The Metabolomics & Analytics Centre (LACDR / Leiden University) is happy to announce:

The METABOLOMICS Summer School

12 – 15 July 2022, De Sitterzaal, Huygens building, Leiden

Short background and course overview

The ambition of the Metabolomics & Analytics Centre of the Leiden Academic Centre for Drug Research and led by prof. Thomas Hankemeier is to develop innovative analytical strategies for metabolomics-driven health monitoring and systems biology studies. We believe that continuous health monitoring and analyzing the health continuum requires high-throughput technologies. Furthermore, we believe that translating biomarker findings from large-cohort studies or real-world settings with multiple patient samples to novel prevention and treatment strategies requires patient-derived in-vitro models and patient-specific computational models. We use advanced statistical methods, computational metabolic networks, and integration of other omics data to analyze and interpret our data. As Metabolomics & Analytics Centre we strive to be a major player in Education & Training on multiple levels; for our own researchers, for students within the LACDR institute, and for external parties such as for the COAST ATLAS programme, Young NMC, Exposome-NL and Fieldlab Phenomix. The Centre is committed to prepare each student (BSc, MSc or starting PhD level) as an independent, critical researcher with the right skillset to be able to address relevant fundamental or societal questions with metabolomics.

Therefore, in this course, we will cover each aspect of the analytical metabolomics workflow, i.e. from biological question and all the way to data interpretation, with a strong focus on the fundamentals and recent developments. A range of applications in the life sciences will be highlighted. An overview of the provisional program is shown in Table 1 and a short outline of each session including a bio sketch of the lecturers is provided below.

Table 1. Overview of provisional program metabolomics course.

	Tuesday 12 July	**Wednesday 13 July**	**Thursday 14 July**	**Friday 15 July**
Morning	X-omics Intro	Separation Science	Data Analysis	Solving Societal Challenges with Metabolomics
Afternoon	Analytical Technology	Mass Spectrometry	Modeling	Group Activity

Session X-Omics Intro

Starting with a general introduction by the coordinators, a kick-off is provided by prof.dr. Thomas Hankemeier who will highlight the possibilities of the recent X-Omics Initiative from a metabolomics perspective for addressing relevant societal challenges Several applications of metabolomics will be highlighted.

Thomas Hankemeier is full professor of Analytical BioSciences at the LACDR, Leiden University, since 2004. He leads the Metabolomics & Analytics Centre. His research is aiming at innovative analytical tools for metabolomics-driven systems biology in personalized health strategies.

Thomas is principal investigator/co-leader of various international and national projects and consortia. He is Medical Delta Professor of Translational Epidemiology at the Department of Epidemiology at Erasmus University Medical Centre, initiator and Scientific Director of the Netherlands Metabolomics Centre (www.metabolomicscentre.nl), and he is leading several (inter)national consortia. He is also co-founder of MIMETAS, the worldwide first organ-on-a-chip company. Thomas is one of the four PIs of the Netherlands X-omics Initiative (2018-2027, 40M€; www.x-omics.nl), and one of the PIs of the Gravitation program Exposome-NL.

Thomas has published over 350 scientific papers and graduated more than 25 PhD students.
Specialties: metabolomics, lipidomics, analytical chemistry, microfluidics, translational drug research.

Session Analytical Technology

This part of the course will focus on Miniaturized and High-Throughput analytical technology. First, we want to discuss the analytical challenges that act as drivers for technology development, including sample-or volume-limited use cases, large numbers of samples, or the unique physical properties of microfluidic systems. Afterwards we will discuss enabling technology involved in in different steps of analytical workflows; from microsampling to microfluidic sample preparation, transfer, and separation, to data acquisition by mass spectrometry and nuclear magnetic resonance spectroscopy.

Dr. Bert Wouters is an Assistant Professor in the Metabolomics & Analytics Centre at Leiden University. He has conducted research in the fields of liquid chromatography, microfluidics, high-throughput sample-preparation and sample-transfer, proteomics, and metabolomics. Current work includes minimally-invasive sampling, modular robotic autosamplers, and segmented flow for high-throughput sample transfer.

Dr. Charlie Clark is a Junior Lecturer and Postdoctoral Researcher at the LACDR, in the group of Thomas Hankemeier. He is an analytical chemist with a background in microfluidics, biochemistry, and forensic science. His research interests include developing high-throughput methods for mass spectrometry, metabolomics, acoustic separation techniques, and analytical microfluidic platforms.

Session Mass Spectrometry

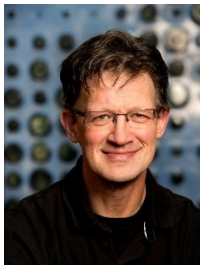
In this lecture the fundamentals and utility of mass spectrometry for metabolomics will be illustrated using relevant examples. Emphasis will be given on how the mass spectrum readout is generated by having a deep understanding of the role played by the various components of a typical mass spectrometer instrument. The working principles of various MS configurations including highlighting their strong and weak points will be considered in detail. Also, the basics of analyzing a mass spectrum of an unknown compound by incorporating information about possible chemical configurations that match the unknown peak(s) will be demonstrated.

