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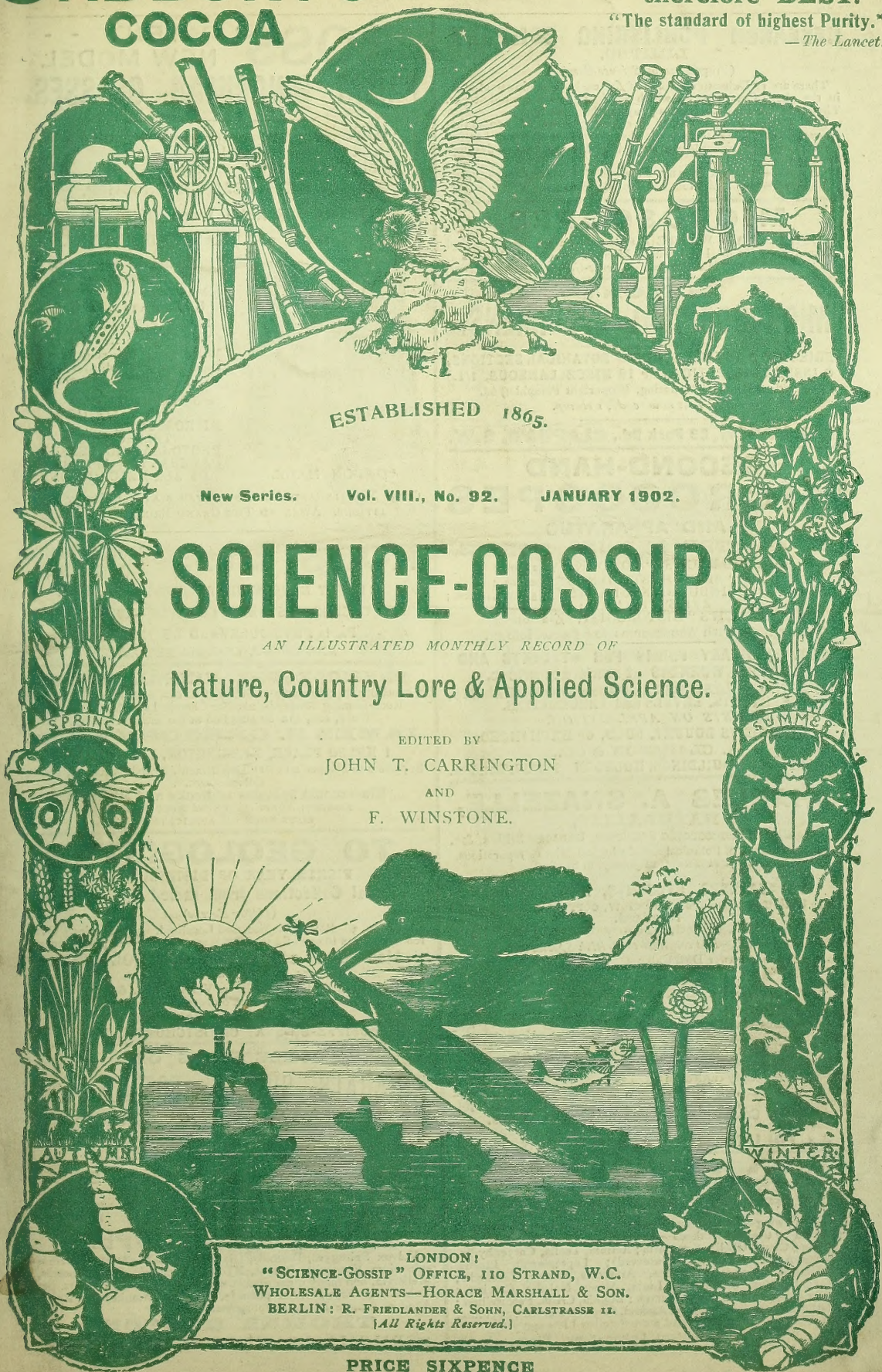

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Nature, Country Lore & Applied Science.

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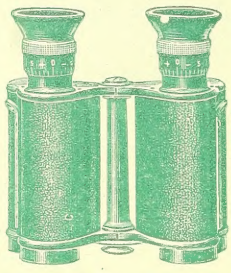

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EDITORIAL.

ON many occasions we have been pressed to give in the pages of SCIENCE-GOSSIP portraits of the Editorial Staff, as it is said that the readers generally who take so much personal interest in "our" Magazine, would wish to have a better acquaintance with those who conduct its pages.

Photo by] [*Elliott & Fry.*

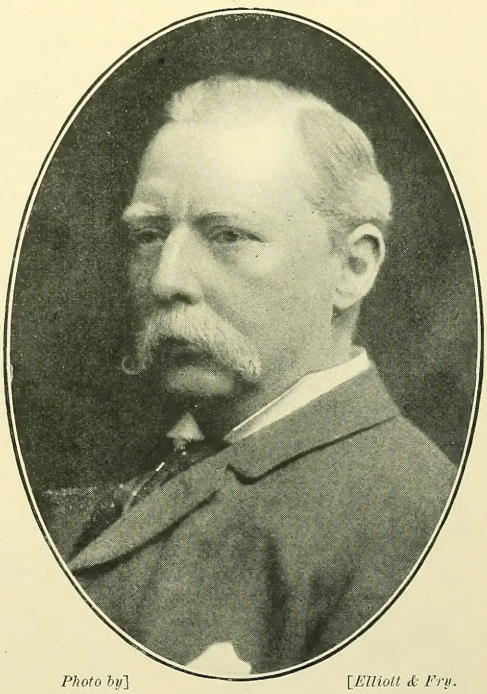
FLORA WINSTONE.

We have, therefore, pleasure in introducing ourselves, together with the gentlemen who occupy the positions of honorary departmental editors with so much care and success.

In arranging the group of portraits of our colleagues, we have had in view the position of the various sciences which they represent. For instance, Physics, being the basis of all things, takes precedence; Astronomy naturally follows in the plan of Cosmos; Chemistry is next, as it investigates the origin of substance; Microscopy is the handmaiden of all sciences; the sequence is continued by Botany, the science of the first life on earth; these are followed by Zoology and the applied sciences.

We have taken the opportunity of giving a short review of the scientific work done in 1901 in the world at large. Most of our colleagues have also contributed some notes, unfortunately of necessity only too short, giving a sketch of what has happened in their respective departments. Space at our disposal is always a trouble to us, on account of its limitations. Still, we hope these sketches of what has happened during the expiring year may contain some points of news for each of our readers, especially to the numerous and ever increasing circle beyond the seas.

This is a fitting occasion to ask the readers of SCIENCE-GOSSIP for further support, by obtaining an increase, wherever possible, to our subscription list. It may not be generally known, but it is none the less a fact, that the journal is edited and conducted without remuneration to either editors or contributors. Still the expenses in its production are necessarily heavy, and every new subscriber helps towards the improvement of our magazine. Therefore those obtaining an increased circulation will, in that manner, indirectly benefit.



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JOHN T. CARRINGTON.

The portraits of our Departmental Editors are from photographs: Mr. Cadman, by J. Brandebourg, Chester; Mr. Dennett, by J. J. Avery, London; Mr. Mitchell, by Maull & Fox, London; Mr. Haig, by the London Stereoscopic Co.; Mr. Scales, by John W. French, Sunderland; Mr. Saunders, by F. Thurston, Luton; Mr. Foulkes-Winks, by J. A. Kay, Southport; Mr. Cobbett, by Gillman, Oxford; Mr. Webb, by Skillman, London.

Published December 24th, 1901.

SCIENCE IN 1901.

By John T. Carrington.

The past year has been remarkable for the number of important persons whose work has ended. One of the first and the most notable of all was Queen Victoria, who, though a lady of the highest intelligence, was brought up in her childhood at a time when it was the fashion to smile at matters scientific. She lived, however, to see that all altered, and to respect the work of the worthies of Science, who in her time by their discoveries changed, not only the system of education, but even the habits and customs of the people in the civilised world at large. Her successor, His Majesty the King, has ever held out the helping hand with the powerful influence of his position. No one has a higher appreciation of the value of scientific investigation and discovery.

Death has, indeed, reaped a great harvest of those who could least be spared from among us. To mention only a few of those who have passed away, there were Lord Armstrong, F.R.S.; Major Serpa Pinto, African explorer; F. W. Egan, of the Geological Survey of Ireland; John Henry Leech, the palaearctic entomologist; Dr. Walter Myers, who died from yellow fever whilst studying its origin; James Bennie, Scotch geologist; Dr. J. G. Agardah, the Swedish botanist; Professor Elisha Gray, associated with invention of telephones; Professor George Fitzgerald, physicist of Dublin; Dr. G. W. Dawson, Director of the Canadian Geological Survey; W. Hodgson, a Cumberland botanist; Dr. Adolph Hirsch, the German Astronomer; Professor Viriamu Jones, F.R.S.; Professor Tait, of Edinburgh; Eleanor Ormerod, the economic entomologist; William Schur, astronomer; Baron von Nordenskjöld, Arctic discoverer; Dr. Thudichum, physiological chemist; Professor Schimper, physiological botanist; William West, botanist; Dr. Meldrum, meteorologist; Sir William MacCormac, the eminent surgeon; Samuel R. Pattison, geologist; the Rev. Hugh A. Macpherson, a Cumberland naturalist; and others.

Among those who have retired from positions of consequence in the world of Science, but who are, happily, with us, are Sir Archibald Geikie, Director of the Geological Survey of the United Kingdom; Professor R. Blanchard, after twenty-three years' service as General Secretary of the Zoological Society of France; Professor A. W. Rücker, Secretary of the Royal Society, on being appointed Principal of the University of London; Dr. Henry Woodward, twenty years Keeper of Geology at the British Museum.

During a wild storm on New Year's Eve, 1900, two large stones in the great circle of Stonehenge fell to the ground. This has led to a renewal of interest in these prehistoric remains, and to their enclosure. A clever paper upon the probable origin of this monument was read before the Royal Society by Sir Norman Lockyer, F.R.S., and Dr. F. C. Penrose, F.R.S., in which it is shown there is little doubt that it was a temple of sun-worshippers, and arranged with astronomical accuracy.

The establishment of the National Physical Laboratory in Bushey Park has been completed, and some of the work of testing formerly carried on at Kew Observatory has been absorbed in consequence of expected electrical disturbance from the electric tram-lines extending past Kew Gardens.

Antarctic exploration has been active during the year; both England and Germany have sent out expeditions. The arrangement of the former was marred in the first instance by an unfortunate dispute between the naval and scientific commands.

The scientific investigation of disease in human beings has received valuable attention. The treatment of several by light has been more or less successful. The application of the X-rays to epidermical affections applies to external cancer, etc. Lupus has been successfully cured by the concentrated rays of a powerful arc-electric light. Much relief from suffering is to be hoped from this branch of science, which is now entitled phototherapy. The Congress on tuberculosis held in London must aid in reducing that terrible scourge.

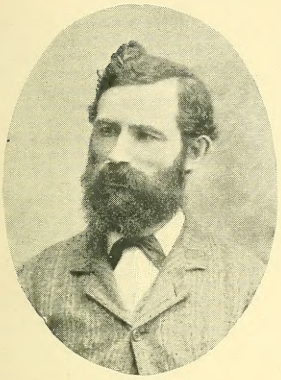
Applied science has produced the new "Mond" gas, which promises to revolutionise domestic heating and production of power for engines engaged in driving machinery. It is said to be cheaper than coal, emit no smoke nor soot, so we may still hope to see our cities beautiful; whilst staving off the exhaustion of our national coal supply.

There seems to be a serious effort to be made to obtain a better understanding of the causes and prevention of fogs in large cities. The London County Council has granted a sum of money to carry out these investigations in the Metropolis.

This year having been the tercentenary of that father of Astronomy, Tycho-Brahe, many ceremonies in his appreciation have taken place. Jubilees have also been kept in honour of Professor Virchow and M. Berthelot, where eminent English men of science have been received with honour.

The long-expected Nobel prizes have been awarded. They amount to about £8,000 each, and three of them are allotted to Science. That for medicine goes to Dr. E. A. Behring; for chemistry to Professor J. H. van't Hoff; and for physics to W. K. Röntgen. The benefactions to educational and scientific institutions have been without parallel. Millionaires have vied with each other, but all have been eclipsed by the munificence of Mr. Andrew Carnegie, who has given such vast sums for these purposes.

The future of Science, and the benefits to be conferred by it upon mankind never looked more promising. We may expect anything to occur during the next few years. We hope our readers may long have opportunity of enjoying these benefits.



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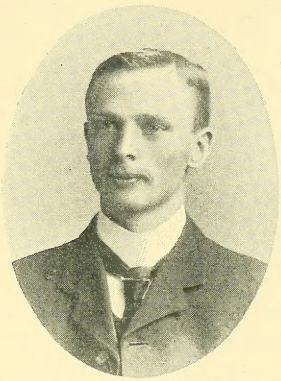

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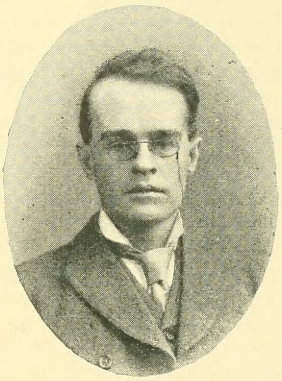

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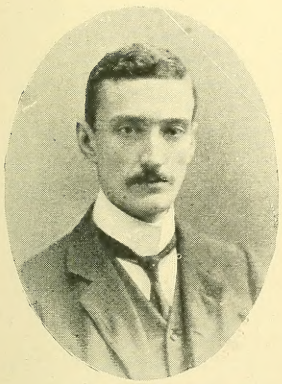

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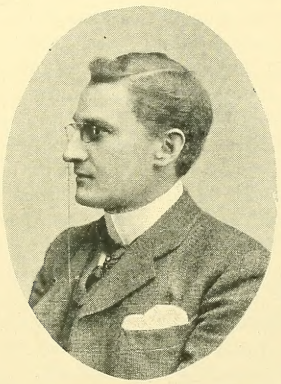

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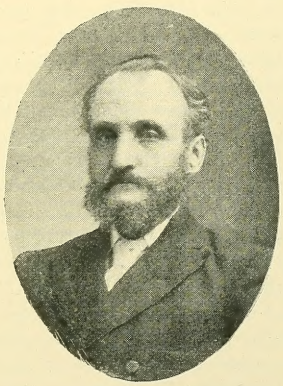

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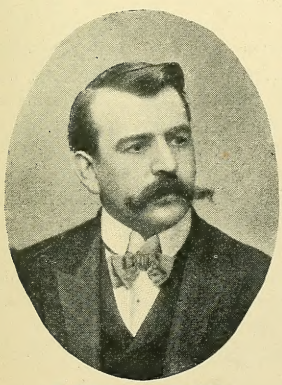

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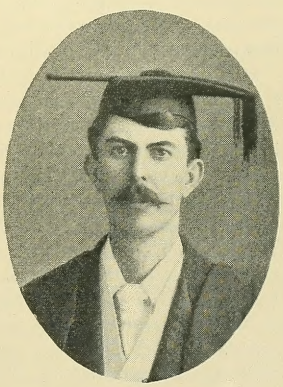

W. M. WEBB
(Malacology)

HONORARY DEPARTMENTAL EDITORS IN "SCIENCE-GOSSIP," 1901.

PHYSICAL SCIENCE IN 1901.

By W. H. Cadman.

During the past year many great and noble men have passed away, including several of the leading physicists of the present time. Irreparable gaps are thus left in the ranks of the leaders in physical science which time alone can repair. Fortunately for us their works survive. Each has laid his bricks, whether few or many, upon the vast and beautiful path of science, making firm foundations for future progress. As we turn to take a short retrospective view, we find on all sides a general trend of advancement, suggesting promising developments in the near future.

Owing to the numerous divisions and subdivisions of physics, and the number of problems which have engaged the attention of workers during the past year, no attempt can be made to give a complete survey of the subject, but our aim will be to consider briefly a few questions of much practical interest. Progress is generally a natural growth, extending over considerable periods of time. In each instance the product of an evolution is before us, so that it is difficult to fully differentiate or record the exact contribution of a given year. Sometimes, however, progress is strikingly spasmodic. Although not one of the following examples originated in 1901, we may take them as types. Faraday's well-known piece of apparatus which we call the induction coil after many years attained the type commonly known as the Ruhmkorff coil. Thereafter came the invention of practical forms of dynamo-electrical generators, and the widespread application of electricity to commercial operations. This opened up a new field of growth, and by a simple inversion the induction coil of the laboratory became the electric welding machine and the transformer of the electrician. Finally the discovery of the X-ray phenomena and recent progress in wireless telegraphy have each created a new demand for the induction coil, and thus stimulated manufacturers in perfecting its construction.

Scarcely a single investigation is undertaken by a physicist in which temperature does not play a direct or indirect part. Its accurate measurement has long been a favourite field of research and development. During the past year the platinum resistance thermometer, with its admirable qualities, has satisfied many of the requirements of a practical working standard. A few remarks upon the tendency of the times as regards steam motors may not be out of place. The phenomenon of heat involved in their action justifies bringing them within the broad domain of physics. To-day we find that steam-turbines, when properly designed, with due regard to the thermodynamic laws, even surpass in efficiency the very best engines of the old type.

In view of the manifold interests that centre in the subject of acoustics, scientific and commercial, it seems strange that during the past year there has been so little systematic exploring in this department. Two or three matters of industrial as well as scientific importance may be noted, namely, the enormous development of speaking instruments, such as phonograph, graphophone, and gramophone, and the many improvements in organ-pipes and reed-stops.

The papers presented to the Mathematics and Physics Section at the Glasgow meeting of the British Association were unusually numerous, and created several interesting discussions, that on the magnetic effect of electric convection being particularly worthy of note. Dr. Crémieu described his experiments, which gave negative results. Lord Kelvin's suggestion of waiting for a repetition of the experiments before accepting the conclusion as final was important, since there was indirect evidence against Crémieu's results. In consequence of a painstaking research Pender has just experimentally confirmed this indirect evidence, and has proved beyond doubt that electric convection does produce magnetic action. Had Crémieu's results been accepted an entire reconstruction of the electro-magnetic theory would have been necessary.

Experiments on viscosity performed during the past year by Professor Gray and his pupils seem likely to have an important bearing on the molecular theory. The new pressure-gauge devised by Professor Morley is an instrument long needed for measuring very low pressures.

During the past year the commercial importance of aluminium as a conductor of electricity and as a fuel has been suggested.

The patience and perseverance in experimenting during the past few years have led to the gradual surmounting of many of the difficulties which first beset wireless telegraphy. Mr. Marconi, Professor Seaby, and the other pioneers have met with promising success. Communications can now be made between ship and ship, and ship and shore. Doubtless the near future will see greater developments in this direction. Indeed, during the last days of the passing year Mr. Marconi claims to have communicated messages between the shores of America and England. A new principle of wireless signalling is being put to the test. It is expected to prove a valuable method for controlling torpedoes and submarine boats from the shore.

Much has been done during the past year in the application of electricity to railway engineering, for telephone, telegraph, and lighting purposes. The problem of constructing electric railways to compete with existing lines is also receiving careful attention.

Physical chemistry has advanced considerably of late, thanks to the labours of Arrhenius, van't Hoff and Ostwald.

We are glad to find the science of Physics is

receiving more attention than formerly in technical schools, and that the importance of well-equipped laboratories has not been overlooked.

The application of scientific results to industrial developments cannot be too highly estimated. We hope during the coming year to see a more organised system for bringing science, education, and industry into closer relationship; because, viewed in its broad aspects, the progress of science involves the general progress of the human race.

ASTRONOMY IN 1901.

By F. C. Dennett.

The opening year of the twentieth century has been marked by the apparition on February 22nd of a Temporary Star more brilliant than any since that observed by Tycho-Brahe in 1572. An important feature of the event is, that it was certainly discovered within a very few hours of the light waves announcing the outburst reaching this world. Its brilliance was such that it has permitted a more minute study of its life-history than has ever been previously possible. The study has been fraught with instruction which will greatly aid in explaining the true meaning of the phenomenon. On this occasion the spectroscope has been enabled to analyse the light from a much earlier point in its history than has been the case with other stars. This is due to the watchfulness of Dr. Anderson, of Edinburgh, who is but a busy amateur observer, and yet has been the first discoverer of two Novae and several variable stars.

