doubtless the reason that on some occasions, as in 1870, the green line is seen beyond the corona—even upon the lunar disc.

Prof. Hastings, in 1883, examined simultaneously with a special arrangement the spectra of east and west portions of the corona, and proved, conformably to the theory that he propounds, that the green line varied in length during the duration of the eclipse, and that it always extended furthest on the most illuminated side of the edge of the moon. Mr. Keeler repeated the experiment in 1889, and also noted that the length of the green line depends upon the position of the sun with respect to the moon. The question would be worth studying further.

The green line is not the only bright line in the spectrum of the corona, the hydrogen lines have also been discovered in it, but these never extend further than about 10′ from the sun's limb. Other bright lines in the red and in the violet were observed by M. Tacchini and by Thallon in 1882. It was in 1882 also that Prof. Schuster obtained the first photograph of the coronal spectrum upon which some thirty bright lines may be counted.

In addition to the incandescent solid or liquid matter producing the spectrum of the corona, and the incandescent gases, which give rise to bright lines, there must also be in the circumsolar regions matter reflecting the light of the photosphere, as our own atmosphere does. This is proved by the polarisation of the light of the corona, and by the presence in its spectrum of the dark lines of the Fraunhofer spectrum. We owe the discovery of these dark lines to M. Janssen. In 1871 he observed only the lines D and *b*, but, since, in 1883, he has recognised some hundred dark lines, thus showing that the complete Fraunhofer spectrum is found in the coronal spectrum. These dark lines are necessarily very faint, for they are drowned in the continuous spectrum. As a rule the line D is most conspicuous, although, according to Prof. Hastings, if a faint solar spectrum is projected on to the continuous spectrum of a gas flame, it is not the line D, but rather the group *b*, which is by far the most apparent. Prof. Hastings concludes from this experiment that the continuous spectrum of the corona is richer in green than in orange radiation, since it causes the group *b* to disappear before the line D.

In conclusion I must quote a remarkable observation made by Prof. Tacchini in 1883, which, should it be confirmed, would suggest a very fascinating theory of the corona. Upon examining the spectrum of one of the sheaves (panaches) of the corona with a considerable dispersion and a wide slit, Prof. Tacchini thought he recognised two or three bright bands characteristic of the hydrocarbons, which are always present in the spectra of comets. Father Perry in 1886 proposed to verify the observation of Tacchini, but unfortunately could not re-observe the bands in question. Certainly he used a spectroscope with slightly illuminated cross wires, and when the period of great solar activity had already passed. It would be well in future eclipses to devote some seconds to the search for these bands, for, if the presence of carbon were recognised in the coronal atmosphere, it would be a new proof of the analogy which exists between the corona and cometary masses. Like comets the corona seems formed of matter subject to a repulsive force on the part of the sun, indeed it is probable that solar gravity does not act upon the corona, for unless this were so, the lower parts, having to support the weight of the upper, would be much more dense than the latter. It would thus result that the lines of the coronal spectrum, the line 1474 for instance, would be wider at their bases than at their upper extremities ; but nothing of the kind has hitherto been observed. Moreover, so that the corona may be visible at 30′ or 40′ from the sun, the coronal matter must necessarily not be too rare in these extreme regions ; but even in ascribing an extremely low density to this, we should find upon allowing for solar gravity that the pressure near the sun would have a considerable value, although it is proved that the pressure at the base of the corona does not exceed some millimetres of mercury.

It is also sought to prove the slight density of the middle corona by the fact that it has never offered any resistance to comets, which, on several occasions, have passed through it ; but as comets themselves experience no appreciable resistance when they encounter a body it is impossible to tell whether the absence of resistance is due to the comets or to the corona.

The repulsive force which expels the coronal matter from the sun would act in the same manner as electrical force ; indeed Prof. Bigelow has noticed that the arrangement of plumes and sheaves round the solar disc, and the incurvilinear forms exactly recall the lines of force of an electric field. Let us complete the parallel between comets and the corona by noting that the tails of comets sometimes assume the curvilinear form found in the sheaves of the corona. The dark parts which divide the tails of comets have also their analogues in the rifts of the corona. To push the comparison still further, it would be very interesting to be able to prove that the corona, like cometary masses, is transparent, and that bright stars can be seen through it. Unfortunately it will be impossible to attempt this experiment at the time of the next eclipse.

An exact photometric study of the solar surface would perhaps detect the transparency of the corona, indeed if we suppose that the corona presents a certain opacity the parts of the photosphere on which the large sheaves are projected must be less luminous than the parts covered by the polar rays.

