

<報告>

**Report on the Fourteenth International Conference on Flow Injection Analysis (ICFIA 2007) Including Related Techniques, in Collaboration with the Japanese Association for Flow Injection Analysis (JAFIA), held in Berlin, Germany, September 2-7, 2007.**

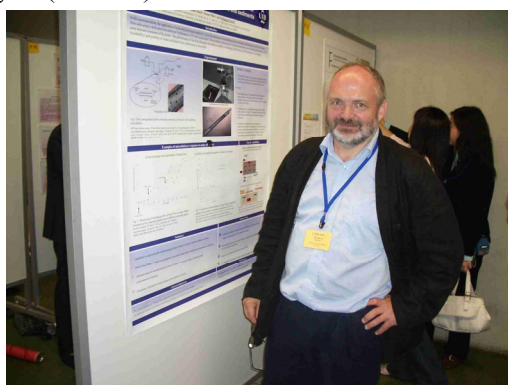
**Gary D. Christian**

Department of Chemistry, University of Washington, Box 351700, Seattle, WA 98195-1700 USA

ICFIA 2007 was hosted by the Technical University of Berlin. Professor Wolfgang Frenzel at TU Berlin was Program Chair, and Professor Jürgen Simon at the Freie Universität Berlin was co-organizer with him. Both were assisted in many ways by their wives, Jolanta Oleksy-Frenzel and Helga Simon. The conference is a semiannual meeting for JAFIA, which was well represented with 18 Japanese participants and 5 accompanying persons.

**Technical Program**

There were 116 participants from 30 countries. The program consisted of 9 invited keynote speakers, representing a cross section of leading FIA research around the world, 6 scheduled lectures in a special session devoted to FIA and related techniques from Japanese scientists, 26 submitted oral presentations, and 108 posters. Wolfgang Frenzel and Jürgen Simon opened the conference on Monday morning with warm welcomes, and this was followed by a short presentation by Gary Christian on the history of ICFIA, from its beginning as the Winter Conference on Flow Injection Analysis (WCFIA) in 1989.



**Keynote Lectures.**

Manuel Miro (University of the Balearic Islands, Spain) gave the opening keynote lecture on the applications of various generations of flow injection for on-line processing of solid samples, including membrane-based and microcolumn-based systems for in-line digestion or leaching of foodstuffs and environmental samples, and for bioavailability studies. Ian McKelvie (Monash University, Melbourne, Australia) followed with a lecture on water quality assessment by FIA, with an emphasis on measurement of nutrient and metal species in natural and wastewaters.

## <報告>

The afternoon session began with a lecture by Marcela Segundo (University of Porto, Portugal) who gave a historic overview of food analysis using FIA and SIA, including integration of in-line sample pretreatment and measurement. Kate Grudpan (Chiang Mai University, Thailand) critically compared the relationships of various FIA techniques to other flow techniques, with an overview of the incorporation of FIA-type techniques in different types of commercial instruments.

The Tuesday morning session began with a presentation by Olaf Elsholz (University of Applied Sciences, Hamburg, Germany) of the use of FIA in bioprocess analysis, emphasizing the requirements of robustness for routine analyses, and the applicability for the different “colors” or types of biotechnology. The afternoon opened with a lecture by Edgar Paski (British Columbia Institute of Technology, Burnaby, Canada) on the challenges of implementing the ISO 17025:2005 standards for FIA and SIA technologies.



On Thursday afternoon, Krystyna Pyrzynska (University of Warsaw, Poland) reviewed preconcentration, matrix removal, and speciation techniques for trace metals using flow methodology, including solid-phase extraction, liquid-liquid extraction, and coprecipitation. Paul Worsfold (University of Plymouth, UK) reviewed the coupling of flow injection with luminescence detection for the analysis of environmental and other samples, with emphasis on chemiluminescence for

determination of reactive oxygen species and iron species in the open ocean. Flow injection is well suited for the ultratrace levels since it is a closed system, which minimizes contamination. The last keynote lecture, on Friday morning, was by Dalibor Satinsky (Charles University, Czech Republic) who presented a critical overview of the current status of sequential injection chromatography.



