the mortar is not only dependent upon efficient burning, but also on skilful slaking and proper mixing. The deterioration in the quality of quick- and slaked-lime with keeping also receives attention.

ANOTHER of Prof. H. B. Baker's interesting studies of the properties of purified substances is described in a recent issue of the Chemical Society's Journal, vol. ciii., p. 2060, in a paper published jointly with Mr. L. H. Parker. Two years ago, at a meeting of the Faraday Society, an experiment was shown in which water prepared under special conditions acted much more slowly than ordinary distilled water on sodium amalgam. It was remarkable that this difference persisted even after a considerable amount of caustic soda had been formed; it was therefore not due to the non-conducting properties of the special water, and has now been traced to the "catalytic action" of traces of hydrogen peroxide. These are present in ordinary samples of water, and in water prepared from pure hydrogen and oxygen in presence of palladium, but are destroyed by distilling from metallic vessels and superheating the steam. One sample of water prepared in this way in a platinum apparatus had no perceptible action on sodium amalgam in three hours, and liberated only 0·1 c.c. in four hours, 0·4 c.c. in five hours, and 0·6 c.c. in six hours. On the other hand, the addition of one part of hydrogen peroxide to 100,000 parts of another sample of water increased the amount of hydrogen liberated from 0 to 3·8 c.c. in one hour, and 4·1 to 32·4 c.c. in three hours, although it did not appreciably affect the conductivity of the water.

A CATALOGUE of periodicals and publications of literary and scientific societies, including standard sets and library editions, which they have on sale, has been published by Messrs. W. Heffer and Sons, Ltd. An inspection of the catalogue suggests that men of science and librarians have here a good opportunity of completing their sets of transactions and of making additions to their libraries at a moderate cost.

A COPY has been received from Cairo of the almanac for the year 1914 compiled in the Government Publications Office for the Egyptian Government. The object of the almanac is to furnish information likely to be useful to the various Government administrations in their relations with each other and also to the general public. In the section concerned with the Ministry of Finance, full particulars are given in connection with the Survey Department; details as to schools and colleges are included under the heading, Ministry of Education; and an exhaustive section, entitled "General Information," supplies up-to-date facts as to rainfall and other meteorological data, magnetic values, scientific societies, weights and measures, in addition to other matters of importance.

OUR ASTRONOMICAL COLUMN.

DETONATING FIREBALL OF JANUARY 19.—A considerable number of records of this object have now been received by Mr. W. F. Denning, and it is certain that the fireball descended to within a very small distance of the earth's surface, if indeed it did not actually fall to the ground. The observations are not sufficiently exact to indicate the precise spot where the meteor fell, if it came to earth, and the event might easily pass unnoticed if it occurred in a country place where no one happened to be near enough actually to witness it.

Several observers carefully timed the interval between the meteor's brilliant flash and explosion and the sound which followed. This was half a minute near Oxford and one minute a little further off in the same part, while at several other places the times are given as one minute to five minutes, according to the varying distance from the scene of the disruption. One minute's interval equals a distance of about twelve miles, and as part of this was horizontal distance and not all vertical height, it is clear the fireball was only a very few miles high at the time of its final outburst.

Inquiries should be instituted in the west part of Berkshire, near Lambourn, for it is possible evidence may be obtained as to the exact locality of the fall, if it occurred. The radiant of the meteor was south of Ursa Major, either at 132°+47°, or 154°+41° probably.

THE TOTAL SOLAR ECLIPSE OF AUGUST 21 NEXT.—*The Observatory* for February publishes particulars of the provisional arrangements which have been made by the Joint Permanent Eclipse Committee with regard to the observations of the total solar eclipse of August 21 next. Under the auspices of the committee Prof. Fowler, Mr. W. E. Curtis, and Father Cortie, with Major Hills and Father O'Connor as volunteers, will be situated at or near Kiev. The first two-named, with Major Hills, will devote their attention to photographing the spectrum of the chromosphere during the partial phases with iron arc comparisons. The other two will take photographs of the corona and its spectrum, chiefly in the region of longer wave-lengths. The Royal Observatory of Greenwich will be represented by Mr. Jones and Mr. Davidson, who will attempt large-scale photographs of the corona, and its spectrum, with special reference to the ultra-violet region; they will be stationed at Minsk. The Solar Physics Observatory of Cambridge will send a party of three, namely, Prof. Newall, Messrs. Stratton and Butler, and this will be stationed at Feodosia, in the Crimea. Their programme will include direct photographs of the corona on large and small scales, the former for studies of "arches," and the latter for extensions. The chromospheric spectrum will be attacked with a concave grating without slit, for comparison with the slit spectra of Prof. Fowler's programme. Polariscopic observations will also be made.

THE ABSORPTION OF LIGHT IN SPACE.—An ingenious method of trying to detect the absorption of light in space is that of photographing the spectra of stars which have similar spectra, but the stars themselves should be at very different distances from the earth. The spectrum of the more distant star should exhibit a greater absorption towards the violet than that of the nearer star, if such absorption be present in space. This method was proposed by Prof. Kapteyn, and a first attempt has been made by Mr. Walter S. Adams, using the Cassegrain spectrograph of the Mount Wilson Solar Observatory; his results are printed in the current number of *The Astrophysical Journal* (January, vol. xxix., No. 1). The choice of stars was facilitated by the use of the ample material previously accumulated for line of sight work, and the pairs finally compared had spectra which were similar line for line. Stars of various spectrum types were employed, and of the twenty pairs investigated seven pairs were of class Ko, two from each of B8, G5, and G6, and one from each of Ao, F4, F7, G8, K2, K4, and K6. While six pairs showed no appreciable difference between the

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 two 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 colloido-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 $7{\cdot}23 \times 10^9$ 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.

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

SMOKE AND SMOKE PREVENTION.

"A BIBILIOGRAPHY 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