versity of St. Petersburg, delivered the Huxley lecture at Charing Cross Hospital on October 1. The function took place in the out-patient hall of the hospital, which was crowded with an enthusiastic audience. The professor was welcomed on his arrival in a small room adjoining the hall by an informal reception committee, consisting of Lord Kilmorey (chairman of the hospital), Sir A. Rücker, Professor Starling, Dr. Pavy, Professor Gotch, Dr. W. V. Bayliss, Dr. Mott, Mr. Waterhouse and Dr. Bosanquet. When Professor Pawlow was conducted into the hall by Lord Kilmorey, the reception accorded to the eminent physiologist was so hearty that it seemed to take him by surprise. In a few words Lord Kilmorey introduced the lecturer to the audience, and Professor Pawlow then proceeded to deliver his address. He spoke in German, and took for his subject the scientific investigation of the psychical faculties or processes in the higher animals. At the conclusion of the address Sir A. Rücker, principal of the University of London, moved a vote of thanks to Professor Pawlow. He assured him that the interest in his address was not confined to the walls of Charing Cross Hospital, but the University of London as a whole was delighted to welcome so distinguished a representative of Russian science. Professor Starling, in seconding the vote of thanks, said that the address bore out the old statement as to the close connection that existed between the advance of science and the advance of methods at the disposal of scientific investigators. Great strides had been made in the science of physiology by the introduction of anesthetics which had abolished pain from the physiological laboratory. The use of anesthetics necessitated the introduction of abnormal conditions into an experiment, but Professor Pawlow had now taught them how to experiment on the living animal in perfect physiological condition without pain, without anesthetics, and without even discomfort. Lord Kilmorey formally expressed the thanks of the meeting to Professor Pawlow, who replied in a few words suitably acknowledging the compliment.—*The British Medical Journal.*

ASTRONOMICAL NOTES.

THE POTSDAM PHOTOMETRIC DURCHMUSTERUNG.

VOLUME XVI. of the *Publikationen des Astrophysikalischen Observatoriums zu Potsdam* has just been issued. It contains the fourth and last zone of the photometric Durchmusterung, which has been carried on by Müller and Kempf during the last twenty years, of which the first volume appeared in 1894. It includes all stars in the northern heavens of the magnitude 7.5, and brighter, and forms a most important addition to the photometry of the stars.

Although the great discordance among the various estimates of brightness made some sort of exact measurements a necessary step in the advancement of astronomy, but little progress had been made until a quarter of a century ago. The first volume of the Harvard photometry, begun in 1879, was published in 1884, and the Uranometria Oxoniensis appeared in 1885.

The Durchmusterung of Müller and Kempf comes opportunely, since it gives measurements of great precision, and throws light on the results obtained by earlier observers. It is of the greatest importance, not only to reduce the accidental errors as much as possible, a result which has probably been accomplished by Müller and Kempf, but, especially, to show whether the systematic errors, which are inseparable from such investigations, are so small as to make the results trustworthy.

The work of Pritchard at Oxford was carried on with a wedge photometer; that of Pickering at Harvard with polarization photometers in which a polar star is compared directly with all the stars whose magnitudes are to be determined; the observations of Müller and Kempf have been made with photometers of the Zöllner type, in which, by means of an artificial star, the stars to be measured are compared indirectly with various well-distributed standard stars whose magnitudes have been determined with all possible care.

The work of the Potsdam astronomers was arranged in four zones extending from the equator to the north pole of the sky. The

authors take advantage of the completion of the last zone to make a discussion of their results, and a comparison between them and the determinations of other astronomers, a brief synopsis of which follows.

Systematic Differences in the Potsdam Observations.—Small systematic differences appear between the two observers, and between the photometers which they employed. For a mean interval of 0.43 magnitude the mean difference in brightness of two stars, with photometer C1, is smaller by 0.02 when measured by M than by K. With photometer D a difference of 0.01 was found for a measured interval of 0.28.

Differences also appear between the observations of the fundamental stars and those of the zones. Taking all four zones together a mean difference of 0.49 magnitude was measured less by 0.030 in the zone observations than in those of the fundamental stars, when photometer C1 was used, and less by 0.007 for photometer D. On the assumption that this quantity increases according to the measured difference, this corresponds to a difference of 0.061 for a full magnitude for photometer C1, and to 0.018 for D. The latter instrument apparently gives results of slightly greater precision. A comparison of the different photometers also shows small differences for both magnitude and color.

For the determination of the differences between M and K, as affected by magnitude and color, a discussion is given of all except the fundamental stars. They are placed in four groups, white, yellowish white, whitish yellow, yellow and deeper shades. For all, $M - K = -0.03$ magnitude. This result agrees well with that of the third zone, but is somewhat at variance with that of the first zone, where the difference was $+0.02$. In the estimation of color intensities no significant differences appear.

The precision attained is indicated by a comparison of the measurements of 2,485 stars, which were observed by both M and K. These give a mean difference between the observers of ± 0.11 magn. The probable error of a single observation is ± 0.052, and for a catalogue value based on two evenings' observations, ± 0.037. There seem to be no marked differences in these values as influenced by magnitude or color.

