the whole body of meteorologists over the globe, of the establishment of such a system of weather observation across this continent; and, moreover, the establishment of an efficient system of stations with their necessary equipment of instruments and observers, could not be in better hands than his whose resolute will and organising genius girdled Australia with the telegraph.

ALGÆ¹

PROF. J. G. AGARDH has taken advantage of the leisure afforded by his retirement from the Chair of Botany which he has filled so successfully for many years at the Lund University, to compose another work on algology. This very interesting volume, which embodies the results of observations made by the Professor during a long course of years, on the Morphology of the Floridæ, has just appeared in the *Transactions of the Scientific Academy of Stockholm*. It is written in the Swedish language, and is illustrated by thirty-three coloured plates of rare and little-known algæ, and of microscopic details of many others, beautifully executed by Swedish artists. It treats the subject in an exhaustive manner, as will be seen from a specification of the contents. The work is divided into three parts, each part being copiously illustrated by reference to the plates, and to descriptions of different genera and species.

Part I. treats of the general aspect and outer part of the Floridæ—their development and growth; of the root and its different forms; of the stem, branches, and leaves.

Part II., treating of the structure of the Floridæ, describes the nature of the cell-membrane and of the cuticle; the contents of the cell under different conditions of development; the various layers or strata of which the thallus is composed; the connection between the different cells, and the manner in which this connection is effected; the various ways in which the cells are formed; their different positions, and the manner in which they are grouped and united with the several strata.

Part III. describes the reproductive organs, namely, the antheridia, the sphærospores, and the capsular fruit and cystocarp, and concludes with remarks on the so-called "double fructification." This third part will doubtless attract the attention of algologists who may be desirous of knowing whether the views of the Professor, in regard to the fertilisation of the fruit in the manner recorded by MM. Bornet and Thuret, have undergone any change since the publication of the "Epicrisis" in 1876. It will be seen from the present work, that although Dr. Agardh has made multitudes of microscopic observations on British and exotic algæ, at all periods of growth, and especially of the species which formed the subject of Bornet and Thuret's experiments, he has not materially changed his opinion. He says that the observations hitherto recorded are too few in number to determine the question, and that, as yet, he has seen nothing confirmatory of the views of the French algologists. For his reasons and remarks we must refer the reader to the work itself. It is to be regretted that Dr. Dodel-Port's very interesting observations on the fecundation of the Floridæ by Infusoria, of which an abstract was given in *NATURE*, vol. xx. p. 463, were not published before the completion of Prof. Agardh's work.

Among the verbal descriptions and illustrations are many which are especially deserving of the attention of British algologists. Among them will be found microscopic representations of the fruit, hitherto imperfectly described and figured, of many British algæ. The cystocarpic fruit of *Callithamnion cruciatum* is now, it is believed, figured for the first time. Among the whole figures

¹ "Floridæernes Morphologi," af J. G. Agardh. *Kongl. Svenska Vetenskaps Akademiens Handlingar*, Bandet 15, No. 6 (1879).

"De Algis Novæ Zelandiæ marinis." In supplementum "Floræ Hookerianæ," scripsit J. G. Agardh. *Lunds Univ. Årsskrift*. Tom xiv.

of algæ is one of a species which, although found on our southern shores, is almost unknown to collectors. This species is *Nitophyllum litteratum* [Plate xxvii. Figs. 1-4], which may—but very rarely—be seen in collections under the name of *N. Hilliæ*. From this last-mentioned species it differs in form, being more lobed, and also in the fructification. The sphærospores, instead of being scattered over the disc as in *N. Hilliæ*, are located between the numerous veins which mark the lower part of the frond. Minor differences are shown in the microscopic details. The capsular fruit of this species does not appear to be yet known. It therefore adds another instance to the long list of Floridæ which hitherto have been found with sphærosporic fruit only.

There is some diversity of opinion as to the place in a general system of classification of certain algæ of a red or purple colour, namely, Porphyra, Bangia, and Batrachospermum. By some of the later algologists they have been placed among the Floridæ, but Prof. Agardh is of opinion that they do not belong to the red seaweeds.

There is another group of algæ, which really belongs to the Floridæ, whose position in the system still appears to be uncertain. We allude to the family, *Corallineæ*. We remember to have noticed that it is not included in the classification of the Floridæ in the *Epicrisis*. We are, therefore, the more disappointed that there is no notice of this interesting group in the present work. Dr. Agardh's observations with regard to it would be most welcome. Had the present very valuable work been written either in Latin or English, it would undoubtedly have been more serviceable; as it is, however, algologists who do not understand Swedish may learn a great deal from the carefully-executed plates. Should the work be republished, it would be desirable to add a table of contents and an index.