The brightest visitant was the large comet first seen on April 12th. Unfortunately for us in Europe it was only visible in southern latitudes. It has proved to be the largest seen since 1882.

Dr. J. J. See has been doing good work at the Washington Naval Observatory in obtaining measures of the major planets with the 26-inch achromatic, using special precautions to avoid inaccuracies due to irradiation, which is such a fruitful source of error.

The discovery of minor planets has gone on apace, over thirty-five having imprinted their images on the photographic plates. The great majority have been discovered at the Astrophysical Observatory, Königstuhl, Heidelberg.

Not the least interesting discovery is that of the variability of Eros, and also of Tercidina, and some others of these tiny worlds. The suggested explanation in the case of Eros is that the planet is really double, the two globes being nearly in contact and revolving round their common centre of gravity. Such an unknown condition in nature at its first suggestion seemed unlikely; but the recent discovery of ν Puppis, an Algol variable, having apparently a very similar form, lends greater probability to the theory.

CHEMISTRY IN 1901.

By C. A. Mitchell, B.A., F.I.C., F.C.S.

The amount of progress made in any science cannot be measured by the number of striking discoveries which have been sufficiently non-technical to arrest the attention and interest of those without special knowledge of that science. This is particularly the case with chemistry, in which every day sees the discovery of fresh compounds, many of great theoretical importance.

To even enumerate the various new substances described during the past year would fill many pages of this journal with a long series of dry names that would not interest anybody. If we refer only to some of the work done during this period, it must not be inferred that this is of greater importance than work less popular. The year has not been marked by any such striking discovery as argon, though it has added considerably to our knowledge of that gas and its companions. Professor Ramsay and Mr. Travers have shown that the five gases, argon, helium, neon, krypton, and xenon, are all monatomic, and form a separate series in the periodic system of elements.

Professor Dewar, thanks to the unparalleled resources placed at his disposal by the Royal Institution, has been able to continue his experiments concerning the influence of low temperatures on these new gases and on hydrogen, which he finds boils at 20·5° absolute and melts at 16° absolute. Helium has not been liquefied, but its probable liquefying point will be about 5° absolute. In Professor Dewar's opinion even the use of liquid helium would not enable absolute zero to be attained, and a still more volatile gas must first be discovered. Organic substances, cooled in liquid hydrogen, phosphoresce even more brilliantly than in liquid air.

Among the many inorganic compounds discovered during the year mention may be made of a new gas, sulphuryl fluoride, that has been prepared by M. Moissan by passing fluorine into sulphur dioxide over a hot platinum wire. The product of the combustion is a colourless and inodorous gas which is remarkably stable.

Considerable discussion has continued as to the nature of Buchner's Yeast Extract, some authorities contending that the active expressed agent is a portion of the yeast protoplasm, and not a separate enzyme, as believed by Buchner. It has been shown, however, that desiccated yeast extract shows no signs of diminished fermentative capacity after being kept for twelve months in a stoppered bottle.

In the domain of Analytical Chemistry the subject of arsenic has been paramount. The methods of detecting arsenic have never before been so thoroughly studied. Many interesting facts bearing on this analysis have been recorded in our columns. It may safely be said that prior to the epidemic of arsenic poisoning food pro-

ducts were rarely tested for arsenic, which has since been found to be a common constituent, in traces, in many unsuspected places.

The Chemical Society has continued its series of Memorial Lectures on Eminent Chemists. In December, 1900, Dr. Miers delivered an appreciation of Rammelsberg, who, though a friend and associate of Berzelius, only died in 1899. More recently Dr. Armstrong paid a similar honour to the memory of the late Sir Edward Frankland. These different memorial lectures are now being published collectively in book form.

MICROSCOPY IN 1901.

By F. Shillington Scales, F.R.M.S.

Microscopy is so largely the handmaiden of other sciences, and the wide fields of research covered by the term have been so much specialised, that a review even of a single year's work is an impossibility in the space at our disposal. In Zoology, Botany, and Medicine the use of the microscope plays an increasingly important part, whilst its applications to manufactures and industrial uses become more notable each year. Especially is this the case with regard to practical problems in connection with the metallography of steel and of metal alloys. Workers like Sir W. C. Roberts-Austen, Mr. J. E. Stead, and others, have elevated the microscopic examination of such crystalline structures into almost a distinct branch of science.

The science of Bacteriology, however, is one that is of necessity universally accepted as coming peculiarly within the domain of microscopy, and it is in this department that many of the most interesting developments have taken place during the past year. Most noticeable of all was probably Professor Koch's startling statement at the recent British Congress on Tuberculosis, which called forth swift and vehement protest. Professor Koch, whilst incidentally giving his adhesion to the theory that tuberculosis is, in contradiction to popular opinion, practically non-hereditary, expressed the opinion that bovine tuberculosis was in reality not communicable to man, because he had entirely failed in communicating human tuberculosis to cattle. The converse is manifest, but though Professor Koch observed that it was impossible to give this question a direct answer because the experimental investigation of it with human beings was out of the question, offers were almost immediately made by various persons to submit themselves to the test. We do not envy Dr. Koch his dilemma.

Equally important has been the progress of the investigations into the causes and prevention of malaria, yellow fever, elephantiasis, plague, distemper, and the abolition of epidemics generally. The work of Major Ronald Ross and others not less devoted to the study has completely disposed o the old theory that malaria was due to miasmatic vapours, and it is now proved, by the use of the microscope, beyond a doubt, that it is due to minute amoebulae in the human blood, which pass part of their lives in certain species of mosquitoes, and by means of mosquito bites infect man. The recent expeditions to Sierra Leone, largely defrayed by private generosity, have already succeeded in making the species of *Culex*, to which suspicion mostly points, comparatively rare in the neighbourhood of Freetown, and in consequence a great reduction in the number of cases of malaria. Yellow fever and elephantiasis have also been traced apparently to gnats. The dissemination of bubonic plague is attributed to the fleas borne by rats. It is sad to have to record the death from yellow fever of one investigator, Dr. Walter Myers, who went out in connection with the Liverpool School of Tropical Medicine.

Death has also taken from us Mr. George Shadbolt, of the Royal Microscopical Society, who did much for the development of the microscope, but whose name is perhaps best known as the inventor of "Shadbolt's turntable."

In the theory of the microscope the most interesting contribution has been Mr. J. W. Gordon's criticism of Professor Abbe's diffraction theory, wherein he maintains that the diffraction effects relied upon by Professor Abbe in support of his argument are really produced by the diaphragms behind the objectives.

We must not omit also two more of Mr. E. M. Nelson's valuable papers on the construction of the microscope, dealing respectively with tube-length and working aperture.

Amongst new books may be specifically mentioned Miall and Hammond's "Structure and Life-History of the Harlequin Fly," and the recently issued eighth edition of "Carpenter on the Microscope."

In new apparatus notice may be taken of the increased attention paid by the opticians to the improvement of microtomes, and to the surrender by some of our leading opticians to popular prejudice, as evidenced by the demand for the Continental model in students' microscopes; also to the improvement in the spherical corrections of achromatic objectives by the use of newer glasses and original forms of construction.

FIELD BOTANY IN 1901.

By James Saunders, A.L.S.

In recalling the botanical literature that has come under our notice during the current year, there is no definite recollection of any startling discovery in connection with the flowering plants of the British Isles. One is, however, impressed with the evident large increase in the army of observers in Field Botany during the last decade. This may

partly be due to the general increase of education, but more especially to the teaching of botany, both in public and private schools. The methods of imparting instruction in this subject show a great improvement on the old system. The pupils are now taught to regard our Field Flowers as living organisms, replete with life, beauty, and not merely as dried specimens to which purely technical names are given.

By means of the collected observations of workers in all parts of the country, more particularly of the varieties of critical forms, botanical authorities who possess the requisite scientific acumen and grasp of the subjects are enabled to arrange in their natural groups such puzzling genera as the Rubi, Salices, etc. We understand that, with these objects in view, Messrs. H. & J. Groves have undertaken a new and revised edition of Babington's Manual. The new issue will contain the result of the labours of many workers in these departments. This statement recalls some pleasant associations with these gentlemen in searching the pools and streams of the South Midlands for Water Ranunculi, which section is having particular attention in the new edition of the Manual. There seems to be an awakening of interest in cryptogamic botany, as we hear of much activity in the study of our native mosses, especially of the sphagnums, of which a new list has appeared.

Another encouraging sign of the times is the increasing popularity of science lectures as means of recreation and instruction. In the town where this is written we have just brought to a successful termination the seventh annual series of science lectures for the people. They are entirely self-supporting, and the attendances have varied from 1,000 to 1,500, according to the popularity of the subject and of the speaker. The best possible talent has been secured, and a large proportion of the audiences have been from the working classes. Botany has not been overlooked in the series, our field flowers having been beautifully illustrated.

STRUCTURAL BOTANY IN 1901.

By Harold A. Haig.

A good deal of interesting work has been done during the past year in connection with cytology, especially with regard to those peculiar bodies, the centrosomes. Some doubt was cast upon the existence of centrosomes in a good many cases, but recently Bernard has settled the difficulty for some plants, notably *Lilium candidum*, *L. Martagon*, and *Helosis guayanensis*. Latterly, bodies akin to centrosomes have been found in some plants in addition to those always present. They are found at the poles of the karyokinetic spindle, but are soon absorbed and vanish before the actual centrosomes. Several forms have been described ("Journal of Microscopy," October 1901). The centrosomes are of kinoplasmic origin and themselves divide, before the process of mitosis takes place.

Some very important facts have been discovered in connection with changes taking place prior to fertilisation in the embryo-sac of Angiosperms. The phenomenon of "double impregnation" is perhaps the most important ontological discovery that has for some years been made. Strasburger demonstrated that in all Angiosperms the formation of Endosperm has as an essential precursory process the fusion of one of the male nuclei from the pollen-grain with one of the polar nuclei of the embryo-sac, the three going together to form the "definitive" or Endosperm nucleus. Professor Campbell has recently shown that double impregnation also takes place in that primitive type of Angiosperm, *Peperomia*.

In plant physiology interesting results have been obtained by Dr. Waller in his investigations by an electrical method of the power of germination of seeds that have been kept for various periods of time. His experiments were conducted on lines that were perhaps suggested to him by the analogous phenomena of after-currents in nerve when stimulated by induction currents. He found that if seeds are to germinate they must possess protoplasm capable of giving an after-response following the stimulus of an alternating current of not too great a frequency ("Proc. Roy. Soc.").

Some work has been done by French botanists with relation to the germinating power of seeds that have been exposed for a long time to the action of certain gases, or have been preserved air-dried in these gases. The results were generally positive. And just recently it has been shown by Jencic that some seeds have their germinating powers increased by exposure to low temperatures.

There has been a tendency to show that plants are really more influenced by surrounding conditions than they were formerly thought to be. The results obtained by De Vries and others in connection with the adaptability and variations of plants placed under changed conditions are especially interesting, from the point of view of the possibility of protoplasm having its directive action varied by measures that are not brought to play on it too rapidly.

The past year, then, shows that there has been an increasing stimulus to the consideration of such problems as the intrinsic structure of the cell-body, the vitality, and variety of response to stimuli, of protoplasm. Other work has of course been done, more especially, as mentioned above, in connection with fertilisation; also the structure of some peculiar organs and tissues (vascular elements of Bryophyta) has been considered. The trend of botanical investigation, however, has been in the direction of elucidating individual cell-structure rather than organography.

PHOTOGRAPHY IN 1901.

By B. Foulkes-Winks, M.R.P.S.

By the time this number of Science-Gossip is in the hands of our readers, the year 1901 will be well-nigh numbered with the past, and remembered in the photographic world only by the advance made in that particular Art-Science.

The greatest amount of progress has undoubtedly been made in the direction of photography in colours, or more strictly speaking, trichromatic-photography. The advance that has been made in this country is largely due to that earnest worker, Mr. Sanger Shepherd, and the gentleman with whom he is prosecuting his researches. Only a few days ago we had an opportunity of examining some large natural-colour transparencies made by the Sanger-Shepherd process. They consisted of two plates of colour pictures in which all the original tints were most faithfully rendered. They were indeed the most beautiful examples of "three-colour" work ever submitted for our inspection, marking distinct progress in this direction. Much has also been accomplished by Messrs Lumiere, of Lyons, who have produced some remarkable examples of natural-colour work. With the idea of bringing this section of photography well within the reach of all, they are about to introduce to England, with working instructions, a complete set of chemicals, dyes, plates, and screens, at a very moderate price, so as to enable any photographer to make experiments in three-colour work with his ordinary apparatus. We may, therefore, hope to see much improvement in this section of photography during the coming year.

We cannot record any startling invention or discovery for the year 1901, but we are pleased to note a steady advance in all sections of photography; especially the increasing tendency of both amateurs and professional operators to finish their work in one of the permanent processes, such as carbon, platinotype, etc. There is an evident desire among our foremost artists to study and to introduce into their work a truer art-feeling, also to combine with photographic excellence a really artistic rendering of the subject treated in their pictures.

Many minor advances have been made in the construction of hand-cameras, and we understand that there is shortly to be introduced to the public an entirely new plate-changing apparatus, that will give those using a hand-camera a power far beyond anything yet attained. The operator will be able to carry any number of plates, and, whenever desired, can expose, develop, and fix his plate in the field. To attain this, he will not have to carry any more weight or bulk than at present. If it were permissible for us to make this system public, we could then, indeed, record a great invention and a distinct advance for 1901.

POSSIBILITIES OF THE FUTURE.

THIS being the first year of a new century is particularly appropriate for the publication of works dealing with the probable lines of development of various branches of science. The term "science" in its widest sense properly includes the study of all the actual facts of life, whether physical or moral. We use the word "facts" in this instance in contradistinction to "sentiments." Speculations with regard to future possibilities have always been a favourite field for novelists, but it is not often the subject is treated in the strictly scientific manner adopted by Mr. H. G. Wells in his recently published work entitled "Anticipations." (1)

The author has endeavoured, by careful analysis of the causes that have led to the present position of civilised communities, to deduce the lines upon which future development will probably travel. For instance, with regard to locomotion in the twentieth century, he reminds us that railways were built in the present form as merely roads with rails, along which travel carriages very little wider than stage-coaches, because at the time railroads were first made the chief means of communication from one place to another was by stage-coach. Men's minds, therefore, could not conceive of any mode of progression that was not essentially similar to stage-coach travelling, though drawn by steam-engines instead of horses. Continuing this method of reasoning, Mr. Wells concludes that as motor cars and carriages are now rapidly coming into favour, and are better suited, in many ways, for comfortable locomotion than steam-engines, the twentieth century will probably see companies formed, having the power to make private roads of a new sort, along which motor cars will be free to travel at their highest possible speed, instead of being limited, as at present, by the exigencies of pedestrian and other vehicular traffic. We note the author is of opinion that aeronautics will not become of much serious use as a means of transport, though he fully believes in its final practicability. "Man," he says, "is not an albatross, but a land biped, with a considerable disposition towards being made sick and giddy by unusual motions; and however he soars he must come to earth to live."

In his chapter on the "Probable Diffusion of Great Cities," Mr. Wells points out, that the question of overcrowding is largely governed by facilities or difficulties in the means of transit to the great centres of work and business. In the early part of the eighteenth century, for instance, when the only means of transport was by animal power, it would be impossible for a busy merchant to live further than eight miles from his office. The working day remains about the same number

(1) *Anticipations*, by H. G. Wells, B.Sc. 318 pp., 7¾ in. × 5¼ in. (London: Chapman & Hall. 1902.) 7*s*. 6*d*.

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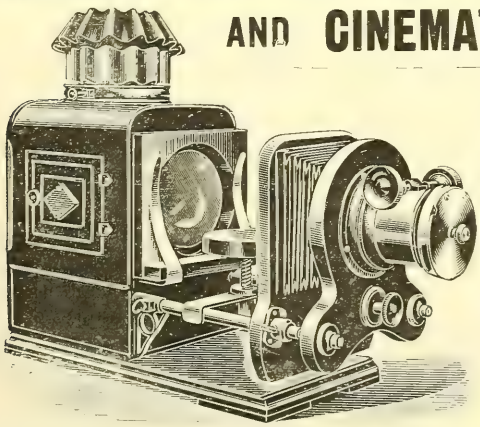

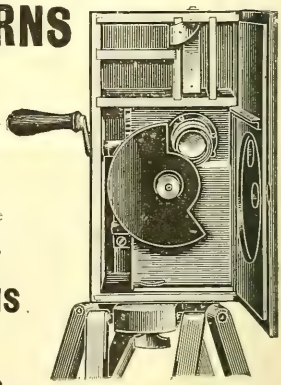

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of hours, and the possibilities of coming, doing the day's work, and returning, must fix the extreme limits to which a city could grow before there were locomotive mechanisms capable of travelling more than eight miles an hour. The author points out in a footnote that in 1801 "the density of population in the City of London was half as dense again as that of any district even of the densest 'slum' districts, to-day." Referring, therefore, to the probabilities of increased means of rapid transport from one place to another, it is probable that in the twentieth century, London, Manchester, Birmingham, and other large centres of trade will become almost entirely non-residential. Especially is this likely to be the case when we consider the developments that will probably take place in the telephone and telegraph services, also in other directions, which the space available will not allow us to enumerate. Mr. Wells is careful to ignore all boundary lines and foreigners, and, indeed, it would scarcely be necessary to consider these purely arbitrary divisions, as his deductions are applicable with slight modifications to most civilised communities.

The chapters on social subjects and "The Faith and Morals of the New Republic" are full of points for thought and consideration. In dealing with these subjects, however, we cannot help thinking that Mr. Wells has regarded human beings too much as machines that will develop, as in the case of locomotion, in set lines. Though man is of course largely mechanical from a physiological point of view, there are, in his complex organisation, so many other factors to be considered, such as heredity and environment, which have assisted his development on the downgrade as well as upwards, that it is scarcely possible to foretell with any certainty what social elements the twentieth century will bring forth. Also, it is a question whether in the process of development suggested in this book, qualities of selfishness, and fighting for a "lone hand," might not be so increased as to bring about a process of deterioration in the twenty-first century.

With regard to wars of the future Mr. Wells is of opinion that the soldier will necessarily have to become more and more a scientific man. The instruments of warfare will require fewer men to work them, several probably being controlled from some central position. "For the commander-in-chief," he says, "on a picturesque horse, sentimentally watching his 'boys' march past to death or glory in battalions, there will have to be a loyal staff of men working; and at the front, every little isolated company of men will have to be a council of war, a little conspiracy under the able man its captain, conspiring against the scarcely seen company of the foe. The battalion commander will be replaced in effect by the organizer of balloons and guns." The natural tendency of such developments would apparently be to shortly put an end to war as we now understand it, and the superiority of different nations, instead of being shown on the field of battle, or in naval engagements, will really be tested in the colleges and universities. The nation that produces the largest development of educated and intelligent people of all sorts, and succeeds best in checking the vices that lead to decay, will certainly be the most powerful both in warfare and peace, thus becoming the dominant nation.

