for physical investigations formed a large part of the equipment of observatories in which the earlier work in astrophysics was carried on, such as those of Lockyer and Huggins, and Dr. King points out that there is a constantly increasing demand for this close co-operation between the laboratory and the observatory. Though much work of great value has been done in university laboratories, greater continuity in the prosecution of extensive pieces of research is possible in a laboratory which is specially equipped, and provided with a staff having full time to devote to these problems. Typical examples of the experimental work carried on at Mount Wilson are described and illustrated; the photographs showing the effect of the magnetic field on the sun-spot spectrum are particularly striking.

PARALLAX OF A PLANETARY NEBULA.—In view of the doubtful value of most of the parallaxes previously deduced for nebulae, a result recently obtained by Mr. A. van Maanen with the 60-in. reflector at Mount Wilson is of considerable interest and importance (*Proc. Nat. Acad. Sci. Washington*, vol. iii., p. 133). The nebula in question is N.G.C. 7662, having a sharp stellar nucleus which gave measurable images with exposures of twenty-five minutes. The absolute parallax is given as $0.023''$, which would place the nebula at a distance of about 140 light-years. As the angular diameter of this nebula is $26''$, its linear diameter would thus be of the order of nineteen times that of the orbit of Neptune.

THE RECENT COLD WEATHER.

AFTER a more than usually severe winter, the spring has opened with exceptional cold over the whole of Great Britain, and the wintry conditions have also embraced a large part of western Europe.

Dr. Mill, the director of the Rainfall Organisation, in a letter to the *Times* of April 11, mentions that "the first ten days of April have been colder this year than in any other," according to the Camden Square record of temperature, which has been kept for sixty years. Frost is said to have occurred on every night but two. In the Camden Town records for 1888 frost occurred every night but one, although the mean temperature for the period was slightly higher than in the present month. The Greenwich records for the past seventy-five years show that prior to the present year the greatest cold for the first ten days of April occurred in 1888, when the highest night temperature for the period was 32.1° on April 1. At South Kensington, the recording station of the Meteorological Office, frost occurred in the open on thirteen nights during the first fortnight of April this year.

The cold has been even more severe over the northern portions of the kingdom; and in the official reports from the health resorts, Southport is shown to have had a minimum shade temperature of 13° on April 3.

In the winter six months, from October to March inclusive, there was frost on seventy-three nights at Greenwich. During the last seventy-five years frost has only occurred more frequently in the six winter months six times, whilst the winter which has just closed has had a greater number of frosts than any winter since that of 1890-91, when there were seventy-six frosts. The highest number is eighty frosts, in the winter of 1887-88.

The frequency of snow in London is dealt with in the *Times* of April 11, and records by a meteorologist at Wandsworth Common for the last quarter of a century are referred to. Snow is said to have fallen on as many as thirty days this year prior to April 11, and since that date snow has fallen on four more days to April 17, so that snow has fallen on thirty-

four days since the commencement of January. This is three times the average for the first four months of the year, and is eleven more than in any corresponding period since 1892. The average number of days with snow in an entire year at Wandsworth Common for the past twenty-five years is thirteen. Mr. Mossman, in a communication made to the Royal Meteorological Society some years ago, showed that the average number of days with snow was fifteen in the course of the year, deduced from the observation of 100 years, and twelve of these snowy days occurred in the first four months of the year.

Snow has fallen in larger quantities during the last few months over the northern portion of the kingdom than in the south, although the occurrence of the snow may not have been more frequent.

In 1908 railway traffic was much hampered in the south of England by a heavy fall of snow on April 25, and ordinary traffic by road was completely stopped for a time.

Rainfall for the past winter was less than in many recent winters, and the total for the six months in London was 14.4 in., which is about 110 per cent. of the average. January and February were dry, little more than one-half of the average rain falling in the latter month. Sunshine has been deficient for months past over England, and in London there has been an unusual number of overcast and sunless days.

CHAS. HARDING.

MEMORIAL TO SIR WILLIAM AND LADY HUGGINS.

ADDRESS BY SIR J. J. THOMSON, O.M., P.R.S.

WE gave on April 5 (p. 109) an account of the unveiling of a memorial to Sir William and Lady Huggins in St. Paul's Cathedral. The address delivered by Sir Joseph Thomson on that occasion has since reached us, and we are glad to be able to print it below.

I have been asked, as president of the Royal Society, to commit this memorial of Sir William and Lady Huggins to the care of the Dean and Chapter of St. Paul's, and also to say a few words as to the inception of the memorial. Shortly after the death of Sir William Huggins some of his friends were anxious to set on foot a proposal to obtain a memorial of him; this came to the knowledge of Lady Huggins, and she expressed the wish that she might be allowed to defray all the expenses, so that no one except herself should be put to any expense in the matter. Before any arrangements had been arrived at Lady Huggins died, and it was found that in her will she had left a sum of money to provide for a memorial to Sir William. It seemed to those responsible for carrying out her wishes that in view of the long and active part she had taken in her husband's work, and that some of the most important papers were published in their joint names, no memorial to Sir William would be satisfactory unless it testified in some way to the part Lady Huggins had played in his work; to effect this a small medallion of Lady Huggins had been added as a pendant to the one of Sir William.

There can be no question as to the claim of Sir William Huggins, the founder of astrophysics, as he has been called, to such a memorial, nor any doubt as to where it could most appropriately be placed. For no man of equal scientific eminence was ever more closely connected with this city. He was born in London, he was educated entirely in London, he was in business in London, and when he retired from business to devote himself to astronomy he built his observatory in London; and in spite of the fact

that the atmosphere of London is far from being an astronomer's ideal, all the observations which led to the discoveries on which his fame rests were made in London. This great Cathedral seems the appropriate resting-place of a memorial to one whose life and work were so linked up with this city.

