

Sección Inglesa.

RADIUM.

Continued.

The compounds of Radium are spontaneously luminous, emitting a light which resembles that of the glow-worm. In fact, it possesses the quality of shining by its own light for an illimitable period, and it also gives out heat sufficient to melt its own weight in ice every hour. A French professor has calculated that a given quantity of Radium, after throwing out heat in this intensity for a thousand million years, would have lost only one-millionth part of its bulk. For all practical purposes, then, Radium is irreducible.

Apart from the heat rays, three distinct kinds of radiation are without ceasing, shooting out of Radium, and these for the sake of distinguishing them, have been named the *a*, *B*, and *y* rays, *a* rays consist of atoms of matter, each 1 per cent. of the weight of a Radium atom, and are projected from it with enormous velocity. They carry positive electric charges, but have exceedingly slight penetrating power, and are stopped by the thinnest sheets of metal or paper. The *B* rays, which consist of flying or escaped electrons, carry negative electric charges and go right through most metals. The *y* rays are analogous to Röntgen's or X rays. They are very penetrating, and can be detected after passing through a foot of iron. It is evident that this radio activity is continued without waste or diminution, and has been going on, as Professor Thomson tells us, "for whatever number of millions of years that Radium may have existed."

Mr. Frederick Soddy, who has been engaged with Sir William Ramsey in investigating the properties of Radium, says that "the internal fires which nourish a bit of Radium and make it glow with its own light, must have been at work when the earth itself was a sun, and, for all we know, will continue after many bodies now suns have grown cold." Sir Robert Ball would, indeed, appear to find in Radium a final explanation of the heat of the sun. The geologists have calculated that the sun has been in existence for 800,000,000 of years, while the mathematicians have allowed only 24,000,000. If Radium, Sir Robert argues, is the source of the sun's heat, we have the discrepancy between the figures of the geologists and mathematicians (whose calculations have been based on certain assumptions in regard to the composition of the sun, as, for instance, supposing an equal weight of coal being burned) almost explained, and in this way he believes that radium will get us over one of the most staggering difficulties the history of science has had to surmount.

By what natural means the power of Radium came to be stored away is at present a mystery, but we know that this power has been illustrated by various calculations to be indisputably electric. Professor Rutherford declared that a single grain of Radium contains a store of power sufficient, if only time

enough is given, to raise 500 tons a mile high! "If 14 lbs. of Radium could be procured and all the energy given off as heat could be utilised mechanically it would suffice to drive a one horse-power engine for at least 50,000 years." Sir Robert Ball illustrated the effect of the velocity of Radium rays in the generation of heat by explaining that if a pound weight, moving at the same rate, struck against a target the heat produced would be more than that generated by the combustion of half a million tons of the best coal; or, if a threepenny bit was travelling at the same velocity, the energy that it would contain in consequence of that motion would take the whole British fleet as far as the top of Ben Nevis. The energy of Radium is, in brief, about a million times as great as the greatest energy obtained in any hitherto known processes. Nothing else in the Universe that we yet wot of, as one scientist has declared, has the shadow of likeness to this power.

M. Danne, M. Curie's assistant at the Ecole de Physique in Paris, has explained that these Radium rays may be helpful or harmful, they may destroy life or stimulate it. They are capable not only of shortening life or prolonging it, but of modifying existing forms of life—that is, of actually creating new species. Finally, by destroying bacteria, they may be used to cure disease, notably the dread lupus, recently conquered by Finsen's lamps, and now apparently conquered by a simpler means. Dr. Emile Javal, the blind French *savant*, has arrived at the conclusion that Radium may offer a means of diagnosis in cases of cataract by showing whether the retina is or is not intact, and whether an operation will succeed. M. Danysz is convinced that all animals, probably all forms of life, would succumb to the destructive force of Radium if employed in sufficient quantities. On the other hand, the substance of certain experiments at the Pasteur Institute is that while animal life may undoubtedly suffer great harm from Radium when used in excess or wrongly used, it may also derive immense good from Radium when used within proper bounds. M. Danysz has successfully demonstrated by experiments on dozens of little worms, that radium rays are capable of arresting development, and thus prolonging the span of life three times beyond the natural period, M. Bohn, at the biological laboratories of Sorbonne, experimenting on tadpoles with Radium has produced "monsters," or abnormal deviations from the original type of the species, while Professor Loeb claims to have caused the growth of unfecundated eggs of the sea-urchin, and to have advanced these through several stages of their development. In other words, "he used Radium to create life where there would have been no life but for this strange stimulation."

To be concluded.