ing, and is characterised by an increasing frequency of Marl bands. These he regards as evidences of shallow lakes, and compares them with similar pools now found in the desert regions of South Africa. The muds forming the floors of these pools, both in the recent and older examples, contain Estheria, and afford impressions of foot-prints, raindrops, and desiccation cracks. The Keuper Marls he compares with the Loess of eastern Europe, and the beds of salt, gypsum, and other salts he regards as the result of evaporation in lakes.

Mr. Holland referred to certain phenomena in the Rajputana desert that supported Mr. Lomas's views with regard to the processes of concentration in arid regions, and gave evidence of the sifting action of wind in India. Similar bands of silt and mud are found filling in hollows in the Archæan rocks. He was not prepared to admit that the features of the British Trias were due only to wind action, but in the main they were due to conditions prevailing in desert regions. Prof. Cole pointed out that, in dealing with the British Trias, we must not forget the great sea eastwards and the likelihood of the establishment of a monsoon system on its margin. This might set up an intense rainy season for, say, three months in the year, followed by a dry season. Sheets of pebbles without well-defined water channels are compatible with general evidence of desiccation. Mr. R. D. Oldham showed that the only agency forming pure sands comparable with the Trias is wind. Mr. Clement Reid compared the peculiar stiff-stemmed flora of the desert with those found in the Trias.

The papers dealing with palæontology were more than usually interesting. Mr. C. G. Danford exhibited and described a fine series of ammonites from Speeton. Mr. A. C. Seward dealt with the Jurassic flora of Yorkshire, and Dr. H. Woodward, in describing a wonderful collection of arthropods from the Coal-measures at Sparth Bottoms, showed what an enthusiastic band of collectors can do, when work is taken in hand in the spirit which characterises the Rochdale geologists.

The report on the fauna and flora of the Trias included an important paper by Dr. A. Smith Woodward on *Rhynchosaurus articeps*, and Mr. H. C. Beasley and Mr. Lomas described the great finds of Triassic foot-prints which have recently been discovered at Storeton, in Cheshire, and Hollington, in Staffordshire.

In petrology and mineralogy great interest was shown in the announcement by Prof. Edgeworth David that diamonds had been found embedded in the matrix near Inverell, New South Wales.

Mr. T. H. Holland demonstrated the peculiar properties of a variety of sodalite from Rajputana. When freshly broken it has a bright carmine colour, which changes to dull grey on being exposed to light. The carmine colour returns when the specimen is kept in the dark. Prof. H. S. Reynolds dealt with the igneous rocks in the district south-west of Dolgelly, and described the occurrence of a picrite from the eastern Mendips.

In general geology Mr. J. Parkinson gave an interesting account of the post-Cretaceous geology of Southern Nigeria, Prof. Cole outlined a scheme of geology suited to agricultural scholars, and Prof. J. Milne discussed certain earthquake relationships.

While the time of the section was fully taken up by the consideration of the above subjects, no less than thirty-seven papers dealing with strictly geological matters were read in other sections. J. L.

ZOOLOGY AT THE BRITISH ASSOCIATION.

THE large attendance at many of the meetings of Section D was sufficient evidence of the general interest of the programme, which included discussions upon the Tanganyika problem, the nature of fertilisation, spicule formation in sponges, the bearing of scientific marine investigations on practical fishery problems, and a number of papers on special subjects, only a few of which can be noticed here.

The Tanganyika Problem.

