HYDROGEN LINES AND SERIES CONSTANT.—Under the heading "Wave-lengths of Hydrogen Lines and Determination of the Series Constant," Mr. W. E. Curtis recently communicated through Prof. Fowler an important paper to the Royal Society (Roy. Soc. Proc., Series A, vol. xc., No. A 622). The object of the research was first to obtain with the utmost accuracy the wave-lengths of the lines in the Balmer or series spectrum of hydrogen in order to test the formula and make such modifications of it as were considered necessary. Another part of the research restricted itself to the evaluation of the international system of wave-lengths of the constant occurring in the formula; the importance of this constant will be appreciated when it is stated that it may be used in all formulæ representing series of lines. The degree of accuracy which could be obtained with the spectrograph employed (10 ft. concave grating) using the new international standards of wave-length was next investigated. The results of the research are summed up as follows. The wave-lengths in I.A. of the first six lines of the hydrogen series were determined with an accuracy of about 0·001 Å.U. Balmer's formula was found to be inexact and the results could be represented by a modified Rydberg formula containing only two constants. An accuracy of 0·001 Å.U. was attainable in the third order of the grating spectrograph with exposures of less than half an hour. With longer exposures the determination became less accurate owing to the uncontrolled temperature of the instrument. The tertiary iron arc standards determined by Burns were tested in the special regions under investigation and found very satisfactory.

A NOVEL FORM OF ROWLAND GRATING MOUNTING.—Dr. A. S. King, in the Contributions from the Mount Wilson Observatory, No. 84 (*Astrophysical Journal*, vol. xl., 1914), describes a vertical adaptation of the Rowland mounting for a 15-ft. concave grating which has recently been mounted in the Pasadena laboratory of the Mount Wilson Solar Observatory. The general arrangement is as follows:—The plate-holder moves on a horizontal track, at a convenient distance above the floor, supported by a frame of channel iron placed over a slot in the cover of the pit used for the already existing vertical Littrow spectrograph. The slit is at one end of the horizontal track and vertically above the grating, and is contained in a hollow iron casting with a brass collar, which holds the slit tube and permits the adjustment of the height of the slit. The grating is contained in a cast-iron box with an extension which is bolted to the web of a girder connecting with the plate-holder carriage. The grating box is fixed to a carriage which is capable of movement on a vertical track, and an ingenious arrangement is adopted to allow for the variable pull when the grating is being raised by the movement of the plate-holder carriage along the horizontal track. Dr. King describes many interesting details about this variable counterweight system, the plate-holder carriage, photographic plate-holder, etc. While the mounting retains all the good features of the usual Rowland form, there are many distinct advantages. In the first place, there is an excellent temperature control in the pit, the grating and connecting girder benefiting thereby. The mounting requires little floor space, a narrow space against a wall being all that is necessary. No darkening of the room is necessary, and therefore no interference with other work being carried on in the laboratory. For assistance in planning the instrument Dr. King refers to Mr. Pease for designing the main structural features, to Mr. Nichols for numerous devices in convenience of working, and to Mr. Ayers and Mr. Shumway for construction and mounting.

