

# Meeting of the Chemical Society Presidents

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*On Saturday 23 August 1997—sandwiched between the IUPAC Congress and the General Assembly—the New Swiss Chemical Society organized an international meeting at the Hotel Noga Hilton, Geneva, to which the presidents of all chemical societies worldwide were invited. Over 50 attended to hear two top-level representatives of the Swiss chemical industry speak on the theme: 'The chemist, facing the structural changes in the chemical industry'. An edited version of a discussion-provoking presentation by Dr Hans Kindler, Member of the Executive Committee of Novartis, Basel, is reproduced here.*

**Dr Hans Kindler**

The significance and the image of the chemical industry and the position, the mission and the professional perspectives of the chemist have experienced significant changes over time. There have been continual changes from the medieval alchemist, a magician searching for gold and immortality, to the scientists of the early 19th century creating the modern sciences and striving to understand and control the elements and the processes of life, to the chemists of a hundred years ago who produced the first manmade dyestuffs on a large scale. The beginning of medicinal chemistry in the 1920s, the increasing knowledge and understanding of chemical reactions and the new material sciences brought further changes. The increasing knowledge about biological processes, the growing relevance of biochemistry and the rapid developments in the field of genetics, in data management and information technology have more recently had a remarkable impact on the role of the chemist.

In all these different eras there was a common feature: for people who are not familiar with the profession there have always been somewhat unclear and sometimes unrealistic notions about the activities, possibilities, limitations and the power of chemists.

The working environment for the chemist, the mission, and working conditions, have also experienced important changes during the past few decades. In the first half of this century an industrial chemist worked either in a research laboratory at the bench or in chemical production. In either case the chemist worked in isolation with little communication and almost no flow of information across the organization. The business was technology driven, chemical research and manufacturing were the core competencies and production had a preferred central position.

Since the 1950s the pharmaceutical/chemical industry has become more and more market driven. New and innovative products have had to be developed and

manufactured to satisfy customers. A good integration of R&D projects in business strategy has become important to manage the innovation process successfully.

Over the same period, understanding of biological and biochemical processes has increased at a rapid pace, leading to a stronger influence of the biosciences in the discovery and development process. In manufacturing, efforts to improve the production processes have been extended from optimizing the cost of production to improving safety and ecology parameters at the same time. All these trends have led away from the working approach of the isolated chemist to an interdisciplinary working environment, to the team approach and an open communication across boundaries of departments, disciplines and locations.

For the chemist these developments mean above all that there is no special status; the chemist has to be able and willing to work in interdisciplinary teams. There are two major areas through which the chemist in industry can proceed and contribute value to the company:

- In the area of life sciences the chemist's knowledge is integrated with that of biologists and other specialists in medicine or animal and plant sciences;
- In material sciences there are many opportunities and challenges for innovation. There is a need for new materials such as composites, ceramics and catalysts for manufacturing, as well as for new analytical methods, chemical sensors and optoelectronic devices.

Against this background of change we ask ourselves what will be the impact on the chemist's future role.

### Changes in the economic environment

The economic environment of the chemical industry is influenced primarily through the globalization of markets and increasing competitive pressures. Through networks of trade and information all major products and services are today offered worldwide and the competitive edge of many products is determined by the ability to differentiate them in performance or price.

Traditional home markets which previously determined the product range no longer exist. Home markets have the same rules as global markets. This also means that preferred locations for marketing organizations and technical operations are increasingly determined by strategic factors, the availability of resources, the social and legal environment and the proximity to customers.

Players in global markets have to adjust their structures and locations and must refocus their activities in view of their competitive advantage. This is leading to an increasing concentration of the industry through mergers and acquisitions. Companies have to exploit their synergy potential through management effectiveness, rationalization and focusing on core competen-

cies. Outsourced segments offer many opportunities for small, highly specialized or start-up companies. Additionally, we observe a dramatic increase in innovation costs and greater expectations and pressures of the financial community.

Another source of change, particularly affecting the pharmaceutical industry, is the 'power shift' of customers. Traditionally the medical doctor decided and prescribed the therapy and the medication for his patients. The decision power is now shifting more and more towards the payer, the health insurance companies and the patient. This shift influences the marketing strategies, organizational structures, product range and supply concept of the pharmaceutical industry.

