

Women in Chemistry-An Historical Survey

The history of chemistry introduces many interesting women in spite of the fact that chemistry, which is a laboratory science, would have been considered entirely a man's field until very recently. In prehistoric times and in the early days of any civilization, the woman kept house while the man was the hunter. Since two essential commodities, potash and salt, had to be prepared in those days by the housekeeper, women might be said to have made the first chemicals. During the period of alchemy, there was one woman, Mary the Jewess, whose writings and story have been preserved. Among other things which she used was a form of water bath which is still called by the name of the discoverer, "bain Marie". Since chemistry was of later growth than mathematics, physics and astronomy, we find comparatively few historic figures, men or women, until a later period.

There are no women of interest in the science before the wife of Lavoisier, whose work marks the founding of Modern Chemistry. Madam Lavoisier was an able, intelligent woman who educated herself along several lines to be of assistance to her husband. She studied Latin and English in order that she might be able to translate chemical treatises for him. Such memoirs as those written by Cavendish, Henry and Priestley were among those translated by her. This was not mere translation since she was able to evaluate and discuss the content of the memoirs with her husband's friends. As a pupil of David, the painter, she learned to draw. This coupled with knowledge of the art of engraving enabled her to illustrate her husband's books. One of the most noted drawings is that of her husband's laboratory showing the assistant undertaking the experiments on respiration and herself taking notes.

Before and after her husband's death, Madam Lavoisier held a

"salon" where many of the noted scientific men of the day gathered. Such eminent contemporaries as Cuvier, Laplace, Biot and Humbolt were her friends. It was to her credit that many men were won over to the new theory of combustion which had been suggested by her husband. After her husband's death her final loyal act was to have his memoirs printed which gave the world the results of his investigations.

It was a woman, a Mrs. Jane Marcet, the daughter of a Swiss merchant in London who wrote a book which played a very important role in the introduction of chemical ideas at the beginning of the nineteenth century. The book was called "Conversations on Chemistry" and appeared in many editions for nearly fifty years. It has been stated that more than 160,000 copies were sold in America alone. Mrs. Marcet was a woman who had a very lively interest in intellectual pursuits and assumed that others felt the same. Her discourse on Chemistry was not the only book which she wrote for the public. She published "Conversations on Political Economy" and "Conversations on Natural Philosophy" as well.

The style of the book is interesting since the entire volume is a series of questions by a Mrs. Bryant followed by answers from one of two scholars, Emily or Caroline. It is therefore very simple and readable for any person. No doubt many young people were influenced by the "Conversations on Chemistry" but Michael Faraday was the outstanding person who acknowledged that it was to this book and the Encyclopedia Britannica that he owed his early interest in science. He was able to read these volumes when he was an apprentice to a book seller. If Faraday was the only one so influenced by Mrs. Marcet's book, it would have been worth writing.

History of chemistry in America can never be complete without mention of Ellen H. Richards to whom both Sanitary Chemistry and Home Economics owe a real debt. She was the first woman to enter the

doors of the Massachusetts Institute of Technology where she devoted herself to the study of chemistry. Instead of continuing to interest herself in pure science, she soon determined to direct her efforts toward educating the public to regard pure air, pure water and pure food as essential.

Ellen Richards might have created for herself a lasting reputation in some research field. Her ability and indefatigable spirit would have served her in anything which she might have undertaken. She knew there was field for investigation in a mineral from which two French chemists later produced samarium and gadolinium. Nevertheless, she chose rather to use the sum of available knowledge and apply it to practical use. Accordingly, Mrs. Richards devoted herself to sanitary chemistry which she taught as an instructor in the Massachusetts Institute of Technology for twenty-seven years. She became a recognized expert and consultant to dozens of institutions and municipalities. She undertook a sanitary survey of the waters of the state of Massachusetts which required the analysis of more than forty thousand samples. Many problems were solved by means of this exhaustive investigation which served also as a standard for other surveys in other parts of the country.

It is a foregone conclusion that Mrs. Richards would become interested in the growth of Home Economics which would enable women who have the responsibility of managing the homes of the country to have accurate scientific background for their household duties. At the University of Illinois, the picture of Ellen Richards hangs in the rooms of both the Department of Home Economics and the Division of Sanitary Chemistry in the Department of Chemistry as a fitting tribute to the pioneer in these two fields.

