Analytical and Bioanalytical Chemistry (2023) 415:3619–3623
https://doi.org/10.1007/s00216-023-04775-8

EDITORIAL

Meet the guest editors of *Young Investigators in (Bio-)Analytical Chemistry 2023*

Nicola Oberbeckmann-Winter[1]

Accepted: 23 May 2023 / Published online: 11 June 2023

For the sixth time, a special issue featuring Young Investigators in (Bio-)Analytical Chemistry has been prepared by an international team of six leading scientists. Thanks to their commitment and dedication, as well as additional support by members of our International Advisory Board, this unique collection of articles authored by rising stars in analytical chemistry was complied.

We invite you to meet the guest editors of this special ABC issue by reading this virtual interview and the following bibliographic portraits:

Thank you for acting as guest editors for the 2023 edition of our famous issue series. We very much appreciate your dedication to make this issue a success story.

BJ: Thanks for the invitation. It was my pleasure. ABC has always been a very important journal and as a PhD student I always dreamed about contributing my work to the journal.
NW: It is a great honor and I am so glad to be part of the issue!

You invited rising stars representing the diversity in (bio-)analytical chemistry. What is unique about this young investigators' generation?

ZG: There are several unique aspects about the current generation of young investigators in (bio-)analytical chemistry:
Firstly, this generation has grown up in a time when technological advancements have allowed for unprecedented access to information, and the ability to connect and collaborate with researchers from all over the world. This has led to a more globalized and interconnected scientific community, where knowledge and expertise can be easily shared and built upon.
Secondly, this generation has a strong emphasis on interdisciplinary collaboration, as they recognize the importance of integrating different fields of science to solve complex problems. They are not afraid to work across disciplines and seek out new perspectives, which has resulted in exciting new discoveries and breakthroughs.
Lastly, this generation is also dedicated to advancing the field of (bio-)analytical chemistry in a more sustainable and socially responsible manner. They recognize the impact that their research can have on society and the environment and strive to conduct their work with these considerations in mind.
Overall, the unique combination of technological proficiency, interdisciplinary collaboration, and a dedication to sustainability and social responsibility make this young investigators' generation a truly exciting and promising group of scientists.
LH: The current generation of principal investigators recognizes the significance of multidisciplinary teams in conducting cutting-edge research. They possess a broader perspective on analytical chemistry and understand the need for collaboration between different fields. Additionally, this generation is more technologically adept and therefore, they employ multivariate strategies to analyze data more efficiently.
BJ: The unique feature is the key contribution that they are making to analytical chemistry to serve society, from wearable sensos to fast diagnosis tools at the point of care. I would like to also highlight the capability of such researchers to adapt to different research environments, as most of them have long stays abroad

Published in the topical collection *Young Investigators in (Bio-) Analytical Chemistry 2023* with guest editors Zhi-Yuan Gu, Beatriz Jurado-Sánchez, Thomas H. Linz, Leandro Wang Hantao, Nongnoot Wongkaew, and Peng Wu.

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

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

and were able to start new research lines at different universities.

PW: I decided to invite rising stars all active in optical probes to represent diversity in that particular area.

NW: Apart from advancing the (bio)analytical chemistry field using novel materials and new methods, many of them are interested in putting their efforts to tackle challenges associated with the measurement of real samples.

TL: This generation of investigators is the first to grow up with computer technology, and it reflects in our science. For example, I wrote a data processing script last week to generate fluorescence traces from 50,000 parallel microreactors. My student created a computer rendering of an accessory for her experiment and 3D printed the part in our lab. We have come a long way from cutting out chromatogram peaks on chart recorder paper. This generation of analytical scientists embraces computer-aided technology to open possibilities that could not have been achieved in the past.

What are the opportunities for your generation in analytical and bioanalytical chemistry?

PW: First, the research diversity increases rapidly. Second, communication with people of different expertise is easier than before. So, there are more chances for co-operation with colleagues of other areas.