The discussion on the Tanganyika problem was opened by Mr. J. E. S. Moore, who dealt, first, with the characters of fresh-water faunas in general, pointing out the wide distribution of many fresh-water organisms over the land surfaces of the world. He held that the difficulties in the way of the migration of these animals were so great that their wide distribution could not be attributed solely to such migration. He suggested that in all probability the sea is becoming more salt, and that this change may have been concerned in the production and separation of marine and fresh-water faunas. Whatever the actual cause of separation, as the general fresh-water fauna of the globe possessed certain archaic characters it would be convenient to name this the primary fresh-water fauna. To this primary fauna there are added in many places, *e.g.* in the Caspian Sea, animals which have, from their structure and affinities, been obviously derived from the sea, and have an origin independent of that of the fresh-water fauna of the region in which they occur. To these animals Mr. Moore applied the name halolimnic. There are in Tanganyika a number of animals peculiar to that lake, and regarded by Mr. Moore as halolimnic. The mollusca of the lake are represented by certain ordinary fresh-water forms, but, in addition, there are several not closely related to any recognised fresh-water type, nor does their anatomy suggest that they have been evolved from any African fresh-water form; there are four Polyzoa, only one of which is phylactolæmatous, and it may be inferred that the other three are derived from marine forms, while the occurrence of a medusa is also suggestive in this connection. There are three possible explanations of these faunistic peculiarities:—(1) that they are due to direct modifications of the general African fresh-water fauna; (2) that they are constituted by the presence in the lake of the remains of an extinct fresh-water fauna; (3) that they are due to the presence of halolimnic elements. Mr. Moore regarded the last as the correct explanation, and referred to the similarity of the shells of certain Tanganyika gastropods to those common in Jurassic seas. The evidence points to Tanganyika having been isolated a long time from the sea.

Mr. W. A. Cunnington gave a brief account of the third Tanganyika expedition, from which he had recently returned. 115 fishes are now recorded from the lake, 102 of which occur nowhere else. Twelve species of prawns (of which only one has been found elsewhere) are all specialised in the direction of reduction of gills, and the four species of crabs are all endemic. These facts are probably to be explained by the long isolation of the lake. It is curious that no Cladocera were met with in Tanganyika, though they are abundant in Victoria Nyanza and Lake Nyassa.

Prof. J. W. Gregory considered that there are no evidences of marine rocks in the plateau of equatorial Africa, though it is evident that the plateau is of great antiquity. The idea of the occurrence of the sea in the Tanganyika valley should be abandoned. He suggested that the "halolimnic" fauna is rather to be explained as a part of an ancient lake fauna at one time widely distributed over Africa, but now surviving only in Tanganyika.

Prof. Pelseneer pointed out that the external resemblances of shells are often illusory, and the results to which they lead quite uncertain, therefore only the study and comparison of the internal organisation of the molluscs can throw light on the question at issue. Messrs. Moore and Digby have suggested that some of the Tanganyika molluscs have affinities to certain marine forms, Chytra being related to Hipponyx and Capulus, Spekia to Lamellaria, and Edgaria (=Nassopsis) to the Architæniglossa; but Prof. Pelseneer held that there are really no affinities, in the usual sense of the word, between these forms, but only distant resemblances, such as are common to all the Tænioglossa, to which group these "halolimnic" forms belong. Nor do they present archaic characters to a greater extent than other fresh-water genera not "halolimnic," such as Ampullaria and Paludina. Prof. Pelseneer concluded that all the "halolimnic" gastropods belong to the family Melaniidæ or to closely related types, as is shown by their radulæ, otocysts, &c., and by special details of their biology—their fresh-water habitat and viviparity. The study of two genera (Giraudia and Lavigeria) the organisation of which has only just been investigated supports this conclusion. Both have in their otocysts multiple otoliths, one otolith being much larger

than the others in two species of Giraudia. Lavigeria, the only genus of which a female has been examined, is viviparous, and its radula most closely resembles that of the Melaniid genus Chiara, while the radula of Giraudia is clearly similar to that of the Melaniid genus Ancylotus.

Dr. G. A. Boulenger, in reviewing the evidence afforded by a study of the fishes, said that the Cichlid fishes, which form so large a proportion of the fishes of Tanganyika, are examples of an extraordinary modification of one type which has entered fresh water all over Africa, and that this lake seems to have served as a nursery for genera and species of this family. The Cichlids of Victoria Nyanza seem to have arisen, like those of Tanganyika, from a small number of generalised types. The fishes of Tanganyika indicate a long isolation of the lake, perhaps extending back to Miocene times.

