elementary and there is no need of any special study to devise them, but for the separation from the neighbouring elements things are more complicated, and emphasis has to be put on the separation from manganese, molybdenum, ruthenium and especially rhenium, which are the four elements closest to element 43 in the periodic table, and have most resemblance to it. The methods and principles of the chemistry of minute amounts of substance and of radioactive detection, as worked out by Curie, Rutherford, Soddy and others in their classical work on the natural radioactive elements, have been employed throughout and satisfactory methods of separation have been worked out. The fundamentals of the analytical chemistry of this element have thus been secured and can now be utilized for further progress.

Practically none of the many physical constants of the new element can be determined using amounts of the order of magnitude of $10^{-10}$ gm. of substance as produced artificially; but this situation prevails also for some of the natural radioactive substances, and there is at present no possibility of overcoming this difficulty. On the other hand, properties such as the volatility of certain compounds, partition coefficient in fractional crystallization, etc., can be determined even with such tiny amounts of substance, and some of these have actually been measured.

A fortunate circumstance allows us to detect even the $K_\alpha$ line of the X-ray spectrum of element 43, though the amount of substance would not be sufficient to show, by ordinary methods of external excitation, this spectral line, or any optical line. One of the radioactive isotopes of 43 exists in two isomeric states and the upper state decays into the lower. By the mechanism of internal conversion of the gamma rays, these transitions eject the $K$ electron of the atom 43, which is now in a condition to emit the characteristic X-ray line. This line has been identified by its absorption discontinuity in neighbouring elements[4], and more recently it has even been possible to photograph it in a bent crystal spectrograph[5]. This is the first time that the X-ray line of a new element, synthesized artificially, has been directly observed.

[1] See, however, Noddack, W., and Tacke, I., *Sitzb. Preuss. Akad. der Wissenschaften*, 19, 400 (1925).
[2] Perrier, C., and Segrè, E., *J. Chem. Phys.*, 5, 712 (1937); and in the Press.
[3] Cacciapuoti, B., and Segrè, E., *Phys. Rev.*, 52, 1252 (1937); and unpublished results.
[4] Segrè, E., Seaborg, G. T., *Phys. Rev.*, 54, 772 (1938).
[5] Abelson, P., unpublished results

# Obituary Notices

## Prof. Henry Louis

THE death of Prof. Henry Louis at his home in Newcastle-upon-Tyne on February 22 at the age of eighty-three years marks the passing of a period in the life of the Royal School of Mines, as he was the last survivor of the students who were present at the first annual dinner held in 1873.

Louis was born in London, and after receiving his preliminary education in London and Germany entered the Royal School of Mines in 1873, where he studied mining under Warington Smyth and metallurgy under John Percy. He became remarkable for the wide scope of his learning, and won fame as a mining engineer, a metallurgist, a teacher and a linguist.

After graduating first of his year, Louis worked for some time in Percy's laboratories and then commenced his professional work in association with Sir William Siemens. For twenty years he was entirely engaged in reporting upon and managing metalliferous mines in different parts of the world, including South and West Africa, South and North America, Malaya, California and Spain. Thus his knowledge of mining practice became almost encyclopædic.

During this period, Louis never lost his early interest in primary metallurgy, both ferrous and non-ferrous, so that when he was appointed to the joint posts of professor of mining and William Cochrane lecturer in metallurgy in Durham College of Science, Newcastle-upon-Tyne, now King's College, Newcastle-upon-Tyne, in 1895, there could have been no more fitting choice. As a teacher he was outstanding. His personality impressed itself on his students and inspired them in a remarkable way, his fund of knowledge and experience being a perpetual source of joy to all those who had the good fortune to work under his direction.

Louis was the author of many publications, in which the breadth of his knowledge is admirably displayed. While he was a persistent and usually kindly critic of the work of his fellows, his comments at times could be devastating. He took a very active part in the life of many professional institutions and was elected president in 1927 of the Institution of Mining Engineers, and in 1929 of the Iron and Steel Institute, which awarded him the Bessemer Gold Medal in 1932. A year later he was elected a fellow of the Imperial College.

The last forty years of Louis' life centred around the northern coalfield, where his work as professor and emeritus professor, as well as his twenty-five years' association as secretary, with the North of England Institute of Mining Engineers will long be remembered. He was a member of various Government Commissions, of which two—the Royal Commission on Mining Subsidence, 1923–1927, and the Commission to inquire into the practicability of gold mining in Merionethshire, 1930—were of particular interest to him.

J. A. S. RITSON.