used. Lavoisier was the only one of the four authors who did not survive the French Revolution; and Guyton, as one of the editors of *Annales de Chimie*, and Fourcroy, as a noted and popular teacher, had great influence on the general adoption of the new system in France.

The first English translation was made by James St. John in 1788. It was he who decided to spell oxygen and hydrogen with a "y" rather than the French "i"; he also used "ph" in words like sulphur, instead of the French "f". Thomas Jefferson, who was in France at this time, wrote a letter in July 1788 in which he states that Lavoisier's new theories are not yet sufficiently established by experiment, and therefore it is too early to reform nomenclature. However, when Samuel Mitchill became a professor at Columbia in 1792, he used the new system in all his lectures, and in 1794 published a volume entitled *Nomenclature of the New Chemistry*. At least two other books on the new nomenclature had been published in America by 1800, and the system was in almost universal use in this country by that time (7).

The *Méthode de nomenclature chimique* was the lexicon of the chemical revolution; it furnished the vocabulary with which the new ideas could be proclaimed and discussed. The spread of the revolution, however, was accomplished by other books, especially those by Fourcroy and Lavoisier. These will be discussed in subsequent papers in this series.

References and Notes

1. Quoted by Lavoisier from A. B. Condillac, *La Logique*, Paris, 1780.

2. Most of the background material in this paper is from M. P. Crosland, *Historical Studies in the Language of Chemistry*, Harvard Press, 1962. This book is strongly recommended for those who wish to know more about the subject. For an earlier study of the same subject, see R. M. Caven and J. A. Cranston, *Symbols and Formulae in Chemistry: An Historical Study*, Blackie, London, 1928.

3. Translated in H. M. Leicester and H. S. Klickstein, *A Source Book in Chemistry, 1400-1900*, Harvard, 1952, p. 182.

4. See for instance D. McKie, *Antoine Lavoisier: Scientist, Economist, Social Reformer*, Schuman, New York, 1952, pp. 97-175.

5. W. A. Smeaton, *Fourcroy, Chemist and Revolutionary, 1755-1809*, Heffer, Cambridge, U.K., 1962, p. 12.

6. The quotations used in this paper are from the first English translation, *Method of Chemical Nomenclature....* translated and adapted by J. St. John; London, 1788.

7. D. I. Duveen and H. S. Klickstein, "The Introduction of Lavoisier's Chemical Nomenclature into America", *Isis*, **1954**, *45*, 278 and 368.

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THE HISTORY OF THE DEXTER AWARD

Part III: The Second Decade

Aaron J. Ihde, University of Wisconsin

Earle Caley (1900-1983), the recipient of the 1966 award, was born in Cleveland, Ohio, where a high school teacher developed in him a lifelong interest in chemistry. After taking a doctorate in analytical chemistry at Ohio State University, he taught at Princeton, where a friend in classics inspired a further interest in archeology. These two interests were finally combined during a sabbatical spent in Athens, where Caley began to analyze coins and other archeological artifacts. This became his specialty as an analytical chemist. After working in industry during World War II, he joined the Ohio State faculty as an analytical chemist, where he published numerous papers and books on analytical chemistry and on his archeological studies.

Earle Caley

The 1967 award was given to Mary Elvira Weeks (1892-1975). Born in Lyons, Wisconsin, she attended Ripon College, where she became interested in chemistry. This led to a M.S. degree in chemistry at the University of Wisconsin and to a Ph.D. at the University of Kansas, where she became a faculty member in 1921. At Kansas she encountered Frank Dains' collection of pictures of famous chemists. This, in turn, led to the publication of a long series of papers in the *Journal of Chemical Education* in the early 1930's dealing with the discovery of the chemical elements and illustrated with pictures from the Dains' collection. This series proved so popular that it was reprinted in 1934 as a book entitled *Discovery of the Elements*. By the time of Miss Weeks' death in 1975, the book had gone through seven editions, the last two done in collaboration with Henry Leicester. In 1944 Weeks took a position as

Mary Elvira Weeks

Research Associate in Scientific Literature at the Kresge-Hooker Science Library at Wayne State University in Detroit. Here she served as a literature expert and translator until her retirement. During this period she also completed the writing of *A History of the American Chemical Society: Seventy-five Eventful Years*, which had been started by Charles Albert Browne but was incomplete at the time of his death.

Aaron Ihde (b. 1909), winner of the 1968 award, was also Wisconsin born and studied chemistry at the University of Wisconsin. After completing his B.S., he spent six years as a chemist with Blue Valley Creamery Company in Chicago. He returned to graduate study at Wisconsin in 1938, specializing in food chemistry. Here he was associated with Professor H. A. Schuette, who stimulated an already emerging interest in history of food chemistry and food legislation. In 1942 Ihde joined the chemistry faculty at Wisconsin, teaching in the general chemistry program during the war years. In 1946 he reactivated a defunct history of chemistry course and pursuit of this subject soon became his principal interest. He published *Development of Modern Chemistry* in 1965, a treatise which deals with history of chemistry from Joseph Black to the mid-20th century. Ihde also created at Wisconsin, in connection with the history of science program, a graduate program in history of chemistry which has directed the doctoral studies of a score of students, most of whom are now pursuing academic work in the history of science field. One of them, Reese Jenkins, was the recipient of the Dexter Prize in 1978 for his book *Images and Enterprise*, a history of the photographic industry which developed out of his Ph.D. thesis.