The Nature of Fertilisation.

The discussion (conjointly with Section K) on the nature of fertilisation was initiated by Dr. V. H. Blackman, who gave a brief account of the recent work on which the present views of fertilisation are based, dealing specially with the *rôle* of the chromosomes, and taking as a starting point the theory put forward by Montgomery (1901), that in synapsis the maternal and paternal chromosomes unite in pairs and are later separated by the reduction division, which thus divides the somatic chromosomes into two groups. Fertilisation appears to be incapable of exact definition, for apogamy and parthenogenesis link it on to vegetative reproduction, and, indeed, nuclear fusions and reductions occur in plants apart from reproduction, *e.g.* in graft hybrids of Mespilus and Cratægus there is evidence that the fusing of vegetative cells has led to the mixing of characters.

Prof. Calkins described his experiments proving that it was possible to carry cultures of Paramœcium through a certain number of periods of depression, and to renew their vitality by means other than nuclear fusion (conjugation), he having been able to do this by treatment with beef extract and with extract of pancreas and brain. Prof. M. Hartog cited what he considered to be comparable cases of the orange, Funkia, &c., where cells of the nucellar tissue grow into the embryo-sac cavity, and, under the stimulus of the exceptional nutrition, grow into embryos which behave exactly like the normal embryos produced by the fertilised oosphere in the same favoured feeding place.

Mr. L. Doncaster gave a brief account of the maturation of parthenogenetic eggs, pointing out that many eggs which produce, not only one, but two polar bodies, may develop parthenogenetically. The fate of the polar nuclei varies considerably; in some cases they are cast out and lost, in others they remain in the egg, and (as in Artemia) one may conjugate with the egg nucleus, taking the place of the spermatozoon.

Dr. Rosenberg (Stockholm) described his experiments on the production of hybrids of *Drosera rotundifolia* and *D. longifolia*, the cells of the former having ten and of the latter twenty chromosomes. In certain of the daughter nuclei, ten, eleven, or twelve chromosomes move to one pole during division, the same number to the other pole, and between these lie a number of separate chromosomes, which are later taken into one or other of the division nuclei. In Hieracium, one polar nucleus returns to the embryo-sac cell and fuses with the egg-cell, producing a cell with unreduced number of chromosomes. Dr. Ostenfeld afterwards stated that Hieracium was able to produce fruits without ordinary fertilisation having taken place.

Prof. Hickson considered that the evidence that the chromosomes are the sole bearers of the hereditary characters had been much weakened during recent years by the results of such experiments as those on enucleated eggs fertilised by the sperms of another species, which gave rise to larvæ showing sometimes paternal and sometimes maternal and mixed characters.

Mr. H. Wager pointed out that in many of the lower organisms the nucleus does not seem to be concerned, as in higher organisms, in the blending, during fertilisation, of two distinct lines of descent, but presides over the nutritional activities of the cell, and fertilisation is replaced by various nutritional devices.

Spicule Formation in Sponges.

Prof. Minchin discussed a number of facts bearing on spicule formation in calcareous sponges, and concluded that the form of primary spicules is in no way dependent upon the physical properties of the material (calcite), but is regulated solely by biological conditions. When, however, primary spicules are joined together to form spicular systems, the physical properties of the material may exert an influence upon the form of the spicule as a whole by determining the angles at which the rays join together. Prof. Dendy dealt more particularly with the evolution of the various forms of siliceous spicules in the Tetraxonid sponges, showing that they are all derivable from a primitive tetraxon form. He showed that these spicules originated singly in mother-cells, and endeavoured to explain their great diversity of form as the result of the action of variation, heredity, and natural selection. Mr. W. Woodland contended that the forms of spicules are not inherited, for such an inheritance of forms of spicules adapted to the architecture of the organism implies that wandering cells (scleroblasts) are severally able to produce a part of the adult organism, an organ, in fact, related in form to the other parts. The collection of scleroblasts disposed about the spicule forming the protoplasmic mould in which the spicule is deposited is the organ assumed to be inherited. Such a theory seems to be contradicted by the facts of experimental embryology, which shows that a blastomere can only give rise to an integral part of the adult organism in virtue of its localised connection with other blastomeres. Mr. Woodland concluded, therefore, that the form of the deposited spicule determines the disposition of the scleroblasts, and not *vice versâ* (as held by the advocates of the inheritance of spicule form), and that spicular phenomena may be fully explained by reference to known physical facts. He suggested that many spicules are probably closely allied in their mode of origin to the curious structures (colloidomorphs) formed by mineral substances deposited in colloidal media.

