

# Journée Scientifique du club CE de l'AfSep

5 juillet 2024  
Montpellier

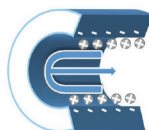


Workshop

PLONGÉE AU CŒUR DE L'ANALYSE  
PAR DISPERSION DE TAYLOR



Nanoscale  
**Metrix**  
ULTRA-SMALL SIZE DISTRIBUTION



# Foreword

Dear Colleagues, Dear Participants,

On behalf of the AfSep CE group, we are very pleased to welcome you to this scientific day entirely dedicated to Taylor dispersion analysis (TDA). Ten years after the first European workshop on TDA, we are again gathered in Montpellier to discuss, exchange and observe the recent advances on TDA, an astonishingly simple technique in its implementation. In the information and contacts exchanged during this scientific day, we hope that you will find new ideas for your analytical challenges. If the scientific principle of TDA is relatively old (1953-55), its modern and automated implementation in narrow bore capillaries allows new applications, many of which remain to be discovered. Our partner for this event (Nanoscale Metrix) and the AfSep CE group warmly thank you for contributing through your presence and participation to the success of this day.

## HERVÉ COTTET

Président du Groupe CE  
de l'AfSep  
University of Montpellier

## MYRIAM TAVERNA

Vice-Présidente du Groupe CE  
de l'AfSep  
Université de Paris-Saclay

## GÉRARD MEUNIER & CÉDRIC SARAZIN

Nanoscale Metrix

# Program

8:30	Welcoming of participants
8:50	Opening of the TDA Workshop
9:00 > 9:20	Principle of Taylor dispersion analysis and current challenges Hervé Cottet   IBMM, Université de Montpellier
09:20 > 09:50	Taylor Dispersion Analysis of Nanoparticles Patricia Taladriz & Sandor Balog   Adolphe Merkle Institute, University of Fribourg, Fribourg, Switzerland

09:50 > 10:10	Evaluation of the physical stability of bevacizumab solutions for intravitreal injections: a comparison of SD-TDA and DLS Philip Chennell   Pharmacie Hospitalière – Hôpital de Clermont-Ferrand
10:10 > 10:30	Taylor dispersion analysis for a fast and absolute sizing and quality control of Extracellular Vesicles Sameh Obeid   Institut Galien, Université Paris Saclay
10:30 > 11:00	Coffee break
11:00 > 11:30	Taylor dispersion in the FIDA1 instrument for the study of biomolecular assembly – from amyloid fibrils to liquid-liquid phase separation Alexander K. Buell   Technical University of Denmark
11:30 > 11:50	Unraveling the aggregation mechanism of amyloid peptides by Taylor Dispersion Analysis Joseph Chamieh   IBMM, Université de Montpellier
11:50 > 12:10	TaylorSizer : High Resolutive size distribution analyzer for UltraSmall NanoObjects (USNO) and more Yasmine Sebti   Nanoscale Metrix
12:10 > 14:10	Lunch & Discussions
14:10 > 14:30	Historical perspectives on TDA and tribute to M. Martin contribution Hervé Cottet   IBMM, Université de Montpellier
14:30 > 14:50	Is Taylor Dispersion Analysis really a separation method? The Separation Index response Michel Martin   ESPCI ParisTech, Paris
14:50 > 15:10	Monitoring the degradation of metal-containing ultrasmall nanoparticles in biological fluids using Taylor dispersion Analysis Agnès Hagège   Institut des Sciences Analytiques, Université de Lyon
15:10 > 15:30	Application of Taylor Dispersion Analysis to industrial analytical research Nadia Delon-Anik   Syensqo, Saint Fons
15:30 - 15:50	Taylor dispersion analysis for determining diffusivity and size of gadolinium-based contrast agents Chutintorn Somnin   Université de Montpellier in collaboration with Guerbet
15:50 > 16:00	Conclusions



**HERVÉ COTTET**

Full professor at the Biomolecule Institute in Montpellier (IBMM)

## Principle of Taylor dispersion analysis and current challenges

Prof. Hervé COTTET is full professor at the Biomolecule Institute in Montpellier (IBMM). His research work concentrates at the interface between separation sciences, analytical chemistry, polymers and pharmaceutical sciences, with expertise in Capillary Electrophoresis (CE) and Taylor Dispersion Analysis (TDA). He is both interested in fundamentals and practical (or industrial) applications of CE and TDA. Recent advances include the development of TDA applications (mRNA loaded lipid nanoparticles, biomolecule aggregation, biomolecular interactions, vaccine antigens, MRI contrast agents...) and a better understanding of TDA principles and limitations (adsorption, coatings, limits in size, processing of the Taylorgrams, limit of detection, new detection modes...). He has co-authored more than 150 scientific articles dealing with CE and/or TDA.

