conditions. A later paper by the same author describes a pocket spectrophotometer embodying some novel features.

In the paper on the platinum-point electrolytic detector for electrical waves Mr. Austin describes the so-called "barretter" patented by Fessenden, and used by him as detector in wireless telegraphy experiments. It consists of a cell with electrodes, one a fine platinum point, the second a plate, the vessel being filled with an electrolyte giving gaseous decomposition products. When an E.M.F. is applied to such a cell polarisation ensues, so that scarcely any current passes unless the E.M.F. exceeds a certain critical value. When electric oscillations pass through the cell the resistance is decreased, and the current for the moment increases. Conflicting statements have been made by various investigators regarding the behaviour of the instrument, and the author has therefore subjected it to a thorough investigation, employing both ordinary alternating current waves and also the Hertzian waves from the station of the National Electric Signalling Company. The chief conclusions of the research are:—

(1) For the stronger alternating currents used the breaking down in resistance is approximately proportional to the square of the alternating current.

(2) Under favourable conditions and with moderate polarisation the detector is equally sensitive to alternating currents with the point electrode, anode, or kathode.

(3) The resistance of the detector for slowly alternating currents varied from 20,000 ohms to 400 ohms, according to the polarising E.M.F. employed.

(4) For electrical waves from a distance the detector is approximately equally sensitive with the point electrode, anode, or kathode, but for waves from a coil in the laboratory some cause appears to annul the sensitiveness of the kathode-point electrode.

The next paper, by Prof. Coffin, is a mathematical investigation on the influence of frequency on self-inductance, and is not capable of useful abstraction.

Messrs. Guthe and Austin then deal with experiments on the magnetic alloys discovered accidentally by Dr. Heusler, and previously investigated at the Reichsanstalt and by Messrs. Fleming and Hadfield. Curves of permeability and inductance were determined for seven different samples, the chemical analysis of which is also given. An ingenious apparatus of high sensitiveness, quite cheap and easy to construct, was designed for study of the magnetic expansion of the alloys. This was capable of detecting changes in length as small as 5×10^{-7} mm. The investigation is not complete, but the relations between the curves of magnetisation and magnetostriction and between magnetostriction and thermoelectric force are clearly shown.

The number and variety of the subjects dealt with in these two instalments of the official publication of the Bureau show that, though only established three years ago, it has already begun to make substantial additions to our knowledge of physics.

J. A. HARKER.

RESEARCHES IN STELLAR PARALLAX.[1]

SOME years ago Dr. Chase, of the Yale University Observatory, communicated to the Astronomical and Astrophysical Society of America the results of a survey which he had carried out, in collaboration with Dr. Elkin, in order to detect stellar parallax. The number of stars examined was ninety-two, and these were generally selected from a list of stars having an annual proper motion of more than half a second of arc. Of these ninety-two stars, fifteen had a negative parallax, and, presuming that some of the smaller positive values were equally untrustworthy, some sixty were left which exhibited a real parallax amounting to more than 0″·05. The scheme was one that seemed worthy of further prosecution, since the method employed proved adequate for the purpose of recognising the existence of measurable parallax. Consequently, this work has been very considerably extended, and the recent publication from Yale gives the details of the discussion of no less than 163 stars, forming a contribution of the highest importance in parallactic inquiry. Some thirteen years have been devoted to the completion of this work, in which, though Dr. Elkin and Mr. Smith have taken part, the heat and burden of the day has been borne by Dr. Chase. This will be seen from the following tabular statement, which shows both the class of stars examined and the distribution of the work among the several observers:—

	Chase	Chase Elkin	Smith	Smith Elkin	Elkin
Stars with proper motion over 0″·4	117	5	13	12	10
Stars selected by De Ball on account of magnitude	11	—	1	1	—
β Cygni, Algol, Nova Persei	5	—	—	—	—
Red stars for colour effect	6	—	—	—	—
Total number of series	139	5	14	13	10

The inquiry has been based entirely on measures of distance made with the heliometer. As a rule, two comparison stars were selected on opposite sides of the star the distance of which was to be investigated, and in the direction of maximum displacement by parallax. These comparison stars were as nearly as possible equidistant from the principal star. When the arrangement of the stars did not permit this programme to be carried out completely, special artifices had to be adopted. On the other hand, in the case of stars of particular interest, a larger number of comparison stars was selected. The precautions which Dr. Elkin found necessary in the course of his work on the parallaxes of stars of the first magnitude were applied here, and further reference to these details is unnecessary. Finally, the observations, when collected, usually give for each star twelve complete observations, consisting of four groups of three nights each, taken at those seasons of the year when the parallactic displacement was at its maximum.

