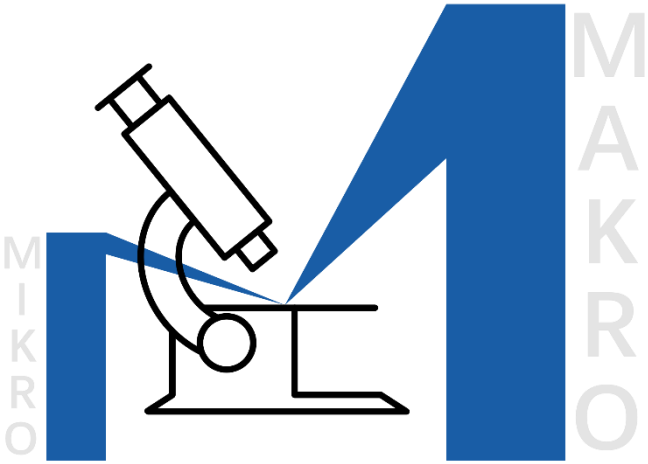
July 21st – 23rd, 2023



Welcome to the jGBM Summer Symposium 2023 in Münster!

We are very happy to welcome you to the beautiful city of Münster to join us at the symposium. During your time here, we will discuss about making objects of all sizes visible and making us visible at our social events.

We will hear about various imaging techniques, as well as their applications and limitations in current research.

Additionally, workshops will complete the portfolio. Their aim is to give you a closer look into a certain imaging technique or into the work of the imaging facilities located in Münster

Breaks and evenings are for getting together and discussing about the things we have learned during the days.

We hope you enjoy the symposium!

The organising Team

Photos & Videos

During the event, photos and videos may be taken, which may be used and published for the public relations of GBM and Junior GBM. A fee will not be paid. Please contact the organizers in advance if you do not want to appear in photos and object to the use.

Content

Program

Friday, July 21st

16:15 - 17:00	Arrival & registration
17:00 - 17:15	Opening remarks
17:15 - 18:00	Prof. Dr. med. Michael Schäfers
From 18:00	Reception Evening in the city centre (Aasee Münster)

Saturday, July 22nd

09:00 - 09:30	Start of the day & coffee
Session 1	
09:30 - 10:15	Prof. Dr. Noelia Alonso Gonzalez
10:15 - 10:45	Prof. Dr. Christian Klämbt
10:50 - 11:20	Prof. Dr. Hartmut Niemann
11:20 - 11:30	SoSym group picture
11:30 - 12:30	Get together & meet the speakers (lunch break)
Session 2	
12:30 - 13:00	Prof. Dr. Roland Wedlich-Söldner
13:00 - 13:30	Dr. Thomas Zobel
13:30 - 14:00	Award of the Working Group "Sustainability"
14:00 - 14:30	Coffee break
14:30 - 17:30	Workshops
From 17:30	Exploring Münster
19:00	Dinner at Cafe & Bar Celona

Sunday, July 23rd

09:30 - 10:00	Start of the day & coffee
Session 3	
10:00 - 10:45	Prof. Dr. Stefan Schulte-Merker
10:45 - 11:15	Prof. Dr. Ulrike Endesfelder
11:20 - 11:50	Prof. Dr. Jürgen Klingauf
11:50 - 12:20	Shirin Kappelhoff (PhD student from Juniorprof. Dr. Katia Cosentino)
12:20 - 12:30	Concluding remarks
From 12:30	Final discussions & Departure

Talk Abstracts

Prof. Dr. med. Michael Schäfers

European Institute for Molecular Imaging, University of Münster

Multiscale Imaging of organ-specific inflammation. A DFG-funded interdisciplinary network at Münster

