From the Editor

Henry G. J. Moseley

While there may be doubt concerning which Italian or Dutch lens grinder first assembled a device that we would recognize as a microscope, there is no doubt who laid the foundation for rapid nondestructive elemental analysis using X-ray spectrometry. That person was Henry Gwyn Jeffreys Moseley, whose 1913–1914 publications have earned him the epithet "Father of Microanalysis."

Prior to Moseley, elemental analysis was a destructive affair typically requiring millimeter-sized chunks of material cut from the bulk. It was carried out by wet-chemical means or by light optical spectroscopy. Although the latter method can be instrumented, elemental spectra are composed of many emission lines. X-ray spectrometry involves simple spectra, is rapid, and can be combined with focused electron-beam excitation for true microanalysis.

While working in Rutherford's Manchester lab in 1913, Moseley began a set of experiments that ultimately re-ordered the periodic table in terms of a set of integers instead of atomic weights. We now call those integers atomic numbers (Z). In his most famous experiment, he devised a method to move a series of elements under an electron beam within an evacuated glass tube. He measured the wavelength (and frequency) of X rays emitted by each element using a Bragg X-ray spectrometer (invented by W. H. Bragg in 1912). Most elements emitted several X-ray lines. When he plotted the Z for each element versus the square root of the frequency of each X-ray line, he found linear relationships. Moseley's plots of K-series lines and L-series lines published in 1914 stand as a monument to his exacting experimental technique. In fact, similar plots of Z versus X-ray energy of various X-ray lines have been a feature of a well-known textbook on microanalysis: J. I. Goldstein et al., *Scanning Electron Microscopy and X-ray Microanalysis,* Springer, 1992 and 2003.

Moseley's 1914 publication did more than establish a new nondestructive analysis method. It provided support for the Rutherford model of the atom (1911), which was not universally accepted at the time. Also, gaps in the plots mentioned above indicated elements not yet discovered: atomic numbers 43, 61, and 75. Rhenium (75) is a rare platinum group metal first isolated in 1925. Technetium (43) and promethium (61) do not occur in nature but were produced artificially in 1937 and 1945, respectively.

Against the advice of his family and others, Moseley volunteered for active service at the beginning of World War I. If he had not been killed in the Gallipoli campaign in 1915, he likely would have been awarded the Nobel Prize for physics. As it turned out, the Nobel Prize in physics was not awarded in 1916.

The IUMAS meeting in Hartford next month will remember Moseley in a plenary talk (Sunday, August 3, 2014) by David B. Williams titled "H. G. J. Moseley: The Scientist Who Put the Z in ZAF (and k_{ab})." During the following week a memorial poster will be displayed, and there will be a discussion concerning microanalysis advances in the century since Moseley.

Charles Lyman
Editor-in-Chief

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