The chemical industry's resources are increasingly focused on segments with high value-added potential and on product innovation and improvement. The value-added segments are increasingly shifting from the producer to the creator of ideas and innovations. A strong process and product innovation effort is therefore the crucial factor for long-term success in the high added-value segment of any business. Consequently the chemical industry's R&D activities are increasing in absolute terms as well as in percentage of sales.

### Changes in science and technology

Developments in science and technology are among the most striking and highly visible changes taking place in our industry. There have never been so many people with such a high level of knowledge and never was communication of results and data so thorough and so easy. Information technology and computer power facilitates most tasks of the chemist and enables progress in areas such as gene technology. As a result, the disciplines of chemistry, biology and medicine are moving closer together.

Molecular biology is broadening the scope of the tools available in life sciences. These are complementing, not replacing, the range of currently available methods and products in healthcare, plant breeding and crop protection. The full impact of methods such as somatic gene therapy and xenotransplantation is not foreseeable yet; however, we have to be prepared to stay at the forefront of such developments.

New technologies are also developing in the non-biological sciences. In material sciences, new lightweight materials with improved mechanical and heat stability properties are being developed. New supramolecular structures are being investigated which exhibit unusual optical, optoelectronic and magnetic properties useful for data storage and other electronic or optical devices. Research in catalysis, especially in stereoselective reactions, has made great progress and opens new possibilities for ecologically improved manufacturing

processes. New territory is also being explored in the research of energy storage and molecular batteries, in sensor technology and analytical/diagnostic tools.

Obvious examples of multidisciplinary techniques are the new approaches in synthesis and testing large libraries of compounds, in computational and combinatorial chemistry and high throughput screening.

### Changes in the social environment

A recent study by the German Institute for Economic Research (DIW) has confirmed a clear pattern of internationalization of the industry: sites for industrial manufacturing follow the customer. Sooner or later R&D follows. As well as economic parameters, legal and social factors influence the selection of production and R&D sites. The social changes taking place in Europe today are characterized by reluctance to accept the activities of the chemical industry, including genetic engineering, the necessity to experiment with living organisms and the need for full intellectual property protection.

Ongoing changes in legislation should also be mentioned. Government activities and industry efforts should be complementary. Initiatives such as those being launched in Switzerland to forbid the use of some technologies are restricting development in the country. An attractive country for an innovative industry has to provide an innovation friendly environment with a positive attitude towards new technologies. This includes practicable legislation in the areas of ecology, animal rights, gene technology and which permits for the construction and operation of pilot plants.

### Consequences for the position of the chemist

#### *Economic environment*

Among the economic changes taking place in our business it is the globalization of markets which will have the most significant impact on the situation of the chemist. Participating in new attractive markets means that some production and R&D sites will be transferred to new sites and locations. The industry needs chemists with leadership qualities who are flexible and prepared to move to new assignments, activities and geographical areas—people with a sound basic knowledge of their professional field and the ability to see the entire picture of the business.

The ongoing structural changes in the pharmaceutical/chemical industry are not only aimed at increasing shareholder value, but are essential to realize synergies, to achieve a greater presence in the market place and to reach a critical mass for innovation potential. Chemists and other scientists in this R&D environment have to understand the driving forces of the

markets and the dynamics of the business. They must be capable of translating market needs into R&D programmes and projects and they must have the ability to explain what they are doing in generally understandable terms.

While some big companies, for example the automotive industry in the USA, reduce their size and structures, many existing positions are substituted. Several activities and services, production of parts and manufacturing of intermediates for example, are outsourced, which creates new opportunities for start-up companies, as can be demonstrated by the figures of the US industry. During the period 1993–95 the large US concerns eliminated 3.6 million jobs; at the same time, 5 million new positions were created by small and start-up companies. The chemical industry is subject to the same changes and for this process needs scientists with entrepreneurial qualities and economic thinking.

#### *Social factors*

As a result of unclear notions about the profession of the chemist, reluctance to accept scientific progress—even fear among the public—and the present tight job situation in the European chemical industry, the number of chemistry students in Europe has significantly declined in recent years. As a consequence public funds for research and teaching in chemistry are also decreasing (universities, national funds). We have to make real efforts to maintain the high scientific standards that makes Switzerland an attractive country for the chemical/pharmaceutical industry. Many respectable colleagues predict a significantly increased requirement for chemists over the next 5–10 years.