Inflammation is a common, fast and innate response of the immune system to sterile or infectious tissue damage or autoimmune triggers. It aims at minimising tissue destruction and maintaining organ function, hence is vital to life. Yet, overshooting or chronic inflammation is a frequent severe cofactor in the development of widespread diseases. The last decades have seen significant progress in understanding the principal pathways leading to inflammatory processes. However, organ-specific properties of inflammatory diseases and the local dynamics of innate immune cell action and interactions remain poorly investigated. CRC inSight brings together an interfaculty team of scientists with the aim of understanding the cellular and molecular basis of inflammation in different tissues and in response to different insults through the development of innovative tools and new cellular and molecular in vivo imaging strategies. Through detailed spatial and temporal analyses, we investigate the dynamics and plasticity of distinct immune cell populations. We image their penetration of endothelial barriers, their activation at sites of inflammation, and their contribution to

tissue damage, and hence, generate novel insights into the complex innate immune response to sterile and infectious noxes in whole organisms. Intravital and dynamic visualisation of cellular and molecular processes using high-resolution optical and whole-body imaging are central to our approach. We generate so far unavailable multiscale image data sets through novel methodological strategies that integrate information from imaging modalities across spatial and temporal scales. This involves genetic and chemical biology-based targeting of immune cells and bacteria combined with new versatile labels for visualising the same molecular mechanism using imaging modalities at different scales. A mathematical and computational strategy will be applied to bridge scales, interactively visualize multiscale data sets and for pattern recognition. The methods developed by this CRC will be applied to preclinical inflammatory models mimicking diseases such as heart and kidney infarction, autoimmune disease and infection.

Prof. Dr. Noelia Alonso Gonzalez
Institute for Immunology, University of Münster

Microscopy, macrophages and phagocytosis - small or large, there's something going on in the phagosome

Macrophages are innate immune cells with a high phagocytic capacity that populate most tissues in the body. Besides their immune functions, they contribute to the normal function of the tissue in which they reside in an organ specific manner, influenced by their surrounding microenvironment. The uptake of substances, antigens and dying cells by macrophages has been long considered as a common mechanism among all macrophage subtypes. The visualization of tissue-resident macrophages during phagocytosis is technically challenging and, the evaluation of organ-specific mechanisms of phagocytosis has therefore remained unattainable. In this talk, the diverse imaging strategies employed to elucidate organ-specific phagocytosis by tissue-resident and recruited macrophages will be discussed.

Prof. Dr. Christian Klämbt
Institute of Neuro- and Behavioral Biology, University of Münster

Myelin and ion channel clustering in Drosophila: Insights into the evolution of saltatory conductance

Much of the fundamental knowledge about the development and function of our brain comes from studies on invertebrates. For example, understanding of the generation and transmission of action potentials was gained using the giant axons of the squid. From these early studies, it is known that the conduction velocity of action potentials depends on the axon diameter and the insulation of the axon by glial membranes. The highest conduction velocities are observed in vertebrates. Here, axons have bundled voltage-gated ion channels at the nodes of Ranvier and efficient insulation of the axon by glial myelin membranes. The integrity of myelin and the clustered distribution of ion channels have direct implications for human pathology, such as that observed in patients with multiple sclerosis. I will show that even flies can cluster voltage-gated ion channels along the axonal plasma membrane and, moreover, form myelin-like structures. This not only offers insights into the evolution of this fundamental feature of our brain, but could also provide a new starting point for understanding neurodegenerative diseases such as multiple sclerosis.

Prof. Dr. Hartmut Niemann
Bielefeld University

Substrate recognition by the Yersinia type III secretion system

"Several bacterial pathogens use a type III secretion system (T3SS) to inject effector proteins into eukaryotic host cells. T3SSs are large multi-protein complexes resembling a molecular syringe. Their assembly and function relies on the correctly timed selection of proteins for secretion. So far, little is known about how secreted proteins interact with cytosolic components of a T3SS during this selection process. Using X-ray crystallography, we determined the first structure of a secretion substrate bound to the export gate of the Yersinia enterocolitica T3SS. The talk will discuss the structure determination, the structure itself and its functional implications."

Prof. Dr. Roland Wedlich-Söldner
Institute for Celldynamics and Imaging, University of Münster

The fungal plasma membrane – control of lateral segregation and turnover in a non-fluid mosaic

Saprophytic fungi rely on the uptake of a wide range of organic materials as nutrients and energy source. To achieve this task yeast cells have evolved a large arsenal of membrane transporters that are tightly regulated in their expression, localization and activity. We and others could previously show that the endocytic turnover of several yeast amino acid transporters is blocked by their lateral segregation into a unique invaginated domain of the plasma membrane. We now combined super resolution microscopy and genetic engineering to reveal how a group of tetraspanner proteins prevents the closure of those invaginations into membrane tubes. Interestingly, lateral transporter segregation is relieved by a conformational change during substrate uptake, which in turn allows the transporter to become ubiquitinated, internalized and degraded. I will discuss the role of this dynamic segregation mechanism in the context of wide-spread crystalline membrane assemblies within the yeast plasma membrane and a lack of lateral diffusion for most transmembrane proteins.