Perhaps one of the most interesting chapters in the book before us is that on the "Conflict of Languages." Tracing the probable origin of the diversity of languages, the author points out that all divisions, whether ethnographical, linguistic, or political, are really caused in the first instance by difficulties in the means of transit from one place to another. He strongly opposes the division of races into Teutonic or Celtic; these, he maintains, "are not races at all if physical characteristics have anything to do with race. . . . There is no such thing as a racially pure and homogeneous community in Europe distinct from other communities." In the times long past, when language was in its beginning, the first complete isolations that established race were breaking down. Races were finding means of communication with other races, chiefly by means of war-paths. There would still be great differentiation, as without frequent intercourse and interchange of women the tribes would develop dialectic and customary, if not physical and moral, differences. These variations would naturally be caused by the necessity of adaptation to environment. As, however, civilisation advanced and means of transit were facilitated, the areas of assimilation would increase until a time arrived when the only checks sufficient to keep a language uniform would be the sea, or mountains. Another development which has largely assisted in the amalgamation of different races is the invention of writing. In the same way as it is impossible for a kingdom, as distinguished from a mere tribal group of villages, to exist without horses, so is an empire without writing. Though the Roman Empire did much west and north of the Sahara Gobi barrier to dominate the world, the union was never at its stablest time more than political. It retarded, but did not prevent, the inevitable differentiation of nation from nation, and province from province. In England at the commencement of the nineteenth century, the dialects of the non-educated men of Somerset, Yorkshire, Sussex and other counties would have been almost incomprehensible to persons of another county. The axioms and idioms differed entirely; in fact, as far as language was concerned, they were almost foreigners to one another, but as education increased, that difference began to die away, because they read newspapers as well as books, which are written at centres and are there-

fore uniform in the language. The process is not only confined to dialects. The native of a small country who knows no other language but his own is increasingly at a disadvantage. He is obliged to learn other languages both for use in commerce and also to assist him in any scientific study. After a careful analysis of the reasons that make one language of more value than another, the author concludes that either French or English will have the upper hand by the end of the twentieth century. We think it will probably be the latter owing to the rapid extension of the Anglo-Saxon possessions.

Our readers will probably have observed the leading feature in Mr. Wells's arguments is that all progress depends on facilities for rapid and easy transit, and in the main this would appear to be the case. There is much matter for consideration in "Anticipations," but if the author had summarised his conclusions at the end of each chapter, we think it would have been of great assistance to the reader. F. WINSTONE.

AN INTRODUCTION TO BRITISH SPIDERS.

By FRANK PERCY SMITH.

(*Continued from page* 198.)

GENUS *LABULLA* SIM.

This genus may be distinguished from *Lepthyphantes* by the anterior eyes being practically equal in size. Metatarsal spines are present.

Labulla thoracica Wid. (*Linyphia cauta* Bl.)
This species, being our only representative of the genus, may be distinguished by the generic characters. It is not rare.

GENUS *TARANUCNUS* SIM.

This genus may be distinguished from *Lepthyphantes* by the posterior row of eyes being strongly curved.

Taranucnus setosus Cb.
This rare species is the only representative of the genus.

GENUS *LINYPHIA* LATR.

Metatarsus I. as long as tibia. Tarsus I. half as long as metatarsus. Eyes of posterior row separated by intervals greater than their diameters.

Linyphia triangularis Clk. (*L. montana* Bl.)
Length. Male 5.5 mm., female 6.5 mm.
The cephalo-thorax has a narrow central line, strongly bifurcate at its anterior extremity. The falces of the male are usually excessively large. An extremely common species, adult in the autumn.

Linyphia montana Clk. (*L. marginata* Bl.)
Length. Male 6 mm., female 7 mm.
Cephalo-thorax yellow-brown, the caput being the darkest. Legs brownish-yellow, distinctly annulated. This species is widely distributed and spins a very perfect horizontal saucer-like snare amongst bushes and low trees.

Linyphia insignis Bl.
Length. Male 4 mm.
The radial joint of the male is furnished with a distinct process on the outer side. The female has a very prominent elongate epigynal process. Not rare in the North of England.

Linyphia marginata Koch. (*L. triangularis* Bl.)
Length. Male 4 mm., female 5 mm.
Allied to *L. triangularis* Clk., but the central abdominal band is furnished with a double row of small cream-coloured spots. Rare.

Linyphia peltata Wid. (*L. rubea* Bl.)
Length. Male 3 mm., female 4 mm.
Closely allied to *L. triangularis* Clk., but lacks the bifurcate thoracic stripe. Not rare.

Linyphia impigra Cb. (*L. impigra* + *L. circumcincta* Cb.)
Length. Male 4 mm., female 4.5 mm.
Cephalo-thorax dull orange-yellow, with a central line bifurcate anteriorly and some dusky converging markings. Abdomen white above, with a central longitudinal brown band, and with a row of brown spots on either side. Very rare.

Linyphia pusilla Sund. (*L. fuliginea* Bl.)
Length. Male 4 mm., female larger.
This species may be best distinguished by the possession of a very long and prominent black spine connected with the palpal organs and projecting considerably beyond them. Not rare.

Linyphia hortensis Sund. (*L. pratensis* Bl.)
Length. Male 4 mm., female larger.
Cephalo-thorax dark yellowish-brown, much the darkest at the caput. Legs orange-yellow. The palpal organs of the male, in common with several other species of this genus, are terminated by a coiled spine enveloped by a semi-transparent membrane. Not common.

Linyphia clathrata Sund. (*Neriene marginata* Bl.)

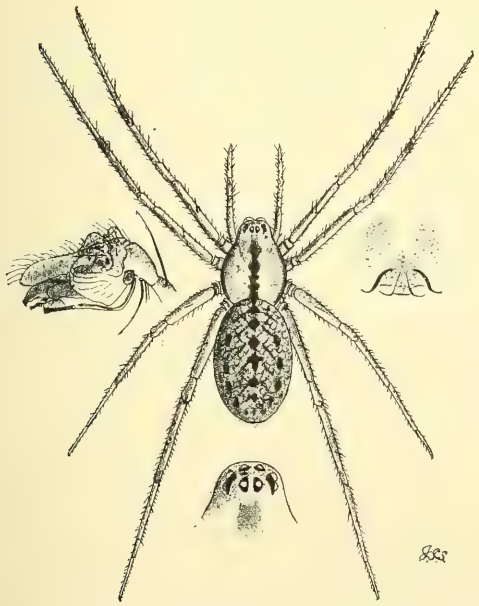
Length. Male 3.5 mm., female 4 mm.

Cephalo-thorax blackish-brown. The anterior portion of the abdomen is usually occupied by two large whitish spots. A very common species, almost invariably found amongst low herbage and debris.

Linyphia furtiva Cb.

Length. Male 4 mm., female larger.

Closely allied to *L. clathrata* Sund. It may be distinguished by the general colouring being more



Stemonyphantes lineata. Female; palpal organs and vulva.

blackish, and by the profile line of the cephalo-thorax being almost absolutely straight. A rare spider, found amongst heather. I have taken it at Oxshott, in Surrey.

GENUS *STEMONYPHANTES* Menge.

Closely allied to *Linyphia*, but the anterior tarsi are somewhat longer than half the metatarsi.

Stemonyphantes lineata Linn. (*Linyphia bucculenta* in "Spiders of Dorset"; *Neriene trilineata* Bl.)

Length. Male 5.5 mm., female considerably larger.

The male palpal organs are excessively large and of a reddish-brown colour. This species is figured. It is very common.

GENUS *BOLYPHANTES* MENGE.

Anterior tarsi at least two-thirds the length of the metatarsi.

Bolyphantes alticeps Sund.

Length. Male 4 mm., female larger.

The caput is conically elevated, forming a point between the eyes. A rare species, found in the North of England.

Bolyphantes luteolus Bl. (*Linyphia alticeps* Bl.)

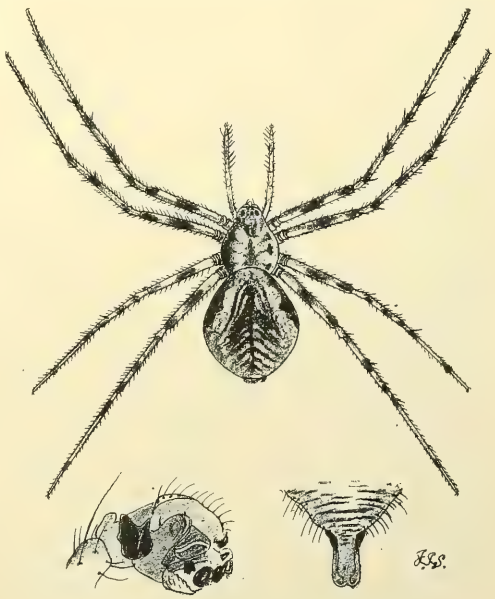
Length. Male 3.5 mm., female larger.

Very similar to *B. alticeps* Sund., but the caput, although considerably raised, is not drawn out into a conical point between the eyes. A common species in the North of England.

Bolyphantes bucculentus Clk. (*Linyphia frenata* Wid.)

Length. Male 3 mm., female considerably larger.

The caput of the male is somewhat elevated and rounded at its summit. It may be distinguished from its allies by the anterior row of eyes being considerably curved. A rare species.



Drapetisca socialis. Female; palpal organs and vulva.

Bolyphantes expuncta Cb.

Length. Male 3 mm., female 3 mm.

Cephalo-thorax yellow, with blackish margins. Behind the eyes is a wedge-shaped dark mark, and there are some blackish converging lines. Abdomen brownish-yellow, with numerous yellowish-white spots. A very rare species.

GENUS *TAPINOPA* WESTR.

This genus may be distinguished from its allies by the clypeus being very low, much narrower in fact than the ocular area.

Tapinopa longidens Wid. (*T. longidens* + *T. unicolor* Cb. in "Spiders of Dorset.")

Length. Male 3.5 mm., female larger.

This spider, which is our only species of the genus, is by no means common. It should be looked for amongst heather or heathy debris.

GENUS *DRAPETISCA* MENGE.

This genus may be distinguished by the presence of a pair of strong short spines upon the basal joint of each falx.

Drapetisca socialis Sund.

Length. Male 3.5 mm., female 4 mm.

This pretty little spider is not at all uncommon on pine-tree trunks, but it assimilates so closely the colour of the bark as to be detected only by a practised eye. It is here figured.

(*To be continued.*)

BUTTERFLIES OF THE PALAEARCTIC REGION.

By Henry Charles Lang, M.D., M.R.C.S., L.R.C.P. Lond., F.E.S.

(*Continued from page* 202.)

PIERIDAE. (*Addenda continued.*)

P. napi L. ab. *intermedia* Krul. Bull. Mosc., 1890, p. 211. A form approaching ab. *bryoniae*. Hab. S. Russia, Siberia, Altai. ab. *sulphurea* Schöyen Tidskr. VI. (1885), p. 140. = ab. *flavescens* Stgr. of this work, p. 31. var. *frigida* Scudd. Pr. Bost. Nat. Hist. Soc., viii., p 161, probably is the same as *P. venosa* Scudd. (*vide* p. 32). var. *orientis* Obth. Et. V. (1880), p. 13, is larger than type and paler beneath. Hab. Amur. var. *sifanica* Gr.-Gr. Hor. xxix.(1894), p. 290, is like the preceding, but more strongly veined in ♂. Hab. Amdo.

P. callidice Esp. var. *orientalis* Alph. Hor. xvi. (1881), p. 359. The same as var. *kalora* Gr.-Gr.

P. chloridice Hb. var. gen. aest. *aestuosa* Stgr. Cat. 1901, p. 12. Much whiter beneath and with less green colouring. F.w. with the central black spot smaller. Hab. Asia Minor. var. *albidice* Stgr. Cat. 1901, p. 12. ♂ has the h.w. almost wholly white beneath. Hab. Schabrud, N. Persia.

Genus *EUCHLOE*, Hb. = *Anthocharis* B.

E. pechi Stgr. Sp. bon. Stgr. Cat 1901, p. 13.

E. tomyris Chr. Sp. bon. Stgr. Cat. 1901, p. 13.

E. mesopotamica = *charloniae* gen. aest. L.c.

E. cardamines L. var. *phoenissa* = *turritis*, but the u.s. is whiter. Hab. Syria.

E. gruneri H. S. var. *armeniaca*. Chr. Iris. VI. p. 86, 1893. This form has the orange tip in ♂ bordered internally by a more or less distinctly dusky margin. Disc. spot sometimes duplicated. Ground colour of wings whiter. Hab. Armenia, Asia Minor, Mesopotamia.

E. eupheno L. var. *androgyne* Leech. Pr. Z. Soc. Lond. Has the orange spot at apex f.w. in ♀ larger, touching the disc. spot. Hab. Morocco.

Genus *TERACOLUS* Swainson.

Add. **T. chryononome** Klug. Symb. phys. t. 7, f. 9, 11 (1829). Stgr. Cat. 1901, p. 14. 35—38 mm.

Orange. H.w lighter than f.w., and dusted with greyish in ♂. F.w. costa and neuration black, a black disc. spot, external to it a row of black spots. H.w. without a disc. spot. All the wings with a black border marked in the spaces between the nervales with yellowish-orange spots. U.s. f.w. costa orange and ou. marg. greenish. H.w. greenish-yellow, with three rows of brownish-red spots.

Hab. S. Palestine.

T. calais Cr. Pap. exot. I. 53 (1779). Stgr. Cat. 1901 p. 14, *dynamine* Klug. Symb. Phys. t. 6, f. 17. 32—34 mm.

Area of wings light orange or yellowish-white F.w. broadly marked with black on costa, the black marking joining the disc. spot, a broad marginal band with a double row of light spots, near an. ang. a rather large black spot. H.w. with a broad marginal black band on which is a row of light spots and a marginal row of light dots.

Hab. S. Persia, ? Syria, Arabia, North and Central Africa.

T. nowna is reckoned a var. of. *T. daira* Klug.

Genus *LEPTIDIA* Billb. 1820. = *LEUCOPHASIA* Steph. 1827.

L. sinapis L. var. *subgrisea* Stg. "al. post. subtus griseis, non virescentibus nec flavescentibus."

Genus *CATOPSILIA* Hb. = *CALLIDRYAS* Boisd.

C. florella F. = *Callidryas pyrene* Swainson.

Genus *COLIAS* F.

C. hecla Sef. = var. *groënlandica* Lampa, *glacialis* Maclachlan. var *sulitelma* Auriv. = *hecla* Stgr. Stett. e.z. Lang B.E. ab. *sandahli* Lampa Ent. Tidskr. vi. (1885). Wings pale yellow ochre.

C. edusa F. ♀ ab. *helecina* Obth. = *aubissoni* Cara l.

C. caucasica Stgr. Cat. 1871, *myrmidone* var.? = *C. olga* Rom. Hor. xxvii. p. 127.

C. aurora Esp. var. *decolorata* Stgr. Iris, x. 1897 = var. *kenteana* R.H. p. 731.

C. diva Gr.-Gr. Hor. xxv. (1891), p. 449. "praec. (*aurorae*) forma Darwiniana?" Stgr. Cat. 1901, p. 19.

I believe *C. diva* to be quite specifically distinct from *C. aurora*. The veining of the border of f.w. ♂ of *C. diva* and the deep shading of h.w. ♀ seem to be perfectly distinct from anything seen in *C. aurora*. The colour of the disc. spt. h.w. in the white form of ♀ is another distinctive character. *C. diva* Gr.-Gr. seems to me to be a completely distinct species.

Family III.

LYCAENIDAE.

We come now to the consideration of this extensive family, which embraces more than a fourth part of the Palaearctic butterflies. They are small butterflies, represented in Britain by the "Hair-streaks," "Coppers," and "Blues."

The Palaearctic genera not represented in Britain are so closely allied to these, that we shall have no difficulty in recognising the species belonging to them as their near allies.

Zoological Characters.

Larva.—Short and thick, having the middle segments larger in diameter than those near the extremities, thus having a "woodlouse" or oniscifform shape. Head small and retractile.

In some genera, such as *Thecla* and *Zephyrus*, the larvae feed on the leaves of various forest trees. In others, low-growing herbaceous plants are selected, notably those of the order Leguminosae, but also those of other orders. Sometimes the seeds or pods, and occasionally the flowers of plants, form the food of the larva.

Pupa.—Short and thick, without angular projections or prominences of any kind; attached by the caudal end and by a central girth, as in the last family. Sometimes free.

Imago.—Small, or, at the most, medium-sized butterflies. Anterior pair of legs equally developed in both sexes. Palpi fully developed. F.w. not elongate nor with angular projections. H.w. mostly rounded and rarely dentate; but in many species with one or more slender thread-like "tails." Outer margin never concave, but forming a shallow groove to receive the abdomen. Antennae straight, with the clubs elongated and not curved.

The members of this family are often very brilliantly coloured, but there is a tendency towards a much lower tone of coloration in the females. This is especially seen in the genus *Lycaena*, where the males are often bright blue and the females brown. Metallic coloration is frequent. We are familiar with this in the metallic red and blue of our native representatives. Some species exhibit a very beautiful metallic green. The undersides are usually of a light colour, with many small ocellated spots, some of these on the h.w. are often marked with metallic centres. At times the markings are disposed in narrow lines or streaks, hence the English name "hair-streak."

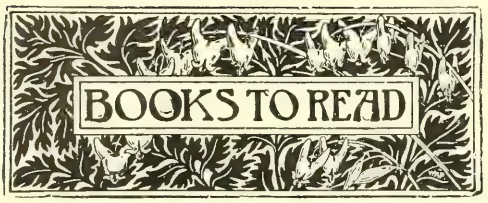
The British species of this family are comprised in the genera *Thecla*, *Callophrys*, *Zephyrus*, *Chrysophanus*, *Lycaena*, and *Cyaniris*; and amount to only sixteen in number. Some of them are very common and widely distributed; as such we may mention the "common copper," *Chrysophanus phlaeas*, and *Lycaena icarus*, the "common blue." Others are more local, but are also widely distributed and common where they occur. These are *Callophrys rubi*, the "green hair-streak"; *Zephyrus quercus*, the "purple hair-streak"; *Lycaena argus*, the "silver-studded blue"; *L. astrarche*, the "brown argus"; *L. bellargus*, the "Clifton blue"; *L. corydon*, the "chalk-hill blue" *L. minima*, the "small blue"; *Cyaniris argiolus*, the "azure blue"; the last seems to be getting much more abundant in Britain than it was formerly.

Other species are local, such as *Zephyrus betulae*, the "brown hair-streak"; *Thecla n. album*, the "white-letter hair-streak," but abundant where they occur; *Thecla pruni*, the "black hair-streak"; and *Lycaena arion*, the "large blue," are excessively local; occurring only in one or two favoured spots in Britain; *Lycaena semiargus*, the "mazarine blue," is rare; but probably was once a much commoner insect than it is to-day. *Chrysophanus dispar*, the "large copper," once common in the Fens, has been extinct since 1848.

Lampides boetica and *Lycaena argiades* are generally included in the list of British Butterflies, but though specimens of the former have indeed been occasionally taken, they must be looked upon as immigrants that have not established a claim to rank as natives. Possibly the latter is a disappearing native species, though there is not much evidence either way with regard to its position in this country.

(*To be continued.*)

Mosquito Extermination.—The success of the anti-mosquito campaign in Sierra Leone appears to be phenomenal. The Governor, Sir Charles King Harman, has written to Major Ross, of the Liverpool School of Tropical Medicine, that out of 400 public servants only three were on the sick list towards the end of October, and these were not suffering from malarial disease. The Nursing Home was empty. Dr. Taylor had done much in draining and clearing up the town. The figures quoted suggest that in Sierra Leone the sick rate has fallen below 1 per cent. This state of things seems almost too good to continue.



NOTICES BY JOHN T. CARRINGTON.

Ferments and their Actions. By CARL OPPENHEIMER, M.D., Ph.D., translated by C. AINSWORTH MITCHELL, B.A. (Oxon.), F.I.C. xii + 343 pp., 8 in. × 5½ in. (London: Chas. Griffin & Co., Limited. 1901.) 7s. 6d. net.

The translation of this work is even more valuable than the original German edition, because Mr. Mitchell has, at Dr. Oppenheimer's request, introduced into the text the results of various investigations which have been made since the author's edition appeared One of the improvements is an outline of the phenomenon of reversibility of the action of a ferment, first recorded by Hill in the case of diastase, and recently confirmed by Kastle and Loevnhart in their researches on lipase. This the translator thinks will modify the author's view, that a ferment can never effect a synthetic process. Perhaps Dr. Oppenheimer's opinions on this matter constitute the weak point in the work; but, with the translator's additions, we imagine the English edition will avoid what might otherwise be misleading. Mr. Mitchell's position as an authority on ferments renders the edition before us exceptionally valuable, as we have within its covers not only the great experience of the author, but also that of the translator.

The Descent of Man. By CHARLES DARWIN, M.A., F.R.S. xix + 1,031 pp., 8 in. × 5 in. New edition with illustrations. (London: John Murray. 1901.) 2s. 6d. net.

