Full Programme

Time	Event	Title
9:00 - 9:30	Coffee Break	
9:30 - 10:15	Mehran Ahmadlou	A subcortical switchboard for perseverative, exploratory and disengaged states
10:15 - 11:00	Bart de Strooper	Identifying the Five Key Transitions in Alzheimer's Disease Progression
11:00 - 11:30	Water Break	
11:30 - 11:50	Courtney Lancaster	Regulating the basal surface in epithelial morphogenesis
11:50 - 12:10	Hayden Johnson	Inferring response time from brain-like VAE encoding
12:10 - 12:30	Zimeng Wu	Understanding the mechanochemical dynamics of collective cell behaviours
12:30 - 12:50	Matthias Loidolt	All-optical interrogation of internal states modulating hunting decisions
12:50 - 14:30	Lunch Break	
14:30 - 14:50	Tessa Robberechts	Dissecting the compartment-specific role of the RNA-binding protein FUS in health and ALS
14:50 - 15:10	Tinya Chang	The inputs to layer 5 of the visual cortex
15:10 - 15:30	Mihaela Gerova	Multi-modal sensory selection in mice
15:30 - 15:50	Jacqueline van Vierbergen	Aβ plaques induce local pre-synaptic toxicity in human iPSC-derived neuron xenografts
16:00 - 16:15	Water Break	
16:15 - 17:00	Science Speed Dating	
17:00 - 18:30	Free Time	
18:30 - 21:00	Dinner	Restaurant Mykene

9:00 - 9:30	Coffee Break	
9:30 - 10:15	Colinda Scheele	Natural tissue remodeling as trigger for tumor initiation?
10:15 - 11:00	Emre Yaksi	Searching for Evolutionary Traces of Vertebrate Thalamo-Cortical Systems
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14:30 - 15:30	Nastya Krouglova	Design principles with Figma: The Good, the bad and the ugly
15:30 - 17:00	Poster Session	
17:00 - 18:30	Pizza	
18:30 - 20:00	Free Time	
20:00 - onwards	Drinks	Oude Markt

Daily Programme

Thursday – 21st of August

Time	Event	Title
9:00 - 9:30	Coffee Break	
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18:30 - 21:00	Dinner	Restaurant Mykene

See page 9 for Friday, 22nd of August

21/08/2025 – 09:30

PLACE HOLDER TITLE

Abstract:
As the world is always changing, animals and humans must adapt their goals, choosing one of three strategies: sticking with what they're doing, trying something new, or giving up altogether. Yet how the brain controls these fundamental strategies remains poorly understood. We discovered that a small brainstem region - the median raphe nucleus - acts like a "strategy switchboard". It contains three types of neurons: GABAergic neurons regulate persistence, specific glutamatergic neurons drive exploration, and the serotonergic neurons keep the animal disengaged from the task. By optogenetically turning these neurons on or off, we could make mice repeat, explore, or quit behaviours. Inputs from brain regions with positive and negative valence into this switchboard guide these choices. These results open a new window into the brain mechanisms that guide behavioural flexibility, and their disruption may contribute to major depressive disorder, obsessive–compulsive disorder, autism, attention-deficit/hyperactivity disorder, and other conditions marked by impaired flexibility.

Speaker:
Mehran Ahmadlou

21/08/2025 – 10:15

IDENTIFYING THE FIVE KEY TRANSITIONS IN ALZHEIMER'S DISEASE PROGRESSION

Abstract:
Alzheimer's disease (AD) is a common and complex neurodegenerative disorder that presents a growing public health challenge. Despite progress in the development of diagnostic biomarkers and therapeutic strategies, the pathogenesis of AD remains only partially understood. A major difficulty lies in integrating its various pathological hallmarks—including amyloid plaques, tau pathology, glial activation, and neuronal loss—into a coherent disease model. Aging, the principal risk factor, is thought to influence the emergence and timing of key transitions during disease progression. The earliest of these involves the gradual accumulation of amyloid-β (Aβ) plaques, which coincides with early cellular responses, particularly among microglia. In this phase, brain homeostasis is generally preserved, and clinical symptoms are absent. Over time, additional alterations emerge in astrocytes, oligodendrocytes, vascular cells, and synapses. The appearance and spreading of pathological tau and the formation of neurofibrillary tangles typically follow in a second stage, which is closely linked to cognitive decline. A third stage involves cell death mechanisms such as necroptosis, granulovacuolar degeneration, and eventual neuronal loss. This sequence culminates in the breakdown of functional networks, associated with clinical dementia. I will present data from our research that supports this model for the disease.

