck and Meeus: Social Effects of the Belgian Liquor Law of 1919.—Dr. Dahlgren: Alcoholism in Russia.—Drs. Bellin du Coteau and Bergeron: Alcohol and Sport.