If the corona is not subject to solar gravity it is scarcely probable that it shares the movement of rotation of the sun ; however, it would be useful to try in the coming eclipse to study the question by the spectroscopic method, as M. Trouvelot wished to do in 1883. It would be desirable to conduct all spectroscopic observations of the corona by means of photography. The instruments which must be used for this purpose should be very luminous (*i.e.* give bright images), for there is little light available, and the exposures are necessarily short. In studying the effectiveness of a spectroscope in the case of an object presenting a large apparent diameter, like the corona, it is seen that the intensity of the spectrum depends entirely upon the width of the slit, and the effectiveness of the object glass which forms the image of the spectrum. As to the collimator and the condenser their dimensions are of no importance, provided that the collimator can well receive all the light of the condenser. As the object glass which forms the image of the spectrum must have an image long enough to give sufficient length to the spectrum, one is led, in order to obtain great effectiveness, to give this object glass a large aperture, and consequently to use a prism of large size.

The visibility of the bright lines depending not only on their brightness, but also on their width, a wide slit must be employed to obtain a good image of these lines ; on the other hand, a narrow slit will give a spectrum of great purity, and will show the dark lines. The employment of two different spectroscopes is then plainly indicated.

It remains for us to speak of the photometric measuring of the corona by optical photometers. Bunsen's photometer has already been used for this purpose, but I think that we must henceforth turn to photography to obtain exact results. The question should not be neglected, for it is certain that the brilliancy of the corona varies considerably from one eclipse to another. Thus Prof. Lockyer estimates that in 1878, at a period of quiescence on the surface of the sun, the corona was ten times less brilliant that in 1871.

Let us end by pointing to the polariscope observations which hitherto have been far from giving concordant results as to the proportion of polarised light in the various parts of the corona. Here also there are new inquiries to be made.

Such, gentlemen, are the different problems suggested by the study of the solar corona. We will hope that the next eclipse will largely contribute to their solution.

MEMORIAL OF SIR RICHARD OWEN.

A MEETING was held at the rooms of the Royal Society, on Saturday, to make preparations for the provision of a suitable memorial of the late Sir Richard Owen. The Prince of Wales took the chair, and was supported by the Duke of Teck, the President, the Treasurer, and the Secretary of the Royal Society, Lord Kelvin, Sir John Evans, and Professor Michael Foster ; the President of the British Association, Sir A. Geikie ; the President of the Royal College of Physicians, Sir A. Clark ; the President of the Royal College of Surgeons, Mr. T. Bryant ; the President of the Royal Academy, Sir F. Leighton ; the Bishop of Rochester, the Dean of Westminster, Lord Playfair, Prof. Huxley, Sir H. Roscoe, M.P., Sir F. Abel, Sir F. Bramwell, Sir G. Stokes, Sir H. Acland, Sir Joseph Lister, Mr. Ericsen, Dr. Priestley, Dr. Günther, Dr. H. Woodward, Dr. Maunde Thompson, Sir W. H. Flower, Sir Erasmus Ommanney, Sir James Paget, Sir Henry Thompson, Sir Spencer Wells, Sir Edwin Saunders, Sir John Fowler,

Dr. E. A. Bond, Dr. P. L. Sclater, Mr. Carruthers, and Mr. W. P. Sladen. There were also present, among others, Sir G. M. Humphry, Mr. Holman Hunt, Mr. Ernest Hart, Dr. Michael (President of the Royal Microscopical Society), Prof. R. Meldola, Mr. O. Salvin, and Prof. T. Wiltshire.

