

the 30-ft., and the first order of the 75-ft. spectrograph, and in the case of the closest pairs curves were also obtained with the registering photomicrometer; the separations derived by the latter process appeared to be least affected by accidental or systematic errors. The mean separations determined at Mount Wilson by three methods were systematically smaller than those indicated by Rowland's tables, the difference varying inversely as the separation. For six pairs, mean separation 0.274, the difference was +0.003; for eight pairs, mean separation 0.145, it was +0.008; and for eight other pairs, mean separation 0.075, it was +0.013. These differences are regarded as being probably due to errors in the Rowland values. The filar-micrometer values were found to vary with the width of the slit and the density of the spectrograms; whatever decreased the intensity of the space between the two components, as compared with the continuous spectrum outside, led to over-estimation of the interval. These results have evidently an important bearing upon recent attempts to detect effects due to anomalous dispersion.

The curious personal errors in the measurement of close lines have also been discussed from another point of view by H. H. Plaskett, in a paper entitled "The Psychology of Differential Measurements" (*Journal R.A.S. Canada*, June, 1916; *NATURE*, vol. xcvi., p. 451.)

SPECTRA AND ABSOLUTE MAGNITUDES OF STARS.—It has previously been shown by Adams that stars of small proper motion are relatively weaker in the more refrangible parts of the spectrum than stars of large proper motion, and that for stars of classes F to K this difference increases with advancing type. While the first result suggests a scattering of light in space, the second indicates that the absorption in the violet depends, in part at least, on the physical state of the star. This investigation has recently been extended at Mount Wilson by G. S. Monk, who has examined about 1200 plates of stellar spectra (*Astrophysical Journal*, vol. xlv., p. 45). The results are in general agreement with those of Adams, but show the effects to a less extent. All the density measures which could be so used were further discussed in relation to the absolute magnitudes of the stars, as determined by Adams on the basis of intensities of certain special lines. A relationship was thus indicated as existing between absolute magnitude and the relative weakness in the violet part of the spectra of stars having small proper motions, and it is concluded that the greater part of this effect is not due to absorption of light in space. It is thought probable that, with the aid of photographs specially taken for the purpose, the relative intensity of the violet part of the spectrum, together with spectral type, might be successfully employed to provide fairly accurate values of absolute magnitudes. An additional spectroscopic method of determining stellar distances is thus suggested.

OBSERVATIONS OF MINOR PLANETS IN FRANCE.—It is gratifying to find that in spite of difficulties caused by the war, the French observatories have been able to secure a large number of observations of minor planets. A useful summary of these observations, made during the year 1915, is given in the *Journal des Observateurs*, vol. i., No. 10. Although no new discoveries were made by French astronomers, an abundance of precise observations of about 120 known minor planets were obtained. About two-thirds of the observations were made at Algiers, on plates taken with the instrument employed for the photographic chart of the heavens. In addition, numerous ephemerides, in many cases constructed from corrected orbital elements, were issued by the Marseilles Observatory.

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THE MARITZBURG MEETING OF THE SOUTH AFRICAN ASSOCIATION.

THE fourteenth annual session of the South African Association for the Advancement of Science was held in Maritzburg, the capital of the Province of Natal, on July 3-8, under the presidency of Dr. Lawrence Crawford, professor of mathematics in the South African College, Capetown. The meetings of the sections took place in what used to be the Natal Houses of Parliament, the buildings of which are now the abode of the Natal Provincial Council. On the afternoon of the opening day of the session the president and members of the association were officially welcomed by the Mayor and Corporation of Maritzburg, and in the evening his worship gave a reception in the Town Hall, after which the president took the chair and delivered his address.

About eighty-five papers were read in the four sections into which the association is usually divided, and summaries of a few of these are given below.

Prof. John Orr, who will preside over the 1917 session of the association, which is to be held at Stellenbosch, Cape Province, was president of Section A at Maritzburg, and his presidential address, which was profusely illustrated by means of lantern slides, was largely a review of the progress of engineering science in South Africa of late years, particularly in connection with mining operations on the Rand.