Some time since we noticed two others of Darwin's works, brought out by Mr. Murray in cheap form. This edition is all that can be desired, well printed and good from every point of view.

The Origin of Species. By CHARLES DARWIN, M.A., LL.D., F.R.S. xxi + 432 pp., 8 in. × 5¼ in. (London: John Murray. 1901.) 1s. net.

Whatever may be the motive of Mr. John Murray in issuing this extraordinarily cheap edition of "The Origin of Species," he is in consequence a benefactor to the cause of education of the people. How we envy the youth of English-speaking parents who can get such a work for a shilling when we remember the price and difficulty of obtaining such books in our youth. Because cheap, it is not in any way nasty; in fact, the volume is beautifully produced, though in paper covers. Neither has it been cut down. The title-page describes it as the "Popular Impression of the Corrected Copyright Edition, issued with the Approval of the Author's Executors." Any one can now read Darwin, and that for a shilling.

Text-Book of Zoology. By G. P. MUDGE, A.R.C.Sc.Lond., F.Z.S. vi + 416 pp., 7½ in. × 5 in., with 2 coloured plates and 100 illustrations. (London: Edward Arnold. 1901.) 7s. 6d.

This is an important educational book written by a teacher of wide experience, as a lecturer on biology in various London medical and other schools. Comparative anatomy dominates the work, which is well arranged and profusely illustrated. It is a working manual which we can recommend.

The Book of Old-Fashioned Flowers. By HARRY ROBERTS. v + 111 pp., 7¾ in. × 5 in., with 9 plates. (London and New York: John Lane, 1901.) 2s. 6d.

This is No. iv. of Mr. John Lane's artistic series of handbooks of Practical Gardening, edited by the author of this volume. In it, Mr. Roberts appeals to those who grow flowers to give more attention to the familiar plants that have so long graced the cottage forecourts of England; such as fritillaries, columbines, foxgloves and the like. In glancing through the pages one cannot help remarking on the association of these old-fashioned flowers with the wild flora of these islands. We agree with many of the author's opinions, but think his tirade against "bedding out" is rather unnecessary in these days of wide borders. Carpet-bedding has wellnigh disappeared excepting from our public gardens and other suitable places, where colour in masses is effective.

The Book of Bulbs. By S. Arnott, F.R.H.S. xv + 114 pp., 7¾ in. × 5 in., with 11 plates. (London and New York: John Lane. 1901.) 2s. 6d. net.

Mr. Lane's fifth volume of the "Handbooks of Practical Gardening" is seasonable at this period of the year, and will be found most useful to those who like brilliant flowers. We wonder larger numbers of persons do not cultivate bulbs for indoor decoration. Wherever grown, however, the "Book of Bulbs" will help the amateur, as it is written by an experienced gardener, though himself one of the leisured class.

The Practical Electrician's Pocket-book for 1902. Edited by H. T. CREWE, M.I.Mech.E., lxx + 216 pp. and diary, 5¼ in. × 4¾ in. (London: S. Rentell & Co., Limited. 1901.) 1s.

This useful little accessory for the electrical engineer, annually shows signs of improvement. The volume before us has been carefully revised and brought up to the present state of knowledge. It is portable and bound especially for pocket use.

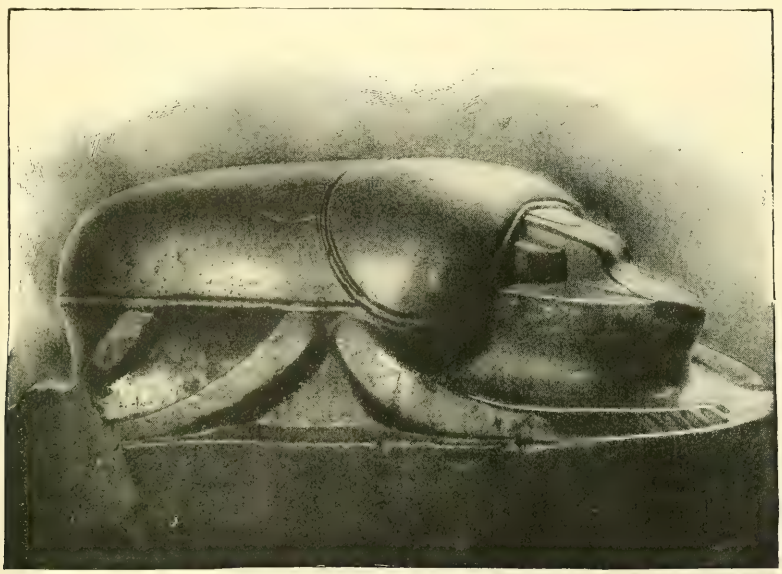
Practical Hints for the Field Lepidopterist. By J. W. TUTT, F.E.S. 108 pp., 8⅓ in. × 5¼ in. (London: Elliot Stock. 1901.) 5s. 6d. net.

Much of the matter in this volume has appeared already in the "Entomological Record," but it is useful to have it collected within covers, though only of paper, which is surprising, considering the comparatively high price. The hints are most valuable to young collectors, and cannot fail to be productive of much success in adding to their knowledge and collections.

The Sacred Beetle. By JOHN WARD, F.S.A. xviii + 122 pp., 8¾ in. × 5½ in., with 16 plates and 72 illustrations. (London: John Murray. 1902.) 10s. 6d. net.

As the author points out in his introductory pages, every educated person is supposed to know "what is a scarab." This is, however, by no means the case, and this popular work upon the Egyptian scarabs in art and history is welcome. They are carved imitations in stone of dor-beetles. These sacred or historical records of a very early civilisation are of the highest interest and value to students of far-away bygone times. Probably used in the earliest periods as amulets, they eventually became sacred emblems, appertaining to the monarchs as heads of the Church in Egypt. It was probable, that the habit of the

dung-beetle of laying its eggs in a small pellet of dirt and rolling it with its antennae till it assumes the shape of a ball, then burying it in a warm bank of sand, suggested resurrection of the human soul, when the newly-hatched beetle left its puparium in the earth. Maybe, the ancients thought the beetles had perpetual life, and so came to worship, in a way, these insects. There are immense numbers of scarabs in existence. They seemed to have come into fashion at least 6,000 years before the birth of Christ, and to have ceased to be used during the Persian period in Egypt, about 500 years B.C. The upper part of a scarab is carved more or less exactly like dor-beetles or cockchafers, with a flat under surface, engraved with hieroglyphics of some signification in history or personality. They were generally carved in a soft stone such as steatite, and every one was unique, there being no attempt at multiplication. Mr. Ward's book contains some 500 examples, having translations of the inscriptions by Mr. F. Llewellyn Griffith, M.A. What strikes the entomologist about these scarabs is that the beetles from which they were modelled some 8,000 years ago, appear to have been identical with some of the species now inhabiting the Nile Valley. This shows that the climate and general environment can have changed but little in that vast period of time, and how slowly Nature works out her ends.



COLOSSAL SCARAB IN THE BRITISH MUSEUM.

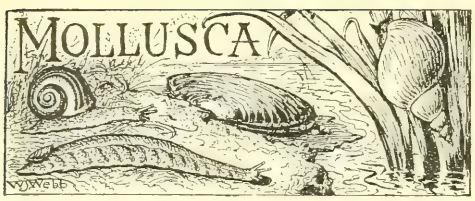
(*From Ward's "Sacred Beetle."*)

The Stars: a Study of the Universe. By SIMON NEWCOMB. xii + 333 pp., 8½ in. × 6 in., with frontispiece and 27 illus. (London: John Murray.) 6s.

This volume is one of "The Progressive Science Series" now being issued under the joint editorship of Professor J. McKeen Cattell, M.A., Ph.D., and Mr. F. E. Beddard, M.A., F.R.S. The book is well written by a veteran worker, and whilst being as accurate and concise as possible, is arranged for the use of people who are not astronomers, being at the same time a reference volume for those who are proficient in the science. It is essentially a book about the regions beyond the solar system, and contains the latest discoveries down to the middle of 1901. The frontispiece is a magnificent reproduction of the photograph of the Trifid Nebula in Sagittarius, taken at the Lick Observatory with the Crossley Reflector. The illustrations generally are good, as also is the type, but the printers' reader should have been a little more careful, as, for instance, on p. 23, line 14, or in the last line of p. 135. The book should find its way into every public library.—*F. C. D.*

Pleasures of the Telescope. By GARRETT P. SERVISS. viii + 200 pp., 9 in. × 6 in. Illustrated with 30 charts and 18 diagrams. (London: Hirschfeld Brothers.) 6s. net.

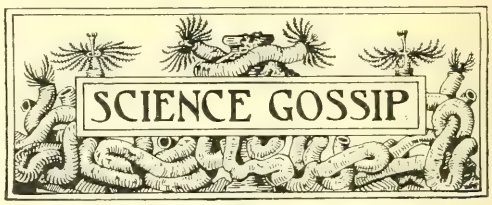
This is a very practical introduction to a study of the beauties of the heavens, especially of the stellar worlds. It combines a description of the objects to be examined, with maps which enable them to be identified. Of course this volume in no way takes the place, for the more advanced student, of Webb's "Celestial Objects" and Proctor's "New Star Atlas." The book was published in America, and to some extent ignores work done this side of the Atlantic. No mention is made of the simultaneous discovery of Capella's binary character at Oxford with that at Lick; nor is there any allusion to its visual elongation at Greenwich. The dark companion theory of Algol's variability was confirmed by Professor E. C. Pickering, but the demonstration was left for Vogel at Potsdam in 1888–91. The description of the lunar crater Posidonius is erroneous ir describing the floor as "about 2,000 feet below the outer surface," as in point of fact it is raised above it. The book is a useful companion to the telescope, notwithstanding that our experience of reflectors does not endorse the author's depreciation of that form of instrument.—*F. C. D.*



CONDUCTED BY WILFRED MARK WEBB, F.L.S.

THE ANATOMY OF MARINE GASTEROPODS.—During the past month Mr. S. Pace, F.Z.S., has read several valuable papers upon the somewhat neglected subject of the anatomy of marine gasteropods. First of all he dealt with *Voluta murica* before the Malacological Society, his material being some obtained for the late Martin T. Woodward, which arrived just about the time of his lamented death. Other allied forms were dealt with, and several mistakes as to their structure were cleared up in a masterly way. A contribution to the Linnean Society dealt with a remarkable deep-sea form, which was put with *Pleurotoma*, and which Mr. Pace summed up as being nearly all snout.

THE PAIRING OF LIMAX MAXIMUS.—Mr. Wallis Kew has recently collected together a great deal of information ("The Naturalist," 1901, pp. 241–254) with regard to the pairing of *Limax maximus* L. The statements and observations of Mr. Lionel Adams, in the "Journal of Conchology" (July 1898), upon the strange and striking methods that prevail in the species in question are well borne out in the paper under consideration. It is also interesting to the present writer to find that the opinions which he expressed to Mr. Adams, and which were published by the latter, are in accord with those of many previous observers, whose records have since been again brought to light by Mr. Kew's careful researches into the literature of the subject. The chief point in the matter is that sperm cells must be exchanged outside the bodies of the two hermaphrodite individuals during pairing, as the structure of the female ducts appears to preclude any possibility of intromission. This conclusion of the writer was based not only upon a knowledge of the genital organs at rest, and the actual dissection of examples described by Mr. Adams, but also from personal acquaintance with at least part of the peculiar act of pairing. The writer has not up to the present published his notes upon the latter observation, which he may say Lister's powerful language in no way over-describes. Suffice it to say, however, that it took place on August 14th, 1897, at Brentwood, at 9 p.m. Mr. Adams carried on his work in July and August of the same year, and says that pairing took place between the hours of 10 p.m. and 2.30 a.m. Mr. Kew quotes Lister (1678) as giving noontide in August, Werlich (1819) 6 p.m. in June, while an allied species of *Limax maximus* itself paired in the month of December, according to Maeysz. There is a great deal to be done in the way of noting the time and manner of pairing among the British slugs, and possibly several among our readers may have already made observations which will throw more light upon the subject, or will be able to do so during the coming year, and communicate them to SCIENCE-GOSSIP.—*Wilfred Mark Webb, "Odstock," Hanwell, W.*



CONTRIBUTED BY J. M. COBBETT.

IT has been decided to include a quarter of an acre of the parks at Oxford in the Museum precincts, the object being to provide access for wheeled traffic to all departments on the north side of the Museum during the hours when open.

SIGNOR BACELLI'S treatment for foot and mouth disease among cattle continues to meet with success. Having proved that mercurial injections have done no harm to the cattle treated, Signor Bacelli has increased, and even doubled, the doses originally prescribed by him.

HERR SIEBLEN GIEBLER has invented a new method of making hard steel, but refuses to sell his secret, which he proposes to develop for the benefit of his fatherland. The new steel is about 140 per cent. stronger and 50 per cent. lighter than Krupp, Harvey, and Böhler steel, and costs about a third less.

AT Cambridge, on Saturday, December 8th, a testimonial was given to Professor Liveing, in recognition of his long and valuable services to chemical science. It consisted of a subscription portrait of the Professor painted by Sir George Reid, P.R.S.A., which is to hang in the hall of St. John's College A bronze bust by Miss E. Bateson is to be placed in the chemical laboratory.

THE annual dinner of the Fellows and Associates of the Institute of Chemistry of Great Britain and Ireland took place on Wednesday, December 4th, at the Hotel Metropole, the President occupying the chair. The guest of the evening was the President of the Board of Agriculture, who dealt, in an interesting speech, with the services rendered by chemistry to the farming community.

M. BERTHELOT, the famous French chemist, has celebrated what may be termed his scientific jubilee, for it is just fifty years since his first scientific publication. The occasion was celebrated in fitting manner by the presentation of a plaquette, for which an international subscription had been opened, by the President of the Republic. Professor Ramsay presented an Address on behalf of the Royal Society of London, and another Address was presented by the Royal Society of Edinburgh.

DR. J. LARMOR has been nominated by the Council of the Royal Society as Secretary, in the place of Professor Rücker. Dr. Larmor is a Fellow and Lecturer of St. John's College, Cambridge, and one of the University Lecturers in Mathematics. He was Senior Wrangler, also First Smith's Prizeman in 1880, and afterwards was for some time Professor of Natural Philosophy at Queen's College, Galway. Last year, at the meeting of the British Association at Bradford, he was President of the Mathematical and Physical section, and delivered a striking address on some very difficult questions in mathematical physics.

A CURIOUS phenomenon was recently reported in the "Pall Mall Gazette." In the mountains near Pontgibaud, in Auvergne, there is formed in the hottest part of every summer a most singular ice deposit, which has no existence in winter. We should be glad to know more about this most unusual event.

A NEW species of fresh-water crab has been discovered by the members of the Skeat expedition to the Malay Peninsula. It is of special interest, in that the fully-formed young are carried about among the swimmerets of the female, and do not lead an independent existence till their metamorphosis is complete.

AN expedition under the command of Mr. H. S. H. Cavendish is about to proceed to Abyssinia. After an audience of the Negus at the capital, the party will continue their journey to the north of Lake Stefanie, in which region it is intended to investigate the mineral resources of the country. It is stated that the expedition has written permission, direct from the Negus, to explore this region.

THE CAMBRIAN NATURAL OBSERVER, the organ of the Astronomical Society of Wales, for November is to hand. Amongst other useful and interesting information it contains a capital paper by Col. E. E. Markwick on Nova Persei, with a good diagram of its light curve, from its discovery until September 9th, based on some 800 observations, made chiefly by members of the Variable Star Section of the British Astronomical Association. The society appears to be full of vigour.

LADY WARWICK presided over the last conference of the Educational Flower Show and Rural Educational Union. It was then practically decided that the Union in its present form should come to an end. A very strong provisional committee was formed, with a view of holding, entirely on its own basis, an exhibition of all branches of Nature study work at a time and place convenient for teachers in schools. This will probably take place in July next, and the Botanic Gardens have been mentioned as a suitable site.

THERE seems to be good reason for hoping that a remedy has been found for cancer of the face. Many cures are reported to have been effected by the X-rays by Dr. Hutchins of Atalanta, U.S.A.; and now the Surgeon to the Rontgen Ray Department of the London Skin Hospital writes to say that cancer of the face has been cured by English surgeons, previous to the successful cases reported from America. His own experience has been similar to that of Dr. Hutchins. It is said that Jews never suffer from cancer, but on what authority is uncertain.

CONSIDERABLE damage is said to have been done to telegraph poles at Cardiff by woodpeckers, the top of a pole exhibited at a meeting of the British Ornithologists' Club by Mr. Howard Saunders being pierced by a hole three inches in diameter. Mr. Saunders was asked if he knew a remedy, and suggested impregnating the wood with chemicals. It is clear that the wood was unsound, and had the simple precaution favoured by many builders been adopted of painting the poles with carbolineum, we should not have heard of the woodpeckers. We suspect *Picus minor* of being the guilty parties.

THE Council of the Royal Meteorological Society, at a recent meeting, designated Dr. Alexander Buchan, F.R.S., as the first recipient of the Symons Gold Medal, in recognition of the valuable work which he has done in connection with meteorological science. This medal, which is to be awarded triennially, was founded in memory of the late G. J. Symons, F.R.S., the originator of the British Rainfall Associati n.

WE hear that the Duke of Bedford has added to his collection at Woburn a dozen specimens of the wild horse of Central Asia. They are smaller and slighter in build than the average domestic horse, but with rather larger heads and longer ears. The mane is comparatively short, thick, and half-erect. The coat is of a greyish colour, except the mane and tail and a streak along the back of reddish-brown. The hair becomes long and shaggy in winter. We shall probably be able to see the wild horse at the Zoological Gardens before very long, as the Council have arranged to purchase from Mr. Hagenbeck a pair of these animals, which will be forwarded from Hamburg as soon as arrangements are completed for housing them.

WE feel bound to call attention to the steady progress of the small-pox epidemic in the Metropolitan district. All authorities appear to agree that the climax of the epidemic is to be expected in May, but the Metropolitan Asylums Board, though they hope to be able to deal with the present rate of progress maintained by this disease, tacitly admit that they scarcely could cope with any sudden large rise in the number of patients. We have seen a statement that out of twenty-three children under five years of age suffering from small-pox who had been admitted to the hospitals of the Board, nineteen who were unvaccinated had succumbed. We think that this fact should be made public. On the other hand, it is satisfactory to learn that we have got over the worst of the scarlet fever and diphtheria trouble, which at one time threatened to be serious.

BY the death of Sir William MacCormac, in his sixty-fifth year, a prominent figure disappears from the ranks of surgery. Sir William MacCormac, who was born in 1836 at Belfast, was the son of Dr. Henry MacCormac, one of the pioneers of the open-air treatment for consumption. Sir William's first chance of distinction was found in the Franco-German War, when he assisted in establishing the Anglo-American ambulance, and was present at the battle of Sedan. In 1871 he became a Fellow of the Royal College of Surgeons of England, and Assistant-Surgeon at St. Thomas's Hospital, a connection only severed by his death. He again saw service in the Turco-Russian War of 1876, and was present at the battle of Alexinatz. For his services as Honorary Secretary of the International Medical Congress of 1881 he received the honour of knighthood, and was made a baronet at the Jubilee of 1897. In 1883 he was elected to the Council of the College of Surgeons, and became President in 1896. In 1897 he was made Surgeon-in-Ordinary to the Prince of Wales, whom he successfully treated for a broken knee-cap, being rewarded with a K.C.V.O. He was also the recipient of numerous foreign honours. His services in connection with the South African War are too fresh in the memory of all to need recapitulation here; though they may be said to have hastened his death.

A TELEGRAM from Cleveland, Ohio, relates that Father Odenbach, Professor of Physics at St. Ignatius College, saw the great sun circle or halo of Hevelius on Friday, December 6th. We believe that this halo has only been recorded on three previous occasions.

SIR W. H. PREECE delivered the inaugural address of the hundred and forty-eighth session of the Society of Arts, dealing with the progress of practical science in the nineteenth century. The period was signalised by no less than five great discoveries:—The principle of evolution, the atomic structure of matter, the existence of the aether and the undulatory theory of light, and, lastly, electromagnetic induction and electrolysis, though in all of these difficulties are to be faced.

