



Flow Injection Analysis: Thirty years on and going strong

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This year marks the thirtieth anniversary of the publication of the first paper on flow injection analysis¹. In this paper, Ruzicka and Hansen introduced the term “flow injection analysis” for the first time, and unintentionally initiated a field of research that would, over the next three decades involve thousands of researchers, and which as to date resulted in more than 14500 publications in the international literature². What is it about flow injection analysis that has captured the enthusiasm of two generations of researchers? For those of us whose early experience of analytical chemistry was the tedium of repetitive batch wet chemical analysis, FIA offered the means of automating, or semi-automating these processes. The ability to assemble a working FIA system from a few simple components, and to see it used to perform analyses with high reproducibility and great rapidity was certainly a satisfying experience. Add to that the potential for enhancement of analytical selectivity by kinetic control or by on-line separations, along with the ability to filter, digest, extract, derivatize or otherwise modify the sample on-line, with minimal reagent use and waste production, and it is hardly surprising that many analytical chemists have become enamoured by the flow injection approach. I’ve recently returned from the Thirteenth International Conference on Flow Injection Analysis in Las Vegas, a meeting conducted in collaboration with the JAFIA. This was a wonderful opportunity to meet friends and colleagues from around the world, many of whom have are long-term supporters of the ICFIA³

¹ Ruzicka, J., and Hansen, E.H. (1975). Flow Injection Analysis. Part I. A New Concept of Fast Continuous Flow Analysis. *Analytica Chimica Acta* 78, 145-147.

² E.H. Hansen, “The Impact of Flow Injection on Modern Chemical Analysis”, Proceedings of the 3rd Annual Symposium on TRF Senior Research Scholar on Flow-Based Analysis, Chiang Mai, Thailand, 23 Spet 2004.

³ The 14th ICFIA meeting will be held in Berlin, in Spet 2007.

and the international Flow Analysis⁴ meetings, and to hear of the most recent developments from their laboratories. It was also very gratifying to see the number of students and younger scientists in attendance, and to hear them describe some of the exciting research in which they are involved. Microfluidic FI, lab-on-valve, separations with monolithic columns in SIA, microfluidic FIA interfaced with CE, detection with liquid core waveguides, and innovative methods for field and process measurement were just some of the exciting third generation flow analysis topics that were presented by this new generation of flow injection practitioners.

In my own area of research, that of environmental chemistry and monitoring, flow injection has become an accepted method for repetitive laboratory analysis of a range of common water quality parameters. However, as yet there are relatively few examples of successful applications of remote and long-term deployments of FIA systems for field measurement. Why is that? Conceptually the flow injection approach is ideally suited to autonomous on-line field measurement, but in practice it is somewhat more difficult to achieve. In part this may be due to a reluctance on the part of researchers to move away from the conventional apparatus of laboratory FIA systems, to equipment that is more suitable for the demands of field deployment, I suspect that real advances in this area will not necessarily rely the development of new sensing chemistries or sensors , but rather will involve the development and application of new approaches to sample and reagent delivery, reagent generation and storage, miniaturization and photonics.

Thus while FIA is now in its maturity, I am convinced that there is still a strong future for research in the area, and particularly related to the development of remote and unattended monitoring systems. Clearly flow injection techniques have much to offer in areas encompassing environmental and process monitoring, food, agricultural and pharmaceutical applications, but it remains to be seen whether the exciting developments of today can be successfully translated into the autonomous detection and monitoring systems of tomorrow.

⁴ Flow Analysis X will be held in Oporto, Portugal, 3-8 Sept 2006, <http://www.ff.up.pt/flow10>