Comparison between the Potsdam Measurements and the Bonn Estimates.—The comparison with the estimated magnitudes of the Bonn Durchmusterung (BD) presents some curious features. For naked-eye stars of all colors, a magnitude by the BD corresponds to 0.9035 of the Potsdam scale, while for the fainter stars the corresponding value is 1.0566. The logarithms of these quantities are 0.361 and 0.423. The corresponding values for the three preceding zones were 0.329, 0.362, 0.366 for bright stars and 0.400, 0.457, 0.484 for faint stars. The variations in these quantities seem pretty large.

When taken with respect to color, the difference, Potsdam — BD, decreases systematically from $+0.41$ for white stars to -0.01 for yellow stars. This difference, Potsdam — BD, shows also a marked but systematic variation according to the declination of the stars. This, however, might perhaps be explained by a large atmospheric absorption at Bonn, for which no correction was applied.

Comparison between the Determinations at Potsdam, Harvard and Oxford.—The Harvard values used are those of volumes XIV. and XXIV. These are referred to as Pickering I. and Pickering II. Later volumes of the Harvard photometry will be discussed at another time. Tables are given showing the systematic mean differences, Potsdam — P I., Potsdam — P II. and Potsdam — Pr (Oxford), for the zone in question, and a special table giving the individual cases in which the differences amount to half a magnitude, or more. The number of such cases is small, one for P I. and five for P II. and Pr. This number is less than in preceding parts of the work, which is explained by the authors as due to the fact that both at Harvard and at Oxford the pole-star was the standard of comparison, and that errors would naturally be fewer in this zone, 60°–90°, which lies near the pole-star.

These tables are followed by others giving the results for all four zones combined. Since the systematic differences are practically the same for all four zones, an inspection of the

final means will be sufficient. These differences can best be shown by the following brief table:

	Potsdam—B D.	Potsdam—P I.	Potsdam—P II.	Potsdam—Pr.	Means.
White.....	+0.25	+0.29	+0.29	+0.23	+0.26
Yellow white.....	+0.26	+0.25	+0.21	+0.20	+0.23
White yellow.....	+0.11	+0.09	+0.02	+0.06	+0.07
Yellow, etc.....	—0.05	—0.04	—0.09	—0.07	—0.06

The most striking feature shown in this table is the remarkable accordance in the mean results at Bonn, Harvard and Oxford. In each case there is a positive difference of about a quarter of a magnitude for white stars, and this quantity diminishes systematically to a small negative value for the yellow-red red stars. The systematic differences between the Bonn, Harvard and Oxford catalogues are inappreciable. In all cases Potsdam makes the white stars fainter and the red stars brighter than the other three observatories. Between these two extremes, however, somewhere between the whitish-yellow and yellow stars, the differences disappear. The differences seem difficult of explanation. On the one hand, we have Potsdam with two observers and with Zöllner photometers, and on the other hand, Bonn, Harvard and Oxford, with eight observers and photometers of several kinds. The differences concerned are small, however, and it may well be regarded as remarkable that the color scale of the different catalogues should agree so closely that for stars of one color the differences are positive, and for those of another color, negative.

Another relation is shown by arranging the observations with regard to magnitude. We may use for illustration Potsdam — P I. It is thus found that the scale of magnitude of the Harvard photometry lies, for stars of different color, on both sides of that of the Potsdam scale. For white stars a full Harvard magnitude equals about 1.05 of the Potsdam scale; for yellowish-white, 1.03; for whitish-yellow, 1.01; and for yellow and red stars, 0.94; and for all, about 1.00. Taking into consideration the systematic differences which are found in the results of a single observatory by different observers and instruments, as shown in the present discussion for Potsdam, and also the known influence of the Purkinje phenomenon, the differences of scale between Potsdam and Harvard are surprisingly small.

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BOTANICAL NOTES.

BOTANY IN THE ST. LOUIS CONGRESS OF 1904.

A LITTLE more than two years ago in the Congress of Arts and Science of the Universal Exposition at St. Louis a considerable number of botanical papers were read which are now given wider publicity by being printed in the fifth volume of the published proceedings of that notable meeting. The following papers on botanical subjects are printed in this volume: 'Development of Morphological Conceptions,' by Professor John M. Coulter; 'A Comparison between Natural and Artificial Selection,' by Professor Hugo de Vries; 'Plant Morphology,' by Professor Frederick O. Bower; 'The Fundamental Problems of Present-day Plant Morphology,' by Professor Karl F. Goebel; 'The Development of Plant Physiology under the Influence of the Other Sciences,' by Professor Julius Wiesner; 'Plant Physiology—Present Problems,' by Professor Benjamin M. Duggar; 'The History and Scope of Plant Pathology,' by Professor Joseph C. Arthur; 'Vegetable Pathology, an Economic Science,' by Merton B. Waite; 'The Position of Ecology in Modern Science,' by Professor Oscar Drude; 'The Problems of Ecology,' by Professor Benjamin L. Robinson; 'Relations of Bacteriology to Other Sciences,' by Professor Edwin O. Jordan; 'Some Problems in the Life-history of Pathogenic Microorganisms,' by Professor Theobald Smith. To these may be added the two more general papers—'The Recent Development of Biology,' by Professor Jacques Loeb, and 'The Problem of the Origin of Species,' by Professor Charles O. Whitman, and the brief introductory addresses by Professor Charles R. Barnes (plant physiology) and Professor Charles E. Bessey (plant pathology). Nor are these all that will