The 1982 Pittsburgh Conference: A Special Instrumentation Report

The 1982 Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy was somewhat like a circus, with three magicians, a man in an alligator suit, a 10-kilometer race, lots of free apples, and other accoutrements. The circus atmosphere reflects the robust health of the instrument industry, even at a time when other industries are losing ground. The instrument industry as a whole is growing at the rate of 12 percent a year, and some segments, such as high-performance liquid chromatography and ion chromatography, are growing at twice that rate. Everyone, be they in industry or academia, needs instruments, and they need not take out a high-interest loan, even for the most expensive ones. The Pittsburgh Conference is also robust; attendance is up 15 percent to 19,884, the number of exhibitors is up 12.5 percent to 560, and the number of booths is up 15 percent to 1380. This good health is straining the facilities of the Atlantic City Convention Center. Meeting rooms that were on the convention floor have been moved to adjacent hotels and even part of the restaurant space has been co-opted for exhibits. Conference officials predict that next year will be the last in which the meeting will be able to squeeze into the hall, and the 1984 meeting is scheduled for Washington, D.C.—if that city's new convention center is completed in time. Successive years will see the meeting in Atlanta and New Orleans before it comes back to Atlantic City in 1987, by which time an addition to the convention hall should be completed. Meanwhile, the happiest people around are the makers of cathode-ray tubes, microprocessors, and keyboards, for these accessories appeared on just about every major instrument at the meeting. Perkin-Elmer Corporation introduced about 23 brand new instruments at the meeting, most of which had video displays. User manuals are disappearing from laboratory shelves and making their way into computer memories, whence they are displayed on the video unit to assist the neophyte technician. "User friendly" is the buzzword signifying ease of use engendered by this approach. Many instruments also feature "soft" keys whose function is changed by changes in the programming, thereby reducing the number of buttons facing the user. Truly, the path to the consumer's heart now seems to be through his television screen.

New Applications, Accessories for HPLC

High-performance liquid chromatography (HPLC) continues to be one of the most actively growing areas of the instrument industry, with sales growing by about 23 percent per year by one estimate. This growth reflects not only new users purchasing instruments and established users upgrading their chromatographs, but also new applications, several of which were evident at the Pittsburgh Conference. Among the more visible trends:

Chiral columns. The separation of optical isomers has always been one of the most difficult problems encountered by the synthetic or analytical chemist. The traditional approach has been to combine a racemic mixture of the desired compound (that is, a mixture containing an optically active compound and its mirror image in more or less equal quantities) with a second optically active compound to form compounds with two chiral (optically active) centers. These compounds can then often be separated by fractional crystallization or chromatography, after which the two chiral compounds are separated and the desired stereoisomer is purified.

Many investigators have attempted to short-circuit this time-consuming process by chromatographing the racemic mixture on columns packed with a chiral stationary phase. Among the many materials that have been tried are modified celluloses, sugars, polypeptides, wool, quartz crystals, and potato starch. Successes with this approach have been very limited.

One of the most successful practitioners of chiral chromatography has been William H. Pirkle of the University of Illinois. Pirkle and his colleagues began by studying chiral agents that would bind with both members of a racemic pair to shift their NMR spectra apart so that absolute spatial configurations and relative proportions of stereoisomers could be determined. It was then a natural progression to apply what they had learned to HPLC.

Their first attempts involved chiral fluoroalcohols bonded to a silica support. These were used to separate, among other things, 3,5-dinitrobenzoyl derivatives of amino acids. They soon realized, however, that a more versatile column could be obtained with the amino acids as the stationary phase. The best proved to be (*R*)-*N*-3,5-dinitrobenzoylphenylglycine. This compound has a chiral center surrounded by three different bonding groups—a π-electron center and two hydrogen-bonding regions, one a donor and the other an acceptor. Steric effects may also be important.

This configuration provides three different sites to which the appropriate chiral substrate can bind. The substrate's mirror image, however, binds to only two and thus passes through the column faster. Pirkle's group has shown [*J. Am. Chem. Soc.* **103**, 3964 (1981)] that such columns can resolve a large number of racemic mixtures, including secondary benzyl alcohols, aryl phosphonates, aryl sulfoxides, cyclic alcohols, and nitrogen heterocycles, among many others.

At Atlantic City, both the Regis Chemical Company of Morton Grove, Illinois, and J. T. Baker Research Products of Phillipsburg, New Jersey, introduced commercial analytical columns in which the Pirkle reagent is ionically bonded to a silica support. Regis also introduced a second column in which the reagent is covalently bonded to the support. Separations on the covalent column are not as good as those on the ionic, but it has the

0036-8075/82/0409-0159$01.00/0