The "List of New Zealand Algæ" is a useful supplement to the "Flora Novæ-Zelandiæ" of Hooker and Harvey. It consists chiefly of species which have been brought home by Dr. Berggren. The names of Hooker and Harvey have been generally adopted; but all the species described have been re-examined by Prof. Agardh, and many of them re-named in consequence of such re-examination. The new species and varieties are about sixty in number. Descriptions are given of new species, and copious notes on such of the already known species as require this addition are appended. M. P. M.

GAS AND ELECTRICITY IN PARIS

SINCE the Jablochhoff light was established for the first time in the Avenue de l'Opera, it may be said that there has been in Paris a regular competition between gas and electricity. The "Compagnie Parisienne d'Éclairage et de Chauffage" by gas is certainly one of the largest in existence, as it possesses every gas-work in Paris, and almost every one in the vicinity. A system of subterranean pipes and valves connects all these establishments, so that gas generated in Courcelles can be sent to any part of the city and suburbs if required. All these different works were conducted as separate establishments before the fusion which took place in 1854, under the auspices of the then existing Imperial Government. Two of these establishments are worthy of note—La Villette, as being the largest, the site of experimental and chemical work, and Vaugirard, where the retorts are warmed by the Siemens' heat-generating process.

Each of the twenty arrondissements of Paris has its special gas office. The Company also sells gas-engines, and makes great efforts to develop the use of gas as fuel for warming and cooking in private houses and shops. The price of gas is dearer in Paris than in any other capital of Europe, and the arrangements are difficult to understand without an explanation of the French municipal institutions.

The cry for more light having been raised in consequence of the experiments conducted with electricity, a new gas burner has been invented by the *Compagnie Parisienne*, and placed experimentally in several large public thoroughfares, principally the Rue du 4 Septembre, the Place de la République, formerly place du Château d'Eau, and a pavilion in the Halles Centrales. The burners used in the Rue du 4 Septembre are the largest, and all the new burners have been constructed on the same principle. The ordinary wing burners consume about 120 litres of gas each hour. In these improved lanterns six burners, representing an hourly consumption of 1,400 litres, have been placed at the six summits of a hexagon. In the centre is a hole for facilitating the introduction of air and better consumption. The effect is really highly satisfactory, and the luminous effect is far greater than in proportion to the gas consumed. A large number of coffee-houses, theatres, and first-class shops have adopted the burners for exterior use. It is impossible to use them within any building except markets, owing to the immense quantity of heat radiated, which would be a nuisance, at least in summer time. A number of these improved gas lamps have been placed in the Lyons railway station (passenger department), and will be, within a few days, used for competitive experiments with the Lontin electric light.

Besides the hole for admission of air, a gas-pipe is placed in the central part of the lamp. The aperture has been disposed so that a small jet is always burning, and thus for lighting the lamp it is sufficient to open the valve of the gas pipe, and the six peripheral burners are lighted at once. After midnight the jets are extinguished and the central one opened, burning with a consumption of 120 litres per hour, or like an ordinary old gas-burner. The supplementary gas consumed by the city is paid for at a very cheap rate, about 1s. 6d. per thousand cubic feet. It must be said, moreover, that the *Chambre Syndicale des Tissus* and other commercial institutions have organised an agitation to oblige the Municipal Corporation to diminish the price of the gas. The Commission of the Municipal Council is at present deliberating upon that important question. A large factory, the Say Sugar Refinery, close to the Orleans Railway Station, built a private gas-work for its own use. They consume yearly about 6,000,000 cubic feet, and will turn their own gas-makers.

In electrical lighting the division principle is represented in Paris by the celebrated Jablochkoff candle, and a diversity of opinions have been expressed on the subject. The apparatus in itself requires no description, but it is necessary to explain the results which have been obtained.

The Jablochkoff light, placed in an opal globe is considered as perfectly suited to large shops and large public thoroughfares, although the diminution of light by the interposition of the globe may be valued at 45 per cent. The price of effective light is enlarged in the same proportion. This is the reason why many persons suppose that from an economical point of view it will never do except in large open places, as the Place de la Bastille, where semi-transparent globes are used without fear of any complaints from shopmen or street passengers. But even for illuminating these large places, it is supposed by many competent persons that other electric lights would be more successful, and at all events more economical. The only place where the Jablochkoff candles can be considered as unrivalled are large establishments like the Grands Magasins du Louvre, the Buttes Chaumont and the Ville de France, where the effect obtained is alone considered without much regard to the expense. The illumination of the Palais de l'Industrie during the evening sittings of the Exhibition of Fine Arts, was a success last summer. It was not attempted a second time during the Exhibition of Sciences Applied to Industry, owing to several circumstances, having nothing

to do with the value of the system. At the Hippodrome the illumination is effected by a combination of gas lights and Jablochkoff candles, and ordinary regulators with luminous points carefully concealed. The general effect is quite satisfactory, but the expense in motive power is considerable.