The woman whom one ought to say most about will be treated briefly due to lack of time. There is no one, scientist or layman who does not know the name of the great Polish woman, Marie Curie,

who was the discoverer with her husband of radium. The subsequent isolation of the metal itself was another scientific feat which awarded her the Nobel prize for the second time. Probably she had more honors from her colleagues the world over than any other scientist in her time. It is fitting that the name Curie should be applied to the unit of measurement of radium emanations. In this way a woman's name will be forever be listed with those other great names in electricity, Faraday, Volta and Ohm. Madam Curie will always represent a woman to whom one can point with reverence and pride. Her daughter has carried on the illustrious name by her scientific research which awarded to her and her husband the Nobel prize in 1935.

In the field of patents there are many applications in every line of endeavor granted to women. Two of these patents which were far ahead of their time are of significance to chemistry. A French woman acquired patent rights to a process for nitrogen fixation long before the urgent need for nitrogen for fertilizer made it imperative that some means to utilize atmospheric nitrogen be found. This was in 1859 when Madam Lefebvre of Paris obtained a patent in England.

However it is the patents taken out in the United States by Mrs. Carrie Everson that are perhaps of most interest. They contained all the basic ideas for the modern flotation process. Mrs. Everson was born in New England. She was taken by her parents to Illinois where she was educated as completely as possible in those days. Later she married a physician to whom she became considerable help through her scientific studies, chemistry in particular, which she undertook in order to assist him. The Eversons invested a considerable sum in a mining venture which did not prove to be profitable. In order to try and salvage some of the loss, Mrs. Everson studied mineralogy so that she could develop a suitable means for the extraction of metal from ore.

About 1879-80, Mrs. Everson discovered what she called "chemical affinity of oils and fatty substances for mineral particles". This idea was patented but did not bring the results which she would have liked. She had no capital and found it difficult to interest others in the idea. Soon after this Dr. Everson died and his widow went to Denver where she became a nurse in order to earn her living. Convinced of the practicality of her flotation process, she finally obtained help, capital was advanced and plans were formulated. A second patent was granted and actual equipment was erected to extract ore by the process. Apparently there was disagreement between her backers and the project was abandoned.

Steps were made to locate Mrs. Everson in 1915 by a group of men interested in metallurgy and mining only to find that she had died in California in 1914. Mrs. Everson's history is comparable to that of the French woman in that they both had ideas which have developed into modern industries. The west was not looking for refinements in the mining industry. As long as the natural resources of the country seemed endless, there was very little interest in working over old material, cast aside as worthless or attempting to consider low grade ore. The flotation process allows the separation of ore from gangue due to the fact that in an oil and water mixture oil wets the ore. If the solid material is finely ground, the fine particles of ore may be floated off the top of the mixture with the oil. When the time came when smaller amounts of metal were worth extracting, then the flotation process was "rediscovered". The process has brought greater efficiency into the mining industry. Actually, it was the original idea of a woman who gained no profit herself but who must have lived to know that it was used successfully by others.

Finally, thru the connections of women with the American Chemical Society, we can link the past with the present. It can actually be said that the American Chemical Society owes its origin to the idea

of a woman. When the end of the hundred year period after the discovery of oxygen was imminent, a woman in Philadelphia named Rachel Bodley suggested that it would be most fitting to organize a pilgrimage to Northumberland, Pennsylvania where Joseph Priestley the discoverer of oxygen had made his last home. Some kind of a celebration has been suggested but it was Miss Bodley's idea which was adopted. During the gathering of chemists which lasted for three days including August 4, 1874, many of those present considered the possibility of founding an American Chemical Society. It was a propitious place for the idea to grow and a group of men which could act as a nucleus for such an organization. There were three groups organized soon after this meeting as well as sub-section C of the American ^{Association for the} Advancement of Science. There is no question but this meeting at Northumberland did much to start the movement.

The first list of members of the American Chemical Society contains one hundred and thirty three members of which one is R.L. Bodley who is probably the Philadelphia woman. In the directory which was published in 1903 there were 2364 members of which forty-three were women. Of these forty three names, twenty of them have appeared subsequently in American Women of Science which speaks very well for that small group who are the forerunners of the comparatively large group of women chemists in the United States to-day. The figures are not available for 1936.

There is no time for enumerating what women chemists have done or are doing to-day. The early workers were consultants, research workers and a great many turned their attention, as Mrs. Richards did, to the problems of the home and became the executives in the departments of Home Economics. The modern list is long and another story. Suffice it to report that several women have had the National Research Fellowship in chemistry during the early years of the award. There is no doubt that those who are in the chemical field at

present are carrying on the tradition of service which the pioneers introduced.

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