tricity to the working of heavy trains under the exigencies of such traffic as the Metropolitan and District Railways will involve some new problems and require much consideration; but for myself I think the time has come for the work to be faced, and I am persuaded that, large as the necessary capital required may be, it will be well spent.

Before leaving the subject of the present developments of electricity, I may draw attention to the work recently inaugurated at Foyers or Loch Ness for the employment of water-power in the production of electricity for the manufacture of aluminium out of bauxite. For the production of aluminium successfully by this process with commercial success, a great deal of power must be available at a cheap rate, and water-power appears to be the only available source for such a purpose. The rainfall in this country, especially on the west coast, provides a most important agent if it can be stored cheaply at a high level, and both these desiderata are possible at Foyers, as also at other sites on the west coast. When we know that the rainfall at such places as Fort William, Ballacludish, Cumberland, and North Wales, varies from 6 feet to 7 feet per annum, and that the configuration of the country renders storage peculiarly easy, we can see that a great future may remain for the use of water-power, not only in the manufacture of aluminium, but also of acetylene and other products which may in the future attain to much importance. At Foyers the working head of water is 350 feet, and the power already developed is 3608 h.p., at an estimated cost per h.p., per annum, which is only 25 per cent. of the cost of steam-power where coal is cheap. Of course this is merely in a humble way what has been done by harnessing Niagara for commercial purposes; but this application of the forces of nature seems to me to have much promise for the future in this country.

Another most interesting subject of contemplation is the work of the engineer as applied directly to domestic life. I suppose that the invention of the lucifer match—not an engineering but chemical achievement—slightly before the beginning of the reign, but brought to mature development within its early years, was perhaps the greatest domestic boon of the century. An old friend of mine (my fishing ghilly) has described to me how, about 1839, he bought, in a then remote part of Scotland, three lucifer matches for sixpence, and exhibited them to his friends and neighbours, who naturally looked upon them with amazement and some amount of distrust as not altogether canny. The instant availability of light and heat was a stride of the greatest importance, and it is impossible to overrate it as a priceless boon for humanity. In the same way three most important home engineering feats, viz. the invention of the sewing-machine, the adaptation of machinery to the manufacture of watches and clocks, and the invention of the safety bicycle, touch and will continue to touch the home life of more individuals directly and intimately than many other engineering developments of the epoch.

Approaching now the circumstances of the present year, I think a subject of special interest at the present moment to engineers is that new departure which has been authorised by Parliament, and which may have an important bearing on the subject of intercommunication to which I have alluded—I mean the Light Railways Act, and what may be called the Auto-Motor Emancipation Act of last session.

I have little doubt that light railways will, in many districts, be of great utility, and I earnestly hope for, and fully expect, at the hands of the Commissioners appointed, a well-considered policy. Much will depend on the inauguration of the system on sound lines. I hold strongly that light railways should in all cases, other than where they will be independent approaches to a port or to a market, be of the same gauge as the standard gauge of the country. The traffic on these lines (with the above exceptions) must be dependent on the trunk or parent line, and in the nature of things will be small in each individual case.

A very important subject for consideration also in connection with the Light Railways Act, and in itself, is the future of auto-motors as applied to the light traffic, whether of goods or passengers, to be accommodated by the proposed light railways; and no engineer can read the accounts of the results attained by auto-motors, or have seen the machines in operation, without recognising their great promise for the future.

The astonishing thing is that, seeing that about the date of the Queen's accession Hancock ran his steam omnibuses regularly between Paddington and the city, and that Gurney and Scott Russell also ran auto-motors commercially about the same time, and that the subject has engaged the attention of engineers from that time to the present, resulting in various most promising auto-motors, it should be reserved for 1895 and 1896 to show so many practical vehicles. One would have thought that the force of invention, backed by public opinion, would have been sufficient before now to have compelled an alteration of the ridiculous regulations of the Acts of Parliament now happily repealed.

Without for one moment decrying the status of the able engineers who exercised their craft prior to 1837, I think it may be said that the Queen's reign has, practically speaking, witnessed the birth of engineering as a profession of a most important character, and with a great future, fulfilling duties of extreme delicacy, and bearing perhaps more responsibility in respect of life and expenditure than is supported by any other calling.

