

two ends of the spectrum, fourteen displayed a marked difference which is stated to be very great in some cases. In every case the star which is relatively faint at the violet end of the spectrum is the star of small proper motion. Mr. Adams points out that the evidence of this small amount of material is too slight to warrant any extended discussion on its application to the problem of the absorption of light in space.

WHO'S WHO IN ASTRONOMY.—The very excellent book, entitled "Astronomical Observations and Astronomers," and published under the auspices of the Royal Observatory of Belgium, which first appeared in the year 1907, is well known to most of the readers of this column, and no doubt has been found a very useful book of reference. The work was from the pens of the astronomers at the Royal Observatory of Belgium, and the task of collecting and arranging the information was no light one. It is now proposed to bring the contents thoroughly up to date, and with this intention circulars have been widely distributed requesting that the printed forms be filled in. These forms ask for a brief statement as to *personnel*, instruments, researches, and publications of observatories, and it is hoped that everyone will do his best to make the volume as complete as possible, and so render more light the labours of M. P. Stroobant and his co-workers.

WORK OF THE VIENNA RADIUM INSTITUTE.¹

OF the seventeen papers before us, from the Radium Institute at Vienna, five by Drs. von Hevesy and Paneth, both of whom are well known in this country, contain notable advances in our knowledge of the chemistry of the radio-active elements. The chemical identity of the several members of a group of isotopic elements has been further put to the proof and extended to include the electro-chemical properties. An elegant application of this new phenomenon of isotopy has been made in analytical chemistry in the determination of the solubility of such excessively insoluble compounds as lead chromate, sulphide, &c. The principle of the method is to add to the common element its radio-isotope in unweighable, but intensely radio-active, amount, and to estimate the distribution of the former after any chemical operation from the experimental distribution of the latter by radio-active measurements. Thus radium D, derived from the decay of radium emanation, is added to lead before its precipitation by potassium chromate. Radium D being isotopic with lead, the ratio of the lead and radium D must remain unchanged by the precipitation. The quantity of lead in the filtrate is, of course, analytically undetectable, but the quantity of radium D is easily estimated. In this way the solubility of lead chromate in water at 25° was found to be 0.012 mg. per litre, or twelve parts in a thousand million.

Another important direction, in which these investigators are extending, is in the application of colloid-chemistry to the radio-elements. Often, as they and Godlewski in France have independently concluded, even these extremely attenuated solutions of the radio-elements behave as colloids rather than as electrolytes and their transport under the electric current is due to electrophoresis rather than to electrolysis. Polonium is the centre of interest in many of these researches, for it is a new element, in the sense

that it is isotopic with no previously known one, and occupies a separate place in Mendeléeff's table, so that its properties cannot, like those of the majority, be exactly determined by proxy.

V. F. Hess describes a convenient method of determining quantities of radium by the γ -ray method, the quantity being read off by the constant deflection of an Elster-Geitel single quartz-thread electrometer, in conjunction with one of N. R. Campbell's high resistances of xylol and alcohol. A long attempt to arrange a standard measuring instrument, calibrated once for all, which would give the quantity of radium without the necessity of employing a radium standard, might have been more successful if the author had been acquainted with A. S. Russell's work on the measurement of γ rays and the necessity, if disturbances from secondary rays are to be avoided, of using lead, not brass, for the walls of the electroscope. In the same field Flamm and Mache continue the account of their attempts to measure the radium emanation quantitatively by the absolute value of the ionisation current in a guard-ring plate condenser.

Hess has continued his determinations of the penetrating radiation of the upper atmosphere by means of balloon ascents, and arrives at the startling conclusion that above 2000 metres there is a rapid increase in the intensity of the penetrating rays. At these heights the penetrating rays from the earth itself would be absolutely negligible, whilst that from the radium emanation in the air, which has its origin in the earth and is of limited life, must be, at any rate, less than at the surface. The conclusion that a great part of the penetrating radiation cannot come from the known radio-active constituents of the earth and atmosphere is one that must evoke general interest, and calls for the further radio-active exploration of the upper atmosphere.

Other papers deal with chemical decomposition produced by radium rays and ultra-violet light (Kailan), the solubility of radium emanation and other gases in liquids (Stefan Meyer and Martin Kofler), the variation in the ranges of the individual α particles through the probability variations in the number of molecules they encounter in their path (Freidmann), and the life periods of uranium and radium (Stefan Meyer). The latter research treats critically the known data from which these constants can be derived, and leads to the result that there is complete agreement among values obtained by independent methods. The most probable values for the periods of average life of radium and uranium respectively are 2500 and 7.23×10^9 years. Incidentally, it may be pointed out, this makes the perennial problem of the origin of actinium more of a mystery than ever, for there should be no such agreement among the methods, if, as is supposed, some 8 per cent. of the uranium atoms branched off into actinium at some point before radium is arrived at. But it may still be doubted whether some of the data chosen, particularly the equilibrium ratio between radium and uranium, are not at fault.

F. S.

SMOKE AND SMOKE PREVENTION.

"A BIBLIOGRAPHY of Smoke and Smoke Prevention," prepared by Mr. E. H. McClelland, has been published by the University of Pittsburg, Pa. (Bulletin 2, 1913, pp. 164; price 50 cents). The bibliography has been compiled for the use of the Melton Institute of Industrial Research, consisting of a body of scientific experts, who are about to embark on an inquiry, the nature and extent of which is set forth in the first bulletin issued by the institute ("Outline of the Smoke Investigation"). It contains an apparently complete

¹ Mitteilungen aus dem Institut für Radium-forschung, xxxviii-lij. Ueber Neuerungen und Erfahrungen an den Radium-messungen nach der γ -Strahlenmethode. By V. F. Hess (*Verh. D. Physikal. Ges.*, 1913, xv, Nr. 20).