AT an ordinary meeting of the Röntgen Society, held on December 5th, Mr. Hall Edwards, L.R.C.P., read a paper on "Bullets and their Billets," an account of his experiences as surgeon-radiographer to the Imperial Yeomanry Hospital in South Africa. The old method of probe and finger exploration was contrasted with the vastly improved results obtained by the use of the X-rays. Before going to South Africa the lecturer was inclined to believe that the coils might be used with advantage in the field, but actual experience had convinced him that they could be much more profitably employed in the field hospitals.

CONSIDERABLE interest has been aroused in all quarters by Mr. Hill's motion condemning the condition of the parrot, kangaroo, and fish-houses, as well as the northern aviary, of the London Zoological Gardens. The motion, as was foreseen, was lost by a considerable majority, but it is evident that the matter will not be allowed to end there, and it cannot be denied that there is room for reform in many directions. We earnestly hope, however, that no personal feeling will be introduced into the discussion, nor anything said that could be construed as an attack on those who have long and faithfully served the Society.

THE British Astronomical Association recently celebrated its hundredth meeting by a conversazione at Sion Hall, Victoria Embankment, when Mrs. Roberts, D.Sc., gave an interesting address on "Celestial Photography," with special reference to the structure and conditions of the nebulae, and the international movement for mapping out the heavens. Views were shown of the Paris Observatory and Dr. Roberts's Observatory at Starfield. The most important instruments, the réseau or ruled network on the photographic plates employed, the methods of determining the magnitude of the stars photographed, and measuring the distances between them were also explained.

THE Earl of Denbigh has continued his experiments in the growth of sugar-beet, and the result is reported to be as favourable as in previous seasons. It was arranged that four tenants on the Home Farm at Newnham Paddox should each grow half an acre of sugar-beet in the same field, and under the same cultivation as a crop of mangolds. For the most part the plants came up very irregularly, but, notwithstanding this, the crops have turned out very satisfactorily. An analysis which has been made shows that the roots grown in England are much superior to those grown in Germany. The cost of growing sugar-beet may be put at £1 an acre more than for mangolds.

IT is rumoured that Dr. Smith Woodward, who, though of the same name is not even a distant relative, will succeed Dr. Henry Woodward, whose retirement we announced last month, as keeper of the Geological department of the British Museum.

THE Christmas Number of the "Boy's Own Paper" contains an interesting account of "Eels and Elvers." The article, which is capitally illustrated, is from the pen of Mr. H. H. Baker, whose paper on Vaccination in our November issue has attracted some attention. The article in question, though primarily meant for boys, contains much valuable information. We understand that Mr. Baker is making a careful study of the electric eel (*Gymnotus electricus*).

THE proceedings of the Zoological Society at the opening scientific meeting of the session were of more than common interest. Professor Ray Lankester gave an abstract of a paper on *Ocapia*, the new genus of the giraffe family, and pointed out that the skulls were necessary to guide zoologists in coming to a conclusion as to the relationship of the animals. He put forward the suggestion that the specimen in the South Kensington Museum may be a female about two-thirds grown, though admitting the probability of a hornless member of the family existing at the present day. Afterwards Mr. Oldfield Thomas exhibited two skulls and the mounted head, with neck, of the five-horned giraffe obtained by Sir Harry Johnston in the North-Eastern part of the Uganda Protectorate, and compared the skulls with those of extinct forms of the Bramatherium. Sir Harry Johnston described the habitat of the Okapi, and gave reasons for thinking that further discoveries would yet be made.

THE Friday evening meetings of the Royal Institution will commence on January 19, when Lord Rayleigh will deliver a discourse on "The Interference of Sound." His Grace the President will, after the discourse, unveil and present to the Institution, on behalf of the subscribers, a bust by Mr. Onslow Ford, R.A., of Sir Frederick Bramwell, Bart., Honorary Secretary of the Royal Institution from 1885 to 1900. Succeeding Friday evening discourses will be delivered by Mr. H. G. Wells, Professor A. Crum Brown, Professor Arthur Gamgee, Major P. A. MacMahon, Mr. W. Duddell, Professor Henry A. Miers, Professor H. Becquerel, Professor E. Ray Lankester, Geheimrath Professor Otto N. Witt, and other gentlemen. The following are the lecture arrangements before Easter:—Professor J. A. Fleming, six lectures (adapted to young people) on "Waves and Ripples in Water, Air, and Aether"; Dr. A. Macfadyen, six lectures on "The Cell: its Means of Offence and Defence Immunity"; Mr. W. N. Shaw, two lectures on "The Temperature of the Atmosphere;" Professor E. B. Poulton, two lectures on "Recent Researches on Protective Resemblances, Warning Colours, and Mimicry in Insects"; Dr. A. S. Murray, three lectures on "Recent Excavations at Delphi and in the Greek Islands"; the Rev. John Watson ("Ian Maclaren"), three lectures on "The Scot of the Eighteenth Century"; Sir Henry Craik, two lectures on "Scotland's Contribution to the Empire"; Mr. E. T. Reed, two lectures on "Caricature in and out of Parliament"; Mr. Hadow, four lectures on "The Landmarks in the History of Opera"; and Lord Rayleigh, six lectures on "Some Electrical Developments."

Mr. Arthur John Evans, Keeper of the Ashmolean Museum at Oxford, has been elected Corresponding Member of the Munich Academy of Sciences.

The business of Abraham Flatters, microscopy Supply Agency, of Manchester, has latterly so rapidly increased that he has had to make it into a limited company. New premises have been acquired at 48 Deansgate, where the concern will be carried on, in addition to the old address, as Flatters and Garnett, Limited.

In his address to the Royal Society, the president, Sir William Huggins, referred to two events of the past year as unusually important. The one was the new star in the constellation of Perseus, which flashed into brilliant light in February last. The second was the rapprochement between scientific societies and education, in which a new departure was made when for the first time the subject was discussed by a special section at the British Association meeting.

Professor Neumayer, head of the Hamburg Naval Observatory, has written a letter to Herr Kirchoff on the prediction of fog. The letter is interesting in view of the scientific inquiries undertaken in London on this subject. Professor Neumayer advocates the increased use of kites and kite balloons, as well as the free balloon. He points out that in order to advance the science of meteorology, and consequently that of weather prediction, it is absolutely necessary to know the condition of the higher layers of the atmosphere.

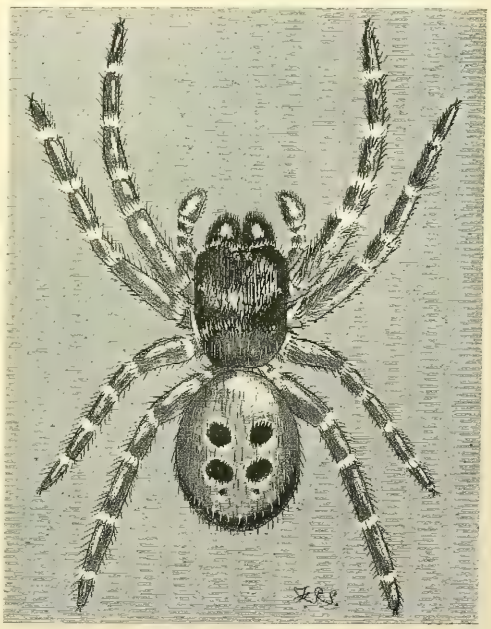
In the December number of "Pearson's Magazine," Mr. W. D. Hulbert continues his interesting series on the natural history of the Glimmerglass Lake in Northern Michigan, U.S.A. That number deals with the life history of the Great Northern Diver, and, like the former articles, is written in popular form, from the bird's point of view. There are several beautiful illustrations by Mr. W. M. Hardy. Former articles dealt with the arboreal porcupine (*Erethiyon dorsatus*), the beaver (*Castor canadensis*), and the mule deer (*Cariacus macrotis*).

Many people have written to the papers describing a brilliant meteor seem about six o'clock on the evening of December 4th. It appears to have been visible all over the South of England, for accounts of its appearance come from Margate, South Devon, Stroud, Henley, Portsmouth, Birmingham, and Eaton Bray, Beds. Its duration seems to have been about five seconds. This topic naturally suggests the account given in "Nature" of the experiments made at Juvisy Observatory in August last to determine the height of meteors. The lowest record of height was 15 kilometres and the highest 119, or not quite 74 miles.

A letter to the "Standard," signed "Ignotus," on "Country Parishes and Insanity," reveals a very grave state of affairs. The writer says:– "I am in charge of a small parish, under 300 inhabitants, and have been for the last five years. During that time one in every eight that have been buried was insane. At the present time two are in the lunatic asylum and two in the workhouse, perfect imbeciles. In the parish itself are four who are harmless, but of very weak intellect. Among the school children there are some half-dozen with intellects much below par, and I have grave doubts as to their ability to earn their own living. . . . Everybody is related to everybody else."

Young Hedgehogs.—Mr. Robert Patterson, writing to the "Irish Naturalist," describes some young hedgehogs born in captivity in September last. They were born blind and the teeth were below the gums. Ears and snouts were unlike adult form. They were each 2½ inches long at birth and weighed three quarters of an ounce, and absence of hair on the body was a character at their birth.

Eresus Cinnabarinus.—I have received for examination a fine specimen of *Eresus cinnabarinus*, a spider very rare in Britain and one whose systematic position has for long been a bone of contention amongst arachnologists. This species may be at once recognised, at least in the male sex, by



Eresus cinnabarinus.

reason of its brilliant markings of scarlet and white upon a jet black ground-colouring. The eyes, too, are placed in a very unusual position, but they are somewhat difficult to detect. Four eyes form a large quadrilateral figure upon the upper surface of the caput, the remaining eyes being arranged in a very small quadrilateral upon the anterior side of the larger one. The specimen was taken in Dorset, about five miles from Bournemouth, on April 22nd, 1900, by Mr. Richard L. Thompson, to whom I wish to accord my best thanks for recording his capture and for forwarding it to me for illustration. I have therefore made the accompanying drawing for reproduction.—*Frank P. Smith*, 15 *Cloudesley Place, Islington.*

JAPANESE WALTZING MICE.—The phenomenon of "waltzing," which is best seen if a circular object be placed in the cage for the mice to waltz round, is due either to an operation on the semi-circular canal in the brain or a disease of the same organ. Professor Gotch does not believe that the waltzing mice are a species to themselves.—*J. M. Cobbett, Woburn Chase, Addlestone, Surrey.*

JAPANESE WALTZING MICE.—In answer to Mr. W. J. Pinckney's inquiry as to the reason for the curious habit that Japanese waltzing mice possess of spinning round and round like tops, I would suggest a theory which I have found after many years of personal observation of these curious rodents. I noticed that by keeping them in a comparatively large space, in fact on a table of about a square yard, with a zinc border all round to prevent the mice falling off, they gradually began to spin less and less. When I purchased them they used scarcely to run about, but kept on spinning frantically. After six or seven months they ran about just like other mice, only occasionally interrupting their course by one swing round. At the end of this period, having to travel during a few months and not being able to allow the mice much space, I placed them in a very small cage, and had the pleasure of seeing them soon reacquire their characteristic spinning motion. During the following years I kept successively three or four pairs of these mice, and invariably observed that they had a tendency to lose their habit of waltzing if allowed a certain space, but soon reacquired it when this was diminished. I also learned from a friend who had been to Japan that these mice are kept in great numbers as pets in that country, but always in very small cages, and thus concluded that the spinning has been acquired by dint of habit from generation after generation always having to turn round and round in a small space to take exercise. A certain proof that the habit is not natural is, as already stated, that it has a strong tendency to being lost when the conditions of the mice are more similar to their natural one. Another curious fact, which I have never been able to explain, is that the Japanese waltzing mice never attempt to climb the bars of their cage, and, if put there, exhibit great signs of fear, and come down step by step, whilst other species would jump down with one leap. The power of procreation seems much diminished in this species.—*Roger Verity, 1 Via Leone Decimo, Florence, Italy.*

PATENT OFFICE LIBRARY.—We have had the pleasure of inspecting the new library of the British Patent Office, which will, it is expected, be open to the public about the middle of this month. The main reading-room is very lofty and well ventilated. Its total dimensions are 150 feet long by 60 feet wide. There are two galleries, each divided, as is the space beneath them, into ten bays. A table occupies each bay, 10 feet long by 4 feet wide; so with those on the ground floor ample seating room is provided for readers. A thorough reclassification of subjects in the books has taken place, and all books and periodicals are available for readers, who need only take them down for reference. The files of scientific periodical and other literature are very complete, and the library contains most works of reference. It is open every weekday until ten o'clock at night.

CONDUCTED BY JAMES SAUNDERS, A.L.S.

ACHILLEA MILLEFOLIUM, VAR. — The pink-flowered variety of the common yarrow is quite abundant, especially in meadows on the south side, near Chesham in Buckinghamshire. Last autumn many of the flowers were very deep in tint.

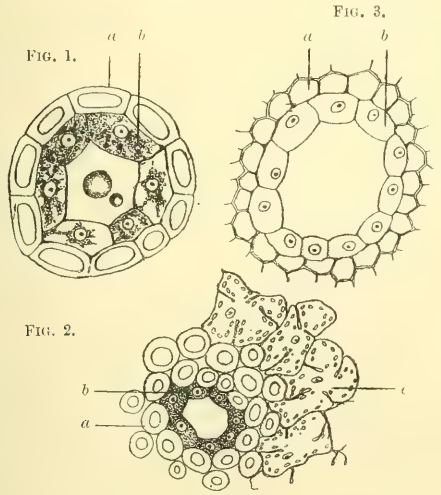
DISPERSION OF SEEDS.—So much stress is laid upon methods of dispersal adopted by seeds and fruits that it is interesting to come across an occasion when they are retained at home. This seems to be the case with ragwort (*Senecio jacobaea*). When its pappus-crowned fruits are ripe, if damp or wet weather prevails, the pappus hairs do not recover their lightness; but, in a moistened clinging mass of down, fall from each flower head, breaking off from the fruit, which remain in their places. Upon the return of dry weather the fruit drop to the ground at the slightest touch, and are scattered close around the parent plant to await the next season of growth. This is a provision seemingly more in keeping with an annual type of plant, and hardly to be expected from ragwort, which is a perennial. If more attention were directed to designs insuring plant families growing in the same spot year after year, especially among annuals, I do not doubt that many examples would be found of special contrivances. There is no reason why a suitable locality should be forsaken on the vague chance of obtaining a better. With a tree shading the ground and impoverishing the soil the matter is different, but I believe many of our short-lived smaller plants are quite content for their children to stay at home.—*R. R. Hutchinson, 28 Princes Street, Tunbridge Wells.*

STRUCTURAL AND PHYSIOLOGICAL BOTANY.

CONDUCTED BY HAROLD A. HAIG.

RESIN-CANALS AND THEIR SIGNIFICANCE.—We find existing in some plants a system of channels for the purpose of the conduction of certain bye-products of metabolism that are either of a protective nature or else form valuable storage material to be used up in processes of nutrition. Such are the laticiferous systems of the Euphorbiaceae and the resin- and gum-resin canals of Gymnosperms and Umbelliferae. It is only the two latter that we shall here consider. In the stems of certain members of the Umbelliferae (*Aethusa cynapium*) we may see, on examining transverse sections, a series of large circular spaces lying just outside the hard bast, one to each of the primary or secondary fibro-vascular bundles. With fairly high magnification, each one of these spaces is seen to be lined internally by a layer of thin-walled parenchyma, the protoplasm of which is granular and possessing a large nucleus (see lower fig.). The spaces are, we find on taking longitudinal sections, sections across the gum-resin canals which the plant possesses in its cortex, and at certain points of our longitudinal section of the canal are to be

found small drops of the intrinsic secretion of the lining layer of cells, which latter are of the nature of a glandular endothelium. In the Gymnosperms (*Pinus sylvestris*) we find in the cortex of the stem similar structures; but we may recognise here two definite layers in each canal. (1) An outer layer of thick-walled sclerised elements forming a "strengthening layer"; and (2) the internal endothelial lining, with cells containing very granular protoplasm (see fig. i. 1). The intrinsic endothelial secretion in this case is a true resin, which is probably an oxidation product of abietic acid. The leaf of *Pinus* has a series of these resin-canals distributed throughout the mesophyll lying just internal to the hypodermis; but in this case the strengthening layer is usually composed of more than one layer of sclerised elements, and moreover are not by any means so regularly disposed as is the case with those in the cortex of the stem (see fig. i. 2).

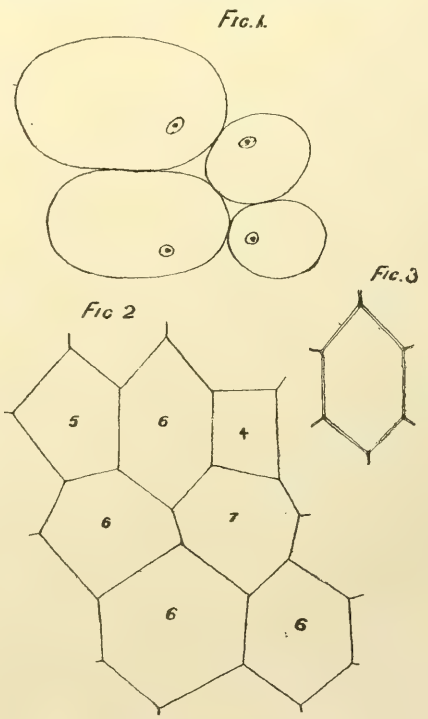


Resin-canals in Section from Different Parts of Plants.

(1) From cortex of stem (*Pinus*). *a*. Strengthening layer. *b*. Endothelium. (2) From mesophyll of leaf (*Pinus*). *c*. Cells of mesophyll. (3) From cortex of stem (*Aethusa cynapium*).

The main structural difference that is to be observed between the canals of *Pinus* and those of the Umbelliferae is the fact that the strengthening layer is so much more developed in the former than in the latter; in *Aethusa* it is merely represented by a ring of smaller cortical cells than the rest, the walls being perhaps slightly thickened. The chemical differences in the respective secretions of their endothelia are however great, but they need not be discussed here, as they are somewhat complex. One reason for the existence of these canals is obvious—namely, they, by virtue of their secretion, form a very efficient protective system in pouring out resin, etc., over buds, and so preserve delicate structures through the cold months. Also, whenever a shoot is lopped off, either accidentally or intentionally, the resin, which is under considerable pressure in the canals, wells up over the cut surface, and so protects it from the outer air, laden with spores of various saprophytes, which might find a good substratum on freshly cut tissues. Another explanation is, however, possible, and one that perhaps is founded on rather more biological grounds. During the progress of metabolism the plant elaborates certain compounds which must be looked upon in the light of excretions. Such a one is abietic acid. These excretions if allowed to remain in the cells might effectually hinder anabolism, and so something must be done to get rid of them if they are produced in any appreciable quantity. A stimulus is thus set up, and the protoplasm, influenced by a sort of "directive action," proceeds to create a system of canals lined by cells whose special function is to utilise the excretions and form a substance (resin) which will be of some use to the plant. This is only another instance of the adaptability of plants to adverse circumstances—one, moreover, fully illustrating the great underlying principle that "action and reaction are equal and opposite." Resin canals of the same structure as those of the cortex are to be found in the first year's wood in *Pinus*, and in the root are seen lying in the fundamental tissue between the forks of the Y-shaped protoxylem. In the latter the strengthening layer is not usually composed of such thick-walled elements as is the case in those of the stem.

Symmetry in Internal Structure.—It is



Hexagonal Symmetry Illustrated.

