RADIUM.

THE London *Times* publishes a report of a paper which M. Curie has communicated to the French Physical Society. It appears that at the time of his lecture at the Royal Institution in June, the resources of that laboratory in producing and manipulating liquid gases were utilized in a new series of experiments. Professor Dewar had already in 1893 improved the calorimetric use of liquid gases by means of a combination of vacuum vessels so that heat-evolution at the temperature of boiling liquid air or hydrogen could be determined with accuracy. When a sample of radium bromide weighing 0.7 gramme was tested in this way it was found to be capable of volatilizing an amount of liquid oxygen and hydrogen equivalent respectively to 6 c.c. and 73 c.c. of the gases measured at the ordinary temperature. It seems that through a very wide range of temperature the thermal emission remains unchanged. Whether at the temperature of a summer day or at that of liquid air, the emission of heat goes on without perceptible variation.

When, however, we make a long downward stride from liquid air to liquid hydrogen, radium shows that it is not always unaffected by external temperature. Within a comparatively short distance of the absolute zero a change occurs in the rate of heat-emission, but not in the direction that might be anticipated in view of the effect of low temperatures on ordinary chemical action. Instead of being reduced, the emission of heat, so far as present *data* can be relied on, is augmented at the temperature of liquid hydrogen. Whatever be the nature of this extraordinary phenomenon, it only increases in intensity at a point where all but the most powerful chemical affinities are in abeyance. The evaporation of a liquid gas gives an absolute measurement of the amount of heat given off by radium. Changes in the degree of radio-activity may escape the most careful observer, or may be imagined where they do not exist, but the quantity of liquid hydrogen which a given mass of radium converts into gas in a given time can be easily measured with an accuracy which is beyond cavil, and the amount of heat required for the conversion can be ascertained with great precision. Hence there is no longer any doubt either of the quantity of heat evolved by radium or of the fact that the rate of emission is apparently greater in liquid hydrogen than at any temperature from that of liquid air up to that of an ordinary room. At the beginning of these experiments in liquid hydrogen a contrary result appeared to emerge when the low-temperature thermal measurements were compared with the early Curie values observed at the temperature of melting ice, as formerly given in *The Times*. This led to the curious discovery that a freshly prepared salt of radium has a comparatively feeble power of giving off heat at all temperatures, but that its power steadily increases with age until about a month from its preparation, when it reaches the *maximum* activity, which it afterwards maintains apparently indefinitely. A solution of a radium salt behaves in exactly the same way. Its power of heat-emission is at first relatively low, but goes on increasing for about a month, when it becomes equal to that of the solid salt, and so remains.

MAGNETIC WORK EXECUTED BY THE U. S. COAST AND GEODETIC SURVEY BETWEEN JULY 1, 1902, AND JUNE 30, 1903.

THE work accomplished during the fiscal year, July 1, 1902, and June 30, 1903, may be summarized as follows:

A. Magnetic Survey Work.—The magnetic elements were determined at 461 stations distributed over thirty-one states and territories, three foreign countries and adjacent seas. The principal work was done in Arizona (54 stations), Florida (26), Kansas (49), Louisiana (15), Maryland (8), Michigan (14), Nebraska (19), Ohio (19), Pennsylvania (52) and Texas (72).

By December of this year, owing to the progress already made, the magnetic survey of the area bounded by latitudes 35° and 41°, and longitudes 75° and 85°, embracing the states of Pennsylvania, New Jersey, Delaware, Maryland, Virginia, West Virginia, Ohio, North

Carolina and the eastern portions of Kentucky and Tennessee, will be completed and the results at once submitted to a careful discussion, with the view of ascertaining what improvements, if any, are needed in the methods of work, to bring out all of the practical and scientific purposes of a magnetic survey.

The work in Louisiana was done in cooperation with the State Geological Survey.

B. Ocean Survey Work.—In January, 1903, a Lloyd-Creek dip circle was mounted on the Coast and Geodetic Survey Steamer *Blake* and observations made on the trip to Porto Rico and return. Some compass work has also been done by the other vessels of the survey. The work has largely been of an experimental nature as yet. It has been demonstrated, however, that if the proper precautions are taken, valuable results may be secured. The Lloyd-Creek dip circle has been proved to be a most satisfactory instrument for both land and sea work.

C. Magnetic Observatory Work.—The four magnetic observatories situated at Cheltenham (Maryland), Baldwin (Kansas), Sitka (Alaska) and near Honolulu (Hawaiian Islands) have been in continuous operation throughout the year. Owing to various improvements being made in the vertical-force instrument, only the first-named observatory is provided with such an instrument, and, in fact, at this observatory a double set of photographic instruments are in operation (Adie pattern and Eschenhagen pattern).

In February, 1903, a temporary magnetic observatory was established in Fort Isabel, Bieques Island, Porto Rico, and since March registrations of declination and horizontal intensity have been secured.

D. Special Investigations.—A variety of special investigations have been made, embracing experimental work in the field and at the observatories and theoretical investigations at the office. Thus, for example, a preliminary examination was made of the locally disturbed region in the vicinity of Machinac straits, some magnetic observations having been made on the ice during the past winter, in addition to some shore observations.

E. Expeditions.—Besides the work of the survey proper, two expeditions have been fitted out with magnetic instruments and the observers given the necessary training and furnished with the requisite data and instructions; viz., the Zeigler North Polar Expedition, W. J. Peters being in charge of the magnetic work and the Bahama Expedition of the Baltimore Geographic Society, O. L. Fassig being in charge of the magnetic work.

F. Publications.—1. 'United States Magnetic Declination Tables for 1902, and Principal Facts Relating to the Earth's Magnetism.' By L. A. Bauer, Washington, 1902. (Special Publication of which a second edition is now passing through the press.)

2. 'The Magnetic Observatories of the United States Coast and Geodetic Survey in Operation on July 1, 1902.' By L. A. Bauer and J. A. Fleming. Appendix 5, Report of the Superintendent (O. H. Tittmann) of U. S. Coast and Geodetic Survey for 1902.

3. 'Magnetic Dip and Intensity Observations, January, 1897, to June 30, 1902, by D. L. Hazard.' Appendix 6, Report of the Superintendent (O. H. Tittmann) of the Coast and Geodetic Survey for 1902.

4. 'Results of International Magnetic Observations made during the Total Solar Eclipse of May 18, 1901, including Results obtained during Previous Total Solar Eclipses.' By L. A. Bauer. Published in *Terrestrial Magnetism,* December, 1902.

SCIENTIFIC NOTES AND NEWS.

Dr. E. B. Wilson, professor of zoology at Columbia University, has been elected a member of the Accademia dei Lincei, Rome.

Captain R. E. Peary has obtained three years' leave of absence from the Navy Department, with a view to conducting another Arctic expedition. It is reported that Mr. Morris K. Jesup is taking an interest in securing the funds required, which are estimated at from $200,000 to $250,000.

Mr. Adolf F. Bandelier and Mrs. Bandelier arrived in New York on September 1, after an absence of eleven years in Peru and Bolivia. Mr. Bandelier was sent to South America by