#### *Science and technologies*

New technologies, above all information technology and molecular biology and their application in genetic engineering, have changed the working environment of the industrial chemist. The new technologies are complementary with traditional chemistry and provide new challenges and opportunities for chemists in the chemical-biological direction as well as in the area of chemical engineering, production and material sciences.

Information technology has changed the working environment of many professions, including chemists. Handling literature and patent searches, managing data, accessing data banks, searching and designing of new active entities and process control, are a few important applications, requiring knowledge and command of electronic tools.

The increasing complexity of the subjects requires a working approach with interdisciplinary teams. The chemical industry will therefore need chemists who are able to manage and to contribute to interdisciplinary teams and processes in the areas of chemistry, engi-

neering and in biosciences. Chemists generally have good access to other disciplines and to an interdisciplinary working environment. They have to be trained even more to approach tasks and problems as team players.

In a recent survey by the New Swiss Chemical Society several managers confirmed these statements and emphasized that medium-sized and start-up biotechnology research companies will employ increasing numbers of chemists, because the majority of future drugs will be synthetic products. The exact figures for open positions for chemists in the chemical industry for the next few years are not known; the New Swiss Chemical Society has initiated a survey to study the future need for chemists in the Swiss industry. It is important to note that the new technologies may cause a restructuring and refocusing of industrial functions and sectors, but they cause a substitution rather than a reduction in positions for scientists.

The education and training of the new generation of chemists has to be adapted to the requirements of a sound knowledge of basic chemistry, an understanding of the areas of application, the management and working habit of interdisciplinary teams and an understanding of basic economic principles.

#### *Education and universities*

In the course of the 'Third International Mathematics and Science Study' about half a million students aged 14 from 28 countries were tested in mathematics and natural sciences and their results were ranked. The Swiss students ranked eighth in mathematics, but only 18 in natural sciences. This is an alarming result, whatever the reasons may be, large classes, few hours of teaching natural sciences, lack of interest of the teachers or lack of learning pressure. The Swiss authorities, the Department of Education, the Cantons and their bodies should take actions for improving this situation.

The public education system, particularly at university level, is of fundamental importance for preparing chemists for their industry position. At universities and institutes of technology teaching and research belong close together. Unfortunately some professors focus their entire interest in their research and consider teaching a burden. Let me state very clearly that the chemical industry considers teaching as the primary mission of universities. High quality research is a good and sound

base for excellence in teaching. We expect chemists to receive a first class, diversified education which prepares them for various positions in industry and gives them a high degree of flexibility in their choice of positions. Universities have to get away from the idea of preparing chemists exclusively for their professional position as researchers. Teaching schedules should also include basics in law, economics, communication and social issues. These topics should be integrated into the regular schedule for students without extending the present time for studying chemistry.

#### **Conclusions**

In conclusion I am convinced that the position and the professional profile of the chemist in today's chemical industry is subject to an evolution, as markets, industry structures and technologies are changing. The requirement for well-educated, versatile and flexible chemists in different business areas is high. Future scientists will need the ability to work in interdisciplinary teams and have well-trained social and communication skills. Familiarity with the applications of information technology and the potential of processes in biotechnology and engineering sciences is essential.

Interest and enthusiasm for science subjects are generated at primary and high school level. The situation in many countries and certainly in Switzerland is mediocre and needs to be improved. It is an important task for the professional organizations and the chemical industry to provide open information about the attractiveness and beneficial contributions of the profession and the future need for chemists.

The chemical industry will continue to engage in dialogues with the public, with authorities and schools, in order to improve the image and knowledge about the merits of the industry and the profession of the chemist. The industry will also continue to support the education of chemists at educational institutions by common projects and cooperations, by sponsoring scholarships and by engaging members of academic institutes as consultants. We are optimistic that the universities will succeed in adapting their teaching agendas to the needs of today and the future in such a way that chemists will be sufficiently prepared to meet their challenges and to fill the positions needed by the chemical industry in the future.