I have enlarged on the subject of the exploits and triumphs of the engineering profession, not in a spirit of boasting, as the representative for the time being of a profession to which I am proud to belong, but with the view of pointing out the dignity of our calling, and the burden laid upon us thereby, as members of this great Institution, of not letting that dignity suffer any loss or disparagement in the years to come.

In connection with the subject of the education of engineers, it is a matter of much interest to us to know what is the instruction given to engineers of other countries, and the guarantees that it has been more or less assimilated by those who are members of kindred institutions. I will only say here that I have made it my business to gain, through our Secretary, much recent information on these points, which were also investigated in 1870 at the request of the President and Council by our Honorary Member, then our Honorary Secretary, Dr. Pole. To enter into these particulars in such an address as this is impossible, and I must content myself by saying that in France, Germany, Austria, Russia, Belgium and Holland, the greatest attention is paid by the State to a strict scientific training, and that the utmost care is taken to see that all candidates for employment as engineers are, so far as education is concerned, thoroughly equipped for the work which may lie before them.

I see no proper way to ensure the same results being attained in this country except through the instrumentality of this body, which is the representative of the profession here; and I venture to think that if this Institution is to retain its present honourable position as the acknowledged head of the engineering profession of Great Britain, and of Greater Britain, we should see that any credentials or degrees conferred by us are based on undoubted qualifications.

BOTANY AT THE BRITISH ASSOCIATION.

AFTER the delivery of the presidential address by Dr. D. H. Scott, F.R.S., an interim report was presented on the method of preserving and displaying botanical museum specimens.

An important new feature at this year's meeting was an address by the Director of the Royal Gardens, Kew, on the geographical distribution of plants. The lecture was primarily intended for those possessing a general interest in botanical science, rather than for specialists. It is hoped that the success of the experiment will lead to a continuance of such addresses at future meetings of the Botanical Section. Another interesting feature was the prominence given to two important subjects which have been matter of discussion and research for some years—the ascent of water in trees, and the problems of cell-division.

Mr. Francis Darwin, F.R.S., in opening the discussion on the former subject, contributed a paper in which the present state of our knowledge of the ascent of water was lucidly set forth, and treated from a critical standpoint. Prof. Marshall Ward discussed several of the questions raised, from a botanical aspect, with special reference to capillarity and imbibition, and particularly the structure of wood. In addition to various botanists, Prof. Fitzgerald and Dr. Joly, of Dublin, took part in the discussion, and dealt with the question mainly from the physical side. It is probable that a fuller account of the discussion will be given in a forthcoming number of the *Annals of Botany*. Mr. Darwin dealt with the subject under two main heads—the *path* of the ascending current in trees, and the *force* which produces the ascent of the water. Attention was called

to the necessity of a complete study of the minute structure of wood in relation to the modern theories. The concluding words of the opening address may be quoted *verbatim*:—"It is at least a hopeful fact for Messrs. Dixon, Joly, and Askenasy that we cannot point to anything in the anatomy of wood which is absolutely inconsistent with their views. Whether we are friends or opponents of Messrs. Dixon, Joly, and Askenasy's theory, the broad facts remain that water has the power of resisting tensile stress, and that this fact must henceforth be a factor in the problem. There are difficulties in the way of our authors' theory, but it is especially deserving of notice that many of these difficulties are equally serious in the case of any theory which excludes the help of the living elements of the wood, and assumes a flow of water in the tracheals. The authors have not only suggested a *vera causa*, but have done so without multiplying difficulties. There is, therefore, a distinct balance in their favour. Huxley, quoting from Goethe, makes use of the expression *thätige Skepsis*. It is a frame of mind highly appropriate to us in the present juncture, if we interpret it to mean a state of doubt whose fruit is activity, and if we translate activity by experiment."

Prof. Vines, F.R.S., drew attention, in the first place, to a paper of his, recently published in the *Annals of Botany*, giving an account of a number of experiments on the suction-force of branches. He had been under the impression that the results obtained were independent of the action of atmospheric pressure—that they were solely indications of tensile stress exerted by the transpiring branch upon the water in the apparatus; but now he had reason to believe that they were, as a matter of fact, affected by the atmospheric pressure. Hence these results are not different in kind from those of other observers, but are comparable with them. The apparatus which he employed is, however, very useful, on account of its sensitiveness and simplicity, for purposes of demonstration.