### *FIA/SIA Developments in Japan.*

Thursday morning was devoted to a special session on contributions from members of JAFIA. Six representative speakers were selected by JAFIA President Tadao Sakai, to include a cross section of older as well as younger researchers. Elo Hansen (The Technical University of Denmark) was invited to give an introduction on the history of FIA development and early contributions in Japan. The late Nobuhiko Ishibashi was an early pioneer in the field, with 42 FIA papers in international journals, and the founding father of JAFIA in 1983.

Hideyuki Itabashi (Gunma University) started off with a very animated talk on an all injection system with solenoid valves for interval monitoring of samples, for example, environmental or industrial monitoring. His all injection analysis (AIA) systems reduce reagent

<報告>

consumption by injecting sample and reagent in a reaction coil in which the solutions are circulated for a fixed time, and then introduced into a detector. A new palm-sized unit has been developed using miniature solenoid valves. Koichi Oguma (Chiba University) described the challenging spectrophotometric determination of beryllium in geological samples, using on-line cation exchange separation to eliminate iron interference. Samples were prepared by fusion with a mixture of lithium carbonate and boric acid.



Tsutomu Nagaoka (Osaka University) described a nanoparticle array detector based on optical and conductivity observation which required no other optical device or labeling of molecules. Evaluation of sensors was made using flow-based measurements. Such a device was used as a DNA sensor. Hideji Tanaka (Tokushima University) described a new concept of multiplex controlled flow ratiometry, a variant of the initial ratiometry system reported previously by Tanaka et al. from the laboratory of P. K. Dasgupta. Fourier transform analysis is used resolve contributions of two solutions to the signal. Norio Teshima (Aichi Institute of Technology) measured catalytic reactions using a new automated stopped-in-loop flow analysis (SIL-FA) system. The SIL-FA system minimizes exposure of the flow-through cell to the sample. Trace vanadium was catalytically determined. Shoji Motomizu (Okayama University) described a flexible computer-assisted flow chemical analyzer (CAFIA). A Visual Basic program was developed to control a variety of flow-based

systems using syringe pumps, selection valves, switching valves, solenoid pumps and valves, and nanoflow pumping and valve systems.



**Submitted Oral Presentations.**

Raquel Mesquita (Universidade Católica Portuguesa) reported on the use of sequential injection systems for spectrophotometric analysis of multi parameters, and Carsten Frank (GKAA Research Centre, Geesthacht, Germany) described a miniaturized system for *in situ* determination of phosphate and nitrate in the North Sea, at a rate of more than 300 samples per hour, needed to obtain close spatial resolution when rapidly towed by a ship using a tow fish. Burkhard Horstkotte (University of the Balearic Islands) analyzed nitrophenols in water samples using multisyringe flow injection for automatic



<報告>

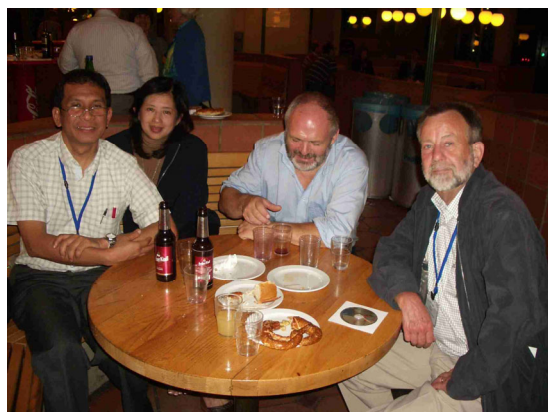
analyte preconcentration, interfaced to a capillary electrophoresis system for separation and measurement. Kazuhiko Tsukagoshi (Doshisha University, Japan) determined antioxidants by microchip capillary electrophoresis with a chemiluminescence detection system. Ahmed Alnajjar (King Faisal University, Saudi Arabia) used sequential injection-solid phase extraction for sensitivity enhancement to determine abuse drugs by CE.