The presidential address in Section B was given by Prof. J. A. Wilkinson, professor of chemistry in the South African School of Mines and Technology, Johannesburg. He laid stress on the fact that South Africa continues to exist on its rich stock of raw materials—its exports, in addition to the raw products of agriculture, being chiefly metals, crude and unrefined, and uncut diamonds. He devoted his address to urging the need of organising the development of chemical industry and research in the widest sense of those terms. He deplored the existence of the popular impression that the duties of the chemist and the pharmacist are identical, and to this cause he ascribed the fact that South African products were not up to the standard of imported goods. In conclusion, he submitted details of a scheme for organising chemical research in South Africa upon sound lines, and urged that this organisation should be undertaken without delay.

Mr. I. B. Pole Evans, chief of the division of botany in the Union Department of Agriculture, was president of Section C. His presidential address took the form of a sketch of the rise and development of mycology in South Africa. Persoon, the father of the science of mycology, he pointed out, was a South African, having been born at the Cape in 1755, and some of the earliest references to Cape fungi are in his "Synopsis methodica fungorum," published in 1801. During the course of his address Mr. Pole Evans incidentally referred to his own appointment as mycologist to the Transvaal Government in 1905. He could not be expected to know that some years previously the Cape Government, too, had put a sum of money on the Estimates for the salary of a mycologist, but so much sport was made of the item in the Cape Parliament that it was hurriedly withdrawn. "The ignorance of the subject and the vague notions that people have about fungi are," said Mr. Pole Evans, "due chiefly to the fact that most of them are microscopic, and consequently cannot easily be conceived by those unfamiliar with the life of the unseen world."

Section D was presided over by Mr. M. S. Evans, who took as the subject of his address a survey of the past and present relations of the European and Bantu

racers in Natal and the surrounding districts. He recalled the conditions of native life as they were when he first landed in South Africa about forty years ago. The influence of the white man had been in favour of the Bantu people, for whom it was then an idyllic time. In 1886 came the great discovery which altered the whole social and economic position, not entirely to the native's advantage. Since then two waves of cattle disease—first rinderpest and then East Coast fever—swept across the territories, and an economically free people with considerable assets has been transformed into a community of debtors. Now education has come, and along with it unrest, the old life no longer satisfying, and so capacity has brought about a hunger to take a higher position. The question is now one which calls for scientific treatment, for investigation, for careful generalisation, and for application to the welfare of mankind.

Of the papers read at the various sectional meetings little can be said here. In Section A there were mathematical papers by Sir Thomas Muir and Prof. Roseveare, and papers on industrial development by Prof. Orr and Mr. Kenneth Austin; but those which attracted most popular notice were two short ones on daylight saving and the metric system respectively by Mr. R. T. A. Innes, of the Union Observatory. The principles advocated in both these papers were unanimously affirmed by Sections A and D meeting jointly, and resolutions were passed urging the Union Government to adopt those principles.

In Section B a highly important compilation of analytical figures from various sources was submitted by Prof. M. Rindl, of Grey University College, Bloemfontein, in a paper on the medicinal springs of South Africa. Dr. C. F. Juritz read two papers: one on the wheat soils of the Alexandria district, a tract of country where wheat once flourished, but in which there has been great deterioration during recent years; another on experiments with sugar beet in South Africa, bringing up to date the record of investigations which had already formed the subject of two previous papers by the author. Dr. A. L. du Toit contributed a paper on the occurrence of molybdenum in Natal, where the metal is present in the unusual condition of an impregnation in coarse sandstone of Upper Triassic age. In a paper on Fischer's synthesis of tanning materials the president of the section hinted at the possibility of synthesised despidies proving a formidable rival to the Natal wattle industry.