The observations in question brought out two important facts: (1) that a high suction-force can be developed by branches which have been deprived of their leaves; and (2) that this suction-force is not dependent upon the life of the branch. He then proceeded to give an account of subsequent observations made with dead hazel-branches (pea-sticks), which had been found to develop considerable suction-force amounting, in one case, to 19½ inches of mercury with a stick 18 inches long. He concluded by expressing the opinion that, in recent attempts to explain the mechanism of the transpiration-current, the part played by the "imbibition" of the cell-walls had been underestimated; and urged that what was especially requisite for further advance, is a more complete investigation of the physical properties of a dead piece of stick.

The second discussion, on some current problems connected with cell-division, was opened by Prof. Bretland Farmer, who gave a very complete account of the present position of cell-division problems, before a joint meeting of Sections C and K. In reference to the centrosome question, Prof. Farmer spoke as follows:—

"Few people are agreed as to what its (the centrosome) very nature actually is, and perhaps still fewer as to the part which it plays in the cell. Some regard it as the active agent in bringing about nuclear division, whilst others believe it to be a transient structure, called into existence by the forces which are at work during karyokinesis. The occurrence and behaviour of centrosomes during karyokinesis (nutosis) require a comparative treatment. Whilst it is quite possible that in the cells of some organisms, the centrosome may possess a marked individuality, it does not therefore necessarily follow that it must occur universally, or that it is concerned, as a principal, with the process; and this latter remark applies even to those instances in which it appears most prominently."

Profs. Minot, Zacharias, Hartog, and others, took part in the discussion. An important contribution, bearing directly on this subject, was made by Miss Ethel Sargant in a paper entitled "On the heterotype divisions of *Lilium Martagon*." Her work may be briefly summarised as follows. There are two series of nuclear division in the life-history of *Lilium Martagon*, which exhibit twelve chromosomes in place of twenty-four. The preparations made by Miss Sargant include the whole oögenetic series and the first three divisions of the spermatogenetic series. The second and third divisions in both are precisely similar to vegetative nuclear divisions except in possessing only half the number of chromosomes. They are called *homotype*.

The first nuclear division on either side is called *heterotype*, because the process of karyokinesis differs from that of the vegetative nucleus. Miss Sargant dealt with the distinguishing features of the latter heterotype divisions.

THALLOPHYTA.

Prof. Magnus, of Berlin, gave an account of some recent observations on the Chytridiaceous genus *Urophlyctis*. The author maintained the genus *Urophlyctis*. He described the development of the species *Urophlyctis Kriegeriana*, occurring in *Carum carvi*, established by him some years ago, and showed that its spores are formed by the conjugation of two cells, arising from different filaments, and that the development of the fungus takes place within a single cell of the host, namely, the central cell of the gall produced by it, which is of limited growth. The author proved that the fungus observed by Trabut in Algiers, which causes large swellings on beetroots, also belongs to this genus *Urophlyctis*. Prof. Magnus proved that its spores are likewise formed by the conjugation of two cells, arising from different filaments, exactly as in *Urophlyctis*.

Mr. Vaughan Jennings contributed a note on *Corallorhiza innata*, R.Br., and its associated fungi. Without being able to speak of his conclusions as in all cases definitely established by proof, the author thus summarised his results.

"So far, then, as this district (Davos Platz) is concerned, it seems that the 'mycorhiza' of *Corallorhiza* is a hymenomycete, and commonly an agaric; and that certain species of *Tricholoma* and *Clitocybe* are those commonly observed. The only other forms yet noted in proximity to *Corallorhiza* are *Cortinarius subferrugineus*, Batsch., and *Mycena umbellifera*, Sch., but further evidence with regard to these is at present wanting."

Mr. Vaughan Jennings also gave an account of a form of *Schizomycetes*, for which he proposed the name *Astrobacter Jonesii*.

Mr. Coppen Jones contributed some observations on the so-called tubercle *Bacillus*. He expressed the opinion that there are several considerations which tend to modify our views with respect to its biological status. The facts he brought forward favoured the view that the so-called "tubercle bacillus" is really a stage in the life-history of some higher form of fungus with a definite mycelial growth. From a systematic point of view, it cannot be regarded as coming within any definition of the genus *Bacillus*, and it is suggested that a more appropriate name would be *Tuberculomyces*. Whether the change in our view as to the real nature of the tubercle fungus will in the future be of any diagnostic value it is impossible to say, as comparatively few cases showing the filamentous growth have yet been observed; but there is some evidence in support of the idea that the hyphal type may be correlated with more chronic stages of the disease, where actual tissue destruction is relatively slight.