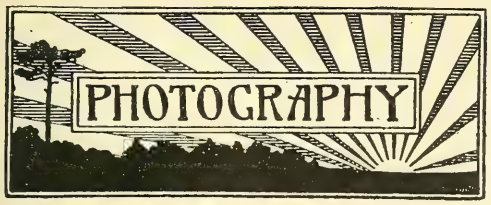
(1) Young cells of pith in bud; these preserve more or less of their oval shape. (2) Cells of pith in stem. The majority of cells in section present six walls. (3) A perfectly symmetrical hexagonal cell from cortex of same plant (*Umbelliferae*).

apparent to every student of the histology of plant-structures that there are definite laws governing

the formation of tissues. The protoplasm appears to possess in each cell or set of cells the capacity of forming cell-walls in certain fixed planes. In fact, it is said to be influenced by a directive action, these planes being tangential, radial, or transverse, if we are considering an elongated structure like a stem or root; or merely parallel to, or at right angles to the surface, if we are dealing with a thalloid one. Moreover, there is a certain amount of symmetry to be observed in individual tissues, in the arrangement of the cells relative to one another. If we take for consideration the pith of any succulent stem and examine transverse sections, first of all through the bud and then through the older portions of the stem, we shall find the following points to hold good:—In the bud the young pith cells are crowded together, but retain more or less of their original ovoid shape, and the intercellular spaces are large. There is little regularity to be seen in the transverse section, but a longitudinal one shows us that the young medullary cells are laid down by the symmetrical formation of fresh "periclinal" and "anticlinal" cell-walls. In the older pith a great many subsequent divisions have arisen, and the cells are so crowded together that they are no longer oval in contour but polygonal. A point to be observed is the fact that in a transverse section the majority of these cells, as also those of the cortex, are hexagonal. In fact, wherever cells are massed together like this, the resultants of turgidity and cohesion tend to produce, first of all, the hexagonal shape, and, later may be, a polygon of any number of sides (fig. 2). Of course there may be intermediate forms, such as 5-sided, or even square cells. The majority are, however, hexagons, as I have repeatedly verified by counting. This fact calls to mind the experiments of Plateau with thin films, in which surface-tension takes the part which the pressure caused by turgidity does here; small soap-bubbles held together by surface-tension enclose spaces, analogous to our cells, that are some multiple of hexagon. Turgid cells thus obey the law of thin films, which states that the surface-tension acts in such a way as to cause these films to present the least area compatible with stability. It is in this manner that we get hexagonal symmetry in crowded tissues. Thus we have symmetry produced in two ways; first, there is that consequent on the regular formation of cell-walls parallel or perpendicular to certain fixed surfaces. Then there is the symmetry arising from purely physical causes, such as cohesion, turgidity, and in some cases surface-tension. The first of these may be termed inherent; the second, which only applies to young or very thin-walled tissues, physical. The first brings about symmetrical arrangement of tissues; the second, symmetry in the grouping together of cells.

Recent Research.—Kornicke (Ges. Nat. u. Heilkunde, Bonn) describes the peculiar process of the passage of nuclei through cell-walls. In *Crocus* this is effected by means of the strands of protoplasm that connect neighbouring protoplasts with one another. All the cells in a pollen-chamber would sometimes exhibit partial passage of nuclei. Professor D. H. Campbell, continuing his former researches on *Peperomia*, has determined that all species of the genus seem to have sixteen nuclei in the embryo-sac instead of the normal eight. Usually eight nuclei fuse to form the definitive nucleus, and they are the homologues of the polar nuclei of typical angiosperms. In *Peperomia* we have, according to Professor Campbell, the most primitive type of Angiosperm. Dr. A. Jencic gives a curious result in connection with the germination of seeds at low temperatures. He finds that in air-dried seeds exposure to −18° Cent. accelerates the power of germination, due possibly to the transformation of insoluble carbohydrates into those soluble in water. A. Burgerstein (Oesterr. Bot. Zeitschrift) communicates some of the results obtained by Professor Anton v. Kerner on the opening and closing of flowers. In many cases it appears that the phenomena in question are not the result of growth, but are caused by changes in turgor, due to transpiration. A new chromogen producing a red pigment has been found in *Schenckia blumenaviana* (Rubiaceae). The pigment is stated ("Journal of Microscopy," October 1901) to be the probable result of the action upon its chromogen of an enzyme, and is not identical with rubian or phycorythrin.

Specific Irritability.—The fact that protoplasm in one part of a plant is capable of producing cells having an entirely different form and function from those in another part of the same organism has for some time been attributed to the fact that there is some intrinsic difference in the response to stimuli in these two parts. In other words, it is to the property possessed by the protoplasm of different cells, known as "specific irritability." In the young tissue of a bud where, before this property has begun to exert an influence, the cells are histologically alike in every respect, we find very soon that different systems of tissues begin to arise, and that, without any obvious external influence. There are, of course, stimuli at work in the shape of nutrition and the maintenance of an optimum temperature and degree of moisture, but there is something else which has to be assumed, and that may be looked upon as inherent in protoplasm, either transmitted with the protoplasm of seeds of former generations, or partly this, and partly the effect of various physical forces. "Specific irritability" is well demonstrated in the effect of various chemical agents upon different plants. To some, iodide of sodium, for example, in dilute solution acts as a food material; to others it is directly harmful, and yet others are not affected at all. This chemotaxy is only another manifestation of specific irritability. The intrinsic property we are here considering is brought into play very strongly during the reproductive processes, especially in the fertilisation of the egg-cell by the generative nuclei of the microspore. In this case we have a species of chemotaxy, and it has been shown in the case of *Vaucheria sessilis* that the oospore secretes a plug of mucilage which contains malic acid that exerts a positive chemotaxis upon the antherozooids. Here, of course, we have a manifestation of irritability probably peculiar to both bodies, and which results in the fusion of these to form the oospore. After all has been said, however, we can only be certain of one thing, and that is, that this irritability, which is manifested in such a variety of ways, is intimately dependent upon the vitality of protoplasm, by which is meant the elementary property of protoplasm to react to stimuli. What it is that causes this reaction to vary in different cells is a matter which is yet under discussion. The consideration of chemotaxy is, therefore, useful in throwing light on the subject.



CONDUCTED BY B. FOULKES-WINKS, M.R.P.S.

EXPOSURE TABLE FOR JANUARY.

The figures in the following table are worked out for plates of about 100 Hurter & Driffield. For plates of lower speed number give more exposure in proportion. Thus plates of 50 H. & D. would require just double the exposure. In the same way, plates of a higher speed number will require proportionately less exposure.

Time, 11 a.m. to 1 p.m.

Between 9 and 11 a.m. and 1 and 3 p.m. double the required exposure. Between 8 and 9 a.m. and 3 and 4 p.m. multiply by 4.

Subject	F. 5·6	F. 8	F. 11	F. 16	F. 22	F. 32	F. 45	F. 64
Sea and Sky..	1/120	1/60	1/32	1/16	1/8	1/4	1/2	1
Open Landscape and Shipping	1/30	1/16	1/8	1/4	1/2	1	2	4
Landscape, with dark foreground, Street Scenes, and Groups ..	1/16	1/8	1/4	1/2	1	2	4	8
Portraits in Rooms ..	8	16	32	1	2	4	—	—
Light Interiors	30	1	2	4	8	16	32	60
Dark Interiors	2	4	8	16	32	60	120	240

The small figures represent seconds, large figures minutes. The exposures are calculated for sunshine. If the weather is cloudy, increase the exposure by half as much again ; if gloomy, double the exposure.

Royal Photographic Society.—For some considerable time a strong current of discontent has been apparent amongst the members of the Society with regard to the working of some of the Articles of Association. This feeling became more and more pronounced, until at last it found vent last October in the presidential address to the Society. A special general meeting was therefore convened at the Society's house, 66 Russell Square, London, for November 11th. At this meeting many of the Articles of Association were altered. The first to be amended was Article 4 : to substitute 1,500 for 1,000 as the limit of the membership. There was a proposition before the meeting that the Society should have a paid secretary instead of an honorary secretary and a paid assistant secretary; but unfortunately this proposal was lost. We are certainly in agreement with those members who advocated this proposition, as there can be no question that a society of this standing, being in fact the premier photographic society of the world, with a membership of nearly one thousand, should have paid officials to do the onerous work of the department. Only such officials can be made responsible for the administration of the many details being executed in a proper manner. There was also a proposal to amend Article 37 which defined the mode of election of committee and other officers. By some evident mischance this was lost; because there is no doubt that the wish of the great majority present was for the amendment. It has been a matter of contention for some years, and so evident was the feeling of the members, that another Special General Meeting of the Society was requisitioned for December 9 for the express purpose of again bringing forward this proposition. There was, then, an attendance of 104 members. The objectionable Article 37 ran as follows: "All nominations must be sent to the secretary not less than twenty-five days before the annual general meeting. A balloting paper containing no names but those of the members nominated and eligible to serve and their nominators shall be sent to every member of the Society at least seven days before the annual general meeting, with instructions to erase all names of members nominated except those for whom he desires to vote. Every balloting paper shall be invalid on which more than one name as president, four names as vice-presidents, one name as treasurer, and twenty names as ordinary members of Council are left unerased, or where there is any indication of the identity of the voter. The balloting paper shall be closed in an envelope provided for the purpose, which shall be enclosed in another envelope bearing the voter's signature, and forwarded to reach the secretary not later than noon of the day preceding the annual general meeting. The secretary shall place such envelopes unopened in the hands of the scrutineers, who shall reject any papers received except those from members entitled to vote, and shall announce the result of the election before the close of the annual general meeting. If the votes in any case are equal, the chairman shall give a casting vote. Votes given to any member nominated in two capacities, and not elected to the higher, shall be counted to the next office, but no balloting paper shall be allowed to count as recording more than one vote for any nominee." The omission of the words "and their nominators," on the third and fourth lines, was proposed by Mr. Child Bayley, F.R.P.S., seconded by Mr. Thomas Bedding, F.R.P.S., and supported by many of the most influential members. The great objection raised by all these gentlemen to the article was that the balloting paper for members of the Council went out with twenty to thirty well-known names as nominators in support of certain candidates for the Council, which system, it was contended, asserted undue influence in favour of the candidate who could get the most members to nominate him. So keen were the members on the necessity of having this article amended, that when the amendment was put to the meeting by the president, it was found that 97 out of a total of 104 members present voted for the proposition to eliminate the words. There is still urgent need for change in management in many directions, and should an entirely new Council be elected, the members may hope to get these reforms carried through. One of the most important is that the Society's rooms should be kept open every evening until 10 o'clock. At present they are only available from 10 a.m. until 4 p.m., excepting one evening in the week. As the great majority of members are business men, it is evident that the advantages of joining such a society are practically denied to most of the members.

CONDUCTED BY F. C. DENNETT.

	1902 Jan.	Rises. h.m.	Sets. h.m.	Position at Noon. R.A. h.m.s.	Dec. ° ′ ″
Sun ..	10 ..	8. 5 a.m. ..	4.10 p.m. ..	19.23.44 ..	22. 3.17 S.
	20 ..	7.56 a.m. ..	4.26 p.m. ..	20. 6.45 ..	20.15.34 S.
	30 ..	7.44 a.m. ..	4.42 p.m. ..	20.48.32 ..	17.49.57 S.

	Jan.	Rises. h.m.	Souths. h.m.	Sets. h.m.	Age at Noon. d. h.m.
Moon ..	10 ..	7.56 a.m. ..	0.35 p.m. ..	5.21 p.m. ..	0 14.45
	20 ..	1. 6 p.m. ..	9.11 p.m. ..	4.13 a.m. ..	10 14.45
	30 ..		4.56 a.m. ..	10. 4 a.m. ..	20 14.45

	Jan.	Souths. h.m.	Semi-diameter.	Position at Noon. R.A. h.m.s.	Dec. ° ′ ″
Mercury..	10 ..	0.30·8 p.m. ..	2·4″	19.47. 3 ..	23.18.21 S.
	20 ..	1 .1·6 p.m. ..	2·6″	20.57.13 ..	19. 8.48 S.
	30 ..	1.23·2 p.m. ..	3·1″	21.58.15 ..	12.53.19 S.
Venus ..	10 ..	2.47·7 p.m. ..	20·5″	22. 4.17 ..	10.31.32 S.
	20 ..	2.18·6 p.m. ..	24·0″	22.14.43 ..	7.21.17 S.
	30 ..	1.35·2 p.m. ..	27·8″	22.10.42 ..	5.13.10 S.
Mars ..	20 ..	1.13·8 p.m. ..	2·0″	21. 9.33 ..	17.31. 7 S.
Jupiter ..	20 ..	11.56·4 a.m. ..	14·9″	19.52. 4 ..	21.15.33 S.
Saturn ..	20 .	11.30·8 a.m. ..	7·0″	19.26.29 ..	21.48.43 S.
Uranus ..	20 ..	9.19·0 a.m. ..	1·8″	17.14.18 .	23. 5.13 S.
Neptune ..	20 ..	10. 3·7 p.m. ..	1·2″	5.56.59 ..	22.15.37 N.

MOON'S PHASES.

		h.m.			h.m.
3rd Qr. ..	Jan. 1 ..	4. 8 p.m.	*New* ..	Jan. 9 ..	9.15 p.m.
1st Qr. ..	„ 17 ..	6.38 a.m.	*Full* ..	„ 24 ..	0. 6 a.m.
3rd Qr. ..	„ 31 ..	1. 9 p.m.			

In apogee on January 5th, at 4 a.m.; and in perigee on 21st, at 6 a.m.

METEORS.

			h.m.	°
Jan.	2 to 3 ..	Quadrantids	Radiant R.A. 15.20	Dec. 52 N.
„	14 to 20 ..	χ Cygnids	„ „ 16.20	„ 53 N.
„	18 to 28 ..	θ Coronids	„ „ 15.32	„ 31 N.

CONJUNCTIONS OF PLANETS WITH THE MOON.

					° ′
Jan.	9 ..	..	Saturn† .. 11 p.m. ..	Planet	4.34 S.
„	10 ..	..	Jupiter* .. 8 a.m. ..	„	5.11 S.
„	10 ..	..	Mercury* .. 10 a.m. ..	„	7. 4 S.
„	11 .	..	Mars* .. Noon ..	„	6.22 S.
„	13 ..	..	Venus† .. 6 a.m. ..	„	3. 8 S.
„	28 ..	..	Juno* .. 9 a.m. ..	„	1.11 N.

* Daylight. † Below English horizon.

OCCULTATIONS.

Jan.	Star.	Magnitude.	Disappears. h.m.	Angle from Vertex. °	Reappears. h.m.	Angle from Vertex. °
12 ..	c^1 Capricorni	5·2 ..	4.17 p.m. ..	53 ..	5.27 p.m. ..	209
13 ..	κ Aquarii	5·5 ..	6.23 p.m. ..	340 ..	7. 1 p.m. ..	267
21 ..	71 Orionis	5·1 ..	8.15 p.m. ..	50 ..	8.39 p.m. ..	6
23 ..	68 Geminorum	5·0 ..	4.56 a.m. ..	118 ..	5.28 a.m. ..	191
24 ..	κ Cancri	5·0 ..	6. 7 p.m. ..	147 ..	7. 1 p.m. ..	315
25 ..	ω Leonis	5·6 ..	5.23 a.m. ..	23 ..	6. 0 a.m. ..	303

THE SUN should be watched for outbreaks of activity. It is nearest to the Earth at 7 a.m. on New Year's Day.

MERCURY is in superior conjunction with the Sun at 6 a.m. on January 2nd, after which he becomes a morning star, setting at 6.20 p.m. on the 30th. At 3 p.m. on January 6th he is in conjunction with, and 2° 11′ south of, Saturn. At 5 p.m. on the 9th, he passes 1° 50′ south of Jupiter, and at 2 a.m. on the 24th is in conjunction with Mars, only being situated 25′ to the south of the fiery planet.

VENUS is an evening star all the month, attaining her greatest brilliancy at 3 a.m. on January 10th. The low declination of the two inferior planets militates against successful observation.

MARS, JUPITER, SATURN, and URANUS are all too close to the Sun for observation. Jupiter and Saturn are in conjunction with the Sun on January 15th and 9th respectively, at 11 p.m. and 10 p.m. on those dates.

NEPTUNE is well above the horizon all the working hours of the night, retrograding along a path 3m. 9s. in length a little west of η Geminorum, which is situated R.A. 6h. 9m. 0s., Dec. 22° 31′ 59″ north.

THE LEONIDS.—The great display seems to have failed, but reports come to hand of many Leonids having been seen in America, and some few in Northern Ireland.

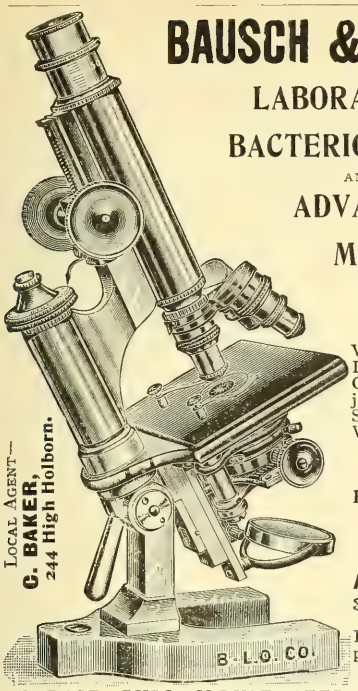
A NEW VARIABLE of the Algol type is reported by Herr F. Schwab, which will be known as 93 (1901) Sagittae, situated in R.A. 19h. 14m. 26s., Dec. 19° 25′ 4″. Its normal brightness is 6·5 magnitude, and falls to nearly 9, so that it can be easily observed with small instruments. Its light curve is very like that of U Cephei, occupying 17 days. Its next minima are due about the 7th and 24th of January.

A NEW PLANETOID, which is believed to approach closer to the earth than Eros, has been found in the southern skies, having at the time of discovery a declination of about 60°. The announcement comes from Professor Pickering, and Professor Simon Newcombe calls attention to its orbit, which is believed to have great eccentricity.

GREAT ORION NEBULA.—Señor Comas Sola, of Barcelona, considers that the sixth star of the well-known trapezium has increased in brightness, being on November 10th only 0·4 magnitude below the fifth star, which itself seemed unusually bright.

STARFIELD OBSERVATORY.—We recently mentioned that Mdlle. Klumpke was leaving the Paris Observatory, where she had laboured so long and well, to assist Dr. Isaac Roberts at Crowborough, in Sussex. This, however, was not the whole fact, as these two valued workers in celestial photography have since been married, and Mrs. Isaac Roberts, D.Sc., gave an interesting address at the conversazione held at Sion College on November 27th, celebrating the one hundredth meeting of the British Astronomical Association.

NOVA 1901 PERSEI.—Herr Osten Bergstrand, of Upsala, after careful determination of the star's place, gives its mean position for 1901·4 as R.A. 3h. 24m. 28·16s., Dec. 43° 33″ 45·0″ N. It apparently has a proper motion in R.A. of −0·05s., and in Dec. −0·7″. This would seem to indicate that the Nova is by no means one of our nearest neighbours in space. The deep purple ray, which is apparently the cause of the smaller aureola which photographic refractors show around this star, is visually visible with the spectroscope, and is also found to be present in the spectrum of



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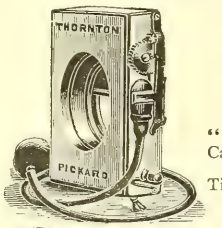

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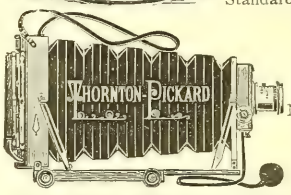

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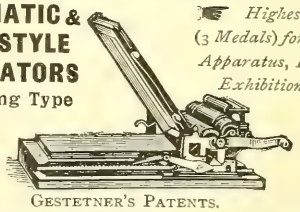

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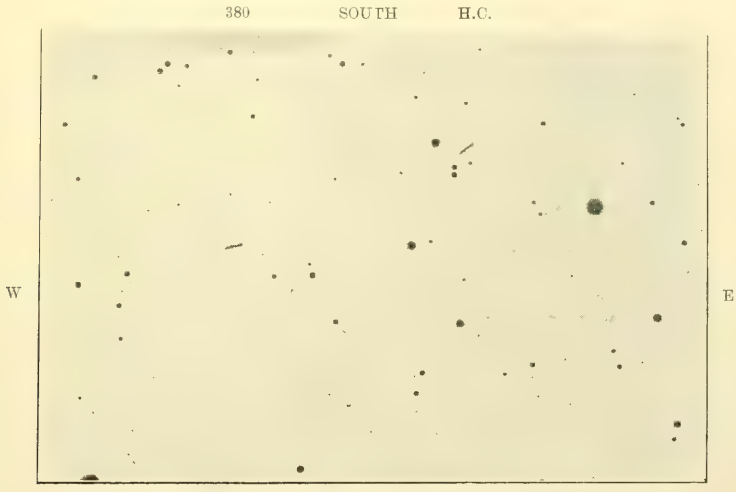
the planetary nebula N.G.C. (New General Catalogue) 3918. Admirable pictures appear in the "Illustrated London News" of November 23rd, 1901, reproducing the photograph of the spiral nebulosity around Nova Persei taken by Mr. W. Ritchey, at Yerkes Observatory, together with an explanatory sketch which shows details appearing in the original negative, but which are barely visible in the prints. This nebulosity must not be confounded with the optical aureola. It is amid this nebulosity that the rapid motion has been observed at Lick Observatory. The greatest proper motion of any star hitherto observed amounts to only 8·7″ per annum, whilst the motion of these nebular nuclei is equal to 11′. This, were the nebula at the distance of 61 Cygni, which has a parallax of 0·39″, would mean 55,200 miles per second, or over five radii of the earth's orbit in one day.

