

## PREFACE

The present volume of the *Journal of Chromatography* is dedicated to Professor Csaba Horváth, who celebrates his 60th birthday on January 25, 1990. Dr. Horváth was born in Hungary and received his graduate degree in chemical engineering from the Technical University of Budapest in 1952. He was on the faculty of the Department of Organic Chemical Technology until the end of 1956. At that time in the wake of the Hungarian revolution he left his country for Germany, where for the next four years he was employed at Farbwerke Hoechst AG in Frankfurt am Main-Höchst. His work involved scaling-up of processes and then research on applied surface chemistry, an experience that proved useful in his later work in chromatography.

In 1961 Dr. Horváth left industry and in 1963 received his Ph.D. in physical chemistry from the Johann Wolfgang Goethe University in Frankfurt am Main. His graduate research under the direction of the late István Halász was quite fruitful and indicative of the directions his future career would take. In the course of his doctoral research Csaba Horváth developed the first support-coated open-tubular columns<sup>1</sup> for gas chromatography, as well as surface-treated beads<sup>2</sup> that would later evolve into special column packings for high-performance liquid chromatography (HPLC). His next position was as a research fellow at the Harvard Medical School, and in 1964 he moved on to Yale University, where he has since remained. He currently holds the rank of professor, and he is also chairman of the Department of Chemical Engineering.

Since the late sixties Professor Horváth has established a vigorous research program in biochemical engineering at Yale. His interest was first focussed on enzyme technology and bioreactors, and later he devoted himself mainly to bioseparations and established a leading research group in this field. Over the years he has taught various courses in chemical engineering and supervised numerous doctoral theses. Many of his former students have become eminent biochemical engineers.

During the mid 1960s Dr. Horváth (in collaboration with the late Sandy Lipsky) pioneered the development of HPLC, and he was the first to construct and publish a complete system for carrying out separations by this technique<sup>3,4</sup>. Throughout the following two decades, Professor Horváth devoted most of his research efforts to a better understanding of both the fundamentals and the practice of HPLC. More than 200 technical publications and innumerable lectures during this period represent an inspiring example of dedication to science—I personally know of no one who has worked harder or accomplished more in this field.

Professor Horváth is associated with many specific innovations and new concepts that have collectively made an enormous impact on our use of chromatography. His introduction of pellicular packings for HPLC played a significant role in the early acceptance of this technique; he has also recently shown that similar particles with diameters of 1–5  $\mu\text{m}$  are unique in their ability to separate large biomolecules in times of a few seconds<sup>5</sup>. Dr. Horváth was among the first to recognize the exceptional promise of reversed-phase HPLC, aided by his further development of the solvophobic theory as a quantitative basis for understanding the physico-chemical basis of retention in these systems<sup>6,7</sup>, and for interpretation of the hydrophobic effect<sup>8</sup>. His early application of reversed-phase chromatography to the separation of biochemical mixtures stands as another landmark contribution. This theoretical work was later

extended to a unified treatment of HPLC retention based on concepts drawn from the field of physical-organic chemistry.

In the late 1970s Professor Horváth began work in another major area of HPLC: preparative separations, especially those based on displacement chromatography<sup>9-11</sup>. This was a classic example of the use of some early (almost forgotten) work to suggest a promising new line of research. At about the same time Professor Horváth extended his earlier work on small biomolecules to the use of HPLC for separating large biomolecules such as peptides, proteins and oligonucleotides. This work aimed at both a theoretical understanding of these separations and the development of new column packings designed specifically for large biomolecules. In due time his separate interests in preparative separations and analytical biotechnology merged, and today he is an acknowledged leader in the area of preparative and process chromatography of large biomolecules.

Professor Horváth is also famous for his interest in philology and his attention to appropriate names for new (or old) ideas. Despite the fact he learned English rather later in life upon arriving in the United States, he has mastered the language as have few other chromatographers. We are indebted to him for coining many new words such as "isocratic" which have become part of our language. His lectures are always a highlight of any meeting, as much for their humor and entertainment as for the novelty and importance of the results and ideas presented.

