

## Directions in Flow Injection Analysis

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As the technique of flow injection analysis is maturing and becoming more widely accepted and used in the laboratory, the question arises, what else is there to do? Commercial instrumentation is fairly well automated and there are process analyzers available. We have seen the recent development of on-line preconcentration devices as well as on-line dilution systems. FIA is seen as a complementary or companion technique to liquid chromatography (see *Analyst*, 115, 475 (1990); *Anal. Chem.*, 62, 455A (1990)).

Despite the advances that have been made in the sophistication of operations that can be performed using FIA, research is underway to extend its capabilities outside of the laboratory by making the instrumentation simple and more rugged, by miniaturizing and further automating, and by portable operation. We have recently developed a battery operated system that fits in a suitcase. It utilizes two peristaltic pumps and two electrically actuated valves that are operated by a lap top computer that also collects and stores the data. But for complete reliability, peristaltic pumps must be replaced. A compact syringe based sinusoidal flow pump was recently developed that, when used in conjunction with an automatic valve, can be used in a simple single channel system to inject sample and reagent in a sequential fashion. Or, two syringes can be operated independently to draw in and then deliver sample and reagent (*Anal. Chem.*, 62, 1861 (1990)). These are just examples of approaches that are being investigated to reverse the complexity of the FIA apparatus to make it more reliable, albeit at the expense of some flexibility. We will undoubtedly see more developments in this direction. At the same time, more sophisticated multicomponent detection systems (e.g., FTIR) will extend the measurement capabilities, particularly when combined with chemometrics techniques made possible by the ready availability of computers.

The popularity of FIA continues to be evidenced by attendance at special conferences on the technique and the organization of special symposia at national and international meetings. New trends in FIA will be presented at the Third Winter Conference in FIA in Scottsdale, AZ, January 6-8, and at Flow Analysis V in Kumamoto, August 21-24. We can expect to see developments in both new capabilities and in real world operation and application.