Minor Planets.—During the month ending November 15th eight of these little bodies were discovered by Professor Max Wolf and his fellow workers at the Heidelberg Observatory; and a ninth



Track on Photo: Plate with Two Minor Planets.

was found by Luther at Düsseldorf. By the kindness of Professor Max Wolf, of Heidelberg, we are able to reproduce the photograph taken on November 4th, after an exposure of 2 hours with the 16-inch Bruce telescope. This shows the trail on the right of one, the new 13·5 magnitude planet, as yet designated H.C., and also the trail of another faint planet, No. 380, discovered in 1894. The position of H.C. was R.A. 2h. 6·3 m., Dec. N. 3° 27′. The plate is enlarged three-and-a-half times.

Professor J. E. Keeler.—The Governing Committee of the Allegheny Observatory have resolved to erect a 30-inch reflector as a memorial to the late Professor J. E. Keeler, who, previously to his appointment to Lick Observatory, had been Director of the Allegheny Observatory. It is expected the instrument will cost £2,000.

MICROSCOPY

CONDUCTED BY F. SHILLINGTON SCALES, F.R.M.S.

Royal Microscopical Society, November 20th.—Wm. Carruthers, Esq., F.R.S., President, in the chair. Four microscopes of great interest were presented to the Society. Descriptions of three of these, prepared by Mr. Nelson, were read. Regarding one made by Powell & Lealand, in 1848, Mr. Nelson writes: "This form was the first instance in which the microscope was hung in a tripod, and it was also the first where the fine adjustment moved a nose-piece by means of a lever inside a bar movement, and this specimen must have been about the last microscope made with the fine adjustment screw at the side of the bar, for it was in 1848 that the screw was placed vertically above the lever, where it has remained ever since." Other features were referred to, and Mr. Nelson characterised it as historically an important and not very common form of Powell & Lealand's microscope. The next instrument described was an old one made by Hugh Powell, certainly before 1841, as in that year Mr. Lealand joined the firm, and his name would have been coupled with that of Mr. Powell. The presence of a sub-stage condenser prevents it being dated earlier than 1839. An important feature is the stage which has an arrangement for focussing by means of three wedges moved by a micrometer screw. The stage has also a transverse micrometer movement for the measurement of objects. The third microscope was made

by John Cuff. The date of its introduction was 1744, and it was called "A New Constructed Double Microscope." After the John Marshall microscope this is, historically, one of the most important instruments in the Society's collection. The other microscope presented was made by Plössl & Cie., Wien, and has already been described in the Journal of the Society. Messrs. R. & J. Beck exhibited a new pattern microscope embodying several new features. The sub-stage was fitted with coarse and fine adjustments, and means of throwing out the condenser while it was in focus. The stage, 5 in. diameter, was rotating, and graduated on the periphery, with a removable mechanical stage graduated as a finder. The body was very short, fitted with a double draw-tube, which allowed the body to be extended to 11½-in. The body was fitted with Ashe's new double fine adjustment. Mr. Conrad Beck gave an exhibition of antipoints, and said they were extremely difficult to show on account of the trouble there was in obtaining points of light sufficiently small and bright, and it was only possible to obtain faint images with so much diffused light as there was in that room. There were six microscopes, all having ½-in. objectives, and the points of light in the first two cases were produced by minute apertures in tinfoil; in the others the light was reflected from small mercury globules. With the first microscope a point of light was viewed with ½-in. objective of ordinary aperture, and showed a point of light surrounded with faint diffraction circles. With the second microscope a similar point of light was viewed with a ½-in. objective of very small aperture, and showed a disc of light and diffraction rings. The other microscopes showed the effects produced by placing various stops behind the objectives, and also by viewing the point of light through a grating which extended the whole aperture of the objective. Mr. J. W. Gordon said he had listened with great interest to Mr. Beck's explanation of the demonstration and was anxious to see the examples, and no doubt the experiments would demonstrate the existence and appearance of the antipoint in each case, but there was another and equally important image which he would like to see, and that was the antipoint which was formed in the eye, and he hoped some day Mr. Beck would be able to give a demonstration of this. A paper "On Stereomicrography," by Professor G. P. Girdwood, of M'Gill College, Montreal, was read by the Secretary. Professor Girdwood's method of obtaining stereomicrophotographs was by placing the slide or object in a tilting frame attached to the stage of the microscope. The frame with the object was tilted to one side to the proper angle and a photograph was taken; the frame was then tilted to an equal amount in the opposite direction and another photograph was taken. Prints from the negatives were then mounted in the usual way to form stereoscopic pictures. The paper was illustrated by a diagram on the blackboard, and a specimen of the stereoscopic photographs placed in a stereoscope was passed round the room.

Quekett Microscopical Club.—The 390th ordinary meeting was held on November 15th at 20 Hanover Square, W., Mr. J. G. Waller, F.S.A., vice-president, in the chair.—Additions to the library and cabinet were announced. A paper by Mr. A. A. Merlin, on the "Spermatozoon of the Rat," was taken as read. The Secretary read a paper, also by Mr. Merlin, "On the Critical Employment of the Microscope for Ordinary Working Purposes." The author enumerated and considered the causes of indifference and opposition to the employment of "critical" methods in the general use of the microscope. The importance of the wide axial cone of illumination with all powers was insisted upon; and, although the author deplored the absence from opticians' catalogues of good low-power achromatic condensers, yet he showed how this want could be met by means nearly as efficient. A few simple experiments were recommended, to convince the naturalist or other low-power worker of the advantage and necessity of relatively wide cones from a condenser with low-power objectives. The author also dealt with the corrections of the objective, which depended upon thickness of cover-glass, and the necessity of adjusting the correction-collar or tube-length to obtain good results. Preservation of the eyes and increase in their perception could be assisted by working in a darkened room and by occasional rests in the dark for a few minutes. Too intense illumination was to be avoided by the use of such screens as the copper acetate solution, and not by modifying the cone. The paper also contained useful hints on eyepieces, etc. In the succeeding discussion Mr. W. B. Stokes said that the remarks they had just heard might be of use, not only to the younger members to whom they were addressed, but also to many who had worked for years with the microscope. He instanced the apathy with regard to "critical" methods frequently noticeable in that room. He had seen objectives corrected for the short tube used on a long body, though correction for thickness of cover-glass was impossible under such conditions. The same objective might require a 4-inch tube with a thick cover-glass, while with a thin cover a 15-inch tube might be necessary before fine detail was shown clearly. Such variations of tube-length were not practicable on most microscopes. His own experience was short and his work intermittent, but he could endorse Mr. Merlin's remarks on the advantages of a darkened room and occasional rests in the dark. Several objects were exhibited after the formal proceedings terminated.

Manchester Microscopical Society.—At the monthly meeting of this Society held at the Grand Hotel, Manchester, on December 5th, Prof. Sydney J. Hickson, M.A., D.Sc., F.R.S., delivered his Presidential Address on the subject of Fertilisation. He said that modern researches have cleared away a great many false hypotheses as to the nature of fertilisation, and had thrown much light on the biological meaning of the process. The study of the Protozoa had conclusively proved that the germinal cells were originally equal in bulk as well as being equivalent in function. The differentiation into ova and spermatozoa is characteristic of the Metazoa, and is accounted for by the necessity of the young embryo to have a sufficient supply of food material. After a discussion on the fusion of all parts of the germinal cells in fertilisation, the President proceeded to describe the recent experiments on artificial parthenogenesis, and pointed out the bearing of these facts on the theories of fertilisation. The address was illustrated by means of the oxy-hydrogen lantern, many interesting photo-micrographs of the actual fertilisation of the ovum by the spermatozoa being shown.

Sunderland Microscopical Society.—The annual meeting of this society was held on November 19th. The annual report was read and officers elected, after which Professor G. S. Brady, LL.D., F.R.S., President, gave an address on "Problems of Pond Life," in which he alluded to the popular delusion that the microscopist who studied pond life was only truly happy when he found a foul, festering pool, covered with green slime and giving off poisonous gases. What the microscopist really sought for was a pond with clear water and abundant vegetation. One of the most interesting problems was as to where all the animals in ponds get their sustenance. After considering this question from various points of view Professor Brady said he had arrived at the conclusion that the lower forms of minute animal life had the faculty of extracting sustenance from the air and water, in a similar way to plants. Professor Brady also gave his experiences in connection with a dredging expedition which he joined really to settle this problem, and for which a special grant had been made by the Royal Society. They found that microscopic vegetable life did not exist beyond about fifteen fathoms from the shore, but they found myriads of minute animal organisms, millions of them in a thimbleful of water. Though really animals, they probably lived in vegetable fashion, absorbing their nutriment from the water in which they lived.

Postal Microscopical Society.—The Annual Report for the session 1900–1901 records an improvement on the previous year, not only from the financial point of view but in other details. The number of boxes sent out has been considerably increased, and the Hon. Secretary has felt justified in purchasing a fresh stock of slides for the use of the Society, in addition to those contributed by the members themselves. The rules of the Society have been modified in some details. The membership shows a slight increase, but we hope to see this improved upon in the forthcoming year. There are few amateur microscopists who would not find membership in this Society both helpful and stimulating. They would have the opportunity of examining a large number of slides partly professional, but mostly mounted by workers in the same plane as themselves. The selected notes which appear each month in these columns will show of what nature are the remarks and explanations accompanying such slides, and the subscription is only 5s. per annum, with an entrance fee of 2s. 6d. The Society needs money less than the help and interest of those who are themselves interested in microscopy, especially of those who are interested in research of any kind, however humble. The Hon. Secretary is Miss Florence Phillips, Hafod Euryn, Colwyn Bay, North Wales.

Journal of the Quekett Microscopical Club.—The November issue of the "Quekett Club Journal" has just reached us, and, as usual, contains much interesting matter. There are two papers, by Messrs. W. B. Stokes and Julius Rheinberg respectively, which deal with the much-disputed question of diatom structure as exhibited by the microscope. Mr. G. Massee describes a new and little-known family of micro-fungi parasitic on beetles, and which have been also sparingly observed on white ants and acarids. The family is known as the Laboulbeniaceae. They are considered to be non-injurious to their hosts, and in their sexual mode of reproduction agree very closely with that of the Florideae or red sea-weeds. Like these Algae, also, they are interesting in showing with unusual distinctness the phenomenon known as the "continuity of protoplasm," the comparatively recent observation of which has so greatly modified the views formerly held, by which the cell was previously regarded as a perfectly closed vesicle with unperforated walls. Our knowledge of these fungi is due almost entirely to the work of Dr. Roland Thaxter, of Harvard University, who says of them: "When examined *in situ* on the host they appear, in general, like minute, usually dark-coloured or yellowish bristles or bushy hairs, projecting from the chitinous integument, either singly or in pairs, more commonly scattered, but often densely crowded over certain areas, on which they form a furry coating." Mr. Massee calls attention to the fact that not a single species has yet been recorded in this country, and reminds the members of the Quekett Club, and with them all workers with the microscope, that this field of research offers a tempting opportunity to those who have not yet settled down to the study of a specific group. Mr. C. F. Rousselet and Mr. Walter Wesché each describe new rotifers, *Metopidia solidus* and *Triarthra brachiata* respectively. Mr. S. W. Smith deals with the micro-structure of metals and alloys and with their preparation, examination, and photography; and Mr. D. J. Scourfield's paper on "*Hydra* and the Surface-film of Water" (alluded to in these pages last month—*ante*, p. 209) is printed *in extenso*. Mr. A. Ashe contributes an interesting article on two-speed fine adjustments. Various shorter notes, some excellent reviews by Mr. D. J. Scourfield—the editor of the Journal—and the usual reports of the proceedings of the Club, complete the number.

Preparing Insect Eggs.—As there has been no reply to my queries (Mounting Methods, *ante*, p. 154) as to devitalising, preparing, and mounting insect eggs, it would appear to be a department of microscopical work in which much has not been done by Science-Gossip readers, and, as a small contribution to micro-technique, it is only fair that I should relate my own recent experience. At the time of writing I had a Vapourer moth, fresh from the chrysalis, which was ovipositing unimpregnated eggs in the pill-box in which it was brought to me. On the death of the moth I removed about half the eggs still attached to the white surface paper of the box. These were easily removed by a thin knife-blade. Being still firmly attached to the paper and to each other, they were easily divided into two smaller masses. One group I dropped into methylated spirit and the other into turpentine. I allowed them to macerate for a fortnight, when I removed them, still firmly fixed to the paper and to each other. They were then placed in a glass-topped box for another fortnight, so that they might thoroughly dry. The question was whether they would retain their plump, natural appearance, and whether they would be affected by the soaking, or would shrivel or collapse in the drying process. At the end of the first week it looked as though both batches would turn out right. At the end of the second week those in the turpentine remained absolutely unaltered, fresh, plump, and fully distended, but the spirit-soaked batch had nearly every egg more or less shrivelled, with the upper face depressed or pulled down, as it were, with the periphery more or less flattened

and the two sides drawn together. The turpentine group I put into a cell on crimson paper with a removable cover, and at this moment of writing, three months after the eggs were deposited by the moth, they look as though quite recently laid, making a beautiful top-light object for the 2-in. binocular. The untouched batch I have still in the original pill-box. They appear to be absolutely unaltered, and apparently as fit to mount as the group which I have mounted. We must not lose sight of the fact that the ova I write of were unfertilised, a fact that would of course, to some extent, bear on their subsequent conduct. Any information hereon from the experience of others would be useful to myself and other readers.—*F. R. Brokenshire, Exeter.*

Artificial Dendrites.—In answer to Mr. Abbott's question as to the classification of the dendrites (*ante*, p. 191)—I presume he means the South Kensington specimens—my knowledge of the subject does not extend so far as to question the classification there given. The theory broached in your September number is not my own, but was advanced by a gentleman before the Geological Society in London about January, 1899, and was reported in your contemporary, "Nature." As I have not now access to the back numbers, I regret that I cannot give the gentleman's name. When I commenced the suggested experiments I had no idea of publication. As to fluidity *versus* plasticity, the difference is more of degree than of kind. I found in my experiments that the more water was added, the finer and more numerous were the ramifications, but that the difficulty of getting a clear figure increased. I agree with Mr. Abbott as to the difference to the eye between the South Kensington specimens, but I fail to see the difference to the mind, because in every experiment there will be a variation of figure, according to the fluidity, the speed in separating the planes, the amount of pressure on them, etc. Probably still greater variations would occur by using substances of different consistencies.—*Edward Moor, 40 Arbitration Street, Doncaster.*

C. Baker's Slide Lending System.—Mr. Charles Baker has sent us a further selection of the notes accompanying the slides in his Slide Lending Department. These include an introduction to the study of the Foraminifera, and descriptions of the first set of twenty foraminiferal slides, written by Mr. A. Earland, to which are added half a dozen plates of excellent explanatory diagrams and illustrations; descriptions of dissections of an earwig, a cockroach, and a grasshopper, contributed by Mr. F. P. Smith, whose name is well known to readers of this magazine; and descriptions of a set of twenty slides dealing with pond life, mainly rotifers, for which Mr. C. F. Rousselet is responsible. This last is exceptionally interesting, and we should have liked to have made extracts therefrom had space permitted. Mr. Baker's scheme deserves success; as we have already said, the mere looking at slides is of no advantage. It is their study that is essential, and no one can fail to benefit by, as well as be interested in, slides accompanied as these are, by interesting explanations, which in many cases cannot fail to tempt the observer to make further observations for himself—a consummation most devoutly to be wished. The subscription to this series is so low, in comparison with its value, that we can recommend it to our readers.

Mounting Web of Spider.—I have to thank Mr. Payne for his note hereon (*ante*, p. 211); but as he says nothing about the viscid globules on the concentric strands which formed the principal feature in the beautiful slide I remember seeing in a friend's collection some long time since, I fear, in his preparation, these had no place, had evaporated, or become absorbed by the strands. I have now a dried portion of a garden-spider's snare beautifully displayed on a slip, and taken with the view of mounting; but the globules are gone, the feature I wish to preserve.—*F. R. Brokenshire, Exeter.*

MEETINGS OF MICROSCOPICAL SOCIETIES

Royal Microscopical Society.—20 Hanover Square, January 15th, 8 p.m.

Quekett Microscopical Club.—20 Hanover Square, January 3rd, 7 p.m.; January 17th, 8 p.m.

Manchester Microscopical Society.—Grand Hotel, Manchester, January 9th, 7 p.m., "The microscopic structure of limestone," illustrated with lantern slides and by a microscopical demonstration; January 30th, 7 p.m., Annual Meeting, Report of the Council, Election of Officers.

Sunderland Microscopical Society.—Subscription Library, Sunderland, January 21st, 7.30 p.m.

ANSWERS TO CORRESPONDENTS.

E. G. W. (Alnwick).—Mr. Cole, the well-known mounter, recommends the following procedure with regard to the cutting of sections of whole insects and staining them:—"Embed in paraffin or celloidin, make sections, and stain afterwards. The latter embedment would answer better. I do not think it would be possible to stain whole insects in bulk; the staining solution would not penetrate the chitine." Concise and reliable instructions for embedding in celloidin will be found in Cross & Cole's "Modern Microscopy," pp. 124, 125; in Carpenter's "Microscope" (8th ed.), pp. 503–506; or in Lee's "Microtomist's Vade-Mecum" (5th ed.), pp. 120–134. If you have not access to any of these works I shall be glad to give you full information as to the procedure.

[For further articles in this number on Microscopical subjects, see pp. 230, 231, 234, and 245.]

EXTRACTS FROM POSTAL MICROSCOPICAL SOCIETY'S NOTEBOOKS.

(*Continued from page* 212.)

[Beyond necessary editorial revision these extracts are printed as written by the various members.—Ed. Microscopy, S.-G.]

Fossil Stems of Crinoids.—Fig. 10 represents fossil crinoids from the same beds of Wenlock shales. These interesting inhabitants of Silurian Carboniferous seas are too well known to need description.