Speaker:
Bart de Strooper

21/08/2025 – 11:30

REGULATING THE BASAL SURFACE IN EPITHELIAL MORPHOGENESIS

Abstract:
Epithelial tissues acquire their shape and function through tightly coordinated changes in cell polarity, adhesion, and cytoskeletal dynamics. While apical domain regulation has been extensively studied, the basal surface—where cells attach to the extracellular matrix (ECM)—plays an equally critical but less understood role in morphogenesis. This talk explores the mechanisms by which the basal surface contributes to epithelial cell and tissue shape, focussing on ECM and cell-ECM adhesion remodelling which coordinates cell shape changes across a tissue surface. Drawing on recent findings from Drosophila retinal development, I will highlight how spatially patterned ECM cues guide basal surface remodelling, contributing to the emergence of complex epithelial forms.

Speaker:
Courtney Lancaster

21/08/2025 – 11:50

Inferring response time from brain-like VAE encoding

Abstract:
Significant progress has been made in developing computational models capable of replicating the behavioral accuracy observed in primate perceptual decision-making. However, fewer efforts have focused on modeling the rich temporal dynamics underpinning the decision-making process, specifically reflected in response times. While existing frameworks such as drift diffusion models effectively capture response time distributions, and neural state-space models describe underlying neural dynamics, limited work has attempted to develop integrated, task-trained models capable of simultaneously accounting for choices, response times, and neural spiking activity.

As a step in this direction, this project proposes the creation of a task-trained evidence accumulation model designed to perform perceptual discrimination tasks with behaviorally realistic response times. We will leverage latent representations learned through Poisson variational autoencoders [1] to encode visual stimuli into a population of rate-coded neurons, modeled as a set of homogenous Poisson processes. Subsequently, we will train an approximate Bayesian decoder, continually updating a posterior distribution over actions conditioned on observed neural spiking activity. Decision timing and choice selection will be determined by monitoring the entropy of this posterior distribution throughout the spike train, triggering a response when entropy falls below a predetermined stopping threshold [2, 3].

Speaker:
Hayden Johnson

21/08/2025 – 12:10

UNDERSTANDING THE MECHANOCHEMICAL DYNAMICS OF COLLECTIVE CELL BEHAVIOURS

Abstract:
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Speaker:
Zimeng Wu

21/08/2025 – 12:30

All-optical interrogation of internal states modulating hunting decisions

Abstract:
To make the right decisions, animals need to combine information about the external world and their internal state, but how this is accomplished by neural circuits remains elusive. Even though ascending neuromodulatory systems have long been posited to encode such internal states and control the dynamical regime of neural circuits through brain-wide projections, their anatomy makes cellular-level interrogation challenging. Zebrafish larvae are a powerful model to address these challenges because their small, optically transparent brains allow for single-cell imaging and optogenetics throughout entire circuits, during behaviour.

We are studying sensorimotor decision-making in the context of hunting, which is an innate visually guided behaviour in zebrafish larvae. Our previous work has identified a pretectal hunting command center that controls hunting routines, and anatomical data indicates that command neurons receive both visual (sensory) and neuromodulatory (presumed internal state related) inputs. To reveal how these distinct afferent inputs are integrated by command circuits, we study the impact of pharmacological manipulations on hunting behaviour in freely moving larvae, and combine two-photon imaging and holographic optogenetics in the context of a virtual hunting assay.

Speaker:
Matthias Loidolt

21/08/2025 – 14:30

Dissecting the compartment-specific role of the RNA-binding protein FUS in health and ALS

Abstract:
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Speaker:
Tessa Robberechts

21/08/2025 – 14:50

THE INPUTS TO LAYER 5 OF THE VISUAL CORTEX

Abstract:
Understanding how a neuron's functional responses arise from synaptic inputs requires precise mapping of its presynaptic partners. We combined intersectional, ultra-sparse viral labelling with optical ablation to achieve retrograde rabies labelling from isolated, genetically defined neurons in cortical Layer 5. Whole-brain volumetric imaging using serial two-photon microscopy revealed labelling of both local and long-range input neurons, including those from thalamic nuclei and the frontal cortex. Combined with in vivo functional imaging, this novel tool allows direct investigation of how presynaptic ensemble activity shapes postsynaptic tuning.

Speaker:
Tinya Chang
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21/08/2025 – 15:10

Multi-modal sensory selection in mice

Abstract:
Sensory selection is a crucial process, which depends on learning and attentional mechanisms, and is disturbed in a number of neurodivergent disorders. Previous studies covering a limited set of brain areas, demonstrate altered neural responses with learning and attention. However, how motivation and behavioral components lead to the observed changes in neural responses is poorly understood.

