

in which (a) one parameter has a value slightly below 2.780, or (b) two of the parameters are nearly equal. Amongst the sulphonic chlorides and bromides two isomorphous series are seen, the second series being restricted to compounds in which an iodine atom is present; it is noteworthy that the two chloriodobenzenesulphonic chlorides are found in different series, and that one of them was on one occasion obtained in a labile form, the crystals becoming cloudy and opaque when removed from the solvent from which they had separated. This behaviour indicates clearly that certain members of the series are actually dimorphous, and the whole series may therefore be regarded as isodimorphous. Isodimorphism was also detected amongst the anilides and toluides. It is remarkable that two other series, containing the halogen atoms in the *meta* position, which were examined by Dr. E. C. Jee in 1900, proved to be isotrimorphous and isotetramorphous respectively. The completion of the work on these series will be awaited with interest.

A SECOND edition of "A Text-book of Zoology," by Profs. T. Jeffrey Parker and W. A. Haswell, is announced as nearly ready by Messrs. Macmillan and Co., Ltd. The work has been subjected to careful revision throughout; some parts have been to a great extent rewritten, and a considerable number of new illustrations have been added.

#### OUR ASTRONOMICAL COLUMN.

VELOCITIES AND ACCELERATIONS OF THE EJECTA FROM HALLEY'S COMET.—Profs. Barnard and Lowell and Senor J. Comas Sola all deal with the velocities and accelerations of the matter ejected from the body of Halley's comet, during May and June, in No. 4441 of the *Astronomische Nachrichten* (pp. 11-16).

From measures of photographs taken at the Yerkes Observatory (Y), Honolulu (H), and Beirut (B) on June 6, Prof. Barnard found the velocities of recession, of a well-marked feature in the tail, given in the following table:—

Stations	Interval between photographs Hours	Hourly motion	Recession per second			
			From comet		From sun	
			Miles	km.	Miles	km.
Y-H ...	4.25 ...	3.60 ...	23.1 ...	37.2 ...	39.7 ...	63.9
Y-B ...	15.15 ...	5.17 ...	33.1 ...	53.3 ...	49.7 ...	80.0
H-B ...	10.90 ...	5.78 ...	37.3 ...	59.7 ...	53.9 ...	86.4

These results show a strong acceleration in the mass measured, which was about  $1.5^\circ$  from the head; from the last two photographs this acceleration was about 14 miles (22 km.) per second.

Similar results are obtained by Prof. Lowell from the measures of two photographs taken, with rather less than an hour's interval, on May 23. On these photographs are shown four knots in the tail, at distances varying from  $1^\circ 28'$  to  $6^\circ 15'$  from the head, and the measures give for the velocities of the particles composing the knots 13.6, 17.2, 19.7, and 29.7 miles per second respectively, thus showing an acceleration of the velocities as the particles receded further from the head.

Senor Sola, dealing with the velocities of the gaseous globes ejected from the nucleus on June 4, shown on photographs taken on June 4, 6, and 7, finds that between June 4 and 6 the acceleration of these ejecta was 0.148 metre per second, and between June 6 and 7 was 0.248 metre per second.

OBSERVATIONS OF COMETS.—New observations of three comets are published in No. 4441 of the *Astronomische Nachrichten*. A number of observers give positions, determined during August, of Metcalf's comet, 1910b, and generally describe it as a faint object, magnitude about 11.0, having a central condensation and a suspicion of a tail.

D'Arrest's comet was observed at the Algiers Observatory on August 26 and 29 and September 1 by M. Gonnessiat. The correction to Leveau's ephemeris was

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an increasing quantity, and on September 1 had the value  $-1m. 19.39s., +6' 16.2''$ ; the comet is described as a diffuse nebulosity of 2' or 3' diameter, with a feeble, central condensation of about magnitude 14.5.

With a 9-inch refractor Mr. Innes found that, on August 11 and 12, Halley's comet was a most difficult object, and was, therefore, much fainter than the magnitude (7.4) given in No. 4423 of the *Astronomische Nachrichten*. Observations made between July 26 and August 11 indicate a correction of about  $-11s.$  to the ephemeris given in the same place; the ephemeris is nearly correct in  $\delta$ . When last seen the comet was a nebulous object, of 1' diameter, showing a slight condensation.