Fishery Problems and Marine Investigations.

Dr. E. J. Allen opened a discussion on the relations of scientific marine investigations to practical fishery problems. He pointed out that the great growth of the fishing industry during the last thirty years has been accomplished by practical fishermen, and, in some directions at least, science could even now help little, *e.g.* in the case of drift-net fisheries any attempt to increase the supply would probably be futile. In the case of trawl fisheries a diminution in the source of supply has taken place, but there is hope of increasing the actual supply of fish in the grounds by (1) regulation and restriction of fishing; (2) re-stocking exhausted grounds by hatching or by transplantation; and (3) destruction of the enemies of food fishes. Before such measures can be carried out with much hope of success, a complete and exact knowledge is necessary of the habits and life-histories of the fishes, and of the conditions under which they live.

Dr. W. Garstang discussed the question of the diminution of the stock of plaice in the North Sea, and the methods suggested for increasing the supply. The diminution is supposed to be caused by the excessive fishing of young fish. In the southern part of the North Sea (Flemish Bight) most of the fish caught are less than 30 cm. in length, while on the Dogger Bank most are more than 30 cm. long. From January to June the small plaice are found chiefly inshore and out to the 11-fathom line; from June to December they travel out to the 20-fathom line. This gives a rough idea of the migration of the young plaice outward into deeper water during the summer and autumn months, and is confirmed by the results of marking experiments. The migration of fish to the Dogger Bank is, therefore, not a direct and simple one, but takes place in at least two stages. Much more information is still required concerning the normal distribution of fishes of various sizes, the migration of young fish, and the causes which determine rapidity of growth.

Mr. G. L. Alward expressed his belief in the value of fish hatcheries, and also advocated the exploration of the area between Norway and Iceland in the hope that new fishing ground may be found so as to relieve the present

strain on the resources of the Dogger Bank. Dr. Masterman and others advocated the attacking of special problems, and thought that the more general questions might be for the present postponed.

Systematic Study of Oceanic Plankton.

Dr. G. H. Fowler put forward some suggestions for the more systematic study of oceanic plankton. Evidence that temperature appears to be the chief determinant in the distribution of plankton was cited, the highest depth of a species being the position of its maximum, the lowest depth that of its minimum, temperature at any given geographical position. It was urged that, for the solution of the problems demanding attention, oceanic expeditions should be confined to the systematic study of small areas instead of making long voyages, that the upper zones of water should be more carefully investigated than has hitherto been the case, and that standard tow-nets should be adopted internationally by all expeditions in order to afford means of comparison of the fauna in different seas and under different conditions.

Life Cycle of the Protozoa.