A suspicion having been aroused that the measures of distance between two stars of different colours might need an additional correction for refraction, a series of observations was made on some strongly coloured red stars taken from Kruger's "Catalog der farbigen Sterne." A term was introduced into the differential refraction correction of the form $\Delta\beta \tan z \cos(p-q)$, where p is the position, q the parallactic angle, z the zenith distance, and $\Delta\beta$ the colour effect sought. The several values of $\Delta\beta$ are as follows:—

Star	Colour Scale	Δβ	Weight
Kruger 985	6·0	−0″·019±0″·019	63·6
,, 1080	7·0	+0″·005±0″·020	64·4
,, 1078	7·1	+0″·009±0″·015	16·0
,, 1181	7·8	+0″·014±0″·018	55·7
,, 1108	8·7	+0″·046±0″·017	45·2
W.B. XV, 745	—	−0″·003±0″·021	55·6

The authors contend from these figures that the mean light of the red star is apparently refracted less than that of the comparison stars. Whether this conclusion is justified or not, the quantities involved are so small that it can be safely asserted that there is no noticeable vitiation in the parallax results arising from this cause within the probable errors. The remark attributed to Sir David Gill, that the tendency of the heliometer observer is to bring the similarly coloured parts of the star's spectra into coincidence rather than the brightest parts, seems to gain additional support from this investigation.

Of the 163 stars examined, the parallaxes range from −0″·13 to +0″·20, and the number of negative parallaxes is thirty-six. Considering how wide the net has been spread to catch any star, the proximity of which might be suspected on various grounds, the chance of finding stars closer to us than those which have already been examined grows very slight. The scheme of the stellar universe, so far as the few stars nearest to us are concerned, is taking fairly definite shape, and the scale that has been adopted from measured parallax will probably need no material alteration. Such a conclusion is the more warranted, because the precision attaching to the mean value of a group of results is far greater than that of any individual determination. The authors insist upon this point, and,

[1] "Parallax Investigations on 163 Stars mainly of large Proper Motion." By Frederick L. Chase, Mason F. Smith and William L. Elkin. Transactions of the Astronomical Observatory of Yale University, vol. ii. part i. Pp. 207. (New Haven: The Observatory, 1906.)

as a matter of fact, have grouped their results in various ways, all instructive. The average values obtained from these groups are of unquestionable significance.

Seeing that the working catalogue was made to depend upon the amount of proper motion, it was most natural to arrange the final parallaxes in such a way as to show what relation existed between these quantities. The following table makes this clear:—

Range of Proper Motion	No. of Stars	Average Magnitude	Average Proper Motion	Average Parallax
″ ″			″	″
0·0 to 0·34	21	3·8	0·14	+0·019
0·41 to 0·54	39	6·3	0·49	+0·032
0·55 to 0·65	45	6·7	0·59	+0·059
0·66 to 0·96	46	6·5	0·77	+0·039
1·01 to 2·34	22	6·2	1·50	+0·109

Notwithstanding the drop corresponding to a mean proper motion of 0″·77, a distinct connection between parallax and proper motion is manifested. This relation is the more marked when the proper motion exceeds one second. In these cases there is a uniformly positive and generally appreciable value of the parallax.

The connection between parallax and magnitude is not so marked, though fairly evident. It is, however, to be noticed that the average proper motion has progressed tolerably uniformly with the magnitude, and this progression tends to mask any effect due to magnitude alone.

Range of Magnitude	No. of Stars	Average Magnitude	Average Proper Motion	Average Parallax
″ ″			″	″
0·0 to 1·5	10	0·8	0·61	+0·095
2·0 to 4·9	29	3·8	0·53	+0·066
5·0 to 6·2	33	5·6	0·63	+0·056
6·3 to 7·0	34	6·7	0·73	+0·045
7·1 to 7·9	31	7·6	0·68	+0·017
8·0 to 9·0	36	8·3	0·80	+0·047

Other tables show the results arranged according to parallax, in order of right ascension, and according to the spectral type and classes as given in the Draper Catalogue. From the last table we may quote the following:—

—	Type I.		Type II.	
	All Stars	Rejecting Doubtful Spectra	All Stars	Rejecting Doubtful Spectra
Magnitude ...	4·0	3·5	5·3	5·4
Proper Motion	0″·42	0″·42	0″·67	0″·70
Parallax	+0·065	+0·066	+0·058	+0·056
No. of Stars ...	13	11	81	69

The exclusion of the stars with doubtful spectra affects very slightly the mean values for each type, and the authors remark that although the evidence to be drawn from Type I. is not very strong, it scarcely supports the law deduced by Kapteyn of larger parallaxes for Type II.