Mr. W. G. P. Ellis contributed an account of the life-history of a fungus which is the cause of a parasitic disease in the Liverwort *Pellia epiphylla*. A disease appearing on and spreading centrifugally over a pan of *Pellia* was investigated during the summer of 1896. The author was led to regard the fungus as the conidial phase of an Ascomycete, similar to, if not identical with *Ascotricha*, the conidial stage of a *Chætomium*.

Prof. Chodat, of Geneva, communicated an extremely interesting paper of far-reaching importance on the polymorphism of the green algæ, and the principles of their evolution. The green algæ may be divided into two distinct groups, the *Euchlorophyceæ*, and the *Siphoneæ*. In the former a true cell-division takes place, while in the latter the thallus is non-cellular. The starting-point in the evolution of the *Euchlorophyceæ* is very likely the *Palmellaceæ* (including the genera *Tetraspora*, *Palmella*, and *Apiocystis*). Observations show that no clear boundary line can be drawn between the different groups and the *Palmellaceæ*, from which they are supposed to be derived. The *Volvocineæ*, for example, agree very closely with the *Palmellaceæ* in the structure of the cells, but in these the resting stage is only transient. In this non-motile condition obtained by culture, they cannot be distinguished from the latter. In another direction the *Protococcaceæ* can be derived from the *Palmellaceæ* by the prevalence of the sporangial condition. In some species or genera the single-celled sporangium produces zoospores, but in the course of evolution these are replaced by the non-motile spores, when the mother cells or sporangia have a definite form as in *Scenodesmus* and *Raphidium*.

In certain forms of *Pleurococcus vulgaris* a production of zoo-

spores occurs, and in others these are replaced by non-motile spores. In this case, as in others, it is easy to observe that a true difference between the so-called cell division and free cell formation (Al. Braun) does not exist; the latter being only the result of an early or late dissolution of the septa.

The homology of the sexuality of *Coleochæte* with the *Archegoniatæ* is only apparent. In none of the green algæ (*Euchlorophyceæ*) can an archegonium or antheridium be recognised. The genus *Aphanochæte* clearly shows that the affinity of *Coleochæte* is with the *Chlorophyceæ*, and not with the *Archegoniatæ*. A fuller account of Prof. Chodat's paper is to appear in the *Annals of Botany*.

Prof. Zacharias, of Hamburg, gave an account of his researches on the histology of the blue-green algæ. In each cell there is a central colourless portion surrounded by protoplasm containing colouring matter. The protoplasm, when treated with reagents, reveals a spongy structure. In the surface, or occasionally outside the central portion, there occur granules which agree in certain reactions with the chromatin of the nucleus of other organisms. To these granules Zacharias has given the name of "central substance." More recent investigations have made it doubtful whether the central substance contains nuclein like the chromosomes. It is probable that the central body of the spore contains glycogen. In the cell protoplasm there occur granules different from the central substance. Cell-division occurs without the karyokinetic figures.

PTERIDOPHYTA, &c.

A paper of exceptional importance was read by Mr. Lang, on some peculiar cases of apogamous reproduction in ferns.

In order to ascertain to what extent apogamy in *Nephrodium filix-mas*, Desv., is correlated with the cresting of the fern plant, from which the spores were derived, the author made cultures of normal and crested forms. Of the three cultures of normal forms one was unsuccessful; one of the others was exclusively apogamous, while the other reproduced itself in the ordinary way. Seven crested varieties were sown; five of these were apogamous, and the other two normal.

Cultures were also made of crested varieties of other species. In all in which young plants were produced their development was at first normal. After the cultures had continued for nine months young plants, developed apogamously, were found in *Scolopendrium vulgare*, *Athyrium filix fœmina*, and *Aspidium aculeatum*, var. *angulare*.

Unfertilised prothalli of *Scolopendrium vulgare* formed a cylindrical, fleshy prolongation of the midrib, the tip of which became in time covered with ramenta, and was continued directly as the axis of the young sporophyte. Archegonia were present just below the ramenta.