Prof. Calkins referred to some features in the life cycle of the Protozoa, and urged that the whole life cycle should be worked out before a new species could be regarded as safely established. This safeguard would prevent confusion and the undue multiplication of species. Prof. Calkins showed, for example, that two such well-known and apparently fixed species as *Paramoecium caudatum* and *aurelia* are no longer to be regarded as distinct. During the progress of a culture of *P. caudatum*, an individual appeared with all the characters of *P. aurelia* (including form of body and double micronuclei), but after forty-five generations, the organisms being watched daily, the *aurelia* characters were lost, and the entire race became *P. caudatum* again. In any such life cycle the organisms pass through phases of vitality comparable to the different age-periods of Metazoa. There are periods of (1) youth, characterised by great vigour of cell multiplication; (2) maturity, indicated by changes in the chemical and physical balance of the cell, accompanied by differences in size or protoplasmic structure, leading to the formation of conjugating individuals, with or without sexual differentiation; (3) in forms which do not conjugate, old age or senescence, ending in death. In many forms, especially where dimorphic gametes are produced, the period of sexual maturity leads directly to that of old age, and gametes which fail to conjugate soon die without further multiplication, as in the majority of Sporozoa and in many Rhizopods. In Ciliata, although failure to conjugate is finally fatal, many generations may be formed before death occurs, and in these may be studied the peculiar cytoplasmic changes which accompany protoplasmic senility. While working at the maturation phenomena in Paramœcium, Prof. Calkins and Miss Cull were able to show that the curious crescent form assumed by the micronucleus is the stage of synapsis, the chromosomes being double at this time, apparently by union side by side in typical parasynapsis. The two following maturation divisions have not yet, however, been completely followed. The speaker also dealt with the subjects of fertilisation and parthenogenesis, pointing out that the latter has only a limited success, acting merely to postpone or counteract physiological death (Hertwig). Physiological and germinal death in Protozoa are connected with exhaustion of vitality and of definite substances in the cell.

Infection of Monkeys with Guinea-worm.

Dr. R. T. Leiper described some results obtained by the infection of monkeys with guinea-worm. These confirm the view that *Filaria medinensis* gains access to the human host by introduction in the larval stage (while still contained within its intermediate host, Cyclops) into the stomach in drinking water. The larvæ are released and stimulated into activity by the gastric juice. A monkey which had been infected in this way was killed after six months, and five guinea-worms—three unfertilised females and two males (each of the latter 22 mm. long)—were found. No experimental evidence could be obtained in support of the theory which has, during recent years, been favourably received in this country, that the causal agent in the disease invades the body through the skin, nor was a repetition of Plehn's experiment of feeding monkeys with freshly discharged embryos attended with the slightest success.

Habits of Tube-building Worms.

Mr. Arnold T. Watson gave an account of the habits of tube-building worms. He showed how Sabella collects, by means of its branchial tentacles, particles which are applied by means of the collar lobes to the outside of a mucous tube secreted by the epidermis. As a safeguard against the intrusion of an enemy, the mouth of the tube usually collapses when the worm retracts, but in one of the rock-boring species the end of the tube rolls up like the frond of a fern. Terebella builds its tubes of sand, shells, or gravel, terminated by an arborescent arrangement composed of single grains of sand or other suitable material. Pectinaria produces the well-known conical sand-tubes, the material for which is selected with great care. Owenia constructs a flexible tube by attaching in an imbricating manner flat sand grains and fragments of shell to a membranous tube secreted by special epidermal glands. Panthalis weaves a massive tube composed of threads supplied by the parapodial glands. These tubes are open at both ends, but the worm is defended from attack by a series of internal valves at each end of the tube, which are automatically closed by the inrush of sea water immediately the inmate of the tube retracts itself.

Papers on Lepidoptera.

Prof. E. B. Poulton exhibited a series of forms of *Acraea johnstoni*, Godm., showing that each one of the protean series of varieties has been evolved in relation to a Danaine or Acræine model, the models and mimics occurring together on the slopes of Kilimanjaro.

Dr. F. A. Dixey exhibited butterflies, some possessing an epigamic scent, others an aposematic or warning scent, and others in which both kinds of scent existed independently. It is well known that the male of *Ganoris napi*, one of our common white butterflies, exhales a fragrant scent (compared to that of lemon verbena) which is probably epigamic in significance. Dr. Dixey has found similar, though weaker, scents in the males of other British Pierinæ, Satyrinæ, and Lycænidæ, and many of the native African species were also found to possess an agreeable odour suggestive of chocolate, vanilla, or the scents of various flowers. These scents are generally distributed by specialised scales (androconia), the distribution being, to some extent, under control, the perfume being economised when not needed in courtship. The offensive odours are more or less shared by both sexes, but are sometimes stronger in the female, and generally occur in forms which, on independent grounds, are believed to be protected. These aposematic odours are usually perceptible even in uninjured specimens, but are much more evident when the thorax is crushed.