The authors are to be congratulated on having accomplished a valuable, long-continued series of observations, admirably planned, and carried to a successful conclusion.

W. E. P.

RUSSIAN SCIENTIFIC PUBLICATIONS.

THE work of the great N. M. Prjevalsky, the first explorer of Central Asia, has been continued by one of his pupils and lieutenants, Mr. P. K. Kosloff, whose portrait appears as frontispiece to vol. i. of the account of the expedition conducted by himself in 1899–1901 to Mongolia and Cham. This volume is dedicated to the memory of the great pioneer, who projected a fifth journey which he did not live to accomplish. As a member of former expeditions, Mr. Kosloff was well equipped for the vast undertaking which he describes. At the end of 1898 he submitted a plan for exploration of the southern or Mongolian Altai, the neighbouring central Gobi, and, if practicable, of eastern and central Tibet. The Imperial Russian Geographical Society and the Ministry of War warmly approved, invested Mr. Kosloff with powers of command and discretion, and furnished the expedition with scientific instruments. Under distinguished auspices the party made its way to the Altai station, and halted to survey the sublime snow-clad range and to collect specimens. Here the members met with a venerable member of a company of Old Believers, Rachmanoff, whose pilgrimages and adventures of more than forty years are mentioned by Prjevalsky. Having achieved satisfactory results, the expedition moved into the arid, sandy wastes of Gobi, an unattractive region. It met with a hearty welcome at the Tshortentan monastery from the lamas, whose personalities and the etiquette of their rule are described at length. Next the party proceeded to the salt-marsh district of Tsaidam. The Mongols of this region appear to have had a distinguished history, but in course of time were forced to cede territory to Chinese and Tibetans, their conquerors compelling them to destroy all documents and records of the earlier Mongol princes. There is only local tradition to depend upon, without any means of verification. A chapter is devoted to an ethnographical sketch of the Tsaidam Mongols, and in other chapters the author discusses Mongolian marriage customs and folklore. A wallet of excellent maps, showing the routes taken by Prjevalsky and other explorers, is appended to the volume.

An interesting account of exploration and observations in an uninviting region is given in Dr. W. N. Tuchoff's volume on the western shores of Kamchatka. In the preface, Mr. K. Bogdanovitch explains that the author, a medical student at Dorpat, had a strong desire to investigate the geographical conditions of Kamtchatka, and spent ten years there almost without interruption. No one but an ardent naturalist would be attracted to this vast area of volcanic ridges and tundra, of monotonous aspect. The main interest lies in the descriptions of the life and occupations of the Kamtchadals, who are exposed to a hard struggle with nature and are suspicious of foreigners. Dr. Tuchoff relies chiefly upon diaries and data collected between 1896 and 1898, and on reports of the Amur section of the Imperial Russian Geographical Society. Each chapter is devoted to the conditions of a particular district.

Although fish is the staple food of the inhabitants and their dogs, the fishers do not exercise much judgment, and lament that catches are consequently less numerous. The people are exceedingly simple and childish, as Dr. Tuchoff shows by humorous stories, and Russian officials of routine temperament sometimes fail to understand them. He devotes some space to their superstitions, *e.g.* the story of the brethren man and bear, and the divinity driven through the woods in a sledge drawn by partridges. "The bear population of Kamtchatka," he quaintly observes, "predominates over the human, and there are more chances of meeting a bear on the road and in the woods than a man," but with more numerous visits of hunters the bears retreat into the more inaccessible regions. In one district mothers quiet refractory children by threatening them with the Russians, in the same way as Border parents used the name of the "Black Douglas." Illumination of the poor dwellings is effected by means of bear or seal fat in a primitive kind of lamp, with moss or a piece of rag for a wick, the results being dismal light, much soot, and foul air. Dr. Tuchoff urges the necessity for a series of meteorological observations with a view to the agricultural prospects, and indicates sites for stations. Cattle-breeding, a feature of settled life, is more developed where there is a Russian settlement, and the author's opinion is that the Kamtchadal native is in the transition state from nomad to settled habits, and that he wants practical instruction in rearing of stock. It is unfortunate that the natives degenerate when in proximity to the Russians. The concluding chapter is devoted to the language, which varies in north and south, and appears to be dialectical. Dr. Tuchoff confesses himself unable to reproduce all the sounds of words, partly because European alphabetical resources are inadequate, and partly because the ear can only distinguish some with difficulty. The transliteration of lists of words in Russian and Latin characters is perplexing to the eye. There is an excellent index and map at the end.