In some prothalli of a fern from Mr. Druery's collection, which was labelled *Lastrea dilatata*, var. *cristato-gracilis*, a similar prolongation of the median region was found. Upon this sporangia were borne, sometimes singly, in other cases grouped together so as to resemble a sorus. The sporangia had a well-developed annulus, which sometimes showed the characteristic reddish-brown thickenings of the wall. The prolongation on which the sporangia were situated bore archegonia and antheridia, which sometimes intervened between two groups of sporangia. Its prothallial nature was, therefore, beyond doubt. The sporangia were borne on prothalli on which no trace of a young sporophyte could be detected.

Prof. Bower, F.R.S., contributed a paper on the enumeration of spore-mother-cells and spores as a basis of comparison of ferns. The author brought out, in a striking manner, some interesting points of comparison between different fern types. He gave in a tabular form the results of computation of the number of spores per sporangium in representatives of various ferns, and also of sporangia and spores per sorus. These brought out distinctly the fact that the potential output per sporangium, as estimated by the number of spore-mother cells, varies very greatly among Leptosporangiate ferns, being only 16 in *Ceratopteris*, while in *Gleichenia* the number may be about 1400; *Aneimia* and *Osmunda* showing, respectively, about 128, and over 500, The further fact that *Gleichenia* produces an output virtually equivalent to that of *Angiopteris*, is specially interesting as showing that no numerical gulf lies between the Leptosporangiate and Eusporangiate ferns.

Remarks were also made on the parallelism of complexity of sporangia and antheridia in various homosporous Pteridophyta.

After the papers by Prof. Chodat, Prof. Bower, and Mr. Lang had been read, a discussion took place, which had special reference to the general question of alternation of generations in plants, which had been treated at some length by Dr. Scott in his opening address. In reply to arguments advanced by Dr. Scott, and relating especially to the examples of apogamy described by Mr. Lang, Prof. Bower expressed the opinion afresh that both apogamy and apospory are to be looked upon as abnormalities, which are not a proper subject for strict morphological argument; moreover, both are susceptible of a physiological explanation, as substitutionary growths. The argument from apospory, as evidence of homologous alternation, involves the fallacy that parts which, under unusual circumstances, can be induced to undergo similar development are of similar origin.

If such abnormalities as Mr. Lang describes be used for argument, the complete jumble of succession would allow of almost any view. The opinion was expressed by Prof. Bower, on the general question, that neither by the description of these abnormalities, nor by the other arguments advanced by Dr. Scott, is the case for homologous alternation made out. The green algæ can at most be used as examples of how alternation may have originated.

Dr. Scott then replied to Prof. Bower's criticisms.

HIGHER PLANTS; PHYSIOLOGY, ANATOMY, &c.

Prof. Casimir de Candolle, of Geneva, contributed some exceedingly interesting notes on latent life in seeds. The author gave an account of some experiments, recently carried out, on the power of germination of seeds exposed for different periods to a low temperature. He also recorded striking instances of the development of normal seedlings from seeds which had been kept for a great number of years. Robert Brown obtained perfect seedlings from seeds of *Nelumbium speciosum* more than a century old. Plants buried under rubbish heaps collected by the Greeks, have been found to develop and bear flowers from seeds which must have been at least fifteen hundred years old. To test the condition of a dormant seed, M. de Candolle exposed the seeds of several plants to a temperature too low to admit of the continuance of the process of respiration. Seeds of corn, oats, fennel, *Mimosa pudica*, and *Gloxinia*, &c., were exposed for 118 days to a temperature of 40° F. below zero. The experiments were carried on at Liverpool in refrigerating machines, in which during eight hours each day the average temperature recorded was − 40° F., and occasionally far lower. Nearly all the seeds of corn, oat, fennel, and a great many of the *Mimosa* seeds germinated. The conclusion to be drawn from the experiments seems to be, that in resting seeds the protoplasm is not actually living, but has reached a stage of inaction in which, although not dead, it is endowed with potential life. In other words, protoplasm in resting seeds is not analogous to a smouldering fire, but rather to those chemical mixtures made up of bodies capable of combining under certain conditions of temperature and illumination.

Prof. Marshall Ward, Dr. Scott, and others discussed several important points suggested by Prof. de Candolle's paper.

Prof. Trail, F.R.S., gave some account of his recent observations on the floral deviations in some species of *Polygonum*. The genus has long been known to show considerable departures from the arrangement and number of parts accepted as most typical (Per. 5. St. 5 + 3, C. $\bar{3}$), such as is found in *P. convolvulus*.