Mr. G. T. Porritt read a paper, full of details, on melanism in Lepidoptera. He pointed out that melanism had increased with extraordinary rapidity in south-west Yorkshire and parts of Lancashire, and also occurred, to a less extent, in other parts of the United Kingdom. In some cases (*e.g. Amphidasys betularia, Odontoptera bidentata*) the change has been sudden, but in most cases there has been a gradual, though rapid, change from pale to black. More than thirty species are melanic in Yorkshire, most of which have become so during recent years, and there are other species which are tending in the same direction. Many of these melanic forms will probably, at no distant date, oust the ordinary pale forms. The variety *varleyata* of *Abraxas grossulariata* has, however, not increased, and, though known more than forty years ago, is as rare now as it was then, although melanism is so strongly impressed on the race that a brood reared this year, from a pair of moths from wild larvæ, were all of the extreme dark form, no single example showing any tendency towards the pale ordinary form. The reasons for and causes of the phenomenon were then discussed. The usually accepted theory is that the darker colour renders the insects less conspicuous as they rest upon the darkened (by soot, moisture, &c.) tree trunks, and therefore, more

likely to survive and to perpetuate dark forms. Mr. Porritt did not believe that birds fed to any great extent on moths, and when they did they took them on the wing at night, when their colour similarity to trees would be of no service. Moreover, many melanic species do not affect tree trunks, *e.g. Larentia multistrigaria*, in which melanism has rapidly developed for no apparent reason. The theory that smoke and humidity in the manufacturing districts have caused melanism, although offering in many cases a likely explanation, seems to be rendered untenable by numerous exceptions. Mr. Doncaster remarked that melanism could not be explained as due to natural selection or as the result of external conditions, as the black forms in some cases arose suddenly, and quickly became numerous. The black form is dominant, that is, the offspring of a pair, one black and one pale, have a tendency to be dark. Dr. Dixey pointed out that in Pierines dark pigment is often substituted for light, the female being usually darker. There may even be two grades of colour in the females, a darker in the individuals found in the wet season, and a lighter in those found in the dry season. He considered that locality, altitude, and other conditions may have an influence in darkening the pigment.

Pineal Eye of Geotria and Sphenodon.

Prof. Dendy described the structure of the pineal eye of the New Zealand lamprey (Geotria), which agrees in most respects with that of Petromyzon, but the former is more complex in histological structure, its pigment cells being divided into inner and outer segments. The pineal nerve is connected both with the right habenular ganglion and the posterior commissure, and in all probability with Reissner's fibre, whereby it would become linked with the optic reflex apparatus described by Sargent. Prof. Dendy also directed attention to some newly observed details of structure in the adult pineal eye of Sphenodon. The rods of the retina project into the cavity of the eye, and are connected with a network of fibres, which is also connected with the "lens." The lens contains a large central cell which resembles a unipolar ganglion cell. Prof. Dendy concluded that, in both Geotria and Sphenodon, the pineal eye is a functional organ.

Formation of Nucleoli.

Prof. Havet (Louvain) traced the formation of true nucleoli or plasmosomes in the nerve cells and blood cells of Rana and Alytes. The central part of each is formed from a small, clear area situated in the centre of the telophasic figure, while the peripheral part is derived from the internal extremities of the chromosomes which remain when the rest of the chromosomes form the nuclear network. Occasionally chromosomes also become included in the central area, giving rise there to one or two chromatic structures.

Milk Dentition of the Primitive Elephant.

Dr. C. W. Andrews, in the course of a paper on the milk dentition of the primitive elephant, pointed out that in recent elephants, owing to the large size of the molars and the shortening of the jaws, the teeth have an almost horizontal succession, their manner of replacement differing widely from the vertical succession found in other mammals. But as the earlier relatives of the elephant are followed back through the various Tertiary horizons a gradual approximation to the ordinary mammalian type of tooth replacement is observed, until in the recently discovered Eocene Palæomastodon a form is reached in which the milk molars are replaced in the normal way by premolars, which, along with the permanent molars, remain in use throughout the life of the animal.