The Prince of Wales, in opening the proceedings, said,—I have the great privilege conferred upon me of being asked to take the chair to-day, upon this very special occasion. We are assembled together for the purpose of paying a mark and tribute of respect and appreciation to the memory of a great man of science who has lately passed away from us. The name of Sir Richard Owen must always go down to posterity as that of a great man—one who was eminent in the sciences of anatomy, zoology, and palæontology. Perhaps I may be allowed to say a word of my own personal knowledge of him. It is now thirty-five years since I had the advantage of knowing him. When I lived as a boy at the White Lodge, Richmond Park, now occupied by my illustrious relative on my right (the Duke of Teck), I had opportunities of visiting him and knowing him. His geniality and his charm of manner to all those who knew him have, I am sure, left a deep and lasting impression. Whether he was explaining to you the mysteries of some old fossil bone that had been given him, or whether he was telling one of his vivid ghost stories, one felt that one was under the charm of his presence. His method of teaching, as you all know, was earnest and clear in every respect; and it even derived a measure of force from a certain hesitation in his manner. His great repute was gained as a zoologist, and in the study, not only of living animals, but of those long extinct, and following the same large range of work as Cuvier, to whom, in the history of science, he may be regarded as a successor. One of the great works and interests of his life was the formation of the Natural History Museum, which is now safely established in South Kensington under the able guidance of our friend Sir William Flower. It may be within your recollection what great difficulties Sir Richard Owen encountered when he was first appointed Superintendent of the Department of Natural History at the British Museum in 1856. He himself saw in getting that appointment that it was quite impossible that these large collections could be adequately seen unless they were removed to some other sphere. In 1862 a Bill was brought in by Mr. Gladstone, who took the greatest interest in the matter, while it was vigorously opposed, strange to say, by no less great a man than Mr. Disraeli. The Bill was lost, though it was eventually, ten years later, carried, and now we have that fine building that we all know and deeply appreciate. I may also mention that he took the greatest interest with regard to the colonies, and in trying to obtain from them specimens that would be worthily represented in the Natural History Museum. In sanitary matters also he was not behindhand, as was shown by his long intimacy with that distinguished man, Sir Edwin Chadwick. There are several resolutions to be proposed, and you will hear far better and more eloquent remarks from the distinguished gentlemen who will move and second them. That is the reason why on this occasion I shall not trouble you with more remarks. Allow me only to repeat the assurance of the deep interest I take in this movement for a suitable memorial to the memory of this great man, and how deeply I appreciate having been asked to take the chair on this interesting and important occasion.

Lord Kelvin moved:—"That it is desirable that the eminent services of the late Sir Richard Owen in the advancement of the knowledge of the sciences of anatomy, zoology, and palæontology should be commemorated by some suitable memorial." He said that, if there was no other reason but the part that Sir R. Owen took in the establishment of the Natural History Museum, and the success that ultimately attended his efforts, he deserved the gratitude of the nation. There was scarcely any branch of the whole of natural history that he had not touched and enriched with the results of his investigations. Three hundred and sixty papers, every one of them valuable, were to be found under his name in the Royal Society catalogue of scientific papers. From these contributions, however, he came back to the Natural History Museum, and he held that every subject of the Queen, in these islands or in the colonies, and every visitor to this country, must feel that he was benefited by the existence of that museum and by the splendid arrangement of its contents.

Prof. Huxley, in seconding the resolution, said that, if he mistook not, there were very few men living who had had occasion to follow the work of the remarkable man whose career they had met to celebrate with more carefulness and attention than he had done. It was a career remarkable for its length, for the rapid rise to eminence, and the long retention of high position of the person who was the subject of it. It was more than forty years ago since he, as a young man, had occasion to look abroad upon the scientific world of London, in which he was then a complete novice, and to see whether, perhaps, in some small and insignificant corner of it room might be found for him. At that time there were four persons whose names stood out amongst the first in the galaxy of scientific men of this country. They were Sir John Herschel, Mr. Faraday, Sir Charles Lyell, and, last, though by no means least, the famous Hunterian Professor, Owen. If he looked abroad amongst the lights of biological science, with which he was principally concerned, there were Johannes Müller in Berlin, Milne Edwards in Paris, Von Baer in St. Petersburg; but for quantity, general excellence, and variety of work there was no one who could be regarded as the superior of Owen. It was a common impression that Owen was the successor and continuator of Cuvier, and that was largely true. The memoirs on the pearly nautilus, on the marsupials, on the anthropoid apes were fully worthy of the author of the "Memoires sur les Mollusques" or the "Leçons d'Anatomie Comparée," while the "Ossemen fossies" had a full equivalent in the vast series of papers upon fossil remains, contained in the publications of the Royal, the Geological, and the Palæontographical Societies. But it was also to be remembered that, in another field, Owen was the successor and continuator of the school to which Cuvier was most vehemently opposed—that of St. Hilaire and Oken. The remarkable contributions to morphology embodied in the works on the archetype of the vertebrate skeleton and on the nature of limbs were able developments of speculative views of another order than Cuvier's. Readers of Goethe would remember that he thought the news of the controversy between Cuvier and St. Hilaire far more interesting than that of the Revolution of July, which broke out about the same time. Whether that was a just estimate of the relative importance of things or not might be left an open question; but it was the peculiar irony of history to show us in so many quarrels that right and wrong were on both sides. And in this particular controversy it had turned out that the right lay neither with Cuvier nor with St. Hilaire, but partly with both and partly with a third party, which at that time hardly existed. Whatever might be the ultimate verdict of science in this particular matter, there could be no doubt that it was a distinct aid to progress to have one view of the case stated and illustrated with the unrivalled wealth of knowledge which Owen brought to bear upon it. If history confirmed, as he believed it would, the estimate of the broad features of Sir Richard Owen's work, which he had suggested, then it would justify them in endeavouring to preserve the memory of the great results achieved by his stupendous powers of work, his remarkable sagacity in interpretation, and his untiring striving towards the ideal which he entertained.