A comparison of different species shows that while each varies, so as in the more variable species to cover almost the whole range observed in the genus, each shows a tendency to certain lines of variation. These tendencies are more alike usually in the more nearly allied species, so as to correspond in the main with the groups based on habit, and they lead from group to group.

The modes of variation commonly observed include almost all the recognised modes of departure from floral symmetry. They affect all the whorls. The *perianth* in some species is very constant. In others it habitually shows cohesion of two or more segments, or abortion in different degrees, or suppression of one or two (usually the inner) segments. Chorisis of a segment is less frequent. Enations from one or more segments are frequent in certain species, rare or absent in others. The *outer stamens* often show cohesion of the two in each pair, varying from the slightest union of the bases of the filaments to absolute union of even the anthers. Abortion (in all degrees to complete suppression) of one or more stamens is not rare. The *inner stamens* seldom show cohesion (except in *aviculare* and its

allies) with stamens of the outer whorl. Abortion is very frequent, and in certain species (*amphibium*) this whorl has completely disappeared.

Miss Lily Huie contributed some observations on the changes in the tentacle of *Drosera rotundifolia*, produced by feeding with egg albumen.

In unfed leaves fixed in watery picro-corrosive (sp. gr. 1·020) and stained with Eosin-Toluidin blue, the apical and lateral glands of the first or outer layer, and also all the cells of the second or middle layer, show a deep-blue cytoplasm, with nuclei possessing little chromatin proper, but large nucleoli and a granular nucleoplasm. Within one minute after feeding the blue cytoplasm becomes purple; after one hour it is greatly vacuolated and reddish purple; after twenty-four hours the blue material has disappeared, and only a few strands of a pink cytoplasm are to be seen. The nucleus after feeding loses the granular cytoplasm, the nuclear chromatin segments enlarge enormously, reminding one of the early stages of mitosis. The nucleolus has lost its red chromatin, and is not easy to see.

Recuperation of the cytoplasm is the result of nuclear activity, for the chromosomes enlarge during the period preceding the appearance of the granular nucleoplasm, which latter in every respect resembles the granular deposit of cytoplasm in immediate contact with the outer surface of the nuclear membrane.

Dr. Morris, C.M.G., contributed a note on the singular effect produced in certain animals in the West Indies, by feeding on the young shoots, leaves, pods, and seeds of the wild tamarind or Jumbai plant (*Leucæna glauca*, Benth.). The wild tamarind of Jamaica, and the Jumbai or Jumbie of the Bahamas, is commonly found along roadsides and in waste places in tropical America. It presents the appearance of a weedy-looking *Acacia*, and belongs to the tribe *Eumimoseæ* of the N.O. *Leguminosæ*. It occurs in the West Indies, Bahamas, Demerara, Brazil, Peru, gardens of South Europe and North Africa; widely found in tropical Africa, East Indies, Ceylon, Mauritius, Java and China.

The author described the plant as being distinctly encouraged in the Bahamas as a fodder plant. The people were fully aware of the singular effect it produced on horses, and added that it also affected mules and donkeys. Its effect on pigs was still more marked. These animals assumed a completely naked condition, and appeared without a single hair on their body. Horses badly affected by Jumbai were occasionally seen in the streets of Nassau, where they were known as "cigar-tails." Such depilated animals, although apparently healthy, were considerably depreciated in value. They were said to recover when fed exclusively on corn and grass. The effects of the Jumbai on horses, mules, donkeys, and pigs were regarded as accidental—due to neglect or ignorance. The seeds probably contain the deleterious principle in a greater degree than any other part of the plant. The active principle in *Leucæna glauca* has not yet been investigated. There is abundant material at hand for this purpose in almost every part of the world. It is probable that the active principle may consist of a volatile alkaloid somewhat similar to that found in *Lathyrus sativus*.

In *Leucæna glauca* we possess a plant with singular properties. It is a vegetable depilatory of a very decided character. No other plant appears to produce exactly identical results.

