

conductivity and fluidity. He had already shown that, in the case of tetraethylammonium iodide, the product $\lambda_{\infty} \times \eta_{\infty} = \text{const.}$, the values of λ_{∞} and η_{∞} varying sixteen-fold, whilst the product varied only by 2 per cent. Similar experiments are now described with six additional salts, namely $\text{N}(\text{CH}_3)_4\text{I}$, $\text{N}(\text{CH}_3)_4\text{NO}_3$, $\text{N}(\text{CH}_3)_4\text{CNS}$, $\text{N}(\text{C}_2\text{H}_5)_4\text{I}$, piperidine picrate, and triamylamine picrate, fourteen organic solvents being used altogether in the different experiments. The same remarkable constancy of the product $\lambda_{\infty} \eta_{\infty}$ was noticed in every case, whilst the two picrates gave the same constant when the measurements were extended to aqueous solutions.

A SET of a new series of Contoured County Hand Maps, issued by Messrs. G. W. Bacon and Co., Ltd., at 1d. net each, has been received. The maps will be of real service in those schools, fortunately an increasing number, where the teaching of geography is based upon practical exercises worked by the pupils themselves. The maps will make it possible for children to appreciate the importance of the relief of an area in determining its geographical character.

A COMPLETE catalogue of the books in the Central Lending Library at Coventry is being issued in five parts. The first part, which has been received, is concerned with scientific subjects and various arts. The catalogue is divided into an author and title index, a class list, and a subject-index. The librarians may be congratulated upon a careful piece of work which should prove very useful to readers using the library.

PARTICULARS of some of the most efficient forms of optical lanterns and accessory apparatus are stated in an illustrated catalogue just published by Messrs. Reynolds and Branson, Ltd., of Leeds. Prominence is rightly given to the Stroud and Rendell science lanterns, which can be adapted to many purposes, and are equally useful for the projection of lantern-slides, apparatus, or practical experiments in science teaching. The "Rystos" petrological micro-polariscope is an instrument designed by Dr. Dwerryhouse to project upon the screen sections of minerals and rocks as nearly as possible under the conditions in which they are seen under the microscope. The notes given in the catalogue on the arrangement of lantern and accessories for various demonstrations illustrate the flexibility of lantern apparatus for purposes of instruction.

THE Year Book for 1912 of the Carnegie Endowment for International Peace has now been issued. In a letter dated December 14, 1910, addressed to the trustees of the endowment, Mr. Carnegie said:—"I have transferred to you as trustees of the Carnegie Peace Fund, 2,000,000l. of five per cent. first mortgage bonds, the revenue of which is to be administered by you to hasten the abolition of international war, the foulest blot upon our civilisation. Although we no longer eat our fellow-men nor torture prisoners, nor sack cities, killing their inhabitants, we still kill each other in war like barbarians. Only wild beasts are excusable for doing that in this the twentieth century

in the Christian era, for the crime of war is inherent, since it decides not in favour of the right, but always of the strong." The year-book details the steps which up to the present the trustees have taken to secure the objects aimed at by the fund. The numerous reports—of the executive committee, the secretary, and of the directors of the various divisions into which the work of the trustees is divided—all show that strenuous and successful efforts are being made in many parts of the world to educate peoples in the desirability of abolishing war as a means of settling disputes.

OUR ASTRONOMICAL COLUMN.

A SOLAR OBSERVATORY FOR NEW ZEALAND.—For many years it has been felt that the European and American Solar Physics Observatories should be supplemented by similar observatories in that great stretch of longitude which at present is not represented. The establishment of Kodaikanal was a tremendous advance in the right direction, and a further successful step was taken by the founding of the new observatory in Australia; the latter, we hope, will soon be in active operation. By the generosity of Mr. Thomas Cawthron, of Nelson, New Zealand, this chain of stations will be carried still further east by about 25° of longitude, for he has offered to build, equip, and endow a solar observatory in the vicinity of Nelson. The climate of Nelson seems admirably suited for such a station. The choice of the actual site is, according to a communication from Miss Proctor, in the hands of Sir Robert Ball, who has been requested to send a representative to select that which is most advantageous, and also to give estimates regarding the equipment. Let us hope that this, the "Cawthron Solar Observatory," will soon be in active operation also, thus completing the girdling of the earth from the solar physics point of view.

A CURIOUS ASPECT OF JUPITER'S THIRD SATELLITE.—J. Guillaume communicates to the *Comptes rendus* for June 9 an interesting observation relative to the appearance of Ganymede, Jupiter's third satellite, near the end of its transit across the planet. Instead of the regular circular disc which it usually displayed, he noticed on May 24 last that it had a gibbous form, reminding him, as he says, of Mars at the epoch of quadratures, and, furthermore, that it showed a very white north polar spot with a grey zone smaller in the eastern part than in the western part. These details were more apparent when the satellite was projected on the disc than when off it. M. Guillaume remarks that he has seen this appearance several times in 1890 and 1893 with a reflector of 0.216 metre aperture, but never in such a conspicuous manner as on May 24, when he was using the equatorial coudé (aperture 0.320 metre) at the Lyons Observatory.

THE STAR CLUSTERS IN PERSEUS, N.G.C. 869 AND 884.—In vol. ii., No. 2, of the *Astronomische Abhandlungen* of the Hamburg Observatory in Bergedorf, Dr. B. Messow publishes the discussion with the results of the mean positions and brightness of 640 stars in the two clusters in Perseus N.G.C. 869 and 884, after his measures of two photographic plates. The plates were secured on October 3, 1899, by Herren Eberhard and Ludendorff, with the small photographic refractor (34 cm. aperture, 3.4 m. focal length) of the Astrophysical Observatory at Potsdam, and the exposures lasted five minutes each under good observing conditions.