Beata Rozum (University of Warsaw) developed an apoenzyme sensor as a detector for determining cofactors in an FIA mode. Shin-Ichi Ohira (The University of Texas at Arlington, USA) determined urinary creatinine by sequential injection kinetic spectrophotometry, using an LED-based 4-channel cell to mitigate interferences. A procedure was devised to estimate 24-hour urine amounts without the need for collecting the whole sample. Renata Mehrez (Technical University of Berlin) applied SIA for on-line measurement of proteins and polysaccharides in activated sludge of membrane bioreactor systems. Kei Toda (Kumamoto University, Japan) described a honeycomb membrane scrubber for a flow-based micro gas analysis system, allowing a wide absorbing area and very thin absorbing solution area. Duangjai Nacapricha (Mahidol University, Thailand) reported on a flow system for extraction and colorimetric measurement of ethanol in gasohol fuel. The ethanol is extracted into an

aqueous potassium dichromate reagent and a red LED serves as detector. Saisithorn Muncharoen (Mahidol University) described membraneless units for flow analysis of volatile analytes liquid and solid samples. The analyte diffuses from the sample into an absorbing solution, reminiscent of the classical batch Conway microdiffusion apparatus.

Abubahr Idris (King Faisal University) determined total morphine in human urine using SIA for on-line sample treatment and measurement. Siavash Nouroozi (Zanjan University, Iran) used sequential injection spectrofluorometry to determine cystine and cysteine in pharmaceutical samples, based on reduction of  $\text{Ti(III)}$  by cysteine in acidic media to produce fluorescent  $\text{TiCl}_3^{2-}$ . Abdulrahman Attiyat (Yarmouk University, Jordan) reported on the FIA-AAS determination of metals and non-metals using online precipitation preconcentration on glass beads.

Yanlin Zhang (Monash University, Gippsland Campus, Australia) separated  $\text{Cd}^{2+}$  from other metals based on a novel SI/FI system in combination with an on-line solid phase extraction. This allows vapor generation for cadmium AAS determination using  $\text{NaBH}_4$  reduction, without interference. Nabil Fakhre (University of Salahaddin, Iraq) determined permanganate by AAS using FI extraction as an ion-pair with an 18-crown-6 ether. Klaus Risveden (Lund University, Sweden) described an automated hyphenated FIA-RISFET



## <報告>

(Region Ion Selective Field Effect Transistor) warning system for pesticides in drinking water.

Eunice Rodriques (University of Porto) used an integrated miniature flow system for the spectrophotometric determination of chlorhexidine. Sonia Ramirez-Garcia (Dublin City University, Ireland) described a fully integrated polymeric microfluidic platform for environmental analysis. A miniaturized low power pump based on electroactive actuators was used. An optical detection system consisted of fused miniaturized LEDs for light source and detector, which exhibited very low LODs.

Peter Solich (Charles University) critically evaluated the similarity and differences of sequential injection chromatography and high performance liquid chromatography. SIC exhibits short analysis time, easy liquid manipulation, online use of reagents in all steps, and low reagent use due to discontinuous flow. Victor Cerda Martin (University of the Balearic Islands) presented automated flow systems and software for flow control and advanced data acquisition. Adam Wiyrawan (Brawijaya University, Indonesia) determined thiocyanate in urine samples and photographic waste using gas diffusion continuous flow spectrophotometry. Mixing with cerium(IV) and sulfuric acid in the donor stream forms HCN which diffuses into a Ni(II) acceptor stream. Orawon Chailapakul (Chulalongkorn University, Thailand) described the simultaneous determination of heavy metals in foods using a new microchip CE device with electrochemical detection. Maliwan Amatongchai (Ubonrajathane University, Thailand) used a microfluidic system incorporating chemiluminescence detection for measuring antioxidant capacity. Nathawut Cheongchan (King Mongkut's Institute of Technology Ladkrabang, Thailand) described a cross injection analysis (CIA) system for multi-reagent introduction. Perpendicular channels are drilled into a horizontal carrier stream channel.