THREE NEW INDIAN METEORITES.—At a meeting of the Asiatic Society of Bengal held on August 5 Mr. Coggin Brown read an interesting account of the fall of meteorites in India which had been described by Mr. C. A. Innes, the acting collector of Malabar. It seems that meteoric stones fell on April 6 last at Kuttayi, Triprangode, Trikanapuram, and Kuttippuram, places in the Pounani taluk of the Malabar district. These places are practically in a straight line, Kuttayi being on the coast and Kuttippuram nine or ten miles easterly from the last-mentioned place. Triprangode is about three miles from Kuttayi, Trikanapuram about five miles from Triprangode, and Kuttippuram about two miles from Trikanapuram. Four small stones are reported from Kuttayi, one from Triprangode, and six from Trikanapuram. One large stone, weighing 71 lb., fell at Kuttippuram, but it is now in three pieces. The account then describes the appearances of the fall at the different stations. As regards the large stone which fell at Kuttippuram, it is stated "the stone fell in a paddy field which was then dry and penetrated some feet into the ground. A cloud of dust rose into the air, and this cloud attracted people to the spot. But they were apparently afraid to touch the stone, and it was not until some hours later that it was dug out, and then it was quite cold. The people who gathered at the spot say that for some minutes after the fall there was a smell of backwater mud in the vicinity. Backwater mud or silt is black, oozy stuff, which is full of rotting organic matter, and its smell, which is familiar to everyone who lives in Malabar, is most unpleasant." The noise of the first two loud reports is said to have been heard at various places in Malabar. It was heard distinctly at Pounani, 4·5 miles from Kuttayi, and was recorded as having been heard at Calicut, a distance of thirty miles north of Kuttayi.

THE LANCASHIRE SEA FISHERIES LABORATORY.[1]

WE have recently received the report for 1913 on the Lancashire Sea Fisheries Laboratory at the University of Liverpool and the Sea Fish Hatchery at Piel, edited by the honorary director of the scientific work, Prof. W. A. Herdman, F.R.S.

It appears that more than one million plaice and twelve million flounders were hatched at Piel and committed to the sea. The usual course of instruction for fishermen was given, and nature-study evening classes were restarted on behalf of the Education Committee of Barrow, both with satisfactory results. In connection with the classes for fishermen, a new edition of the syllabus has been published and brought up to date by Dr. Johnstone, while a section on navigation by Captain Thornber has been included. There is also appended an excellent series of biological photographs by Mr. A. Scott.

Various observations arising out of mackerel investigations by Mr. Scott are given, particularly with regard to the food of the mackerel, and also a report on the distribution and periods of occurrence of pelagic fish eggs. The seventh annual survey of the work on the intensive study of Irish Sea plankton is submitted by the director, together with some observations on the summer plankton of the west coast of Scotland. The records of the work done by Dr. Johnstone in connection with diseases of fishes are incorporated, as is also a continuation of his detailed work on the measurements of plaice, the latter being of particular interest in view of the proposal by the International Fisheries Bureau to impose limits on

[1] Report on the Lancashire Sea Fisheries Laboratory for 1913. No. xxii.

the size of plaice to be landed. The results of Dr. Johnstone's plaice-marking experiments are also given.

Mr. William Riddell continues his hydrographical investigations, and the results of the chemical analyses of the water samples and a dissertation on their import are given by Prof. Bassett. As part of a proposed general scheme of investigation of the British herring races arranged by the Board of Fisheries, several samples of herrings from the Welsh coast and from the Smalls were examined and the measurements are detailed in the report. A paper of a preliminary nature on sea-bottom deposits and fish food off the Lancashire and Cumberland coasts is contributed by Mr. R. Ray. Dr. Johnstone gives a topographical description of the mussel grounds in the Ribble Estuary and several other Welsh beds. From the results of a bacteriologial analysis, also given, much sewage contamination seems to exist at several of the grounds.

Two important papers by Prof. Moore and his collaborators are given on the debated question of the ability of marine animals to subsist on the organic carbon dissolved and in suspension in sea-water. The results seem to prove conclusively that such subsistence for long periods is impossible, and that neither dissolved organic matter nor the average amount of suspended plankton suffices to account for the nutrition of the larger marine organisms.

Several minor reports conclude the survey of the year's work.

THE METROPOLITAN WATER SUPPLY.[1]

THE two reports by Dr. A. C. Houston, director of water examination, recently issued by the Metropolitan Water Board, show how much is now being done to safeguard from contamination with dangerous micro-organisms the metropolitan water supply, which is admittedly largely derived from sewage-polluted sources. The eighth annual report gives the results of the chemical and bacteriological examination of the London waters for the twelve months ended March 31, 1914. In the introduction Dr. Houston points out that experience in the Water Board laboratories indicates that *Bacillus coli* is practically totally absent from pure waters; in ten specially devised experiments with the Twins well (Deptford) water, typical *B. coli* was absent from 10,000 c.c., and it has been abundantly shown that it is possible, at a not impracticable cost, so to purify the raw river waters that the final product contains no typical *B. coli* in 100 c.c. in more than 80 per cent. of the samples.