Speaker:
Mihaela Gerova

21/08/2025 – 15:30

Aβ plaques induce local pre-synaptic toxicity in human iPSC-derived neuron xenografts

Abstract:
Xenotransplantation enables the interrogation of human neuron-specific vulnerabilities to Alzheimer's pathology within a physiologically relevant in vivo context. While Amyloid-beta (Aβ) is known to disrupt synaptic integrity, it remains uncertain whether the synaptotoxicity observed in vitro accurately models the disease. Here, we establish a xenotransplantation paradigm in which human neurons integrate into the brains of APP-transgenic mice that develop amyloid plaques. Using a genetically encoded presynaptic reporter, we label human pre-synapses post-engraftment to assess early-stage pathology. We demonstrate that extracellular Aβ plaques induce localized synaptic damage in human neurons, characterized by local pre-synaptic loss and the formation of dystrophic neurites. Notably, this pathology is restricted to the plaque microenvironment and does not result in widespread pre-synaptic degeneration. Our findings establish this human-mouse chimera model as a platform for dissecting Aβ-induced synaptic pathology and reveal that extracellular Aβ exerts a compartmentalized yet impactful toxicity on human pre-synapses.

Speaker:
Jacqueline van Vierbergen

Programme

Friday – 22nd of August

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9:00 - 9:30	Coffee Break	
9:30 - 10:15	Colinda Scheele	Natural tissue remodeling as trigger for tumor initiation?
10:15 - 11:00	Emre Yaksi	Searching for Evolutionary Traces of Vertebrate Thalamo-Cortical Systems in the Zebrafish Brain
11:00 - 11:30	Water Break	
11:30 - 11:50	Şakir Kaan Çetindağ	Stimulus-specific contributions of cortical and collicular pathways to visual feature detection
11:50 - 12:10	Zhexing Ge	Astrocyte Transcriptomic and Morphological Changes in mouse models of DYT1-TOR1A Dystonia
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18:30 - 20:00	Free Time	
20:00 - onwards	Drinks	Oude Markt

22/08/2025 – 09:30

PLACE HOLDER TITLE

Abstract:
Oncogenic clones frequently emerge in normal tissues as we age, progressively colonizing their host tissues for decades while remaining fully functional. This suggests that tissues possess a remarkable capacity to manage the presence of mutant cells while maintaining functional and morphological normalcy.

This phenomenon is particularly surprising in heavily remodeled tissues, such as the mammary gland, where oncogenic clones are effectively kept in check. The mammary epithelium is dynamically remodeled throughout the different stages of reproduction, which include consecutive estrous cycles, pregnancy, lactation, and involution. Using genetically engineered mouse models combined with lineage tracing and intravital microscopy, we investigated how these different reproductive stages influence the fate and behavior of cells carrying oncogenic mutations, and how these life events could therefore influence breast cancer risk.

After sporadic induction of different oncogenes, coupled to fluorophore expression, we identified intrinsic tissue-resistance mechanisms against oncogenic transformation at the cell and tissue level. By coupling these cellular dynamics with live recordings of pathway activity using signaling reporters and timed single-cell transcriptomics, we further elucidated the molecular pathways driving this tissue-intrinsic resistance to oncogenic transformation.

Speaker:
Colinda Scheele

22/08/2025 – 10:15

SEARCHING FOR EVOLUTIONARY TRACES OF VERTEBRATE THALAMO-CORTICAL SYSTEMS IN THE ZEBRAFISH BRAIN

Abstract:
In vertebrates, cortical regions are defined by distinct thalamic innervations that convey sensory and cortico-thalamic information. The zebrafish telencephalon, regarded as an ancestral homolog of the vertebrate cortex, supports complex behaviors such as navigation and social interactions. However, how the zebrafish telencephalon receives and processes sensory information and how these processes compare to other vertebrate cortices remain unclear.

Using anatomical tracing, electrophysiological circuit mapping, calcium imaging, and comparative transcriptomics, we characterized thalamo-cortical systems in zebrafish. Our findings revealed that the preglomerular nucleus (PG) serves as the primary source of visual and auditory inputs to the telencephalon. We demonstrated that PG neurons and their axonal projections within the telencephalon exhibit topographically organized, sensory-specific responses. Instead, the sensory responses of telencephalic neurons display multiple layers of topographically organized hierarchies, ranging from simple sensory-specific responses to multimodal and coincidence-detecting nonlinear responses. Notably, we observed a progressive increase in the complexity of sensory computations within the telencephalon, topographically organized into distinct nuclei from posterior to anterior regions. By mapping these individual nuclei to distinct cortico-limbic cell types in other vertebrates, we identified zebrafish telencephalic neurons homologous to the vertebrate neocortex at the top of the sensory computation hierarchy. Our ongoing research is now focusing on elucidating the role of these neocortex-like neurons in relaying telencephalic computations to other brain regions.