Mr. Scott Elliot read a paper on the influence of habitat upon plant-habit. The author gave the results of an attempt to tabulate and compare the habits and habitats of the *Ranunculaceæ*, *Papaveraceæ*, &c., in the Kew and British Museum herbaria. The tables exhibited illustrated the dependence of habit upon habitat in 230 plants. In conclusion the author anticipated the objections of those who hold the original hypothesis of Prof. Weismann (that acquired characters can by no means be inherited), by pointing to the most recent publication of this writer, wherein use inheritance of a kind is admitted.

Dr. Wilson exhibited a series of excellent photographic lantern slides illustrating his numerous experiments on hybridisation in Passion flowers and Albucas. The first paper, on a new hybrid Passion flower, dealt with a cross between *Passiflora Buonapartea* and *P. Cœrulea*, the latter being the pollen-parent. The former has a quadrangular winged stem, and the leaves are elliptical in outline; the latter has a cylindrical stem, and the leaves five-lobed. The stem of the hybrid exhibits many intermediate characters, and the leaves are three-lobed. The presence of a group of glands terminating the coronal filaments was shown on the screen. The glands are present in the seed-parent, but not in the pollen parent, and in the hybrid they appear in reduced number.

In a further communication, dealing with observations on hybrid Albucas, Dr. Wilson exhibited a large series of illustrations from nature, showing the effects of hybridisation on the bulbs and flowers of these plants. He described a new species, named by him *A. prolifera*. This species is characterised by producing remarkable lateral outgrowths which carry young bulbs, while it also bears numerous obscurely-stalked basal bulbils.

Mr. Gwynne-Vaughan gave an account of his investigations on the arrangement of the vascular bundles in certain *Nymphæaceæ*.

Mr. Keeble described certain observations on the *Loranthaceæ* of Ceylon, relating to the emergences on the embryo of *Loranthus neelgherensis*, and to the mode of penetration into the host.

Fossil Plants.

Dr. D. H. Scott, F.R.S., gave an account of some researches on certain Carboniferous fossils referred to *Lepidostrobus*.

Mr. A. C. Seward contributed notes on a large specimen of *Lyginodendron*, based on the examination of specimens in the British Museum. He proposed to designate the species *L. robustum*.

Mr. Seward also gave an account of a new cycad from the Isle of Portland.

Dr. Woodward lately obtained an exceedingly fine specimen of a cycadean stem from the Purbeck beds of Portland, which is now in the fossil plant gallery of the British Museum. The stem, which is probably the largest known, has a height of 1 m. 18·5 cm., and measures 1 m. 7 cm. in girth at the broadest part. A striking feature of the specimen is the conical apical bud enclosed by tapered bud scales, bearing numerous ramental outgrowths on the exposed surface.

REPORT ON TECHNOLOGICAL EXAMINATIONS.

THE Report, just issued, on the work of the Examinations Department of the City and Guilds of London Institute, is a noteworthy document. The functions of this department of the Institute extend beyond those of an ordinary Examining Body. Its efforts have been directed for many years towards encouraging, in different ways, sound technical instruction; and the aim of the Committee has been rather to secure for artisan students systematic teaching, than to increase the number of candidates for examination. Unfortunately, such students are often quite unprepared to receive technical instruction.

Several of the Examiners refer to the defects of the earlier education of the students, and some surprise is expressed that the candidates spell so badly and experience such difficulty in expressing what they know in words. The Examiners in plumbers' work complain that very few of the candidates knew how to work out a simple geometrical problem, and that in those elementary principles of science which underlie plumbers' work, a very small proportion of the candidates appear to have received any adequate instruction. Among engineering apprentices, a large number of candidates appear to have attended science classes; but in the subjects of weaving and spinning, and in most other subjects, the number is very small. The Committee of the Institute have consequently come to the conclusion that the principles of science should be presented to the artisan student in a form bearing more directly upon the trade in which he is engaged, than is possible when the elements of any one branch of science are taught to a large class of students occupied in different pursuits. They have accordingly added to their programme a course of instruction to be taken before certain technical subjects. This difficulty as to inadequate preliminary knowledge is met with all over the country, and is a constant cause of failure in many branches of the work of Technical Education Committees.

Another difficulty widely experienced is to find competent teachers for trade classes. This arises from the combination of qualifications required in such teachers. It is desirable that they should spend sufficient time at their trade to have become skilful workmen; they must have some knowledge of scientific method, besides having received a fairly good general education. The Committee think that facilities in the way of scholarships should be offered by County Councils to intelligent workmen, to