Towards the end of the memoir he makes a comparison with ninety-six stars of the same cluster, taken by Rutherford during the years 1870-74 and measured by Miss Young, and he finds that they agree within very small limits, with the exception of one star. Omitting this, and two others which were measured only on one of his two plates, the differences Young minus Messow were as follows:—

$$D_{\alpha} = 0.0005. \quad D = +0.01'$$

A further investigation of the differences between Young and Messow as regards proper motion leads the latter to state that the two star clusters have not altered their position in space. The memoir concludes with a catalogue of the positions of the 649 stars for 1899-1900, together with their estimated and measured magnitudes.

OXFORD UNIVERSITY OBSERVATORY.—From the thirty-eighth annual report of the Savilian professor of astronomy we learn that the Cambridge ledgers containing the corrections to the Cambridge meridian observations from all the separate plates taken at Oxford have now been completely revised and discussed for magnitude equation. It has been found that the observations of faint stars are affected by considerable and rapidly changing errors, such as Prof. Arthur Searle found at Harvard. To enable this work to be accomplished, the work on differential star places had to be temporarily put aside. We are further informed that two zones ($+64^{\circ}$ and $+63^{\circ}$) of the Vatican plates have been completely reduced with the exception of one doubtful plate in zone $+63^{\circ}$. This plate has since been repeated at Rome.

THE THIRD INTERNATIONAL ROAD CONGRESS.

THE Permanent International Association of Road Congresses, which held its first meeting in Paris five years ago, completed its third congress in London on Saturday last. The attendance of home and foreign members and visitors was far greater than at either of the two previous meetings, and there is no doubt that both in the quantity and quality of the matters discussed, and the general interest taken in the road inspections and in the road-making apparatus shown at the exhibition, this congress showed a marked advance on the two previous ones.

Too much was attempted. Papers on nine important questions had been invited, and the response was such that more than 120 papers replying to the questions alone had been received, to be translated into the three official languages—English, French, and German—and summarised for discussion by carefully selected reporters. The discussions were on these summarised reports, and as the resolutions voted on after their discussion reach 4500 words in English, 5500 in French, and about the same in the German readings, it will be seen that much has been attempted.

The questions on which papers were invited were the following:—(1) The planning of new streets and roads; (2) the best types of surfacing to be adopted on bridges; (3) the great question of bituminous construction of macadamised roads; (4) wood paving; (5) the best methods of lighting streets and highways; (6) the causes of deterioration of road surfaces noted since 1908; (7) the regulation of fast and slow traffic; (8) the functions of road authorities; (9) finance and the incidence of taxation necessary for the upkeep of the roads.

In addition, communications on many important subjects were invited, but on these, although many

of them contained much valuable data, there was no time for discussion.

The resolutions discussed and voted on are really condensed summaries of the average opinions contained in the papers, and therefore have a certain value as indicating the general trend of well-informed opinion on road matters in the year 1912, for on account of the time necessarily occupied in the preparation, printing, translation, and summarising most of the conclusions arrived at last week were based on papers written nearly a year ago.

It was, of course, inevitable that a great mass of the contributions came from countries where road construction and road problems are not in a very advanced state, so that the real interest to the more scientific members present lay in the opportunities that these meetings give for personal discussion of the problems which are now presenting themselves in this most interesting branch of engineering.

All who are studying the modern road development which is called for by the steady demand for door to door transport of passengers, as well as goods, know that the question of the time is how to produce road surfaces which are efficient from the point of view of reducing so far as possible the running cost of the vehicles which use them, at the lowest cost for road construction and annual maintenance.

It is almost unnecessary to repeat what has been so often urged, that road engineering demands as intimate a study of the action of the wheel rolling on the road surface as has been devoted to the same question on railways, with such marked economy in the cost of railway transportation. On account of the widely varying type of the vehicles running on the roads and of the great variety of their means of propulsion, and of the fact that for many years to come horse-drawn as well as mechanically-propelled vehicles will use the same road surface, the problems of construction and maintenance are certainly more complicated than those of the railway.

At the informal meetings of the more scientific of the engineers who visited London last week many interesting views were interchanged which cannot fail to further the science of road engineering, as has been found to be the case at the international meetings of the Iron and Steel Institute, where such informal discussions have always been the real feature of the meetings.

On account of the abundant supply of bituminous binding material provided by the tars and pitches from our gasworks, England has made an exceedingly good start in the science of binding road surfaces with tarry matter. On the other hand, America made her first road developments by using the bitumens which are either obtained from natural deposits or as the residuals from the distillation of some of the earth oils. Quite recently the demand for the various forms of petroleum for power and heating purposes has increased the production of the bituminous residuals, and it is likely that the low cost of freight will enable America to supply these residuals to English road engineers as a formidable rival to the tars and pitches which have been in use up to the present.

One of the most interesting features to the scientific members of the congress has been the inspection of the trial lengths of roadways laid down by our Road Board to enable various road materials, such as the roadstones, the tars, and bituminous binders, to be tested under fixed and regular conditions of heavy traffic at Sidcup, Wandsworth, Fulham, and on other roads and streets in and near London. In addition, the latest scientific development of road apparatus was shown to the members of the congress at the National Physical Laboratory at Bushy, where