



Robert Kellner Lecture awarded to ABC author Luigi Mondello

Nicola Oberbeckmann-Winter¹

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Luigi Mondello is Full Professor of Analytical Chemistry in the Chemical, Biological, Pharmaceutical, and Environmental Sciences Department of the University of Messina. He is Deputy for Research (Science and Technology Area) at the University of Messina and a member of the Teaching Board of the Doctorate course on Chemical Sciences. He is President of the Steering Committee of the Italian Separation Science Group of the Italian Chemical Society, a member of the expert team of Chromedia (chromatography knowledge base), a member of the International Committee for Excellence in Food and Nutrition (Campus Bio-Medico University, Rome, Italy), and copresident and cofounder of the Mediterranean Separation Science Foundation Training and Research Center.

In September 2017 he received the Robert Kellner Lecture Award from the Division of Analytical Chemistry of the European Association for Chemical and Molecular

Sciences. His lecture, entitled “Different approaches to multidimensionality in chromatographic separations coupled to mass spectrometry detection to face challenging analytical tasks,” was presented at Euroanalysis 2017, held in Stockholm, Sweden, from August 28 to September 1, 2017.

The Robert Kellner Lecture Award, sponsored by Springer-Verlag, recognizes a European individual who has made substantial contributions in the last 5 years to the advancement of analytical chemistry research or education. The award was established by the Division of Analytical Chemistry of the European Association of Chemical and Molecular Sciences in memory of the efforts and achievements of Robert Kellner, Vienna University of Technology, in particular toward the consolidation of analytical chemistry in Europe.

Who is Luigi Mondello?

Luigi Mondello talked about his research, his motivations, and himself to Nicola Oberbeckmann-Winter.

What is the focus of your award-winning research and what was/is your motivation?

The task of lipid analysis and profiling is crucial to separation scientists working in many different fields, including the pharmaceutical, clinical, cosmetics, and food fields. Given the high complexity of matrix composition and the great structural diversity of these molecules, no single analytical technique is capable of affording thorough knowledge of all the lipid classes and species in a given sample. This research aimed to exploit state-of-the-art “hyphenated” and multidimensional chromatography techniques to develop an “omic” approach, allowing quick fingerprinting of lipids in complex natural matrices, and also alleviating the need for tedious and time-consuming sample preparation/purification.

✉ Nicola Oberbeckmann-Winter
nicola.oberbeckmann-winter@springer.com

¹ Analytical and Bioanalytical Chemistry, Springer Verlag, Tiergartenstrasse 17, 69121 Heidelberg, Germany

What was the trickiest problem you had to overcome in that research? How did you solve it?

As is often the case when one is dealing with multidimensional comprehensive techniques relying on online “hyphenation,” a compromise has to be found between the two separation dimensions in terms of mobile phases, gradient elution, and analysis time. Specifically, in the case of mussels containing lipids in a wide range of polarities and amounts, the use of hydrophilic interaction liquid chromatography afforded only a class-type separation in the first dimension, whereas the “bulk” of the work relied on a short octadecylsilica secondary column. The use of monodisperse stationary phases, with very narrow particle size distribution, allowed very fast repetitive gradients to be run in parallel, resulting in good performance even at high flow rates and with a short reconditioning time.

From where did you start and how does your current work relate to/differ from your scientific roots?

During the first few years, my research work was mainly focused on the study of essential oils, particularly those from the genus *Citrus* (lemon, bergamot, orange, mandarin, etc.) analyzed by both liquid chromatography and gas chromatography. The aim was to evaluate their authenticity, find new markers of adulteration, and find indicators of their origin. It was, of course, desirable to implement efficient methods based on capillary columns, and soon it was possible to reduce analysis times thanks to an insert allowing ballistic heating of an oven: this was the beginning of fast gas chromatography. Nowadays, I am much more involved in the development of multidimensional instrumentation and software, and also my analytical tasks are a bit more challenging, including petrochemicals, lipidomics, and complex foodstuffs. However, I am still committed to finding the best solutions in terms of efficiency of separation materials, speed and sensitivity of detection, and possibly, reducing the time needed for sample preparation.

How would you explain your current research to a child?

Well, I remember one day at work at the beginning of my academic career. I was analyzing some foodstuffs, and my first daughter, Alice, was sitting nearby and looking around her in the laboratory with amazed eyes. She was very curious about my work, and as I was about to manually inject a juice sample into a chromatograph, she promptly asked me whether I was a doctor. It took a while for me to find a suitable answer, and

then I said, “Yes, sweetie, I am a doctor of foods. I examine what we eat or drink to look out for those things that make foods healthier, and I try to get rid of bad things that can hurt people.”

Where do you consider your field is heading?

I recognize some major trends in the field of separation science, one being the multidimensional and comprehensive techniques my colleagues and I are working on. For sure, they will continue to have a revolutionary effect on the chromatography community, as long as more effort is put into making these powerful technologies available to all in terms of robust hardware and user-friendly software. Also, miniaturization has been a long-term trend in analytical techniques, from sample treatment and introduction to miniaturized and portable systems for separation, and detection in microenvironments. Finally, it is evident how applications of mass spectrometry will continue to expand in almost all fields of research, as high-resolution and tandem techniques are rapidly transitioning from specialized testing to being broadly applied. As Chairman of the International Symposium on Capillary Chromatography organized together with the GC×GC Symposium (held in Riva del Garda, Italy, every 2 years), I have been aware of this pattern from the contributions of participants, and consequently more space is being dedicated to featured oral and poster sessions.

Which recent discovery might prove most valuable to the field of bioanalytical research or beyond?

Undoubtedly, the advancement of omics technology has vigorously prompted the development of bioanalytical sciences; mass spectrometry imaging in particular has emerged as a powerful tool with a promising future in scientific research and clinical practice. In addition to providing spatial and molecular information for a wide range of biomolecules, the ability to map their distribution without labeling of target compounds has made this technique unique for its versatility.

What motivated you to become a researcher and what do you find most rewarding in your professional life?

Since I was a child, I have always been very attracted to the nature surrounding me, and I felt intrigued with the phenomena occurring around me. I still like to face new challenges and find solutions to new tasks since I believe that if you are

questioning every day, then you will be learning every day. Mine is a profession where you grow daily.

What is your advice for young analytical scientists today?

Young people today who are keen to get into a career in science, whether in academia or in industry, face a bewildering array of technologies and analytical instrumentation. I would recommend everyone to build a solid platform on which to base decisions for their future plans, but at the same time to be brave enough to seek the doorway to their vocation, and step out to pursue their dream.

From your personal point of view, which ABC feature do you like (best) and why?

Analytical and Bioanalytical Chemistry is unanimously appreciated as a journal committed to rapid publication and

global visibility of outstanding scientific articles, and I fully agree with this merit. Among its distinct features, I find the free educational articles very useful to practitioners at all levels, offering a boatload of tips and a roundup of the latest science developments.

And last, but not least, what do you enjoy most when you have time to spare?

Indeed, I have very little (if any) spare time, which I entirely dedicate to my family. Exceptionally, I allow myself to sail, relax, and feel the wind waft my thoughts away. Being the master of your boat is like being the master of your instrument, in that immense laboratory that is the sea. I like also scuba diving and watch the amazing amount of wildlife underwater in complete silence.