THE SOLAR PHYSICS OBSERVATORY, SOUTH KENSINGTON.—From the report published by the Board of Education, dealing with the work done at the Solar Physics Observatory, South Kensington, during 1909, we learn that spectroheliograms of the solar disc were obtained on 147 days during the year; of the 286 negatives secured, 231 have been selected for the measurement of flocculic areas in pursuance of the scheme for establishing a cooperative daily record of such areas. Fifty-seven photographs showing the calcium prominences at the limb were also secured with the spectroheliograph. Visual observations of the sun were possible on 232 days, and "no spots" was recorded on five occasions. The spectra of 138 spots were observed visually, and show that the lines chiefly affected, in the region F-D, are due to V, Ti, Sc, and Mg, associated with H. A powerful instrument for the photographic recording of sun-spot spectra cannot be used owing to the vibration occasioned by traffic in the vicinity. Work with the 36-inch reflector on Halley's comet and other objects was also restricted by the poor observing conditions. A large number of photographs of stellar spectra were secured with various prismatic cameras, those obtained with a calcite-quartz optical system being employed for the temperature-comparisons of various stars.

THE DETERMINATION OF LONGITUDE.—In an interesting brochure of sixty-two pages, now published as an extract from the journal *L'Horloger*, Dr. Jean Mascart recounts the history of the determination of longitudes, with a special chapter on the invention and development of marine chronometers, and an account of the voyage of the *Flore*, which had for its purpose the actual testing of the different methods of determination, in 1771-2. The brochure is well illustrated with portraits and cuts of historical instruments and their parts, and contains numerous references to the literature of the subject with which it deals.

#### THE ROYAL COMMISSION ON WELSH MONUMENTS.

THE first report of the commission contains a general account of work already done, and an outline of the work proposed to be done. The first volume of classified information the commission hopes to publish in the course of the present year, in the form of an inventory of monuments in the county of Montgomery.

The task undertaken is truly immense. No type of monument nor available source of information seems to have been overlooked in the outline given. There are, of course, inevitable limitations to be considered, but it is not likely that the work in value and extent will ever be a subject for serious adverse criticism. As, however, the commission's plan of campaign has been published at a time when that plan may be reconsidered in some details before the information collected has been cast into a final form, one may venture to direct attention to a class of facts which is not even mentioned in the report, but which may be shown to be by far the most important within the scope of the inquiry.

The most important documents are the monuments themselves. Whatever facts may be directly elicited from them take precedence of all facts elicited from "finds," folklore, and documentary information. They may be

called structural facts, and they are to be regarded as facts irrespective of any theory. So long as such facts may be gathered, as a rule, at every ancient site, there seems to be no valid reason why they should not be treated as of first importance in any examination of ancient monuments. Opinions may differ greatly as to the value of deductions from the facts, but no difference of opinion can possibly justify a policy of turning a deaf ear to the positive testimony of the monuments themselves.

The sharpest distinction should be made between the testimony of a structure and that of any "finds," and the commission's chief object is to make an inventory of structures. Judging a structure by the finds alone, the popular epithet "sepulchral" is often tolerable, but the epithet does not explain the structure even of a hermetically closed cist, which everybody would regard as sepulchral. Now, "grave goods" have been given a place in the commission's schedule, and for that reason alone one would claim recognition of the structural facts. The relation of a burial to the surface soil is particularised, and such details show that the structural facts, in a way, are included in the schedule. The facts I have chiefly in mind are measures, both angular and linear. Some measures of the sort, of course, are given in ordinary reports and plans of monuments, but measures made on the lines of a working theory, based on the sum of knowledge already gained by measurements, must be much more to the point than any measures made with absolutely no theory in view. Even when a working theory is adopted, some technical knowledge is indispensable for making the required measures.

The subject, I understand, has been considered by the commission. Some information bearing on the astronomical inquiry, which I had the honour of submitting at the Cardiff meeting, was accepted. I understand, further, that some arrangements have been, or are being, made for making measures. The report, however, gives us no light on the matter. There is not even a recommendation of the inquiry. We are told what features of ancient churches are to be observed, but not a word about the one feature which usually gives character to the whole, orientation.

If measures of monuments have any meaning—and if they were and likely to remain meaningless, to ignore them would be a reckless accommodation to our ignorance—that meaning must be the vertebral column of any body of information about them. In most, if not all, branches of scientific inquiry measurements take precedence of any other data. If such a commission were appointed to gather anthropological data, is it likely that anthropometry would be given a second place in the inquiry? A similar method for archaeological research has been devised in which measurement forms the first and best basis for a classification of monuments, all apart from any theory as to the significance of the measures. To those who are in the habit of regarding measures as constituting the very soul of a monument, the preservation of measures is the best possible preservation of a monument.

