

(4) There is also an electric gramophone recorder for making dialect gramophone records, and a jet-tone apparatus for studying the action of the vocal organs in speech.

The first work of the laboratory, which is under the joint supervision of Mr. H. Orton, of the English Department, and Dr. E. G. Richardson, of the Physics Department, will be to obtain definitive pictures of the standard English speech sounds. This work is, in fact, almost completed. Records of dialect speakers will then be taken for the purpose of the main object of the laboratory, which is the

comparative philology of the region in which the University of Durham lies. In this connexion, room is provided elsewhere in the College for card indexes of local variants in pronunciation.

For the benefit of others who may be intending to take up similar work, it may be mentioned that the cost of the equipment of a laboratory such as this is quite moderate. Excluding the string galvanometer (which is not essential), the whole of the equipment has cost less than fifty pounds, although it is true that this does not include the cost of the labour of assembling the apparatus.

Chemical Society's Mendeléeff Commemoration

THE centenary of the birth of Mendeléeff was commemorated by the Chemical Society on April 19, when Lord Rutherford delivered an address at the Royal Institution on "The Periodic Law and its Interpretation".

About the period 1860-70, accurate atomic weights and chemical data were available for the known elements, and the time was ripe for some connecting generalisation. The conception of a periodicity in properties when the elements are arranged in the order of their atomic weights was advanced tentatively by Newlands in 1864. Mendeléeff was the first, in 1869, to enunciate the law clearly, to perceive its utility in correlating and even correcting the recorded chemical properties of the elements, and to make from it predictions which might be verified by later investigation.

Mendeléeff's first table, published in 1871, bears a remarkable resemblance to that of the present day. He perceived the true place of the transition elements in the scheme, and did not hesitate to reverse the apparently discordant order of iodine and tellurium. Where his table demanded the presence of then unknown elements, he ventured to predict their properties, his prophecies being strikingly fulfilled by the subsequent discovery of scandium, gallium and germanium.

The discovery of argon and its congeners by Ramsay, at the close of the century, led not to an alteration, but to a widening of Mendeléeff's scheme, the inert gases falling naturally into a group of zero valency and forming a transition between the halogens and the alkali metals. During this period, the Periodic Law lacked any theoretical background which might lead to its interpretation. Sir J. J. Thomson's recognition of the electron as a constituent of all atoms of matter, in 1897, first led to the conception of the electrical structure of matter.

Lord Rutherford himself has been intimately con-

nected with much of the subsequent development in this field. From consideration of the scattering of α -particles by heavy atoms, he was led to the nuclear theory of the atom, according to which the mass of the atom is concentrated in a minute, positively charged nucleus, the charge on which is proportional to the atomic weight of the atom. The conception that the nuclear charge and ordinal number of an element might be the same was applied by Bohr in his theory of spectra. It was brilliantly verified by Moseley's work on the X-ray spectra of the elements, which fixed the true order of the elements, and showed that only 92 exist from hydrogen to uranium. Of these, only one—No. 85—still awaits discovery.

The recognition of atomic number rather than atomic weight as defining the properties of the elements cleared away the apparent discrepancies in Mendeléeff's table. It has been found that most of the elements are actually complex, consisting of isotopes having the same nuclear charge but different masses. The chemical properties of isotopes, depending on nuclear charge, are identical: properties depending on mass may differ sufficiently to render separation possible, as is the case with hydrogen and lithium.

The explanation of the Periodic Law must lie in the arrangement of the outer electrons. Bohr's conception of quantised planetary orbits has been developed by the new wave mechanics to give a complete picture of atomic properties. The rare gases have highly symmetrical, tightly bound configurations. Addition of successive electrons leads to the occupation of the next group of orbits, and runs parallel to the observed chemical properties of the elements. A periodic pattern is thereby obtained, repeating after each inert gas, in which the transition elements and rare earths find a natural place. About the structure of atomic nuclei, little is yet known: the recognition of any periodicity with increasing nuclear charge awaits the discovery of the future.

Increase in Temperature due to Solar Radiation

PROFESSIONAL NOTE No. 63 of the Meteorological Office, the title of which is "Maximum Day Temperatures and the Tephigram", by Lieut.-Col. E. Gold, is a discussion of the problem of estimating the probable rise of temperature in the course of a single day during clear weather on account of the solar radiation, with the aid of the 'tephigram' of Sir Napier Shaw.

In the 'tephigram' the rectangular co-ordinates are temperature and entropy, and any closed area, corresponding with a cycle of changes of a portion

of the atmosphere, represents a definite amount of energy. Isothermal lines and dry adiabatics are represented respectively by vertical and horizontal lines, and moist adiabatics, corresponding with saturated air that is rising and expanding, and is in consequence having its entropy increased by the energy released by condensation of water vapour, are represented by sloping lines that become more nearly horizontal at low temperatures owing to the diminished capacity of air for water vapour at such temperatures. This form of diagram is in use in the