Aaron Ihde

The winner of the 1969 award, Walter Pagel (1898-1983),

Walter Pagel

was born in Germany, the son of Julius Pagel, professor of medicine and author of a two-volume *Geschichte der Medizin*. Walter was educated for a medical career and became a professor at the University of Leipzig, where he became noted for his work on the pathology of tuberculosis. Like his father, he was interested in history of medicine and soon became fascinated by the medical developments in the Renaissance. He contributed important biographical studies of van Helmont and Paracelsus, studies which were continued in England after he fled from Nazi Germany.

Ferenc Szabadvary (b. 1923), recipient of the 1970 award, was born in Hungary and educated at the Technical University in Budapest, where he is now professor. He also holds the position of Director of the Hungarian National Museum for Science and Technology. Szabadvary developed an early interest in the lives of Hungarian chemists and in history of analytical chemistry, a much neglected field. In 1956 he published in Hungarian a *History of Analytical Chemistry*, which was later translated into German and English. He has

also published a biography of Lavoisier and numerous papers in history of chemistry, some of which have appeared in the *Journal of Chemical Education* after translation by Ralph Oesper, winner of the first Dexter Award.

The 1971 award was given to Wyndham Miles (b. 1916). Born in Wilkes-Barre, Pennsylvania, about 90 miles from the residence of Joseph Priestley in Northumberland, Miles studied chemistry at the Philadelphia College of Pharmacy. This was followed by a master's degree at Penn State, where he also served as an instructor in chemistry, and by the study of the history of science at Harvard. After taking his Ph.D., Miles became associated with the U.S. government, first as an historian in the Chemical Corps, later with NASA, where he worked on the history of the Polaris Project, and then with the National Institutes of Health. He became active in the History

Wyndham Miles

Ferenc Szabadvary

of Chemistry Division early in his career and has contributed extensively to the activities of the Division. Perhaps his most influential work is his editorship of *American Chemists and Chemical Engineers*, published by the ACS in 1976.

The winner of the 1972 award, Henry Guerlac (1910-1985), was born in Ithaca, New York, where his father was professor of languages at Cornell. After receiving an M.S. in biochemistry at Cornell, he pursued a doctorate in history at Harvard, specializing in the history of science. Upon graduation, he became the first chairman of the newly created History of Science Department at the University of Wisconsin. After two years, he took a leave of absence to become historian with the Radiation Laboratory at MIT. In 1946 he accepted a professorship in history at Cornell, where he created a top-ranking history of science program. As a talented linguist, Guerlac focused on the work of Lavoisier and his contemporaries. His book *Lavoisier - the Crucial Year* made a deep scholarly impact on the field upon its publication in 1961. Through acquisition of the Lavoisier collection of Duveen, Guerlac created at Cornell what is probably the best site for the study of early French chemistry in the United States. He also served as the major professor for numerous students in the history of science.

Bernard Jaffe (b.1886), winner of the 1973 award, was born and educated in New York City, where he spent most of his adult career in the New York City school system. Following his B.S. at City College, he served with the U.S. Infantry in France. On returning to New York, he took his Master's at Columbia and soon became a chemistry teacher in the city school system. Besides his teaching, he contributed many popular articles on chemistry and chemists to local papers and magazines. The publication of his book, *Crucibles*, in 1930

Henry Guerlac

Bernard Jaffe

brought him nationwide attention among chemists and chemistry students. The collection of biographies, ranging from Bernard of Treves to Irving Langmuir, was a milestone in the popularization of chemistry. Later books included *Men of Science in America* and biographies of Michaelson and Moseley. He was also well-known for his secondary school textbook, *New World of Chemistry*.

For some reason, the nature of which remains a mystery, no Dexter Award was given in 1974, the only such gap in the history of the award.

Johannes van Spronsen (b. 1928), recipient of the 1975 award, was born in The Hague and studied chemistry at the Technische Hogeschool in Delft and at the University of Leiden. Since 1954 he has taught in the Gymnasium in Alkmaar and since 1960 at the University of Utrecht. He has published many papers in history of chemistry in the *Chemische Weekblad* and in other journals. His English publications are primarily in *Janus, Chymia* and the *Journal of Chemical Education*. His best known and most important work is the *Periodic System of the Elements - A History of the First 100 Years*, published in English in commemoration of the centennial of the discovery of the table by Meyer and Mendeleev.