One can easily understand why a representative body of archaeologists should hesitate a little before giving its endorsement to a line of inquiry which has to make its own way into favour. Probably at a mixed gathering of archaeologists a majority might be found in favour of keeping it in abeyance. The commission might justify its silence, if not inaction, in such a matter, to such an audience, by referring to the element of prejudice which unfortunately is not confined to non-scientific bodies. There is, however, no evidence, so far as the commission is concerned, of such a slavish subjection of what should be a free, open, and thorough inquiry to the idiosyncrasies of the human equation. Just as the commission seeks the sympathetic cooperation of the Welsh public in its work, it is to be hoped that a representation of this kind will receive an equally sympathetic treatment by the commission itself.

The task of sifting and sorting the contents of the vast drag-net which the commission has cast over Wales is not an enviable one, but a better master of method in handling such materials could hardly be found than the secretary, Mr. Edward Owen.

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## ANNUAL REPORT OF THE GOVERNMENT LABORATORY.

THE report of the principal chemist of the Government Laboratory, London, upon the work of the department during the last fiscal year, contains, as usual, a mass of information respecting the chemical examinations and inquiries made for the various branches of the executive. On former occasions we have described the general work of the laboratory in some detail, and will therefore, in the present instance, merely note a few of the many miscellaneous points of interest mentioned in the report.

Conformably to the provisions of the White Phosphorus Matches Prohibition Act, 1908, which came into operation on January 1 this year, a number of samples of imported matches were examined in order to ascertain whether they were free from the white or poisonous form of phosphorus. In only seven instances, however, out of 647, was white phosphorus found to be present. The importation of the matches in these consignments was prohibited. They were but an insignificant proportion of the total matches imported. Only doubtful cases are dealt with in the laboratory, as the absence of white phosphorus is shown in the great majority of cases by simple tests which have been devised for application by the local customs officials. The effect of the Act already has been to stamp out the use of white phosphorus in imported matches; and as regards matches made in the United Kingdom, samples of the paste used for "tipping" have been taken from the factories, but in no case has the use of white phosphorus been detected.

A number of samples of beer and brewing materials were found to contain arsenic in excess of the limits laid down by the Royal Commission on Arsenical Poisoning. One sample of malt contained as much as one-eighth of a grain of arsenic per lb., and the beer brewed from it showed a considerable excess of the poison. The brewers were immediately warned of the danger of allowing such beer to go into consumption. On investigation, the presence of the arsenic was traced to the fuel used for kiln-drying the malt.

Articles of food taken from the canteens on board naval vessels were not in all cases free from objection. Thus, of four samples of "lard," one consisted of cocoa-nut oil, one was considerably adulterated with cotton-seed oil and beef stearine, and the remaining two gave evidence of slight contamination with cotton-seed oil; and out of four samples of condensed milk, one was found to be a "skimmed" product and another was deficient in fat. The general Admiralty supplies, however, were found to be usually satisfactory.

The tendency of makers of foodstuffs to work down to a "standard," when one has been fixed, is exemplified by a remark which the principal chemist makes in regard to the proportion of water in imported colonial butter. Since the fixing of the limit of water at 16 per cent., "the quantity of water in colonial butter, formerly exceptionally low, is now nearer the limit, and occasionally exceeds it." Two samples of imported "pastry margarine" were found to contain solid paraffin, in one case as much as 10 per cent. Amongst miscellaneous samples analysed may be mentioned certain feeding-meals which were examined in connection with alleged poisoning of cattle; in some instances the meal was found to contain Java or Rangoon beans, which, on digestion with water, produce prussic acid through the influence of an enzyme. In another case of cattle poisoning, the food was found to have been contaminated with an arsenic-paste sheep dip.

In connection with lead poisoning in the pottery industry, a large number of samples were examined. From works in which cases of plumbism had occurred, thirty-six specimens of glaze were taken. The proportion of lead oxide in these glazes varied from 12.6 to 47.5 per cent., and it is noteworthy that, with one exception, the lead was almost wholly present as a soluble compound.

Samples of air from certain mines in Scotland were found to be very impure, proportions of carbon dioxide as high as 3½ per cent. being shown, and as much as 16 per cent of methane; whilst the oxygen in one sample had been reduced to 15½ per cent.

Arising out of suspected frauds in connection with claims