The resolution was then put and agreed to unanimously, as were also those which followed.

The Duke of Teck moved:—"That the memorial shall consist primarily of a marble statue which shall be offered to the Trustees of the British Museum to be placed in the hall of the Natural History Museum." His Royal Highness said,—There is no doubt, in my mind at least, that this would be the most appropriate place and the most appropriate form in which to erect the likeness of our admired friend. It is, so to say, his second home, the home of his later labours, and no better place could be found. Besides, I think it is a very nice idea that every one who enters the hall should see first of all the man to whom we owe this inheritance. Others have said so much about Sir Richard Owen that it is needless for me to go over the ground again. As all of us know so well, what he has been and what he has done will remain in the minds of all who survive him, and, therefore, I will only say that in my opinion the hall, which is a very fine interior, of the Natural History Museum should be the place where the memorial of this great man should be erected.

Sir William Flower, in seconding the resolution, said that having twice in his life succeeded Sir Richard Owen, he had had special opportunities of judging of his work, and he might, therefore, be expected to say something about the general character and extent of that work on the present occasion, but after what had been said in the introductory remarks of His Royal Highness, and the speech of Prof. Huxley, than whom no one

was more competent to give an opinion upon the scientific side of the question, there was no necessity for doing so. He could not refrain, however, from speaking upon one point. Among the various characteristics of Sir Richard Owen, one of the most remarkable was his untiring industry, which enabled him to produce an amount of work which was truly prodigious. It could hardly be expected that such a vast series of memoirs on so many diverse subjects, as that which he had given forth to the world during his long life, could all be equal in quality, or that the merits of some of them should not have been the occasion of controversy. He would only refer to one instance of this kind. As long ago as 1837, Sir R. Owen read a paper before the Society in whose rooms they were now assembled, which was published in the Philosophical Transactions, and in which certain remarkable characteristics were stated to exist in the brain of marsupial animals, widely distinguishing them from other members of the class to which they belong. The conclusions apparently established by this paper were generally accepted for nearly thirty years, but in 1865 another memoir was read before the same society, and also published in the Philosophical Transactions, in which a different view was taken both of the nature of the structural peculiarities and of their significance in classification. The views of the author of this second paper have generally found favour until within a few months since, when an independent investigation of the subject, carried on with all the improved methods of modern research, by Dr. J. Symington, has resulted in a declaration in favour of the accuracy of Owen's original description and conclusions. These observations may still require confirmation by others, but as he (Sir W. Flower) was the author of the second paper, he considered it only fitting that he should, at a meeting assembled to do honour to the memory of the great anatomist, from whom, on this point, he had differed so long, call attention to them. He thought this the best contribution he could make to the object for which they had gathered together.

Dr. P. L. Sclater suggested that, in addition, a memorial catalogue of the late professor's writings should be issued, with a portrait and biographical memoir.

Sir James Paget moved that a committee be formed to carry out the preceding resolutions. It would be impossible, he said, to have any better evidence that the resolutions just passed were right than the number and position of those who had offered to serve on the committee, for there was never a more representative list. Headed by the Prince of Wales, the Duke of Teck, the Archbishop of Canterbury, and the Lord Chancellor, it contained nearly 150 of the most prominent workers in all branches of science and many who were the best judges of the influence of science on the general well-being of the nation. He was the oldest person present who had worked with Sir R. Owen, and could remember him on entering St. Bartholomew's Hospital as a student in 1834. He could testify to the influence Owen had exercised in promoting the study of science by showing to all around him how keen his delight was in it, and how in itself alone it might be a sufficient reward. He resisted all temptations to leave science, though he might have been a very successful medical practitioner; and he was one of the first by whom the real reform of sanitary matters was begun in this country.

Sir J. Evans briefly seconded the motion.