Reagents and sample are simultaneously injected into the cross channels using peristaltic pumps.



### **Poster Presentations.**

A total of 108 posters were submitted that covered the whole array of FIA-based and related techniques, including novel instrument development and new applications. In addition to the 19 countries mentioned above, contributions were also from Brazil, France, Greece, Philippines, Romania, Russia, Sultanate of Oman, Taiwan, Venezuela, Ukraine, and Uruguay, for a total of 30 countries.

### Poster Prizes.

*Microchimica Acta* (Springer Verlag, Vienna), *Analytical and Bioanalytical Chemistry* (Springer Verlag, Heidelberg), and *Talanta* (Elsevier, Amsterdam) provided monetary prizes for best posters. The *ABC* poster was selected by a vote of conference participants, while the others were selected by a jury of the invited speakers. The *Microchimica Acta* award was for “Flow injection assay of the pathogenic bacteria using lectin-based quartz crystal microbalance biosensor” by Gulnara Safina, Margret van Lier and Bengt Danielsson from Lund University. The *ABC* award was for “Development of a fully automatic flow method for the determination of nitric oxide radical scavenging capacity” by Luís M. Gagalhaes, Marcela A. Segundo, Salette Reis and José L. F. C. Lima from Universidade do Porto. And the *Talanta* award was for “Flow analysis with a microfluidic device comprising sample pre-treatment by TiO<sub>2</sub>-assisted photoelectrocatalytic digestion of organic-matter – voltammetric evaluation” by Daniela Daniel and Ivano Gebhardt Rolf Gutz from the University of São Paulo.

### Exhibition

Instruments were exhibited by Hach Lange GmbH, Düsseldorf ([www.hach-lange.de](http://www.hach-lange.de)) and by Medizin-und Labortechnik Engineering GmbH, Dresden ([www.mle-dresden.de](http://www.mle-dresden.de)). FIALab Instruments, Bellevue, WA USA ([www.flowinjection.com](http://www.flowinjection.com)) displayed instrument literature and the 3<sup>rd</sup> edition e-book of Jarda Ruzicka, made available to participants. In addition, eDAQ company ([www.edaq.com](http://www.edaq.com)) provided leaflets informing about their current systems for data evaluation, and Sciware, SL ([www.sciware-sl.com](http://www.sciware-sl.com)) made a live presentation of their software for control of flow systems and data evaluation.



Social Program



The conference started with a welcome reception on Sunday evening at the conference site. On Monday evening, a tradition originating at ICFIA 13 in Las Vegas, at the suggestion of Elias Zagatto, was continued with an *ad-hoc* party with participants bringing traditional drinks and foods from their home countries. Wednesday was a free day, with a full-day excursion to the historical city of Potsdam. Helga Simon and Jakob Frenzel gave very detailed and informative histories of the sites. The group enjoyed a traditional German luncheon at the Meierei Brauhaus on a lake. The excursion finished with a three-hour boat ride through the rivers and lakes around Potsdam and Berlin.

A conference banquet was held at the university Mensa Hall on Thursday evening, where poster awards were announced and mementos given to several speakers for different aspects of their presentations.

<報告>

### ***Talanta* Special Issue**

A special issue of *Talanta* will be published of papers submitted from the conference. Wolfgang Frenzel is Guest Editor. All papers are subject to the usual peer review.

### **ICFIA 15**

The ICFIA International Steering Committee members met to determine the next venue and time for the International Conference on Flow Injection Analysis. A proposal was unanimously approved from the Japanese Association for Flow Injection Analysis to hold ICFIA 15 as part of the 25<sup>th</sup> anniversary celebration of JAFIA in Nagoya, Japan, September 28-October 3, 2008. The Program Chair will be Tadao Sakai. Inquiries and submissions may be directed to him at [tadsakai@aitech.ac.jp](mailto:tadsakai@aitech.ac.jp) or Department of Applied Chemistry, Aichi Institute of Technology, 1247 Yachigusa, Yakusa-cho, Toyota 470-0392, Japan.