In the tenth report on research work, the results of several important researches are detailed. The search for the typhoid bacillus and similar micro-organisms in raw river water and crude sewage has been continued, but although a large number of samples has been examined, none has been found. Various methods for the isolation of the typhoid bacillus in these circumstances are reviewed.

A study of the streptococci present in excremental matters has not resulted in finding any definite difference between those present in human, and those present in animal, excrement.

The value of storage as a means of eliminating pathogenic micro-organisms and of lime as a bactericidal agent are further confirmed in series of new experiments.

[1] Metropolitan Water Board (*a*) "Eighth Annual Report" on the results of the Chemical and Bacteriological Examination of the London Waters for the twelve months ended March 31, 1914. (*b*) "Tenth Report on Research Work." Both by Dr. A. C. Houston, Director of Water Examination, Metropolitan Water Board.

Altogether these two reports are worthy of careful perusal by public health authorities and bacteriologists, and show how much valuable but unobtrusive work is being done by Dr Houston and his staff.

R. T. HEWLETT.

LOCAL CASE-HARDENING OF STEEL.[1]

IN a paper read to the Société d'Encouragement pour l'Industrie National, MM. Guillet and Bernard discuss the various methods employed when it is desired to case-harden steel objects in certain parts only. The methods used are:—

(1) The parts to be protected against cementation are covered with fire-clay. The protection thus furnished is not complete, as the gases penetrate the fire-clay. Also in complex shapes the method becomes complicated and expensive.

(2) A tube is shrunk over the parts to remain uncemented, the thickness of the tube being slightly greater than the depth of case required. After the end of the cementing process, the tube is broken off. This method is obviously very limited in its application.

(3) The object is made with extra thicknesses in those parts which must not be hardened. After cementation and before hardening, these extra thicknesses are machined off. This process is very expensive.

(4) The parts not to be cemented are protected by a metallic deposit which must be (*a*) solid at the cementing temperature, (*b*) impervious to the cementing materials, (*c*) easily obtained commercially, and (*d*) easily removed after the operation. Copper and nickel are the only metals which fulfil conditions (*a*) and (*c*), and the latter fails to comply with condition (*b*).

The metal may be deposited by immersion in a salt solution, by electrolysis, or by the Schoop spraying process. The first mentioned is not satisfactory owing to the thinness and uncertain adherence of the coating. The electrolytic process is cheaper to instal than the spray process, which, on the other hand, is quicker and more easily localised.

The authors also consider the question of diffusion of metals. They show that for this to take place, (1) the two metals must be capable of forming solid solutions with each other, (2) they must be in very good contact, and (3) the temperature must be between the limits at which the solid solution exists. The higher the temperature, the greater is the rate of diffusion. They conclude that the diffusion of solids into solids is a very common phenomenon, which in certain cases (*e.g.* tinned condenser tubes) may introduce very considerable changes into the properties of the metal.

THE AUSTRALIAN MEETING OF THE BRITISH ASSOCIATION.

SECTION K.

BOTANY.

OPENING ADDRESS BY PROF. F. O. BOWER, D.Sc., F.R.S., PRESIDENT OF THE SECTION.

To preside over the botanical section on the occasion of its first meeting in Australia is no slight honour, though it also imposes no small responsibility. We members from Great Britain have a deep sense of the advantage which we derive from visiting these distant shores. I am doubtful whether any scientific

[1] Les réserves en cémentation et la diffusion dans les solides." By MM. Léon Guillet and Victor Bernard. *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, vol. cxxi, No. 5. Pp. 588-618.