Dr. Ahmed Ali is an assistant professor of Biomedical Sciences at LACDR, Leiden University. He leads single cell research in the Analytical Biosciences and Metabolomics group, he is a visiting researcher at Shimizu's group, BDR, RIKEN, Japan, and Misr International University, Egypt. His research involves developing innovating analytical methods tailored for small-volume, or single cell analysis to enable metabolomics-driven systems biology in personalized health strategies.

Dr. Amy Harms joined Analytical Biosciences group in 2010 and manages the metabolomics core facility of the LACDR. She received her PhD in chemistry from Penn State and did post-doctoral research in the field of biological mass spectrometry at Pacific Northwest National Lab. Amy's interests include instrumentation, data processing strategies, and quality control. Amy has ample experience with experimental design, the actual collecting of data, data interpretation and integration of (large and complex) metabolomics projects.

Session Separation Science

This session will be given by prof.dr.ir. Peter Schoenmakers, Professor Analytical Chemistry at the University of Amsterdam and Educational Director of ti-COAST.



Peter Schoenmakers obtained his PhD from the TU Delft in 1981. After a career in industry at Philips Research Labs (Eindhoven) and Shell (Amsterdam and Houston), he became full-time professor of polymer analysis and analytical chemistry at the University of Amsterdam in 2002. His current research focus is on comprehensive two-dimensional (liquid) chromatography and on applications of analytical chemistry in forensic science. He has published more than 270 peer-reviewed papers.

Peter has won the Eastern Analytical Award for Outstanding Achievements in Separation Science (2009), the Martin medal of the Chromatographic Society (2011), the John H. Knox Medal of the Royal Society of Chemistry (2014), the Csaba Horváth Memorial Award (2015), the CASS Award for Distinguished Contributions to Separation Science (2015), the Fritz-Pregl Medal of the Austrian Society of Analytical Chemistry (2018), and the Dal Nogare Award of the Chromatography Forum of the Delaware Valley (2019). In 2016 he was awarded an ERC Advanced Grant for Excellent Research.

Session Data Analysis

Dr. Alida Kindt-Dunjko leads the Data Analysis team at the Metabolomics & Analytics Center. She obtained her PhD at the University of Edinburgh, followed by PostDoc positions in Innsbruck and Munich, working as a data analyst and biostatistician for over 10 years. The last 7 years she focused on analyzing metabolomics data. The lectures on data analysis will highlight areas requiring special attention when dealing with metabolomic datasets, such as quality of the data and transformations. Further topics covered will range from different analysis methods such as univariate and multivariate models to visualizations.

Session Modelling

The importance of modelling metabolomics data using relevant biomedical examples is demonstrated in this session.

Dr. Aga Wegrzyn obtained her PhD in the group of Systems Medicine of Metabolism and Signalling, Laboratory of Paediatrics, of University Medical Center Groningen. By using systems medicine approaches, Aga studied metabolic consequences of various inborn metabolic diseases, investigated potential novel biomarkers and therapeutic approaches. In Nov 2018, Aga started her postdoctoral research in the Metabolomics & Analytics Centre of the LACDR by studying the pathogenesis of Parkinson's Disease using X-omics data integration and systems biology approaches.

Session Solving Societal Challenges using Metabolomics

In this final session, we will outline using convincing and actual examples how we have used our metabolomics approaches for addressing relevant biomedical and clinical questions. The session is followed by a social group activity to complete the metabolomics course.

Dr. Rawi Ramautar obtained his PhD on the development of capillary electrophoresis-mass spectrometry methods for metabolomics from Utrecht University. In 2013 and 2017, he received the prestigious Veni and Vidi research grants from NWO for the development of CE-MS approaches for volume-restricted metabolomics. Currently, he is an associate professor at the Leiden University where his group is developing methods for sample-restricted biomedical problems. Rawi was recently selected for the Top 40 under 40 Power List of the Analytical Scientist. He is editor of Microchemical Journal (Elsevier).

Target audience

The Metabolomics Summer School is meant for PhD students, postdocs and (highly motivated) master students. It is also well suited for industrial/clinical researchers at that level.
The material requires a broad, general knowledge of Chemistry, Biology and Data Analysis, but participants do not need to be experienced in Metabolomics.

At the end of the course

The participants will gain a good understanding of Metabolomics in all its facets.

Course duration and time investment

Course duration: 4 days
Participants are asked to bring their own computers to facilitate work.

Registration

Registration is open from 25 May 2022:

www.aanmelder.nl/Metabolomics-Summer-School-Leiden

Fees depend on affiliation (academic / industrial) and community memberships (NMC, Exposome-NL, X-omics, Field lab Phenomix). More information can be found on the site mentioned above.

In the case it is not clear to you which registration box to check or if you have any other question, please send a mail to petra.aarnoutse@ti-coast.nl (mention in the subject line 'Metabolomics Summer course').

Participation is limited and will be allocated on a first-come-first-served basis.