

of ultra-violet light and of the penetrating rays of radium on various organic and inorganic compounds, and Meyer and Prziham discuss, among other phenomena, the effect of exposure to radium rays in increasing the "Hallwachs effect" in minerals.

Meyer and Paneth have undertaken a re-investigation of the proportion of α rays in a uranium mineral due to the uranium and radium respectively, which they find to be 100 : 57.3, instead of 100 : 45, as found initially by Boltwood. The new ratio agrees perfectly with the present view that uranium consists of two elements, uranium I. and II., each emitting one α ray per atom disintegrating, of ranges respectively 2.5 and 2.9 cm. of air at 15°, with which the older ratio was seriously in disagreement.

Lastly, Hess deals with the heat generated by a pure radium salt at the moment of its preparation, when it is free from the products of disintegration, and finds it to be 25.2 calories per hour per gram of radium (element). In the course of a month, in which the first four products accumulate to the equilibrium quantity, the heat generated increases by 107.1 cal. per hour, the total (for α and β rays, and 18 per cent. of the γ rays) agreeing perfectly with his previous measurements in collaboration with Prof. Meyer on a different preparation. As an example of the perfection to which our knowledge of the processes of atomic disintegration has been brought, and to which it would perhaps be difficult to find a parallel elsewhere in the molecular sciences, it may be mentioned that the figure 25.2 calories per hour per gram of radium agrees, within 1 per cent., with the value deduced from Rutherford's direct measurements of the number, mass, and velocity of the α particles expelled by radium, taking into account the kinetic energy of recoil. An analogy to this would be a determination of the "heat-drop" of steam by counting the number, measuring the individual mass, and determining directly the velocity of the molecules leaving a turbine-jet.

F. S.

SCIENTIFIC WORK OF THE CENTRAL CHEMICAL LABORATORY OF THE ITALIAN CUSTOMS.

THE report of the year's work of the Central Chemical Laboratory of the Italian Customs at Rome (*Annali del Laboratorio Chimico Centrale delle Gabelle*, vol. vi., 1912, pp. xxxvii + 707), under the direction of Prof. V. Villavecchia, which has recently been issued, contains an introductory article by the director on the history of its twenty-five years' activity since its inauguration in 1885. In this period 225,679 analyses have been made, and 1524 special reports prepared for various Government departments, whilst 127 original papers have been published in the *Annali* issued from the laboratory. Recently a museum of commercial products and raw materials has been established in connection with the Central Laboratory, care being taken to ensure the genuine character of all the specimens, so that they can be used as standards of reference by the Government chemists; an account is given in the report of the 32,382 samples collected for this museum, and a description of the building.

In the present report some of the most important original contributions are as follows. I. Barboni has investigated comparatively the different methods which have been used for the analysis of commercial calcium citrate, and reports on their suitability. A. Capelli, in examining the alkaloids contained in maté, has been able to separate only caffeine, although the statement has been recently made that caffeine is present only in traces, the principal alkaloid being

matteine. There is a series of papers by R. Belasio on the electrolytic estimation of zinc, the separation by electrolysis of iron and manganese, the analysis of white metals and tin foil, the detection of antimony and of tin in metallic alloys, and a description of the electrolytic methods of analysis in use in the laboratory of the *Gabelle*. Among papers dealing with organic analysis the following may be cited:—G. Testoni, the estimation of sucrose in the presence of other sugars; E. Castaldi, the Halphen test for cotton-seed oil; L. Settini, a characteristic colour reaction for soja-bean oil; S. Camilla and C. Pertusi, the detection and estimation of the xanthine bases in cocoa, tea, and coffee; V. Villavecchia and A. Capelli, the quantitative estimation of cotton, wool, and silk in mixed fabrics.

Independently of its work of routine analyses for the control of commercial and dutiable articles, the laboratory is carrying out valuable work in investigating the many different and often conflicting methods of analysis in current use, and, when necessary, devising new processes to meet freshly arising needs.

THE HYDROMETER AS AN INSTRUMENT OF PRECISION.¹

MR. J. Y. BUCHANAN publishes in the Transactions of the Royal Society of Edinburgh (vol. xlix., part i., 1912) the results of extended researches on the specific gravity and the displacement of some saline solutions. The memoir, which occupies 225 quarto pages, deals with the densities and variations in densities of certain groups of saline solutions; but although the results obtained are themselves of interest and value, the importance of the work centres rather in the detailed study of the use of the hydrometer as an instrument for work requiring a high degree of accuracy. This importance, of course, arises mainly from the fact that ever since the days of the *Challenger* expedition, Mr. Buchanan has been the principal champion of the hydrometer method for determining the specific gravities of samples of seawater for purposes of oceanography, and that the method has now for many years been practically disused by most oceanographers.

Two forms of hydrometer are described. In the "closed" type—that ordinarily used for, e.g., seawaters—the weight of the instrument is varied by adding to or subtracting from a number of weights placed on the top of the glass stem of the hydrometer. The additional weights are obviously limited by questions of stability, for if too much weight is accumulated at the top of the stem the whole instrument will tend to capsize. Solutions of high density are therefore treated with an instrument of the "open" type, in which the stem is left open at the top instead of being hermetically sealed, and the paper scale is replaced by one etched on the stem itself. The internal ballast can then be altered by varying the amount of mercury or the number of lead pellets, as the case may be, and the final adjustment by weights at the top of the stem made without risk of the instrument swinging out of the vertical.

Every worker with the closed type of instrument (that used on board the *Challenger*) knows that the real difficulty is not to get consistent results, but to get accurate results, or results which will either agree with those obtained by other methods or differ from them in some way which can be accounted for. Much labour has been expended by many investigators in efforts

¹ "Experimental Researches on the Specific Gravity and the Displacement of Some Saline Solutions." By J. Y. Buchanan, F.R.S. (*Trans. R.S.E.*, vol. xlix., part i., 1912.) Pp. 227. (Edinburgh: Neill and Co., Ltd., 1912. Price 7s. 6d. net.)