Johannes van Spronsen

The 1976 award was given to Trevor I. Williams (b. 1921). Born in England, where he studied chemistry under E. J. Holmyard at Clifton College, Williams continued his studies at Oxford before joining Florey and Chain in the isolation of penicillin. After 1945 he abandoned experimental chemistry and turned fully to authorship, becoming editor of *Endeavour*, a publication sponsored by Imperial Chemical Industries. He published several works on the history of chromatography and chemical industry before joining Charles Singer, E. J. Holmyard, and A. R. Hall as editor of the comprehensive *History of Technology*, which appeared in five volumes, and to which Williams contributed significant sections on the history of chemical technology. He later published additional works on history of technology and is perhaps best known for his editorship of *A Biographical Dictionary of Scientists*.

Trevor I. Williams

The overall statistics for the second decade of the award show that the recipients have become younger. In contrast to the first decade, in which half of the recipients were over 70 and none under 50 years of age, only three of the recipients for the second decade were over 70 and two were in their 40's when they received the award. Again, all but one (Pagel) received formal chemical training at either the undergraduate or graduate level. The balance of those professionally functioning as chemists, rather than as historians, shifted towards the historians, with three academic chemists, no industrial chemists, three historians, one professor of medicine, one librarian, one editor, and one high school teacher receiving the award.

Part IV of the series, dealing with the third decade of the award, will appear in the next issue.

Dr. Aaron Ihde is Professor Emeritus in the Department of Chemistry of the University of Wisconsin, Madison, WI 53706. A Past-Chair of the Division (1962-1964) and a winner of the Dexter Award (1968) himself, Dr. Ihde is perhaps best known for his classic text "The Development of Modern Chemistry", which has recently been reissued as a Dover paperback. He is currently completing a history of the chemistry department at Wisconsin.

DIVERSIONS AND DIGRESSIONS

A Note on the Discovery of Nuclear Fission

Fathi Habashi, Laval University

Ida Noddack (1896-1978)

The year 1989 marks the 50th anniversary of the discovery of uranium fission. However, the first observation of uranium fission unknowingly occurred five years earlier. In 1934, Enrico Fermi (1) in Rome announced the discovery of at least five new radioactive elements as a result of bombarding uranyl nitrate with neutrons, one of which, with a half life of 13 minutes, he supposed to be a transuranium element corresponding to element number 93. Fermi put it in the periodic table under rhenium and called it eka-rhenium. This work was inspired by the so-called phenomenon of induced radioactivity discovered a year earlier by Irene Curie and Frederic Joliot in France as a result of bombarding atomic nuclei with alpha particles. Fermi used neutrons, recently discovered by James Chadwick in England, instead.

Fermi's paper attracted the attention of Ida Noddack (1896-1978) (2), best known as the discoverer of rhenium, largely because it dealt with yet another element in the manganese group and was thus presumably related to her work on rhenium. Noddack was at the time a chemist at the Physikalische Technische Reichsanstalt (Imperial Physico-Technical Research Office), a government laboratory in Berlin. Soon after reading Fermi's paper, she published a comment (September 1934) entitled "On Element 93" (3) in which she showed that Fermi's experimental evidence was incomplete and his conclusions were unjustified. She also suggested an alternative interpretation of his results, writing "When heavy nuclei are bombarded by neutrons, it would be reasonable to conceive that they break down into numerous large fragments which are isotopes of known elements but are not neighbors of the bombarded element (in the Periodic Table)" (4).

In this statement, Noddack conceived, before anybody else, the idea of nuclear fission. Her argument was as follows. When atoms are bombarded by protons or alpha particles, the nuclear reactions that take place involve the emission of an electron, a proton, or a helium nucleus and the mass of the bombarded atom suffers little change. When, however, neutrons are used, new types of nuclear reactions should take place that are completely different from those previously known.

Fermi's experiments were repeated by Otto Hahn (1879-1968) and his coworkers in Berlin. They confirmed his conclusions and published a series of papers on extensive radiochemical separations of the so-called trans-uranium elements. The results, however, became so contradictory that after five years of intensive research and extensive publication the concept of trans-uranium elements had to be abandoned. Hahn then announced in January 1939 the definite formation of barium during the bombardment of uranium and started speculating about the mechanism of its formation (5). Ida Noddack wrote a short article in *Die Naturwissenschaften* (6) in March 1939 in which she reminded Hahn of her suggestion five years earlier that the uranium atom might have undergone fission, and ended by chiding him for failing to cite her paper on this matter, although she had once explained her views to him personally. The editor of the journal apparently asked Hahn to comment, but he refused, and the editor had to add a note of his own instead (7):

> Otto Hahn and Fritz Strassmann informed us that they have neither the time nor the interest to answer the preceding note. They think that they would rather renounce commenting, as the possibility of breaking down a heavy atom into smaller fragments - an idea already expressed by many others - cannot be concluded without experimental evidence. They leave the judgment on the correctness of the views of Frau Ida Noddack and the way she expressed them to their peers.