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Radio-Activity. By E. Rutherford. Second edition. Cambridge (Eng.): University Press; New York: Macmillan. 1905. 8vo, pp. 580.

A throng of public sensations due to advances in natural science crowd upon a sexagenarian's recollection (Stewart's syrup was the greatest personal sensation of his infancy), *e. g.*, vulcanized rubber; daguerreotypes; the telegraph; Dr. William T. G. Morton's demonstration of the anæsthetic property of ether (and the ether wonder was not a week old when news came of the discovery of the planet Neptune), the same memorable year bringing straw-paper, gun-cotton, and the sewing-machine; the stereoscope; then, the doctrine of the conservation of energy, long debated, though at first pooh-poohed by scientific magnates; the mechanical theory of heat; the Ruhmkorff coil; Foucault's pendulum experiment; Bessemer iron; aniline dye-stuffs; the Atlantic cable; wood pulp; Pasteur's refutation of spontaneous generation as an ordinary event; spectroscopic analysis with rubidium and cæsium; the theory of natural selection; Deville's aluminium; the extensive use of nitroglycerine; Andrews's discovery of the critical temperature; the wonderful Holtz machine of 1865 (the simultaneous and equivalent Töpler machine somehow being less noised abroad), and, three years later, the Gramme dynamo; in 1869 Mendeléeff's periodic law; then a long calm, hardly broken by such successes as that made by the ammonia soda process, or such half successes as Loomis's wireless telegraphy, which, however, came into wider notice in 1877, when the telephone and phonograph had turned public attention into that channel; the first confirmation of Mendeléeff's law in the discovery of the metal gallium, duly melting, according to prediction, in the warmth of a man's palm; the azo-dyes; Pasteur's germ-theory, followed by Koch's detection of the tubercle-bacillus, and, later, by the enzyme theory; osmotic pressure; the incandescent light; stereochemistry; Weismannism; Cowles's aluminium; smokeless powder; kodaks; the new physical chemistry guided by Willard Gibbs's phase rule, and leading to liquid air and hydrogen; the successful linotype (though that can hardly be reckoned as a scientific sensation); Hall's aluminium; the electric furnace and acetylene; argon; the Röntgen rays; the flutter about Herzian waves; the contact process for the manufacture of sulphuric acids and anhydride; and, latest, radio-activity and radium. Of all these the last promises to mark the deepest revolution of scientific conceptions, by reducing matter from the rank of primordial substance to that of a special state of electricity. After that, we shall be prepared for anything, even for experimental demonstration of the tychist's doctrine that electricity is a psychical phenomenon.

To any person who wishes to be thoroughly informed concerning radio-activity, the above-cited complete digest of all that is known about it, worked out as it is to the utmost secure conclusions on a general kind, is entirely indispensable. It is, to be sure, only the second edition of a work of which the first edition seemed as perfect as possible, and follows that first edition by but fifteen months. Nevertheless, it is largely rewritten; and it would deserve notice if there were nothing more remarkable about it than that, though the preface is dated the 9th of last May, the contributions to its science made in April are so fully discussed that it is manifest that a considerable part of the rewriting of the first edition must itself have been again rewritten while the new edtion was going through the press. The fact that the second edition is almost a new work, although the first edition was everywhere hailed as most remarkable, simply evidences the wonderful advance of the science in which Professor Rutherford is himself so large and active a factor. The methods he pursues are wholly novel, though they rest on familiar and indubitable principles, and his conclusions are not open to intelligent doubt. Accordingly, we are to know that all elements whose atomic weights exceed that of bismuth, 208, are endothermic compounds, which are undergoing spontaneous dissociation accompanied with a liberation of heat energy millions of times as much as that which could be due to the combustion of as much matter. This decomposition seems to consist in the separation of helium, whose atomic weight is 4, leaving an element whose atomic weight is only 4 less than that of the element first taken. However, as to the products of the disaggregation, it is not likely that any one rule will cover all cases. We simply mention what seems to be the prevalent type.