Jablochkoff candles are used in the illumination of large works carried on at present on the Seine for repairing the Pont des Invalides. These works have been interrupted for the last month owing to the frosty weather, but the Jablochkoff light has worked admirably. The use of the Jablochkoff candles is progressing immensely in private establishments, although the Municipal Council will in all probability discontinue the electric lighting of the Avenue de l'Opéra, the Place de la Bastille, &c., from February 1, and keep it burning only on the Place de l'Opéra. This impending resolution is attributed to the prevalence of the gas interest.

In the first months of the Jablochkoff trial, many complaints were made against the irregularities of the light; now extinctions are almost unknown, and the red colour of the electric flame less frequent.

Extensive preparations have been made in the green room of the opera for a comparison between Jablochkoff and Werdermann candles, and will be completed in a few weeks. It is argued by Werdermann's opponents that his light is merely incandescent light, and that the loss of illuminating power is far greater than with the Jablochkoff system. M. Garnier, the architect, being intrusted with the task of reporting on the matter, it would be unbecoming to give an opinion before his verdict is published. M. Reynier has another incandescent light offering some analogy with Werdermann's, but the contact being more intimate, the loss in power is larger, and the public exhibition of it has been considered a failure. It is regarded as merely an apparatus for lecturers wishing to show their audience an electric light with few elements. The lamp is cheap, and its working quite regular.

It should not be forgotten that even naked Jablochkoff lights lose a part [of their illuminating power. A quantity of electricity, which may be valued at 30 per cent., passes through the insulating caolin or plaster.¹ Consequently it must not be wondered at, if some inventors tried to dispense with insulating lamina.

M. Denayrouze, the former lessee of the Jablochkoff candle, has purchased the Jamin candle, in which the electric flame is directed by the attractive power of magnetism or electricity. Private experiments have been made, and they are preparing for an exhibition in one of the suburbs of Paris. M. Jamin having to lecture at the Sorbonne on January 17 it is probable that the large hall will be illuminated by his own light on this occasion. This light company has purchased a patent for gas engines, and will try to use the gas under the furnace as fuel, dispensing with it for illumination. They are said to contemplate a public issue of shares for a large capital.

It is known that the principal difficulties in the construction of regulators, has always been the absolute fixity of the luminous point in space. It has led M. Serrin to the invention of his excellent regulator. But the use of the Jablochkoff light proved that inventors had gone too far in the way of complication, at least for street illumination, and where no dioptric or catoptric arrangement is contemplated. M. Suisse was the first to start a lamp which may be regarded as a simplification of Serrin's original, and is working very well. The carbon is placed upwards, and descends in proportion as the negative is consumed. In order to diminish that consumption the diameter of the negative carbon has been enlarged.

A number of regulators have been tried in competition

¹ It shows that a Jablochkoff candle placed in an opaque globe is diminished (1) 0.70 by the loss of the caolin, and (2) 0.50 by the opacity of the globe, so that it gives only 0.35 of the original illuminating power.

or will be, but Suisse's is now the only one which works regularly at the Lyons railway terminus, in conjunction with a few of Lontin's regulators and with Lontin's generator. The results of the illumination are quite satisfactory, eighteen lamps being fed at an expense of 36 kilogrammes of charcoal per hour during fifteen hours every day, and with an expense of 9 francs per hour, including three francs of royalty for the Lontin Company. When this extensive space was illuminated by gas, the expense at 19 centimes per cubic metre was 6 francs per hour, and would have been nine francs if the gas were charged 30 centimes, or the full price. The economy for the Company results from the immense augmentation of the light distributed. They were enabled to diminish by 70 per cent. the number of hands engaged in night work, and the risks from fire are reduced to nothing. Lontin's system will be tried within a few days, in competition with improved gas, on the platform of the passengers department.

At the exhibition of the Palais de l'Industrie, Lontin's machine is working regularly every day from two to the closing hour, which varied according to the hour of sunset. No accident has been recorded. Siemens's machine has been very seldom at work, owing to several circumstances which prevented the public from making a direct comparison. The engineer of M. Siemens's factory having been selected as one of the jurymen, Siemens's machine was *ipso facto* out of competition; consequently we will not risk giving any definite opinion at present, confining ourselves to known facts. We visited Siemens's light at the works established by the universal firm at Passy, and we were very much satisfied with the effect which we witnessed. The illuminating power and regularity were out of question.