Spicules of Gorgonia.—Figs. 11 and 12 represent species of Gorgoniadae mounted by the Rev. J. E. Vize, F.R.M.S., and presented by him to me some time ago. They deserve careful examination. Fig. 11, *Donatia lyneurium*; Fig. 12, *Lophogorgia palma* and *Paragorgia arborea.*

Antheridia and Globules of Chara fragilis.—The sexual reproductive organs of the Characeae,

the male antherids and the female archegones are visible to the naked eye as minute globules and elliptical green bodies. The number of antherozooids in the antherids is said to be many thou-

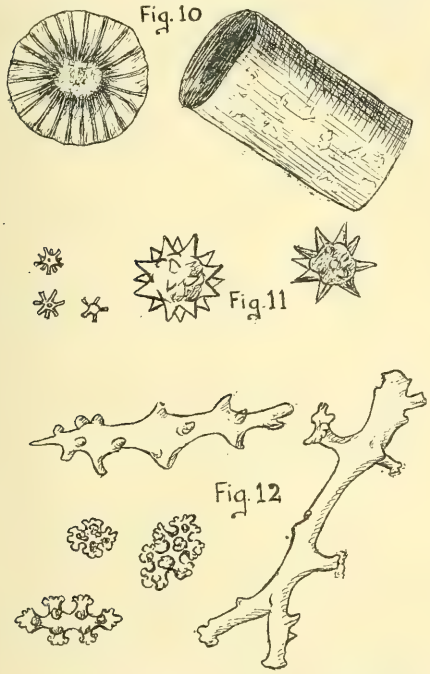
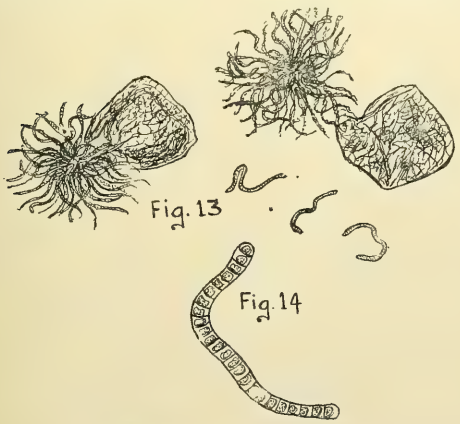


Fig. 10. Fossil Stem of Crinoids. Fig. 11. *Donatia lyneurium.* Fig. 12. *Paragorgia arborea* and *Lophogorgia palma.*

sands. When ripe the shields fall apart and the antherozooids escape from their mother cells and move about rapidly in the water by means of vibratile ciliae. Fig. 13 shows the antheridial



Figs. 13 and 14. *Chara fragilis.*

filaments escaping. Fig. 14 shows an individual filament enlarged, and containing the antherozooids.

Xenodochus carbonarius (Burnet Brand) spores (Fig. 15).—This somewhat rare micro-fungus is parasitic on the Great Burnet (*Sanguisorba officinalis*, L.), a plant of local distribution. I found it in great plenty in the Lake District. In the Bath and Bristol district it is only to be found in one or two places.—*A. G. Wheatcroft.*

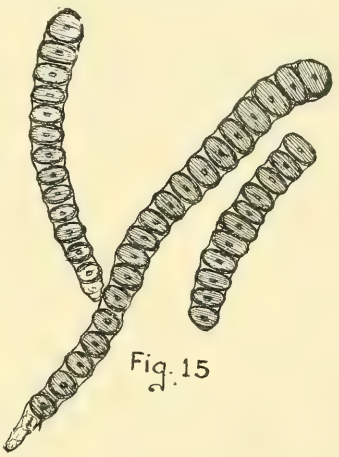


Fig. 15. Spores of *Xenodochus carbonarius.*

Remarks.

Are not the star-like spicules sponge-spicules ?—*R. S. Pattrick.*

I recommend all who have not examined the fruit of Chara when living to do so next season. *Xenodochus carbonarius* differs from *Aregma bulbosum*, the common blackberry brand, only in having more numerous spore cells.—*John Terry.*

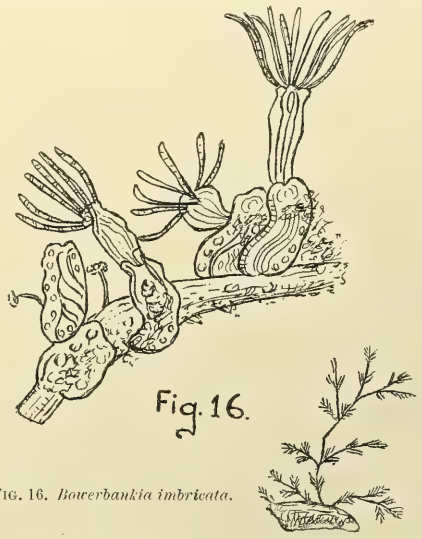
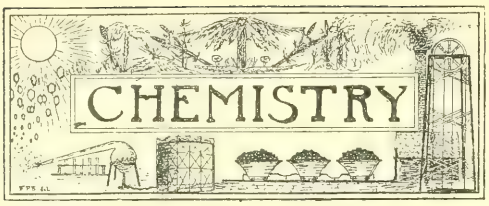


Fig. 16. *Bowerbankia imbricata.*

These fossil polyzoa are very beautiful, and I have made drawings of them, as well as one from a living Bowerbankia (fig. 16).—*Florence Phillips.*

I think with Mr. Pattrick that the spicules referred to are from a sponge. I never saw any from Gorgonias at all like them, and those I have seen are all similar to the other forms represented.—*John Hibbert.*

(*To be continued.*)

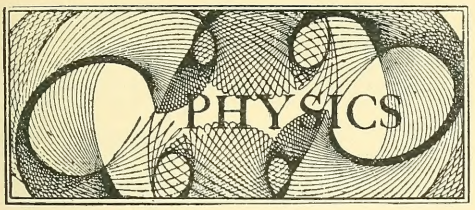


CONDUCTED BY C. AINSWORTH MITCHELL, B.A.OXON., F.I.C., F.C.S.

Food Preservatives Inquiry.—The Departmental Committee of the Local Government Board, appointed in July 1899 to investigate into the use of preservatives and colouring matters in food products, have just issued their report in the form of a Blue Book of 500 pages. The use of boric acid is shown to be very general as a preservative in butter, cream, ham, and potted meats. In the case of the flesh foods the Committee consider that there is no sufficient reason for interfering with the use of boron preservatives, but that the quantity used for butter or margarine should not exceed 0·5 per cent., and should be accompanied by a notification of its presence and amount. Salicylic acid or its salts was found in 320 of the products examined, temperance drinks forming nearly half of this total. Formalin was detected in twenty samples, of which thirteen were milk and cream The Committee recommend that formalin be absolutely prohibited, and that salicylic acid be not used in greater proportion than 1 grain to a pint in liquid food, or 1 grain to the lb. in solid food. Further recommendations are that no preservative or colouring matter be added to milk or to any food intended for the use of infants or invalids. Professor Tunnicliffe differs from the rest of the Committee in that he would allow half a grain of metallic copper per lb. as a colouring matter in tinned peas, whereas the other members would prohibit its use entirely. It is to be hoped that the Court of Reference which the Committee suggest should exercise supervision over preservatives and colouring matters may eventually be established, since new preservatives, not yet tried to any extent, will probably become common when the use of the older ones is prohibited or limited.

Action of Formalin on Flesh.—Formaldehyde has been made the basis of many meat preservatives such as "carnolin," which is a very weak solution slightly acidified; but according to the results of different observers it has not proved successful. Ehrlich, for instance, found that an 8 per cent. solution preserved horseflesh perfectly, but that a very unpleasant odour was developed. Beef treated with the same solution was equally preserved, and did not develop the odour of horseflesh; but on the other hand the meat was only fit to be eaten for a short time after the addition of the preservative, owing to the chemical changes caused by it. According to Bloxam, too, fish treated with formaldehyde becomes so hard as to be unsaleable, even when the preserving solution only contains 1 part in 5,000. It is an interesting confirmation of these statements that a large consignment of birds' skins recently imported from New Zealand have become absolutely rigid. The cause of this change is the combination which takes place between the formaldehyde and the albuminous compounds in the flesh, with the formation of remarkably insoluble substances. This hardening influence on animal tissues must necessarily render meat less digestible, and in fact it has been found that as little as 0·2 gramme of formaldehyde interfered with the artificial peptic digestion of blood fibrin, so that the recommendation of the Preservatives Committee (*supra*) is fully justified by these facts. It is interesting to note that while formaldehyde is a powerful antiseptic for bacteria, it does not inhibit the growth of moulds or yeast. The writer has succeeded in cultivating an exceedingly pure yeast in a solution containing sufficient formaldehyde to prevent bacterial growth for weeks.

Water of the Dead Sea.—The most remarkable characteristic of the water of the large inland lake which receives the river Jordan is its great density, which far exceeds that of any commonly-known natural water. So striking is this property that it has attracted the attention of every traveller, and is the origin of the many marvellous legends found in old and mediæval literature. Sir John Maundeville, for instance, whose "Travels" were published between 1357 and 1371, wrote:—"And neither Man, Beast nor any thing that beareth Life in him may die in that Sea. And that hath been proved many times by Men that have deserved to be dead, that have been Cast therein and left there for 3 Days or 4, and they might never die therein; for it receiveth no Thing within him that beareth Life. And no Man may drink of the Water for Bitterness. And if a Man Cast Iron thereon it will float above. And if Men Cast a Feather therein it will sink to the Bottom, and these be Things against Nature." Lavoisier, who analysed some of the water in 1778 by the imperfect methods of analysis at his disposal, found it to contain 46·6 per cent. of solid matter, consisting of 40 per cent. of calcium and magnesium chlorides and the remainder of common salt. The specific gravity was 1·2403. The present writer has recently had an opportunity of examining a specimen of the water brought back some years ago. This had a specific gravity of 1·203, or, in other words, a gallon of it would weigh approximately 12 lb., as compared with ordinary sea-water, a gallon of which weighs about $10\frac{1}{4}$ lb. The density of the water was due to the saline matter in solution—24·46 per cent., as against about 3·5 per cent. in sea-water. This large proportion of salts is due to continuous evaporation of the water, and the introduction of fresh quantities charged with mineral matter from the surrounding soil. The effect of this saline matter on bathers is very striking, the skin rapidly becoming coated with a thin crust of salts on leaving the water. A small amount of organic matter (0·5 per cent.) was also present, probably consisting of bituminous substance derived from the asphalt which is still found floating on the water (*cf.* Gen. xiv. 10). The salts consisted chiefly of magnesium chloride and sodium chloride, with smaller quantities of calcium chloride and potassium chloride; but these constituents were present in a very different proportion from their ratio in sea-water. Calculated into their probable combinations the salts consisted of per cent.:—Magnesium chloride, 9·06; calcium chloride, 3·49; sodium chloride, 8·52; potassium chloride, 2·37; iron and aluminium chlorides, 0·55; calcium sulphate, 0·148; ammonium chloride, 0·029; silica, 0·083; magnesium bromide, 0·21. Total, 24·460.



CONTRIBUTED BY W. H. CADMAN.

VELOCITY OF SOUND IN HOT AIR.—A recent experiment has been made by E. H. Stevens. He used a porcelain resonance tube closed at one end, which was heated by means of a coal-stove. The actual velocity of sound in the hot air at 950° and 1,000° was found to be slightly less than the theoretical value. In each case the value 1·34 was obtained for the ratio of the two specific heats from the observed velocity of sound in the hot air, using Laplace's formula $V = \sqrt{\frac{\gamma P}{\rho}}$. Determinations made in Arctic expeditions at very low temperatures below the freezing-point give values for the velocity of sound in cold air also slightly less than the calculated value.

ELECTRIC CONVECTION.—In the October number of SCIENCE-GOSSIP a short account was given of the experiments by means of which M. V. Crémieu concluded that a moving electrified body produces no magnetic effect, though, in opposition to the classical experiment of Professor Rowland, Harold Pender has just published an account of his elaborate research on this subject. His experiments show beyond any doubt that electric convection does produce magnetic action. For a complete description of Pender's experiments we refer our readers to the "Physical Review" for October.

PERIOD OF A ROD VIBRATING IN A LIQUID.—The "Physical Review" for September contains an account of a series of experiments on the period of a rod vibrating in a liquid by Mary I. Northway and A. Stanley Mackenzie. It has been known since 1786 that the period of a pendulum is greater when vibrating in a fluid than when vibrating in a vacuum. This is due to loss in weight through buoyancy and also to the pendulum being loaded by, or dragging with it, a certain amount of the fluid. In 1848 Stokes treated the problem of a body oscillating in an infinite liquid medium, and considered mathematically the effect of the viscosity as well as of the density of the fluid. The experiments about to be described approximate very closely in their main results to this important piece of work. The relation between the pitch of bells and tuning-forks in air and that in various liquids has received the attention of several experimenters, and various suggestions have been made to explain the lowering of pitch from simple mechanical principles. The rod experimented on was held in a clamp screwed to the inside of a wooden box, which held when required the liquid under consideration. An electro-magnet was used to maintain the rod in vibration. The experiments were made in water, cotton-seed oil, and a saturated solution of sodium nitrate with brass and steel rods. The results show that the interval of lowering for a rod of given cross-section is independent of the length, and is also approximately the same for brass and steel. It is further evident that the main factor in the lowering of pitch is the density of the medium, and that the effect of viscosity is relatively small.

THE PRESSURE OF LIGHT.—Professor Peter Lebedew of Moscow University gives in the "Annalen der Physik" for November last an account of a research by means of which he has succeeded in demonstrating experimentally the pressure of light. Maxwell pointed out that "the concentrated rays of the electric lamp falling on a thin metallic disc, delicately suspended in a vacuum, might, perhaps, produce an observable mechanical effect. It was thought that Sir William Crookes obtained this effect in his radiometer, but the magnitude proved many thousand times too great. Professor Lebedew used a large bulb with high exhaustion and excluded rays capable of heating the tube walls. In this way he eliminated the radiometer action. The radiometer vanes were of very thin aluminium foil suspended by a glass fibre, and the electric arc was the source of light. The following are the principal results:—(1) The incident beam of light exerts a pressure both upon an absorbing and a reflecting body; (2) this pressure of light is directly proportional to the amount of incident energy and is independent of the colour of the light; (3) this pressure of light corresponds with the ponderomotor, forces of radiation calculated by Maxwell and Bartoli. Hence the existence of the Maxwell-Bartoli pressure of light is experimentally proved.

THE RAINBOW.—When a ray of sunlight falls on a raindrop it is refracted, then part of the light is reflected from the internal surface and again refracted on leaving the drop. In the figure the path of such a ray has been drawn. The white sunlight is not only refracted when it enters

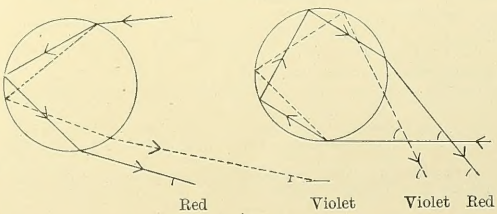


FIG. 1. SHOWING FORMATION OF PRIMARY BOW.

FIG. 2. SHOWING FORMATION OF SECONDARY BOW.

and leaves the drop, but dispersion also takes place as shown by the dotted lines. The eye sees bright circles of light for each kind of light, and since sunlight is made up of different kinds of homogeneous light we get a series of circular arcs, showing the spectrum colours, the red being outside, and the other colours following in the order of descending wave-length. The whole constitutes a primary rainbow. A secondary bow is sometimes seen outside the first. This is formed by the light being twice reflected inside the raindrops in the manner shown in the second figure. The less refrangible rays are on the inner side. Rainbows due to still more internal reflections are too feeble to be observed. It is possible to get a white rainbow if the sun is clouded or if there is a mixture of raindrops of very different sizes.

SURFACE TENSION OF OIL FILMS ON WATER.—When olive oil is dropped on water a film is formed, in the middle of which an oil drop persists. The size of the drop, its angle of contact, and the surface tension of the film have been shown experimentally by R. H. Weber to vary with the size of the surface. The values of the surface tension found varied also with time, and it was concluded that the film consisted of a third liquid formed from the oil and water, probably by hydrolysis.

MAXWELL'S POEMS.—It is not, perhaps, generally known that James Clerk Maxwell wrote a large number of poems, many of which are very original in character. The early life and brilliant career of this great physicist are well known, and it is not surprising to find that a man with such a wide capacity for knowledge as Maxwell possessed should also have a poetical mind. The following is an extract of one of his poems taken at random:—"Through many an Ohm, the Ampère flew, And ticked this answer back to me: I am thy Farad staunch and true, Charged to a Volt with love for thee."

NOTICES OF SOCIETIES.

Ordinary meetings are marked †, *excursions* * ; *names of persons following excursions are of Conductors. Lantern Illustrations* §.

ROYAL INSTITUTION OF GREAT BRITAIN.

Jan. 2, 4, 7, and 9.—† "Waves and Ripples in Water, Air, and Aether" Professor J. A. Fleming.
„ 14.—† "The Cell." Dr Allan Macfadyen.
„ 16.—† "Recent Excavations at Delphi and in the Greek Islands.' Dr. A. S. Murray.
„ 17.—† "Interference of Sound." Lord Rayleigh.
„ 21.—† "The Cell." Dr. Allan Macfadyen.
„ 23.—† "Recent Excavations at Delphi and in the Greek Islands." Dr. A. S. Murray.
„ 24.—† "The Discovery of the Future" H. G. Wells.
„ 28.—† "The Cell." Dr. Allan Macfadyen.
„ 30.—† "Recent Excavations at Delphi and in the Greek Islands." Dr. A. S. Murray.
„ 31.—† "The Ions of Electrolysis.' Professor A. Crum Brown.

SOUTH LONDON ENTOMOLOGICAL AND NATURAL HISTORY SOCIETY.

Jan. 9.—§ "Notes on the Nightjar." E. Step.
„ 23.—Annual Meeting.

HAMPSTEAD SCIENTIFIC SOCIETY.

Jan. 3.—† "Entomology of Iceland." Rev. F. A. Walker, D.D., F.S.S.
„ 8.—§ Photographic Section "Portraiture."
„ 10.—† "The Anatomy of a Sea-Anemone." Dr. J. W. Williams, F.S.S.
„ 24.—Photographic Section. Demonstration on the Carbon Process.

NOTICES TO CORRESPONDENTS.

TO CORRESPONDENTS AND EXCHANGERS.—SCIENCE-GOSSIP is published on the 25th of each month. All notes or short communications should reach us not later than the 18th of the month for insertion in the following number. No communications can be inserted or noticed without full name and address of writer. Notices of changes of address admitted free.

EDITORIAL COMMUNICATIONS, articles, books for review, instruments for notice, specimens for identification, etc., to be addressed to JOHN T. CARRINGTON, 110 Strand, London, W.C.

BUSINESS COMMUNICATIONS.—All business communications relating to SCIENCE-GOSSIP must be addressed to the Manager, SCIENCE-GOSSIP, 110 Strand, London.

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THE Editor will be pleased to answer questions and name specimens through the Correspondence column of the magazine. Specimens, in good condition, of not more than three species to be sent at one time, *carriage paid*. Duplicates only to be sent, which will not be returned. The specimens must have identifying numbers attached, together with locality, date, and particulars of capture.

NOTICE.—Contributors are requested to strictly observe the following rules. All contributions must be *clearly* written on one side of the paper only. Words intended to be printed in *italics* should be marked under with a single line. Generic names must be given in full, excepting where used immediately before. Capitals may only be used for generic, and not specific names. Scientific names and names of places to be written in round hand.

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ANSWERS TO CORRESPONDENTS.

S. S. D. (Dunfanaghy).—We do not know that Reynolds published such an Atlas. If so, it would be out of date. The Geological Survey of Ireland would be best. You might try W. & A. K. Johnston's "Geological Map of the British Isles." See p. 82, Vol. IV. of SCIENCE-GOSSIP for notice

EXCHANGES.

NOTICE.—Exchanges extending to thirty words (including name and address) admitted free; but additional words must be prepaid at the rate of threepence for every seven words or less.

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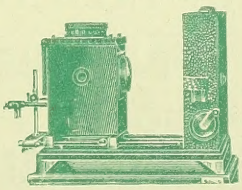

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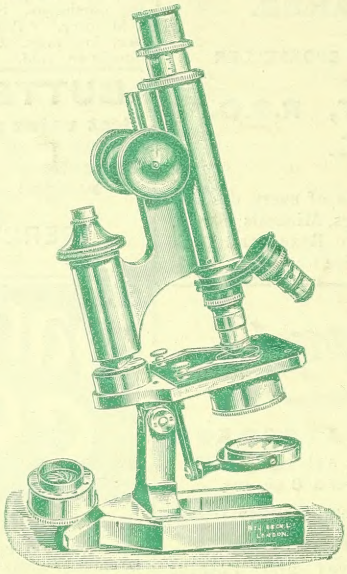

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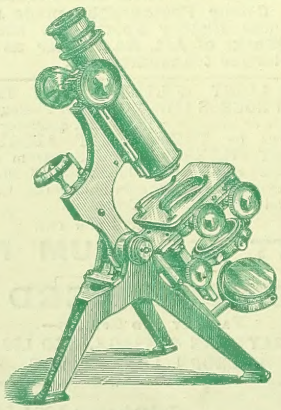

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