Dr. Thomas Zobel
Imaging Network, University of Münster

Münster Imaging Network – Data Acquisition, Analysis & Publication

With about 50 large instruments and almost 500 users, the MÜNSTER IMAGING NETWOrk (MIN) is one of the largest microscopy facilities in Germany. In this talk, the various services of a microscopy facility will be presented using the example of MIN. These services include maintenance and servicing of the microscopes, management of a booking schedule, project meetings and establishment of methods, e.g. super resolution methods such as SMLM. Using research examples, the latest microscopy systems will be presented. Another service of an imaging facility is the assistance in image analysis. Here, the example of new DeepLearning methods is used to show how the MIN makes new techniques in image analysis accessible to the work groups at the University of Münster.

To quantitatively and qualitatively analyze the generated data, high demands are set on the technical infrastructure. In addition, data should be stored according to the FAIR criteria ensuring the data is findable, accessible, interoperable and reusable. To make data FAIR, convenient options for sharing large, original datasets need to be offered. Especially when sharing data, the annotation of the data with meaningful metadata is an essential prerequisite to enable reproduction of results and reuse of the data for new studies. Therefore, I

will also present the work of the new founded NFDI4BioImage (National Research Data Infrastructure (Nationale Forschungsdateninfrastruktur, NFDI)) consortia, which focus on all steps of the research data life cycle for microscopy and bioimage analysis, to support researchers with workable and trusted solutions to handle the ever-increasing amount of bioimage data.

Prof. Dr. Stefan Schulte-Merker
Institute for Cardiovascular Organogenesis and
Regeneration, University of Münster

From zebrafish embryo to human patient: mikro and macro aspects of lymphangiogenesis

The lymphatic vascular system serves vital functions in tissue homeostasis and immune surveillance, but is less well understood than its 'cousin', the blood vasculature. We use zebrafish and mice as model systems to better characterize gene functions and cell activities during development and adult stages, and have in the past identified novel genes in zebrafish embryos that have turned out to be relevant in the human clinic in form of disease-causing orthologues human genes in lymphedema patients. The lecture will demonstrate how imaging over several scales (micro to macro) in zebrafish embryos enables visualization of critical processes during lymphangiogenesis, from behaviour of individual cells to formation of an entire organ system.

Prof. Dr. Ulrike Endesfelder
Institute for Microbiology and Biotechnology, University of Bonn

"Visualizing cellular life: From single cell imaging to in vivo single molecule biochemistry and (micro-)biology"

Microbes as unicellular organisms are important model systems for studying cellular mechanisms and functions. In the last decade, immense progress has been made in our understanding of the life and inner workings of bacteria with the help of modern fluorescence microscopy techniques. By visualising single molecules and the molecular architecture of subcellular structures in living cells, we can now look at bacteria based on their molecular interactions and assemblies with molecular resolution. In particular, we can generate detailed, quantitative, spatially and temporally resolved molecular maps and decipher dynamic heterogeneity and subpopulations at the subcellular level. Here, we will present some examples from our work and give an insight into our visions for the future.

Prof. Dr. Jürgen Klingauf
Institute of Medical Physics and Biophysics, University of Münster

Visualizing single synaptic vesicle exocytosis and endocytosis

Shirin Kappelhoff
Molecular Cell Biophysics, University of Osnabrück

Molecular mechanism of GSDMD membrane permeabilization in pyroptosis

Pyroptosis is a highly inflammatory form of regulated cell death implicated in the host response to pathogen infection, inflammatory diseases and cancer. Pyroptosis is executed by the Gasdermin (GSDM) family of pore-forming proteins. The family member GSDMD is activated upon cleavage by inflammatory caspases which results in the release of functional N-terminal domain from the auto-inhibitory C-terminal domain allowing the translocation to the plasma membrane (PM) and assembly into pores that enable the release of cytokines and promote cell lysis. Understanding the mechanism and regulation of GSDMD pore formation is key to understand the role of GSDMD in modulating the release of inflammatory molecules and cell death.