Sir William Huggins was a prominent example of a type of man to whom English science owes much, the non-official worker. Like his contemporaries, Darwin and Joule, he never held any professorship or scientific appointment. When in 1858 he retired from business at an unusually early age, he seems to have been undecided as to whether he should devote himself to the microscope or the telescope. The telescope gained the day, and he built an observatory at Tulse Hill; he began by making drawings of the planets, but seemed to be losing interest and to be rather despondent, when Kirchhoff's determination of the chemical elements in the sun by the aid of spectrum analysis came to his knowledge. This was to him, he said, like water in a thirsty land, and he determined to attempt to find out the constitution of the stars by the same method. At the beginning of 1862 he persuaded Prof. Miller to join with him in the work, and in spite of the formidable difficulties due to the feebleness of the light, the mechanical difficulties of keeping the image of the star on the slit of the spectroscopic, and the caprice of the London atmosphere, they were able to present to the Royal Society in 1863 a preliminary statement as to the spectra of some of the brighter stars; while in 1864 they published in the *Philosophical Transactions* of the Royal Society a general account of the spectra of about fifty stars, with a detailed study of some of the more important ones. They showed that the stars are made up of elements which, with few exceptions, are found in the earth. In 1864 Huggins made a discovery of capital importance in connection with the evolution of the stars, for he discovered a nebula the spectrum of which showed that it consisted of glowing gas, and was therefore in quite a different state of development from the stars he had examined, the spectra of which showed that their physical condition was analogous to that of the sun. Huggins threw himself with characteristic energy into the study of the spectra of the nebulae, and found that the nebulae were not all of one kind; some were stellar aggregates, while others were continuous masses of incandescent gases.

The importance of these results and the interest they excited were recognised by scientific societies with a promptitude almost without parallel. Three years after beginning serious scientific work he was elected a fellow of the Royal Society, the next year he was awarded a Royal medal, and after ten years he seems to have been elected to almost every scientific society in Europe. The work which commenced with such brilliance was carried on with undiminished ardour for nearly fifty years; since 1875 with the active co-operation of his wife. It showed throughout the characteristics so noticeable in the earlier work: the power to select the right problem to attack, the ability to devise the best way to attack it, and the industry to take boundless pains in overcoming the difficulties which sprang up at every turn.

On behalf of the Royal Society, I record with gratitude the help he gave to the work of that society, and especially to the distinction and dignity with which he for five years discharged the office of president. For the medallion we are indebted especially to Mr. Pegram, the artist whose skill has produced it, and to Miss Montefiore, who has borne the burden of the heavy work necessary to bring such a scheme to completion.

THE DEVELOPMENT OF VEGETATION.¹

CONSIDERABLE scepticism is not infrequently expressed by botanists who are not ecologists as to the possibility of formulating a satisfactory natural classification of vegetation, *i.e.* of plant communities; and this scepticism is natural enough when we consider the numerous attempts, largely inconsistent and contradictory, that have been made in this direction, especially in recent years. It is obvious that the ultimate test of validity will be general acceptance, and certainly we cannot claim that there is anything like agreement among ecologists as to a natural scheme or as to the principles upon which such a scheme should be based. At the same time, it must be remembered that it took a very long time and constant efforts from many quarters to arrive at a natural system of classification of species which commanded anything like general acceptance. The task of the classifier of plant communities is much more difficult for many reasons, the chief of which is that the outlines of the classificatory units—the plant communities—are frequently vague and shifting, owing to the multiplicity of causes and combinations of causes which determine their nature and limits. Some would doubtless go so far as to say that the units themselves are illusory, but it is significant that this is not the view of those who have seriously studied vegetation in the field.

The natural system of species has been ultimately established on a phylogenetic—*i.e.* a developmental—basis, and any other was impossible once the principle of evolution had been accepted. Prof. Clements's fundamental contention in the volume under review is that the natural system of plant communities must also be established on a developmental basis, and he includes in his purview not only present vegetation, but all the past vegetations that have come into existence since plant-life first appeared on the earth. As the basis of this contention Prof. Clements claims that the *plant formation*—his basic unit—is an organism.

Whether that claim can be admitted or not depends, of course, upon our conception of an organism. Starting with individual animals and plants, which are the typical, or, as some might say, the only, organisms, it is clear that we can, if we so choose, extend the conception to human societies, for instance, which certainly have very many of the same characteristics, though they have not the close-knit spatial unity of structure and function of the individual plant or animal. If we extend the conception further to include plant formations in Clements's sense, we drop from our concept one of the characteristics of the higher animal organisms and of human communities—the conscious co-operation of parts in pursuit of the ends of the whole. But neither is this a character found in the lower animals or in plants. Unless, therefore, we definitely restrict our conception of organism to individual animals and plants, we must concede Clements's contention that plant formations are organisms, and if we do so restrict it we have perforce to admit that the plant formation has many of the characters of organisms, a fact which we may perhaps express by calling the vegetation unit a *quasi-organism*.

Prof. Clements's plant formation is the plant community in equilibrium with its climatic habitat, *i.e.* determined and kept constant by the control of a distinct climate. The type of such a formation is the forest of definite floristic composition which maintains itself indefinitely so long as the climate maintains its general character. Prof. Clements points out that such a community has a definite organisation, *i.e.* a fixed spatial and functional relation between the plants

¹ "Plant Succession: an Analysis of the Development of Vegetation." By Prof. F. E. Clements. Pp. xiii+512+61 photographic plates and 51 figures in the text. (Carnegie Institution of Washington, 1916.)