# New Challenges and Innovations in Separations Technology

Separation processes are estimated to account for 40%–70% of both capital and operating costs in industry (*Separation Process Technology,* 1997). During the 20th century, significant progress has been made in developing the knowledge base and innovations needed for the design of efficient, low-cost separation systems. Among the examples fueling this progress are the development of high-efficiency distillation trays and structured column packing, synthetic zeolites, high surface area activated carbons, and the asymmetric polymer membrane, along with related theory, experiments and computer simulation protocol.

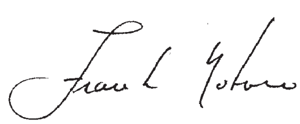
To meet the new millennium's challenges of higher productivity in current applications, as well as the development of new concepts and equipment, the knowledge base and innovative output of separation science and technology need to expand considerably.

Each year, the Separations Division of the American Institute of Chemical Engineers (AIChE) convenes the foremost international forum where researchers and practitioners in separation science and technology share new knowledge and experience. Eleven articles featured in the special section on separations (pp. 1060–1176) of this issue were presented at special sessions of the 1999 annual meeting of the Institute, in honor of Drs. Heiner Strathmann and Alan Michaels for their contributions to the field of membranes, Dr. Kenneth Porter for his extensive contribution to the area of distillation, and Dr. Alan Myers for his lifelong contribution to fundamental understanding of adsorption.

These articles focus on the future need for higher levels of fundamental understanding and innovation in both technology and applications and are quite congruent with the research needs outlined in the *Vision 2020 Separations Roadmap* published in 1998 by AIChE's Center for Advanced Waste Reduction Technologies in cooperation with the U.S. Department of Energy. In particular, new adsorbent materials and tools to predict adsorbent performance are stressed, as are improved understanding of physical phenomena and better predictive modeling tools for distillation and of new materials, enhanced operability and robustness, and predictive models for the area of membranes.

The discussions of electrostatic interactions in protein transport in membranes, structured packing in catalytic distillation, and the use of hybrid systems in the removal and recovery of volatile organic compounds all point to opportunities for innovation.

The discussions on modeling underscore the enabling power of modern computational capability for enhancing understanding of existing technologies and for future research. Rapid developments in material and computational sciences are certain to fuel new waves of invention and innovation in separations, which in turn will fuel new strides in both industrial production and environmental quality control, and present new challenges and exciting times to the separations community.



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**AIChE Separations Div. Chair, 1999**

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