



K. K. Unger 60th Birthday

High Performance Liquid Chromatography first appeared in the mid 1960's. Thirty years of unflagging and rapid development has brought HPLC to the forefront of analytical separating techniques, and is the method of choice for the analysis of complex mixtures and synthetic products. The high resolving power of HPLC has been the principal reason for seeing its progressive expansion in separations on an industrial scale in recent years.

The success of HPLC, in both analytical and industrial applications, is related to the development of new types of chromatographic packings, which differ greatly from the packings of classical liquid chromatography. Theoretical requirements of the sorbents were formulated at the outset of HPLC, but their realisation has required a long time. The achievements in the development of HPLC sorbents were summarised in Prof. K. K. Unger's book entitled, "Porous Silica" published by Elsevier, Amsterdam in 1978. This is a standard treatise, ideal for all scientists working on the synthesis and characterisation of HPLC packings, or in related fields. Later developments were outlined in his book, "Packings in High Performance Liquid Chromatography" which appeared in 1989.

Professor Unger is certainly one of the pioneers in the development of silica based materials for HPLC. Considering his scientific approach, we now have the opportunity to reflect on the milestones that he has achieved in this field.

Professor Unger commenced his research into the chemistry of silica at the end of the 1960's while at the Technische Hochschule, Darmstadt. He later moved to the University of Mainz where he pursues his academic scientific research, combining it with the teaching of analytical chemistry.

The investigations performed since 1975 in co-operation with the company, E. Merck, have led to the development of sol-gel technology in the production of HPLC quality silica gels. The basic principles of this method are now widely used in the production of commercial HPLC-packings. Today, the majority of HPLC separations are performed on modified silica gels, particularly on so-called reversed-phase packings (RP-packings). These hydrophobic packings are produced by silanisation of native silica. The chemistry of silica modifications, the study of selectivity, hydrolytic stability, and the chromatographic performance of modified silica packings constituted the main topics of Prof. Unger's investigations during the 1970's. The research into modified silica packings was fundamental in the successful development and application of these materials for the separation of biopolymers in the 1980's. A great number of different silica based packings, both hydrophilic and hydrophobic, have been synthesised and examined, and have provided a significant contribution in the establishment of bioanalytical methods.

The specific requirement of the bioanalysis of unstable and highly reactive solutes is the speed of separation. To

perform a separation within a few seconds, the mass-transfer kinetics must be significantly higher than those achieved with conventional porous silicas.

A major breakthrough in the acceleration of chromatographic analysis was accomplished by the development of non-porous silica spheres with a diameter of ca. 1–2 μm in diameter. These packings were introduced by Professor Unger at the end of the 1980's and already numerous publications are cited in the literature proving their great potential.

Professor Unger has won wide acclaim and recognition from the scientific community for his work in chromatography and was duly awarded a number of medals and honours, among them the Pregl Medal of the Austrian Society of Analytical Chemistry, the A. J. P. Martin Award in Chromatography of the Chromatographic Society, London, and the Award in Chromatography of the American Chemical Society. Professor Unger is a permanent member of the Scientific and Organising Committees of the International Symposia on Column Liquid Chromatography, Preparative Liquid Chromatography, and Separation and Analysis of Proteins, Peptides, and Nucleotides. He has served on the editorial boards of the Journal of Chromatography, Chromatographia, LC-GC International and Trends in Analytical Chemistry.

Chromatography is probably the most important, but not the single scope of scientific interest of Professor Unger. Even during the early stages of HPLC, he recognised that the synthesis of reproducible packings was not possible without the exhaustive characterisation of the porosity of adsorbents.

Therefore, a great deal of effort was put into the development of new adsorption techniques for characterisation of porous supports. This technique is now known as high resolution adsorption. The fundamental investigations were widely recognised and promoted

Professor Unger as a leading scientist in adsorption science. He is a member of the IUPAC Commission on Colloids, Surface Science and Catalysis and a member of the scientific commission of the International Conference on Characterisation of Porous Supports.

In the development of the high resolution adsorption technique, Professor Unger paid particular attention to the investigation of materials with a well defined pore structure, such as zeolites. This introduced him into the realms of zeolite and molecular sieve synthesis and further into investigations of their catalytic properties. Performed in conjunction with industrial partners, these investigations formed the third milestone of his scientific career.

He won equal recognition in the field of zeolite science as that in chromatographic and adsorption sciences. He is bestowed with the chairmanship of the IUPAC Subcommittee on "Nomenclature of Ordered Mesoporous Materials", President of the German Zeolite Association, member of the Federation of the European Zeolite Associations, and a Member of DECHEMA Commission on Zeolites.

This year Professor Unger celebrates his 60th birthday and continues to exhibit the same level of enthusiasm and productivity as he did at the onset of his remarkable and prosperous career. Over 130 MSc and PhD students started their academic and industrial careers under his supervision and wish him a fruitful continuation in his scientific and teaching activities. We join in congratulating and wishing you good health and happiness for many more years to come!



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