A New Conception of Segregation.

Mr. A. D. Darbishire directed attention to some essential but usually unrecognised features of the Mendelian theory. He pointed out that although half the total number of children born to hybrids were unlike their parents, the hybrids, according to that theory, bore no single germ cell containing an element representing an animal like themselves, and that if a hybrid could be made to multiply parthenogenetically it would produce no offspring like itself. An experiment for testing this theory in an individual case was described.

Mr. J. T. Cunningham spoke on the evolution of the cock's comb; Mr. H. M. Bernard, on a periodic law in organic evolution, with a re-estimation of the cell; and Dr. H. J. Fleure and Miss Galloway gave a detailed paper on the habits of the Galatheidæ in relation to their structure; but these and a few other papers do not lend themselves to the purposes of a summary.

J. H. ASHWORTH.

THE ROYAL PHOTOGRAPHIC SOCIETY'S ANNUAL EXHIBITION.

THIS exhibition at the New Gallery in Regent Street will remain open until October 27. The three rooms, the central court, and the balcony, indicate its five main divisions. The last of these is devoted to scientific and technical photography and its application to processes of reproduction, and the exhibits here naturally fall into three sections, namely, the ordinary exhibits, those contributed by special invitation of the council of the society, and a small collection of photographs that have no other interest than that they are good technical work, and represent subjects of more or less interest, chiefly architectural. We hope to see this kind of work more fully represented in future exhibitions, for between the more strictly technical and the ultra-pictorial it has been almost squeezed out of existence.

A series of beautifully made models of light-pencils, which show the various effects of aberrations that particularly concern photographic lenses, is shown by Mr. C. Welborne Piper, and has been awarded a medal. The three dozen models illustrate very clearly a subject that must always be a somewhat difficult one. Immediately following this are a large number of photographs of living things, but chiefly birds, which appear to be receiving a very undue share of attention just now. Of these, we notice particularly a series of twenty-four photographs of the stone curlew in different stages of its existence, by Mr. W. Farren. Of the other subjects, "A Study of Wych Elms," by Mr. Alfred W. Dennis, is among the more novel. It is a series of seven photographs that show the same pair of trees, leafless and in leaf, and on larger scales the details of the trunk, blossom, fruit, leaves, and winter buds. Dr. Vaughan Cornish sends a further series of waves; Mr. J. C. Burrow two coal-mine subjects, excellently rendered as usual; and Mr. Bagot Molesworth a telephotograph of Vesuvius in eruption, taken from a distance of eight miles.

In the invitation section, Mr. Douglas English shows some examples of mimicry in British insects, and a particularly realistic effect is obtained in some of them by making the original carbon print with a green tissue, and staining the insects with dyes to represent their natural colours. The Royal Observatory, Greenwich, has contributed several of its recent results, including some of last year's solar eclipse. Mr. F. E. Baxandall (for Sir Norman Lockyer) also illustrates the eclipse, and sends photographs of two British stone circles that were erected some four thousand years ago as astronomical observatories. Series of cloud photographs are shown by Dr. W. J. S. Lockyer and Captain D. Wilson-Barker. Photographs illustrating the investigation of crimes, such as forgery and burglary, and the detection of the criminals, by Prof. R. A. Reiss, of Lausanne, will be of very general interest. Mr. K. J. Tarrant shows a series of thirty photographs of high-tension electrical discharges. Mr. Edgar Senior has continued his study of the Lippmann method of colour photography, and although the image generally shows no grain under the microscope, he has by special illumination got the surface to appear covered with discs of light, though what these indicate is not very clear.

There are a few photographs in "natural colours," but nothing better than, if quite so good as, has already been shown. Messrs. Sanger-Shepherd and Co., by preparing a more rapid and red-sensitive plate and special colour filters,