By combining single-molecule total internal reflection microscopy and stoichiometric brightness analysis of GSDMD oligomers in mimetic membrane systems, we dissected the assembly mechanism of GSDMD and identified important post-translational modifications that regulate pore formation.

To resolve the structure of GSDMD pores at the PM of pyroptotic cells, we combined DNA-PAINT super-resolution microscopy with a newly developed approach, called Polymer-supported plasma membranes (PSPMs). PSPMs are

plasma membrane sheets generated by removing the cell body from cells tethered to a polymer-coated surface. This strategy preserves membrane topography and integrity while removing any cytosolic fluorescence contribution. We resolved nanoscopic GSDMD structures in their native PM environment and revealed the presence of heterogeneous structures in form of rings, arcs and clusters of variable size and stoichiometry with different permeabilization abilities. With this approach, we explored the role of the membrane environment in modulating GSDMD pore formation in cells. Specifically, we observed the conversion of PI(4,5)P2 to PIP3 during pyroptosis. Notably, the increase in PIP3 levels correlated with faster pyroptosis kinetics and the formation of larger ring-shaped structures, indicating a stabilizing effect of PIP3 in the formation of GSDMD pores.

Workshop Abstracts

For registration for a workshop, participants of the symposium will receive an e-mail with a link to a survey. If you did not get an invitation, please contact the organising team.

Münster Imaging Network & Microscopy

Modern microscopy techniques enable amazing views into cells and organisms. But generating an expressive image is often hard and needs advanced methods, good equipment and experience. For these reasons, the Imaging Network Microscopy and the Multiscale Imaging Centre (MIC) provide expertise and microscopes to scientist in Münster and help applying techniques like TIRF, Confocal and Super-Resolution microscopy on current research questions. In this workshop, Dr. Thomas Zobel (Coordinator Imaging Network Microscopy) and his team will give you insights into different microscopy techniques and demonstrate how to produce fascinating images on a microscopic scale.

The workshop will start with a tour through the Multiscale Imaging Centre. Afterwards, small groups of max 5 participants will rotate through three different microscopy techniques.

Meeting Point: Coffee Lab 14:30 hrs

cryo EM facility

You want to take a picture of a molecule? Impossible? Not for cryo EM!

This technique has seen a rapid development during the last decade. After the "resolution revolution" and the Nobel prize in 2017, cryo EM became a powerful and widely used method in structural biology. One of the (currently) best cryo EM microscopes in the world and an Aquilos Cryo FIB (Focused Ion Beam device) were installed in the recently opened EM facility in Münster. With these devices, scientist will take pictures of molecules at atomic resolution and will furthermore establish cryo-electron tomography to enable snapshots of protein, DNA and other macromolecules directly in their native cellular environment. Facility manager Dr. Alexander Neuhaus and the team of Prof. Christos Gatsogiannis will explain the techniques to you and give a guided tour to the facility.

Meeting Point: Registration Desk 14:30 hrs

How-To-Postdoc?

The GBM Working Group of Young Investigators introduces itself to you and invites, in an open panel discussion, to an informal exchange about the subsequent steps of a scientific career, with a focus on the time after the PhD. From our current perspective of young group leaders, we will offer personal experiences and tips based on different career paths for interested participants. We will certainly address the classic questions, e.g. on deciding for or against one or more postdoctoral stays and the first group leader position, as well as current topics around one's own expectations, external requirements and general challenges such as work-life balance, career and family, funding and the relevance of lab stays abroad. In this discussion, three YI representatives will be happy to answer your questions arising during the discussion.

Meeting Point: Seminar Room 100.017 14:30 hrs

Many thanks to our supporters!

biomol

NEW ENGLAND BioLabs GmbH

be INSPIRED | drive DISCOVERY | stay GENUINE

CELLS IN MOTION
Interfaculty Centre

FINNE
-Bio Craft Beer-

Dergute Bäcker | H.Krimphove

The organising team:

René, Sonja, Maria, Wiebke, Saskia

Contact: sommersymposium@junior-gbm.de

If you have any problems or concerns, send us an E-Mail or directly talk to us or one of our helpers!

Map of Münster