



SIMS-24

24th International Conference on Secondary Ion Mass Spectrometry

8-13 September 2024

La Rochelle, France

www.sims-24.com

Mass spectrometry imaging and innovations in spatial biology

Ron M.A Heeren and the whole M4i team

Molecular analytical technologies in the field of spatial biology are rapidly evolving. New innovative technologies improve sensitivity, resolution, content and throughput at an ever increasing speed. Mass spectrometry is also undergoing a revolution in spatial biology. Innovative “omics” & imaging technologies, push the limits of spatial molecular detail acquired. These technologies continue to impact many fields of research. More and more interest is generated for the development of local analytical techniques in single cell metabolism throughout biomedical science for various applications. In this context, SIMS offers exquisite spatial resolution and combined with other techniques in spatial biology offers novel contextual metabolic insights. MALDI complements SIMS with broad molecular coverage but lower spatial resolution down to 1-2 micrometer. New insights in the spatial and molecular complexity of single cell metabolism help us to contextualize cellular function in health and disease. Innovations in mass spectrometry based chemical microscopes have now firmly established themselves in translational molecular research. One key aspect of translational success is the ability to obtain this molecular information on thousands of molecules on a process relevant timescale. Modern mass microscopes can now rapidly acquire images of metabolites, lipids, polymers, peptides and proteins, depending on the spatial resolution chosen. Combined this offers a truly precision multi-omics approach that reveals contextual molecular complexity of cellular phenotypes. This lecture will focus on innovative analytical imaging MS and mass microscopy, for a sensitive and selective study of distribution of molecules in cells and tissue. State-of-the-art MultiModal MS based imaging techniques provide a seemingly endless array of new applications and methods. Combined they will revolutionize the way we deal with spatial biology in the future.