TL: This generation of scientists will continue to develop novel measurement techniques—like previous generations of scientists—to quantify a multitude of analytes with ever increasing sensitivity and spatial and temporal resolution. But I think this generation will further embrace technology by integrating artificial intelligence into their workflows. I see the most successful labs of the future likely being the ones that harness AI to guide their experimental design and find meaning in large data sets. Gaining an ability to draw biomedical conclusions more expeditiously and accurately will provide insight into biological pathways and disease prognoses that could not have been obtained in previous decades.

BJ: They have a good opportunity to benefit from the new fabrication and 3D printing technologies to develop new portable sensors and novel analytical techniques that can serve for fast diagnosis, quality control, etc.

LH: While there are numerous research opportunities in (bio)analytical chemistry, some of the most exciting ones involve improving the resolution and sensitivity of current measurement techniques. There is significant interest in applications that push the boundaries of sensitivity, such as single cell measurements and single molecule detection. Additionally, untargeted analysis for differential analysis is a growing area of research that explores chemometrics to yield new insights into complex chemical systems.

NW: The greatest opportunity is to build a new generation of (bio)analytical chemists based on our previous knowledge, experience, and lessons learned from the past several years. The new generations will be able to realize what has been done and what still needs or is worthwhile doing to advance the field. With respect to research, I see an opportunity to perform more complex investigations in (bio)analytical chemistry than we could do in the past because of the rapid progress and advance of artificial intelligence (AI) and machine learning (ML).

How does your generation respond to the publish or perish "pressure", do you think there is a different expectation or an adjusted way to publish scientific results?

TL: Funding decisions are still being made by established scientists who are accustomed to the "publish or perish" paradigm. Consequently, young investigators face the same standards that demand large numbers of quality publications to maintain funding for their laboratories.

LH: Overall, there is a growing recognition that the "publish or perish" culture may be unsustainable and may not align with the ultimate goals of scientific research. Particularly early-career PIs feel the pressure to publish as many papers as possible in order to advance their careers and secure funding. However, there is a growing recognition that the quantity of publications is not necessarily an accurate measure of research quality. In my opinion, there must be a shift in academic culture towards a more balanced approach between quality and quantity.

NW: In my opinion, pressure to publish is different from place-to-place. I have heard that in many places academic staff/researchers are suffering to increase their publication number. In particular, the pressure is even higher for the places with low research resources and facilities. Fortunately, at my current workplace, I don't feel this pressure at all. Instead, I rather like to publish my work, not because I want to add to publications listed in my CV, but because I want to tell the science community what I have learned from the experiment and of course I am very happy when my work is being cited, which indicates its usefulness for others. From the investment point of view, it is also necessary to contribute knowledge or know-how to the science community as we basically spend research funding/time as well as importantly generating waste

from experiments. Moreover, publishing can be a tool for students to learn and practice how to effectively communicate their work in a written form.

BJ: The pressure is always there. In my generation the pressure was high, as the only way to access Spanish universities was with a very competitive contract such as Ramon y Cajal (with a success rate lower than 10%) and publication was crucial. A lot has changed these days with the DORA declaration and the adhesion of many government research agencies.

PW: I think the "pressure" still exists, and perhaps more significantly than before. Although currently people emphasize more the "significance" of the research, in most cases, "significance" associates with "impact".

ZG: The "publish or perish" culture is a well-known phenomenon in academia, and it is something that the current generation of young investigators in analytical and bioanalytical chemistry are keenly aware of. However, I do believe that there is a growing recognition within the scientific community that the quality and impact of research is more important than simply the number of publications.

In recent years, there has been a push towards more responsible and sustainable research practices, and this has led to a greater emphasis on the quality and reproducibility of scientific results, rather than simply the quantity of papers produced. This has been reflected in the increased scrutiny of research practices and the push towards open science, where research findings are shared openly and transparently with the wider community.

What is the most important lesson you have learned so far over your career?

LH: An important lesson for a sustainable career and life is balance. Achieving balance means finding the right equilibrium between the quality and quantity of publications. At the same time, it's essential to create a balanced life, where work is not the sole defining aspect. Other pillars such as family, community, health, and faith play an important role in ensuring that one leads a fulfilling and meaningful life.