<https://ibmm.umontpellier.fr/dsbc/hcottet/index.html>

<https://orcid.org/0000-0002-6876-175X>



**YASMINE SEBTI**

Applications engineer at the Nanoscale Laboratory

## TaylorSizer : High Resolutive size distribution analyzer for UltraSmall NanoObjects (USNO) and more

Yasmine SEBTI is an applications engineer at the Nanoscale Laboratory. She contributes to helping the science of UltraSmall NanoObjects follow in the footsteps of the pioneers of Taylor dispersion! She works on particle size distribution of very small nanoparticles or molecules using cutting-edge Taylor dispersion technology at the crossroads of the worlds of research and industry.

## Taylor dispersion analysis of nanoparticles

Dr. Patricia TALADRIZ-BLANCO obtained her bachelor's degree (2007) and PhD in chemistry (2012) from the University of Vigo, Spain. Dr. Taladriz is an interdisciplinary researcher working in the field of nanoparticle detection in complex environments, with a particular emphasis on nanoplastics. Her other research interests include thermoplasmonics, microfluidics (microdroplets), and bio-nano interactions. Currently, Dr. Taladriz works as a group leader at the Adolphe Merkle Institute (BioNanomaterials group, Fribourg, Switzerland), and her primary research line focuses on the detection of micro- and nanoplastic particles using well-established nanotechniques such as Raman, DLS, NTA, and TDA, among others.

## SANDOR BALOG

Sandor BALOG obtained a PhD in physics from the University of Fribourg (Switzerland) in 2007 based on experimental studies quantifying universal coherent wave-correlations in multiple light scattering. Before joining the Adolphe Merkle Institute at the University of Fribourg in 2012 as a staff scientist, he worked for the Paul Scherrer Institute (neutron scattering), Lausanne's Federal Institute of Technology EPFL, (optical microscopy and spectroscopy on photonic crystal cavities) and CERN (optical methods for the Higgs boson and muons). Since 2012, Sandor's activity has revolved around the theory, practice, and application of scattering, spectroscopy, and microscopy techniques in soft matter research. Taylor dispersion analysis has become a particular interest in the physical characterization of nanoparticles. Sandor's forte is modelin, simulation, and data analysis, benefitting from applied mathematics and, recently, machine learning techniques.



**PATRICIA TALADRIZ-BLANCO**

Bachelor's degree (2007) and PhD in chemistry (2012) from the University of Vigo, Spain



**SANDOR BALOG**

PhD in physics from the University of Fribourg (Switzerland) in 2007



## Evaluation of the physical stability of bevacizumab solutions for intravitreal injections: a comparison of SD-TDA and DLS

Philip CHENNELL is a Pharmacist, Assistant Professor and Hospital Practitioner. He obtained his master's degree in 2012, his PharmD in 2013, and his PhD in 2018. He assumed teaching duties in 2014 at the University d'Auvergne (which became Clermont Auvergne University), and is now member of the research team UMR CNRS 6296 "Materials for Health" at the Institut de Chimie de Clermont Ferrand (ICCF). He is also in charge of the Control and Development laboratory unit of the pharmacy department of Clermont-Ferrand's University Hospital. His current professional interests focus on pharmaceutical preparations (developpement and stability), medical devices and content-container interactions, including how drugs interact with infusion lines, tubings and catheters.

**PHILIP CHENNELL**  
Pharmacist, Assistant Professor and Hospital Practitioner



## Taylor dispersion analysis for a fast and absolute sizing and quality control of Extracellular Vesicles

Sameh OBEID obtained his PhD in Nanobiotechnology from the University of Bourgogne-Franche-Comté in 2017. After his PhD, he held three post-doctoral positions at different institutes where he worked at the interface between biophysics and cell biology. In 2023, he joined the Institut Galien Paris-Saclay (CNRS), at the University of Paris-Saclay, as an associate professor of Biotechnology and Bioanalysis. His current research activities focus on the development of new microfluidic and microscale approaches for the isolation, detection and characterization of Extracellular Vesicles (EVs). He is particularly interested in exploring how the physicochemical properties of the EVs surface impact their functionalities regarding their application as biotherapeutics and nanovectors of therapeutic agents.

**SAMEH OBEID**  
PhD in Nanobiotechnology from the University of Bourgogne-Franche-Comté in 2017.

## Taylor dispersion in the FIDA1 instrument for the study of biomolecular assembly – from amyloid fibrils to liquid-liquid phase separation

Alexander K. BUELL was born in Stuttgart, germany. He studied general and physical chemistry at the University of Tübingen and at Ecole Normale Supérieure, Paris. He obtained a PhD in Biophysics in the Nanoscience Centre at the University of Cambridge, UK under the supervision of Prof. Sir Mark Welland and Prof. Sir Christopher Dobson in 2011. He then held independent research fellowships while working in the Chemistry department of the University of Cambridge in the group of Prof. Tuomas Knowles. In 2015, he moved to the University of Düsseldorf in Germany and took up an assistant professorship. In 2019, Alexander accepted a position as Full Professor of Protein Biophysics at the Technical University of Denmark, DTU. Alexander is the recipient of the 2023 EliteForsk prize of the Danish Ministry of Research and Education and in 2023 he also obtained an ERC consolidator grant.