All the work of the Jablochhoff candle is done with Gramme machines, which have been fitted with a current inverter.

Lontin, Suisse, and other regulators are worked with continuous currents, which is considered as more advantageous.

Three different magneto-electric generators are before the public: Gramme, Lontin, and Siemens, based on similar principles, having a strong similarity in many respects, each of them claiming priority. We cannot presume to give a definite opinion on their special value, or on the value of their respective claims. The question can only be settled by the city or the Government deciding for the illumination of some part of the city or of some large public buildings.

We can state, at all events, that the Meritens Company, has started new machines, which we witnessed working with regularity at the Continental Hotel on the occasion of a great ball; that the Alliance machine, although excellent for lighthouses, has proved too heavy, too expensive, and too cumbersome for ordinary purposes. The Lontin machine is rotated at a rate of 200 or 250 turns per minute, and its rival from 700 to 800, which is a decided advantage in its favour.

It is not our province to adjust the claims relating to the manner of exciting almost any number of currents with a single generator and an electro-magnetic divider. But all the visitors to the Palais de l'Industrie have been astonished by the regularity of the Lontin light and its facility of combining the several arcs.

The other day the Ouest Railway Company established in the terminus of La Rue Saint Lazare three rival lights: Lontin, Parisian Company's improved lights, and Jablochhoff candles.

We decline to give a definite opinion of the respective merits of the Lontin and Jablochhoff systems before the moment when the numerous measures officially taken with a new photometer and the expenses in coals, electric carbon, and oil will be made public; but we can say that gas-light seems to be one-third dearer, and one-half only in general intensity.

Some of the great expectations raised when the Jablochhoff light was first exhibited have proved groundless. The shares of the gas companies have recovered from their depression, and reached at least their former value. But it cannot be said gas has conquered electricity, as electric lighting, with all its variety of origin and regulation, is gaining ground daily. Siemens's agents are at present fitting a large factory at Meaux with their regulators and generators. The works of installation of the Senate and Chamber of Deputies would have been impossible without the help of the electric light. A new influential daily paper, *Gil Blas*, has opened on the Boulevard de l'Opéra an "Halle aux Nouvelles," with no less than eight Jablochhoff candles. There is no part of Paris where electric lighting has not been exhibited, and its appearance is no longer a novelty, which is an all-important thing for its propagation.

In the meantime there are other inventors trying to generate electricity by new means. M. Beaudet has started a bichromate battery which he calls *unpolarisable*, perhaps without any real ground, but which, at all events, keeps in tolerable regulation for many days. M. Clamond has continued to produce a real electric light out of a series of thermal elements, which was considered as a mere impossibility a few months ago. We cannot say if the scheme of lighting by electricity out of a stove which warms an establishment, or a furnace which creates steam, is a Utopia, but we witnessed during some hours a light generated by the Clamond process, and a large workshop uses no other lighting process during the present winter.

The Municipal Council of Paris should open a public competition for lighting a large place or building, and invite all inventors of regulators and magneto-electric machines to place their apparatus in the hands of a competent commission, otherwise the question of electric lighting will remain in the dark for years, as it will be impossible for private individuals to decide which is the cheapest light produced and the best regulator.

W. DE FONVIELLE

NOTES

WE regret to have to announce the death of Mr. George Wharton Simpson, the editor of the *Photographic News*, which took place at Catford Bridge on the 15th inst. He was well known to the large circle of amateur and professional photographers as an able chemist, a lucid writer, and a careful experimenter. As one of the very earliest followers of photography, he was fully acquainted with all the many phases through which that technical science has passed, and we believe that very rarely, if ever, did he err in a matter of photographic history or technology. There existed between the readers of his journal and himself a feeling of almost personal friendship, as no question was too trivial to be answered in his notices to correspondents, and the answer given was always of a kindly and helpful nature. To Mr. Simpson we owe, amongst other things, the perfecting of the collodio-chloride process, a process which for delicacy and permanency is up till now unrivalled. Mr. Simpson was also an occasional contributor to various daily and other journals, and some of these articles we hope may be reprinted, since they are really succinct histories of progress in the art-science with which he was so greatly bound up. He will not easily be replaced in his editorial position, since there are few, if any, who have lived through the stirring times which have made photography what it is, and have followed it with the attention which he bestowed upon it. The large gathering of literary men and photographers at Abney Park Cemetery on Tuesday last evinced the high esteem in which he was held.

It is rumoured that Dr. William Ogle, Fellow of Corpus Christi, Oxford, and Examiner in Natural Science in the