NW: Work life balance and happiness in what we are doing are the keys that help us to successfully achieve what we want and to drive us to reach the set goal or even go beyond.

BJ: I will quote a sentence from my best scientific mentor: Life is not easy! Let's say analytical Chemistry is not easy, but never surrender and keep going to reach your dreams.

ZG: The most important lesson I have learned is that maintaining a passion and interest in an important field is critical for long-term success and satisfaction. When you are genuinely interested in a subject, you are more likely to enjoy your work, be motivated to learn and improve, and be willing to tackle the challenges that arise in your career.

PW: I would say focus is more important than interest.

TL: Assembling a good team is paramount to success. However, finding the right personnel is not trivial, especially early in your career. But once you have people with motivation and scientific curiosity, managing a lab becomes a highly rewarding experience. Even if experimental results do not come out as planned, people with good attitudes are interested by the outcomes and work to find an alternative path to their goal, which can be better than originally planned.

Looking back to 2001 when ABC was founded, the most challenging question was "identification". What is this question for analytical chemists nowadays?

NW: It still exists as the most challenging question nowadays. With increasing interest for onsite detection where there is no or minimal chance to discriminate a specific sample of interest from complex entities in matrices. Even though many previous studies have successfully obtained favorable selectivity by diluting samples in a detection medium to reduce signal from interfering species. However, looking at the future applications where minimal operator input and real-time measurement are expected, e.g., wearable devices, this conventional strategy would not be practical anymore.

BJ: Identification has always been important for analytical chemists. To quantify you need to identify, and both terms are crucial. The question these days is the same, but with a different vocabulary: sensing and biosensing.

PW: I think currently the most challenging question is "what's new".

TL: The most challenging question in my mind is about the "interconnectedness" of nature. Biological molecules do not work in isolation. How do multiple disparate molecules operate in tandem—across different length and time scales—to cause a specific biological outcome?

LH: In the context of differential (bio)analysis, untargeted analysis has become an increasingly challenging application. This approach involves the use of advanced strategies for putative identification, data handling, preprocessing, and multivariate data modeling, including both linear and non-linear models.

How would you describe the role of analytical chemists to answer this question?

LH: The primary role of analytical chemists is to bridge the gap between chemistry, measurement sci-

ence, and statistics. By combining their expertise in these fields, analytical chemists are able to develop and apply cutting-edge techniques for (bio)chemical analysis. They play a vital role in advancing our understanding of complex chemical systems and are instrumental in developing solutions to real-world problems. As such, analytical chemistry is a key discipline in the modern scientific landscape.

NW: Analytical chemists need to have a clear understanding and are able to identify what causes false negative or false positive signals from the measurement system being developed. For example, some electroactive species, e.g., ascorbic acid, are not a problem with optical transduction methods while they are a big problem for electrochemical methods. This crucially enables analytical chemists to solve the problem efficiently by using whatever strategy they have in mind.

PW: I think currently we should not just focus on higher sensitivity, but rather on the new information brought by the higher sensitivity.

TL: Analytical scientists must develop new techniques to measure disparate classes of biomolecules that span many orders of magnitude in concentration and operate at different points in space and time. Characterizing only one class of analytes from a static sample potentially misses critical connections in the biological pathway under investigation. Therefore, technology must be created to assess the interplay between molecules to understand how everything is interconnected.

And how would you define the role of a journal like ABC in meeting these new challenges?

TL: Journals should continue publishing interesting science regardless of whether an immediate impact will be made to the field. Developing innovative capabilities positions the next discovery to be made from that precedent, even if it takes some time.

PW: Since no one knows where the next breakthrough point is, ABC should maintain diversity, such as being indiscriminative about papers submitted from different areas.

