INDUSTRIAL CHEMISTRY IN UNIVERSITY EDUCATION

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Industrial Chemistry was a major subject in university education of chemists in Europe and America several decades ago. It was given up completely or almost completely at most universities and institutes of technologies because of its descriptive character.

In countries which have a strong and research-minded chemical industry in very specific and restricted fields, this leads, however, to difficulties in the recruitment of first-class trained young chemists for industry. Top graduates do not want to enter an industry with an objective which they do not know from their university education.

I shall give some samples based on such a specific case, namely dyestuff chemistry in Switzerland (Switzerland being the second largest dyestuff exporting country in the world). In the second year of the undergraduate curriculum an introduction to physical organic chemistry, in particular to application of kinetic and spectrophotometric methods for the investigation of organic reaction mechanisms, is given with examples from aromatic chemistry which are related to dyestuff synthesis (e.g. electrophilic and nucleophilic substitution mechanisms, general and specific acid and base catalysis, structure and reactivity of metastable intermediates). Simultaneously the mechanistic principles of the optimization of reaction conditions are discussed (e.g. influence of acid–base pre-equilibria on rates, relationships between rate ratios and yields in competitive processes in the formation of wanted products and byproducts etc.).

A series of industrial and university chemists (particularly those interested in synthesis and natural products) attribute a danger to modern trends in chemistry education (as suggested by G. S. Hammond and others) namely that the factual knowledge is not emphasized sufficiently. The above-mentioned integration of elementary physical organic chemistry is, in my experience, able to overcome this difficulty and, at the same time, able to increase the interest of the students to specific requirements which may be of vital interest to the industry which needs chemists well-trained in their respective fields.

On such a basis the education in industrial chemistry should be called *applied chemistry*, where, however, the word 'applied' is used in a somewhat different sense to the usual. Applied chemistry is the application of basic and strictly scientific principles to specific examples of chemical processes which are used in industrial production programmes. By such an education in applied chemistry students get training in the use of principles of pure chemistry (particularly, of physical chemistry including catalysis, reaction

mechanisms, etc.) during their university years and they do not get lost when they enter an industrial enterprise where they are faced with fundamentally different types of problems related to those they treated in pure chemistry.