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FROM THE EDITOR-IN-CHIEF

About Nobel Prizes, Again

In its issue of October 25, 2004, the journal *Chemical and Engineering News* gave the following subtitle to the article on Nobel Prizes: "One doesn't have to be a dyed-in-the-wool chemist to win the Nobel Prize in Chemistry." In fact, several of the Prizes in Chemistry were awarded over the last decade to scientists working in fields ancillary to biology, or to full-fledged physiologists and medical workers. Thus, the 2003 Prize in Chemistry was awarded "for discoveries concerning channels in cell membranes." One of its laureates works at the Howard Hughes Medical Institute and Rockefeller University; the other is a professor of biological chemistry at the Medical Department of John Hopkins University. The situation with the laureates of the 2004 Prize in Chemistry was similar. Both laureates were surprised at being awarded a Nobel Prize in Chemistry rather than in physiology or medicine; one of them said that even though he was awarded the Nobel Prize in Chemistry, he did not feel himself to be a chemist.

Nobel Prizes in Chemistry have been awarded to nonchemists before. Thus, physicists Ernest Rutherford (1908), Peter Debye (1936), Edwin Mc Millan (1951), and Gerhard Herzberg (1971) were among the Nobel Prize winners in Chemistry.

Many Nobel Prizes have been awarded for research in chemical analysis. Among the laureates, one can find researchers who differ in their backgrounds and scientific interests. Differentiation in science is accompanied by the appearance of new scientific disciplines, the diffusion of boundaries between the disciplines, and their intertwining.

What Nobel Prizes could be awarded to the rather unfocused branch of chemical analysis known as analytics? Let us try to list them, although the list will obviously be incomplete.

The 1922 Nobel Prize in Chemistry was awarded to Francis William Aston "for his discovery, by means of his mass spectrograph, of isotopes in a large number of nonradioactive elements, and for his formulating the whole-number rule" (the official announcement of the Nobel Committee). It must be stressed that, for analysts, Aston is the founder of mass spectrometry: he designed the first mass spectrograph, marking the start of the development of mass spectrometry as an analytical method.

The 1923 Nobel Laureate in Chemistry was Austrian physicist Fritz Pregl. He received his prize "for inventing a method for the microanalysis of organic substances," i.e., for developing a micromethod of elemental analysis. The 1930 Prize in physics was awarded to Indian physicist Venkata Raman "for his work on the scattering of light and for discovering the effect named after him." We all know that Raman spectroscopy is now widely used in chemical analysis. Note that the effect was simultaneously discovered by Soviet physicists L.I. Mandel'shtam and G.S. Landsberg, who gave it its original name, *kombinatsionnoe rasseyanie sveta* (the combination scattering of light).

The 1943 Nobel Prize in Chemistry was awarded to Hungarian scientist George (Geörgy) De Hevesy "for his work on the use of isotopes as tracers in studies of chemical processes." The radioactive tracer technique has long been and remains highly important for analytical chemistry. It is also well known that Hevesy was one of the discoverers of neutron activation analysis (in coauthorship with Hilde Levi in 1937), and pioneered research in X-ray fluorescence analysis (1931).

The 1948 Prize in Chemistry was awarded to Swedish scientist Arne Wilhelm Kaurin Tiselius "for his research on electrophoresis and adsorption analysis, and especially for his discoveries concerning the complex nature of serum proteins." His research actually marked the start of the development of frontal chromatography and electrophoresis and of their application to the separation and identification of proteins.

The 1952 Prize in Chemistry was awarded to British scientists Archer John Porter Martin and Richard Laurence Millington Synge "for their invention of partition chromatography." Like the research of Tiselius, theirs was based on the fundamental discovery of chromatography by M.S. Tsvet; the laureates then progressed to the chromatography technique. Thus, Martin and Synge proposed several versions of partition chromatography, one of which was paper chromatography.

The 1959 Nobel Prize Winner in Chemistry was Czech physical chemist Jaroslav Heyrovský. He got the prize "for discovering and developing polarographic methods of analysis." His research is quite familiar to analysts.

The 1961 Nobel Prize in Physics was awarded to Rudolf Mössbauer (Germany) "for his research concerning the resonance absorption of gamma radiation and his discovery in this connection of the effect that bears his name." Mössbauer spectroscopy is not a practical analytical method; however, it is used for determining iron and sometimes tin, as well as for determining their speciation in test samples.

One of the laureates of the 1977 Nobel Prize in Physiology and Medicine was Rosalyn Yalow (United States), "for the development of radioimmunoassays of

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peptide hormones." Methods of immunoassay analysis are well studied and have gained wide acceptance; however, radioimmunoassay today holds a quite modest place among immunoassay methods.

The 1981 Nobel Prize in Physics was awarded to Swedish physicist Kai M. Siegbahn "for his contribution to the development of high-resolution electron spectroscopy." In the analytical literature, the technique developed by Siegbahn is known under the name "electron spectroscopy for chemical analysis" (ESCA). This technique is a powerful tool for surface analysis and for the determination of binding energies of electrons in atoms.

The 1991 Nobel Prize Winner in Chemistry was Richard R. Ernst (Switzerland), "for his contributions to the development of the methodology of high resolution nuclear magnetic resonance (NMR) spectroscopy." Ernst had developed an analytical method of two-dimensional Fourier NMR spectroscopy.

The 2002 Nobel Prize in Chemistry went to John B. Fenn (United States) "for developing methods for the identification and structural analysis of biological macromolecules," "developing soft desorption ionization methods for mass spectrometric analyses of biological macromolecules (Fenn and Koichi Tanaka, Japan)," and "developing nuclear magnetic resonance spectroscopy to determine the three-dimensional structure of biological macromolecules in solution (Fenn and Kurt Wüthrich, Germany)." Fenn had proposed the electrospray technique; Tanaka, soft laser desorption.

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