## Unraveling the aggregation mechanism of amyloid peptides by Taylor Dispersion Analysis

Joseph CHAMIEH (MC HC, 37 publications) earned his PhD in analytical chemistry back in 2009 from the University of Strasbourg in France, under the supervision of Dr. Agnès Hagège. His doctoral research centered on advancing silica monoliths for liquid chromatography. Following his PhD, he embarked on a two-year postdoctoral contract in Lyon, collaborating with Professor Claire Demesmay's team. Here, he focused on the development of an immunoconcentration microsystem employing an organic monolith as a chromatographic support. In 2011, He made his way to Montpellier for a one-year postdoctoral stay in the group led by Professor Hervé Cottet. During this tenure, his work revolved around applying Taylor Dispersion Analysis to monitor the degradation of dendrigraft poly-L-Lysine. Subsequently, he was appointed as an Associate Professor in Professor Cottet's group, where his research concentrates on the application of Taylor dispersion analysis and electrophoretic methods to investigate weak biomolecular interactions.



**ALEXANDER K. BUELL**  
PhD in Biophysics in the Nanoscience Centre at the University of Cambridge, UK



**JOSEPH CHAMIEH**  
PhD in analytical chemistry back in 2009 from the University of Strasbourg in France



**MICHEL MARTIN**

Research Director at CNRS (French National Centre for Scientific Research)

## Is Taylor Dispersion Analysis really a separation method? The Separation Index response

I am an emeritus Research Director at CNRS (French National Centre for Scientific Research). My research activities focus on fundamental physicochemical and hydrodynamic phenomena involved in separation of mixtures of small molecules, macromolecules or particles by various methods (chromatography, field-flow fractionation, capillary electrophoresis, Taylor dispersion analysis). Since the last thirty-five years, they were conducted in the Laboratoire de Physique et Mécanique des Milieux Hétérogènes at ESPCI – Paris.

## Monitoring the degradation of metal-containing ultrasmall nanoparticles in biological fluids using Taylor dispersion Analysis

Agnès HAGÈGE is a researcher of the French National Center of Scientific Research (CNRS). She holds a PhD degree in analytical chemistry from the University of Lyon.

Her research activity focuses on metal/ biological compound interactions and metal-based compounds in biological fluids by means of separation sciences: capillary electrophoresis, affinity capillary electrophoresis, HPLC, IMAC.

She develops particularly the use of capillary electrophoresis and its hyphenation with ICP/MS for monitoring the distribution of metals in biological samples and determining affinity constants.



**AGNÈS HAGÈGE**

Researcher of the French National Center of Scientific Research (CNRS)

## Application of Taylor Dispersion Analysis to industrial analytical research

Nadia DELON-ANIK is an expert in polymer and materials characterization at the Syensqo St Fons (formerly Solvay) Research and Innovation Center.

She holds a PhD in analytical chemistry from the University of Montpellier, under the supervision of Prof. Hervé Cottet. Her thesis work contributed to the development of the capillary electrophoresis technique for characterizing synthetic polymer architectures. Her current research focuses on developing innovative analytical methods for characterizing the multi-scale structure of polymers and materials, and understanding their structure-property relationships.

## Taylor dispersion analysis for determining diffusivity and size of gadolinium-based contrast agents

Chutintorn SOMNIN received her Master's degree in Analytical Chemistry from Mahidol University (Bangkok, Thailand) in 2021. She is now a PhD student at the University of Montpellier under the supervision of Prof. Hervé Cottet and Dr. Joseph Chamieh. Her thesis topic deals with the comparison of different detection modes for the sizing of nano-objects and the study of their interactions with biopolymers using Taylor dispersion analysis and Capillary Electrophoresis.



**NADIA DELON-ANIK**

Expert in polymer and materials characterization at the Syensqo St Fons (formerly Solvay) Research and Innovation Center

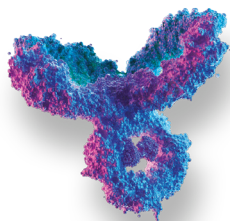


**CHUTINTORN SOMNIN**

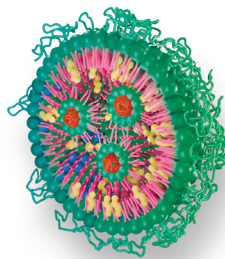
Master's degree in Analytical Chemistry from Mahidol University (Bangkok, Thailand) in 2021

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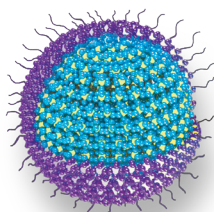
for measuring the size distribution of nanoparticles & nanoobjects on our website



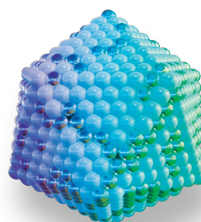
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