Speaker:
Emre Yakşi

22/08/2025 – 11:30

Stimulus-specific contributions of cortical and collicular pathways to visual feature detection

Abstract:
Our ability to see and interact with the world heavily relies on the efficient and precise processing of visual information, consisting of multiple features continuously in flux. Visual perception arises from signals propagating through parallel neuronal pathways wiring the retina to both cortical (primary visual cortex(V1); higher visual areas(HVAs)) and subcortical structures (thalamus; superior colliculus(SC)), each with distinct functional properties and cellular compositions. However, the precise distribution of behaviorally relevant visual signals across these pathways remains unclear, as probing the entire visual system poses significant challenges. To address this, we combined a visual detection task in mice with mesoscopic optogenetic suppression of cortical activity using patterned-light activation of parvalbumin-positive (PV+) neurons. This allowed us to probe visual stimuli of varying contrast, speed, and spatial frequency, reflecting the diverse visual stimuli encountered in natural environments. Suppressing V1 or HVA activity during low-contrast stimuli and presentation decreased detection rates and increased reaction times, which is consistent with reduced sensory evidence. The effects also persisted when targeting individual HVAs, suggesting widely distributed representations. At high contrast, the impact of suppression depended on stimulus speed and spatial frequency, with pronounced effects observed for slow-moving, high-spatial frequency stimuli and minor effects for fast-moving, low-spatial frequency stimuli. Furthermore, chemogenetically inhibiting the superficial SC in addition to cortical optogenetic inhibition impaired the detection of fast-moving, low-spatial frequency stimuli even in high contrasts. Our results demonstrate the broad distribution of behaviorally relevant visual information and that both cortical and subcortical pathways contribute dynamically to visual perception, while showcasing the potential of spatially targeted optogenetics.

Speaker:
Şakir Kaan Çetindağ

22/08/2025 – 11:50

Astrocyte Transcriptomic and Morphological Changes in mouse models of DYT1-TOR1A Dystonia

Abstract:
Astrocytes play important roles in maintaining circuit homeostasis in the CNS. Histological findings of gliosis were reported in post-mortem brain tissue of patients with genetic forms of dystonia and in mouse models of dystonia, suggesting that astrocytes are implicated in the disease progression. Yet, changes in astrocyte transcriptomic signature and protein expression remain unexplored but is paramount in determining their contribution to the pathophysiology of dystonia.

To study astrocyte changes during the progression of DYT1-TOR1A dystonia, we used a novel mouse model with spinal restricted conditional knock-out (cKO) of Tor1a and a constitutive Tor1a knock-out model, both with characterised motor and circuit dysfunction. Bulk-sequencing of p7 and p18 Tor1a-cKO homozygotes revealed differential regulation in astrocyte enriched genes with upregulation of Gfap, Cd44, Aqp4, and downregulation of Kcnj10 and Slc12a2. Histology showed spatially heterogeneous changes in gross astrocyte morphology with increasing GFAP expression in the gray matter. In contrast, in p1 homozygotes and non-dystonic heterozygotes, astrocytes remain unaffected.

Speaker:
Zhexing Ge

22/08/2025 – 12:10

REGULAR HEALTH CHECK-UPS OF A TWO-PHOTON MICROSCOPE

Abstract:
Two-photon microscopy is a powerful method to monitor the activity of cells and molecules deep within the tissue in vivo. In this talk, I will present how one can build a custom two-photon microscope and quantify its performance.

Speaker:
Sumiya Kuroda

22/08/2025 – 12:30

DECODING BEHAVIOURAL REPRESENTATIONS ACROSS THE DENDRITIC TREE

Abstract:
Neurons integrate a plethora of information streams across their dendritic trees. It thought that different domains of the dendritic tree integrate individual streams of information, such as behavioural variables. However, so far it is not known to what degree information across whole dendritic tree is representative of behaviours. To that end, we have used random access 3D 2-photon imaging to record whole dendritic trees across days and relate their modulation to behaviouras. We find that information in the dendritic tree is broadly tuned and more informative than the soma. Furthermore, we find that the dendritic activity patterns are stable but fluctuating across days.

Speaker:
Friedrich Kling

22/08/2025 – 14:30

Design principles with Figma: The Good, the bad and the ugly

Abstract:
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Speaker:
Nastya Krouglova