My own association with Csaba goes back to 1968, when, together with Barry Karger we embarked on writing a book on separation science<sup>12</sup> —a project that would stretch out over the next five years. I often recall this period with a smile, because of our many meetings enlivened by Csaba's remarkable wit and ability to express his thoughts in concise (and usually humorous) terms. Toward the end of our book-writing activities, Csaba and I became involved in another project that lasted for the balance of the 1970s. I was then at Technicon, and Csaba proposed that a great improvement could be effected in the way certain clinical testing was carried out —by making use of enzyme reagents that were immobilized on the inside of the tubing used in the Technicon analyzers<sup>13,14</sup>. He soon carried this concept from the laboratory to production, and eventually these enzyme-coated tubes became a major product line at Technicon. This work well illustrated Csaba's early involvement in applied biochemistry and biochemical engineering, an area that he would later combine so successfully with HPLC.

During the past two decades I have often been in touch with Csaba, as have many others. He is constantly traveling from one country to another, in order to touch base with chromatographers and biotechnologists in all parts of the world. The past two decades have brought him a wide recognition of his many contributions and given him the opportunity to exercise his talents on a vast stage. Among his many notable accomplishments, along this line I think first of his chairmanship of the "HPLC'84" Symposium in New York City. This was at the time the best attended HPLC meeting by far, with the most impressive collection of technical presentations. Another important contribution is a series of volumes he has edited under the title *High-Performance Liquid Chromatography —Advances and Perspectives*. He is also the founder of the New England Chromatography Council, an active group of local chromatographers, and was Chairman of the Chromatography Subdivision of the American Chemical Society in 1987.

He has served on the editorial boards of several journals, including the *Journal of Chromatography* since 1977. Dr. Horváth has received numerous awards and other honors, including the Dal Nogare Award (1978), the Commemorative Tswett Medal of the USSR Academy of Science (1979), the M.S. Tswett Award in Chromatography (1980), The Humboldt Award (1982), the American Chemical Society Award in Chromatography (1983), the Chromatography Award of the Eastern Analytical Symposium (1986), and honorary degrees from Yale (1986) and the University of Technical Sciences in Budapest (1986). He is also an honorary member of the Hungarian Chemical Society (1986).

Finally, I would like to acknowledge Csaba as both a personal and professional associate, one who over the years has exhibited all the characteristics of a good and loyal friend: sympathy, empathy, consistency, caring and sharing. It is encouraging to see that he has not slowed down after 60 years, and we all wish him well in the years to come.

Orinda, CA (U.S.A.)

L. R. SNYDER

- 1 I. Halász and Cs. Horváth, *Anal. Chem.*, 35 (1963) 499.
- 2 I. Halász and Cs. Horváth, *Anal. Chem.*, 36 (1964) 1178.
- 3 Cs. Horváth and S. R. Lipsky, *Nature (London)*, 211 (1966) 748.
- 4 Cs. Horváth, B. A. Preiss and S. R. Lipsky, *Anal. Chem.*, 39 (1967) 1422.
- 5 K. Kalghatgi and Cs. Horváth, *J. Chromatogr.*, 398 (1987) 335.
- 6 Cs. Horváth, W. Melander and I. Molnár, *J. Chromatogr.*, 125 (1976) 129.
- 7 Cs. Horváth and W. Melander, *J. Chromatogr. Sci.*, 15 (1977) 393.
- 8 W. Melander and Cs. Horváth, *Arch. Biochem. Biophys.*, 183 (1977) 200.
- 9 Cs. Horváth, A. Nahum and J. H. Frenz, *J. Chromatogr.*, 218 (1981) 365.
- 10 J. Frenz and Cs. Horváth, *AIChE J.*, 31 (1985) 400.
- 11 J. Frenz and Cs. Horváth, in Cs. Horváth (Editor), *High-Performance Liquid Chromatography—Advances and Perspectives*, Vol. 5, Academic Press, New York, 1988, pp. 212–314.
- 12 B. L. Karger, L. R. Snyder and Cs. Horváth, *An Introduction to Separation Science*, Wiley-Interscience, New York, 1973.
- 13 Cs. Horváth and B. A. Solomon, *Biotechnol. Bioeng.*, 14 (1972) 885.
- 14 L. P. Leon, S. Narayanan, R. Dellenbach and Cs. Horváth, *Clin. Chem.*, 22 (1976) 1017.