Radium is a metal, extremely like barium, except that its atomic weight is about the sum of those of barium and of strontium, and except that the average life of an atom of radium is only about two thousand years. It casts off helium, and what is left is a chemically inert gas, somewhat like xenon. The average life of the atom of radium emanation is only five days. It decomposes, and its principal constituent, called Radium A, is left as a deposit on the surface of the vessel. The average life of the atom of Radium A is only four and a third minutes. It is converted by throwing off helium or something like that into a somewhat more volatile element called Radium B, of which the average life is half an hour. Radium B is decomposed in a different way, little studied as yet, into another, less volatile element, Radium C, whose atom has an average life of 40 or 41 minutes. This gives off, not merely such rays as radium itself emits, but, besides others, great penetration, and there is left another element, a little more volatile, called Radium D. The average life of the atom of Radium D is over half a century, and in its decomposition no rays at all are given off, and the very non-volatile element, Radium E, remains. This has an average life of nearly nine days, and, in decomposing, gives off only the more penetrating rays, none of those by which radium affects the photographic film, and is converted into the first of the new elements discovered by Mme. Curie, polonium, which has an average life of ten months. But we will not pursue these vicissitudes further. Polonium is an element very much like bismuth. Dr. Boltwood holds that all these changes come to an end with the production of lead, but we cannot understand that in an absolute sense; and it is not particularly unlikely that lead should be converted into gold. In fact, the tales of the philosopher's stone and of projection do not seem to-day half so marvellous as what we may see at any moment by looking into a spintharoscope.

The index, though it is not quite as full as we could wish, fills twenty-two pages of double columns.

Australian Life in Town and Country. By E. C. Buley. G. P. Putnam's Sons. 1905. Pp. x., 288. Illustrations.

We are not sure whether Australians will feel complimented by being included with Japanese, Chinese, and others in a series of books on "Our Asiatic Neighbors." We have not, however, often read a volume in which solid information was conveyed in a more pleasing style. The illustrations, while having little apparent direct relation to the text, are well chosen. Hannan Street, Kalgoorlie, in 1895 and again in 1905, is especially interesting. Land and climate, country and town life, politics, education, literature and art are all treated.

The last chapter is on "Australia's Destiny." We here find a widely different Australia from that of which we were accustomed to read, and of which some of us had practical experience half a century ago. Deep-shaft and scientific mining have taken the place of the tin dish and cradle. Sheep are shorn by machinery. Bush hands seek work on bicycles. Stately mansions, in which are to be found grand pianos and the newest books, have taken the place of the slab huts formerly occupied even by rich squatters. Foxes, introduced to kill off rabbits, have themselves become pests. Camels are in certain districts used as beasts of burden—we are informed that the native-bred is a much finer animal than his Western prototype. Ox teams no longer cumber the streets of Melbourne and Sydney. Australians live in a soberer atmosphere than in the old "Cheer, boys, cheer!" days. Casual visitors—how much more "old hands"!—must feel drawn by the beckoning mystery of the pathless and still but imperfectly explored country stretching inland—the "never, never land" here so graphically described. As the clack of a windlass and the smell of tar may tend to call many an old sailor against his better judgment again to tempt the deep, so may the pages of this book rouse the desire in some old Australians again to shoulder their "swags" and take to "the wallaby track."

Whatever changes irrigation and artesian wells may bring about, Australia, with its vast proportion of desert and its uncertain seasons, can never become a United States. One would gather that the mental outlook is narrow. Sport, music, and, in a certain degree, evangelicism, have become disproportionately large interests in life. Australia does not enjoy the advantage of having been primarily colonized by men in search of religious and political freedom. One of the most interesting chapters in Mr. Buley's book is on State Socialism. In the bush, with the State for landlord, remittances of rent are through political influence obtained in bad seasons. The State owns the railways and is often compelled to advance money for roads and bridges. The State trains teachers and manages the schools. Help and supervision in the establishment of new industries is constantly demanded. After bad seasons the State sometimes provides seed, and even advances money to tide farmers over till next harvest. The State regulates the hours of labor, fixes wages, and decides industrial disputes. All this