

The Birth of Medical Chemistry

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Up to nearly the middle of the sixteenth century men studied chemistry for personal gain, striving with patience, perseverance and zeal, first after the discovery of a substance that would change all metals into gold, the "philosopher's stone", and later after the discovery of a medicine that would cure all diseases, the "elixir vitae". From the thirteenth century to the time of Paracelsus, who died in 1541, the aim of the alchemist, or the chemist of that period, was the transmutation of the common metals into gold and the preparation of a universal elixir. Disappointment and failure could not damp his ardour, nor could poverty force him from the pursuit of his illusory objects.

In the history of chemistry it is very noticeable that progress was often delayed by the prevalence of a wrong idea. The ideas of a philosopher's stone and of a universal medicine were usually associated in the minds of alchemists, though sometimes it is not clear whether they were searching for two things or for just one but with the double property of turning metal into gold and curing any disease. The search lasted for centuries, and, although in the course of their experiments the alchemists made real discoveries and truths were acquired that might have remained unknown for ages, still the alchemist's passion was the cause of much delay of progress in the field of chemistry where time, money, health, and study were prodigally sacrificed.

The man who first suggested that the chief aim of the alchemist should be the curing of disease and who, engaging chemistry in the service of medicine, reorientated it and established it as a true science equipped for further advances, was Paracelsus, the son of a Swiss physician and an individual of originality and strong opinions, who was

born at a village near Zurich in 1493. Paracelsus regarded the efforts of the alchemists as a waste of energy which might be better employed. He considered that one of the main objects of chemistry should be the preparation and purification of chemical substances for use as drugs, and urged chemists, apothecaries, and physicians alike, to devote themselves to experiments of this purpose. One must remember that the apothecaries of that time usually had no knowledge of chemistry, and prepared their medicines from roots, leaves, fruits, syrups and the like in the fashion of a village housewife, and that the physicians were in no better case. "They think it suffices", says Paracelsus of contemporary physicians, "if, like apothecaries, they jumble a lot of things together and say: *Fiat unguentum*... Yet if medicine were handled by artists (that is, chemists), a far more healthy system would be set on foot". It was indeed the vigorous impulse of this reformer that deflected many chemists from their alchemical pursuits, liberated physicians from slavish deference to authority, and gave a new aim to chemistry making it an indispensable part of a medical training. Released from the trammels of degenerate alchemy, "the art of chemistry was cultivated by medical men in general, it became a necessary part of their education, and began to be taught in colleges and medical schools; the object of chemistry came to be, not to discover the philosopher's stone, but to prepare medicines; and a great number of new medicines, from both the mineral and vegetable kingdoms, some of more and some of less consequence, soon issued from the laboratories of the chemical physicians".

Of a restless disposition Paracelsus journeyed through Germany, Italy, France, the

Netherlands, Denmark, Sweden, and Russia, and, according to some, may even have visited India. For a time he served as an army surgeon in the Danish wars, and managed to secure the degree of Doctor of Medicine, though at what university remains undecided. During his travels he associated with physicians, alchemists, astrologers, apothecaries, miners, gipsies, and adepts of occult science, returning to Germany with a stock of curious knowledge such as few men can ever have possessed. We are told by a contemporary that Paracelsus was most laborious, and that he would often throw himself, fully dressed booted and spurred, upon his bed and write ceaselessly for hours. He has, in fact, left us a large number of books on medicine and chemistry. More than a writer he was an accomplished experimenter. Among other items of chemical information scattered throughout his books, are references to zinc, cobalt, and bismuth, to the fact that gas is given off when iron is dissolved in dilute sulphuric acid, to the bleaching action of sulphur dioxide, and to several other observations that bear witness to his laboratory experience. He showed, too, that the alums differ from the vitriols, since the latter are derived from a metal, but the former from an earth (that is from a metallic oxide which at the time could not be reduced to metal). It was he who first gave the name 'alcohol' to spirit of wine; because the term al-kuhl or al-kohol had come to mean the best or finest part of a substance and he regarded spirit of wine as the best part of wine.

Paracelsus died physically worn out by the restless and strenuous life he had led. His epitaph reads as follows:

"Here lies buried Philippus Theophrastus, distinguished Doctor of Medicine, who with wonderful art cured dire wounds, leprosy, gout, dropsy, and other contagious diseases of the body, and who gave to the poor the goods which he obtained and accumulated.

In the year of Our Lord 1541, the 24th of September, he exchanged life for death."

This was the epitaph to the man who had brought about the downfall of alchemy. It was the epitaph which marked the birth of iatrochemistry or medical chemistry. After the death of Paracelsus a bitter strife broke out between his followers and the supporters of the old methods of pharmacy and medicine. Medical chemistry however, was not killed in its cradle, but, to the contrary, it prospered, it steadily gained in weight in the hands of Libavius, van Helmont, Lemery, and other exponents of the Paracelsian doctrine. Libavius may be said to have planned the first chemical, as opposed to alchemical, laboratory, with a main room equipped with furnaces, descensories, sublimatories, distillation apparatus, crucibles, mortars, and phials, and with a store-room for chemicals, a preparation room, room for the laboratory assistants, a room for crystallization and freezing, a room for sand and water baths, and a feul room. van Helmont, the greatest of iatrochemists, was the founder of pneumatic chemistry, and it is indeed by his work on gases that he will be chiefly remembered; it was he who first realised that here was a new and important class of substances, and who, as a matter of fact, actually invented the word 'gas' (from chaos) by which to designate them. Lemery was one of the most acute and skilful experimenters France has ever produced. Lemery's rational outlook in all his work is characteristic of the man who was resolved to abolish from chemistry anything enigmatical and mystificatory. After Lemery the progress of medical chemistry was no less steady, till gradually medical chemistry grew into the giant science which the world of to-day is familiar with. To-day, while the physical sciences are benefiting mankind with new comforts and luxuries, medical chemistry is doing the same thing with the preparation and purification of drugs essential for the prevention and the cure of disease.