Section C had a very large number of papers, and only very few of these can be so much as mentioned here. Mr. J. L. Henkel, Conservator of Forests for the Natal Province, contributed three papers on different phases of forestry in Natal, and there were other papers on the subject by Mr. T. R. Sim, who also read a paper on wattle growing, another paper on the entomological aspect of the latter subject being read by Mr. C. B. Hardenberg. Four papers, having as their respective subjects the mealv bug, the Argentine ant, the house fly, and the cultivation of strains of beneficial insects, were submitted by Mr. C. W. Mally. Dr. Ethel Doidge contributed three important papers on bacterial diseases in citrus and pear blossom and on citrus canker. Mr. F. Vaughan Kirby read a paper on game protection in Zululand, while Mr. D. T. Mitchell discussed the association of game in Zululand with tsetse-fly disease. Mr. W. R. Tucker gave an account of the progress of the Natal sugar industry, and Mr. W. H. Scherffius discussed the cotton-growing industry.

Section D, too, was fully supplied with papers, so much so, indeed, that next year will see it divided into two sections, the council having decided to establish a new section, E, specially for native affairs, a

subject which has engrossed much attention in Section D during the last three sessions. Two papers in this section by the Rev. Noel Roberts, illustrated with lantern views, on "Rock Paintings in the Northern Transvaal" and on "Bantu Methods of Divination," were both highly appreciated. The Rev. W. A. Norton read an informative paper on Bantu movements in Africa, illustrated by African place-names. Another paper of similar character was read by the Rev. John R. L. Kingon on the place-names of the Tsolo District. One of the most important papers read in Section D was delivered by the Rev. B. P. J. Marchand, and gave an account of the history and operations of the labour colony at Kakamas, on the banks of the Orange River. A valuable paper entitled "The Relation of Production to Consumption," by Mr. P. J. du Toit, Under Secretary for Agriculture, indicated the growth of South African farming industries, and advocated, as channels for constant progress, the increase of the European population, the development of fresh markets, and the educational and social advancement of the natives. Dr. Loram read a paper comparing the mentality of natives and Europeans in view of the theory of arrested development of the former. The Rev. A. T. Bryant gave two papers on the religion of the Zulu, and the concluding paper of the session was read by the Rev. J. R. L. Kingon on native education. Mr. Kingon said that this subject was one of supreme concern to the South African nation. Originally, the deliberate policy of the Imperial Government had been to provide native education as an insurance against Kaffir wars, but to-day the problem is chiefly economic and moral, and on both grounds he urged that the argument against native education is erroneous and unsound.

During the session two evening discourses were delivered, one at Maritzburg by Mr. C. P. Lounsbury, chief entomologist of the Union, on "Scale Insects and their Travels," and the other at Durban by Mr. R. T. A. Innes, Union astronomer, on "Astronomy."

On the first evening of the session, after the presidential address, the president presented to Mr. T. R. Sim, in recognition of his botanical researches, an award of 50*l.* and the South Africa medal for achievement and promise in scientific research, the fund for the annual presentation of which was raised by the British Association during its visit to South Africa in 1905.

C. F. J.

ECONOMIC HISTORY OF THE UNITED STATES.¹

IN 1904 work was commenced upon an extended study of the economic history of the United States, under the auspices of the Department of Economics and Sociology of the Carnegie Institution of Washington. The subject-matter of this study was divided into twelve departments, and the two volumes before us represent the contribution to learning of the Department of Domestic and Foreign Commerce. They include six parts, dealing respectively with "American Commerce to 1789," "The International Commerce of the United States," "The Coastwise Trade," "The Foreign Trade of the United States since 1789," "American Fisheries," and "Government Aid and Commercial Policy," which are based, in part, upon monographs, some of which have not been published. Vol. ii. contains a classified bibliography which runs to 24 pp., and vol. i. gives 10 pp. to notes and a bibliography concerning American

¹ "History of Domestic and Foreign Commerce of the United States." Vol. i. By E. R. Johnson, T. W. Van Metre, G. G. Huebner, and D. S. Hanchett. Pp. xv+363. Vol. ii. Pp. ix+398. (Washington: Carnegie Institution, 1915.)