Sir A. Clark moved—"That the following list of gentlemen constitute the executive committee: His Royal Highness the Prince of Wales (chairman), His Serene Highness the Duke of Teck, the President of the Royal Society, the President of the Royal College of Physicians, the President of the Royal College of Surgeons, the President of the Linnæan Society, the President of the Zoological Society (treasurer), Sir John Evans, Prof. Michael Foster, Dr. A. Günther, Prof. Huxley, Sir F. Leighton, Sir James Paget, Dr. P. L. Sclater, Mr. W. Percy Sladen (secretary), Lord Walsingham, Mr. A. Waterhouse, R.A., and Mr. Henry Woodward." Sir Andrew remarked that this memorial movement reminded them that nations no more than individuals can live by bread alone. Material prosperity did not constitute the true abiding life of a nation; it was necessary that it should live by ideas: and the nation honoured those who, like Owen, communicated new ideas which spurred others to new courses of activity.

Mr. T. Bryant, in seconding the motion, said the College of Surgeons felt the loss that science had sustained in the death of him who unquestionably was the grand expounder of John Hunter and who, more than any one else, demonstrated the value of the materials John Hunter left behind him. He did more than any one else to call the attention of the scientific world to the museum in Lincoln's Inn, and by additions to it to make it what it is. More than that, at a time when comparative anatomy and biological studies were little thought of he called attention to the value of them, the necessity for them, and the pleasures they would yield. As a young man he attended Owen's lectures, and felt the full force of his quiet enthusiasm, which was altogether independent of the materials embodied in the lectures.

Lord Playfair, in supporting the motion, said that he was the last surviving member of the Health of Towns Commission of 1844, upon which he was brought into continual intercourse with Sir R. Owen, and therefore he knew how much Sir Richard had at heart the advancement of sanitary science. This interest in it he maintained throughout his whole career. He lived close to Sir Edwin Chadwick, and although no two men could be more unlike, they were most intimate friends, and were constantly discussing how to advance the health of the nation. When Sir Richard returned from his interesting expedition to Egypt he told the speaker that he had come back in an unforgiving spirit towards Moses, because though skilled in the learning of the Egyptians, and having derived his chief commandments from those of that ancient race, he missed one important one, "Thou shalt not pollute rivers." Owen, like Prof. Huxley, exercised great influence outside the domain of science. Prof. Huxley had benefited the education of the country, and Prof. Owen had considerable influence in improving the sanitary condition of the country.

Sir W. Flower read a first list of donations, headed with one of £25 by the Prince of Wales.

Sir Henry Acland moved, and Prof. Michael Foster seconded, a vote of thanks to his Royal Highness for consenting to become chairman of the committee, and for presiding on the present occasion.

The Prince of Wales, in responding, said,—I beg to return my warmest thanks to my kind and valued old friend, Sir Henry Acland, for the way he has proposed, to Mr. Michael Foster for the way in which he seconded, and to you all for the kind manner in which you have received this resolution. It has indeed been a labour of love to me to-day to preside on this very interesting occasion, and I think that it has seldom been my good fortune to listen to more interesting or eloquent addresses than those which have fallen from the lips of those eminent gentlemen who have spoken. Nobody will take a deeper interest in the carrying out of this memorial of our lamented friend Sir Richard Owen than myself, and most sincerely do I hope that the great work that is to adorn the Natural History Museum will be worthy of a great sculptor and of the great man that it represents.

SCIENTIFIC SERIALS.

Bulletin de l'Académie Royale de Belgique, Nos. 9 and 10. Classe des Sciences.—On some new *Caligidei* of the coast of Africa and the Azores Archipelago, by P. J. van Beneden.—On an optical atmospheric phenomenon observed in the Alps, by F. Folie (see Notes).—On a state of matter characterised by the mutual independence of the pressure and the specific volume, by P. de Heen. It is easily shown that the density of saturated vapour at the critical temperature is variable, and depends, at constant pressure, upon the proportion of liquid enclosed in the tube. Experiments were made in order to decide whether this independence of pressure and volume was shown also at other temperatures. The liquid chosen was ether, and the volume of liquid and vapour contained in a sealed tube was read by means of a cathetometer. A series of results showed that during condensation by pressure the density of unsaturated vapour was greater than that of saturated vapour, or that the specific volume increased with the pressure. This is an experimental verification of Prof. James Thomson's pseudo gaseous state of matter.—On the most complete reduction of invariant functions, by Jacques Deruyts.—Ex-meridian observations made at the Royal Observatory of Belgium from March to October, 1892, by L. Niesten and E. Stuyvaert.—On a new fluorine-derivative of carbon, by Frédéric Swarts. This is a liquid, of the formula CCl_5F, boiling at 24°·7, insoluble in water, and unaffected by sulphuric and nitric acids. Its density is 1·4944; an alcoholic solution of