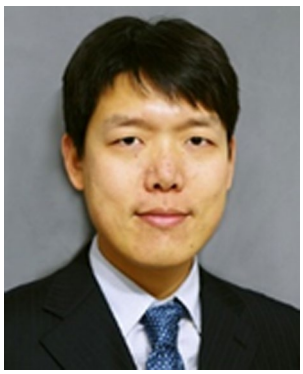
BJ: ABC has always been a reference journal for analytical chemists. Competition is hard with new journals appearing every year. Yet, ABC topics are broad enough to cover current topics in analytical chemistry, in particular "-omics", bioanalysis, miniaturized devices, sensors. etc.

NW: Journals like ABC play an important role in reviewing and disseminating high-quality research that delivers novel strategies, new knowledge, current challenges, and trends which would later trigger novel ideas or research directions in the future.

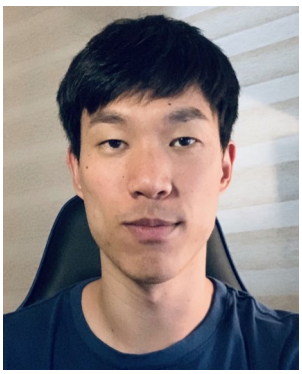
LH: Multidisciplinary journals play a crucial role in providing PIs with a platform to report and share their findings, like ABC in the context of analytical and bioanalytical chemistry. Such a context-oriented journal provides a valuable forum for researchers from diverse backgrounds to collaborate and share their expertise efficiently.

Thank you all for sharing your thoughts with us!

Beatriz Jurado-Sánchez has been Associate Professor at the University of Alcalá (Madrid, Spain) since 2022. She is Assistant Editor for the journal Microchimica Acta and Associate Editor of RSC Advances. Her research interests are the synthesis of tubular and Janus micromotors based on nanomaterials, the integration of micromotors into portable instrumentation, biosensing with micromotors integrating quantum dots and the development of micromotor based environmental remediation approaches.



Zhi-Yuan Gu has worked as Jiangsu Distinguished Professor in Nanjing Normal University since 2014 after graduating with a PhD from Nankai University and a postdoctoral stay at Texas A&M University. The current research interest includes porous moiré materials, nanoscale metal–organic frameworks, the high-resolution chromatographic separation, carbon dioxide electroreduction, and the single-molecule nanopore analysis.



Leandro Wang Hantao is Assistant Professor at the Institute of Chemistry at the University of Campinas. His research group is dedicated to developing fundamental and applied research in all aspects of conventional and multidimensional gas chromatography, with a particular emphasis on chemometrics. His work has been recognized with awards, including the prestigious "John B. Phillips Award" in 2019 and his inclusion in the "Top 40 under 40" Power List in 2018. Recently, he was featured in the LCGC Europe's Rising Stars of Separation Science (2023). He is a member of various editorial boards and has also acted as a guest editor for several leading journals in the separations community, including Analytical Chemistry, Journal of Chromatography A, and Analytical and Bioanalytical Chemistry.

Thomas H. Linz is Assistant Professor in the Department of Chemistry at Wayne State University, Detroit, MI, USA. His research interests include developing microfluidic separations and digital analysis systems to measure diverse biological analytes from biomedical samples.

Nongnoot Wongkaew is currently working towards her habilitation and leading the nanofiber group at the Institute of Analytical Chemistry, Chemo- and Biosensors, University of Regensburg, Germany. From 2014 to 2016, she was a postdoctoral fellow of the Alexander von Humboldt Foundation under supervision of Prof. Antje J. Baeumner. Her research focuses on exploiting beneficial features of nanofibers in miniaturized analytical systems as separators, immobilized surfaces, and transducers both optically and electrochemically. The developed miniaturized devices with integrated nanofibers aim to be applied in food, clinical and environmental areas.

Peng Wu is Professor of Chemistry at the Analytical & Testing Center and College of Chemistry, Sichuan University, China. He obtained his PhD in chemistry from Nankai University in 2011. He was a recipient of the Chinese National Science Fund for Excellent Young Scholars of China in 2015. His current research interests are room-temperature phosphorescence for analytical detection, singlet oxygen-based analytical detection and optically-active nanocrystal for analytical detection.