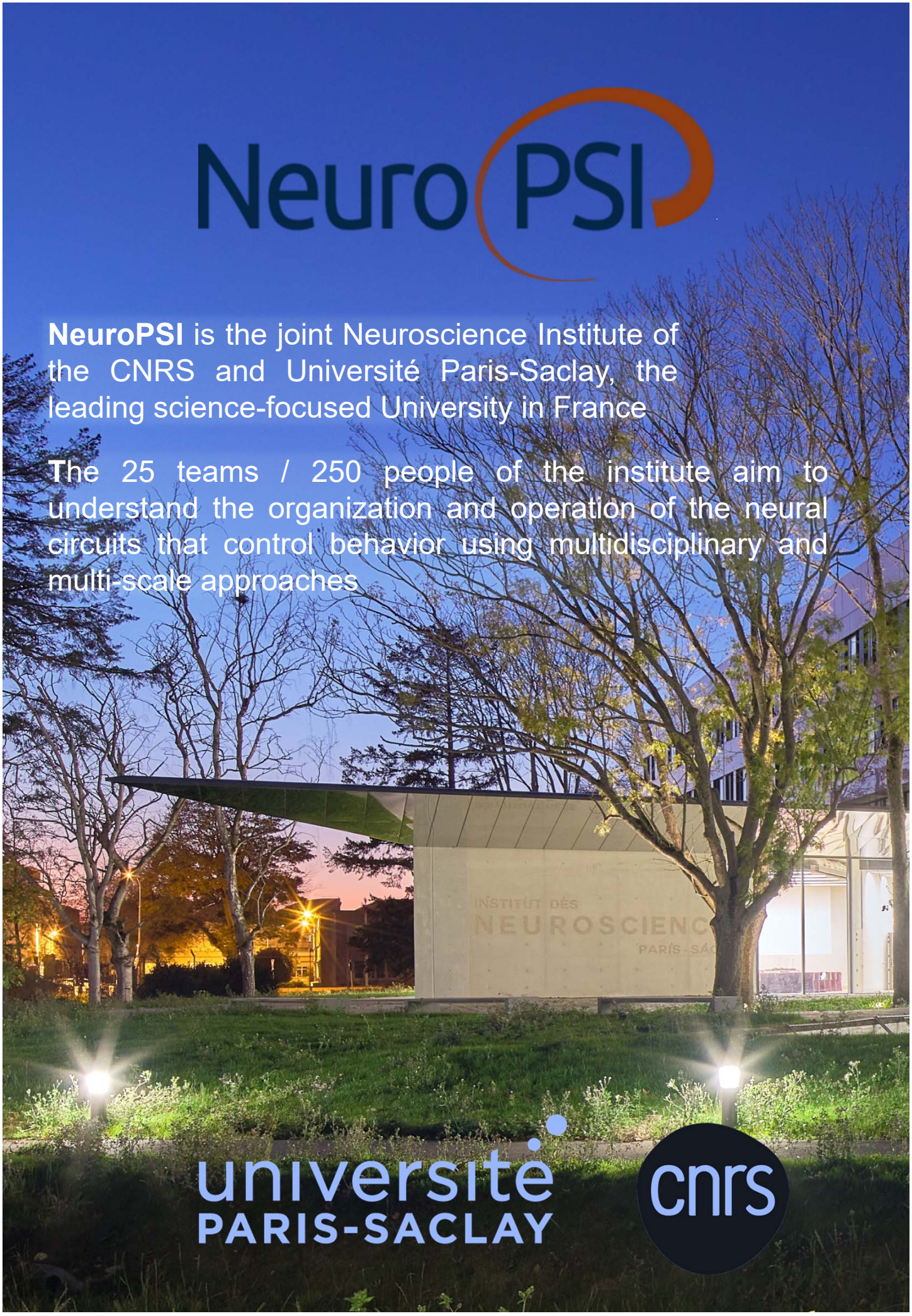
Program & Abstracts Book

SOCIAL COGNITION, DECISION MAKING & COMMUNICATION

Integrating Neuroscience and Artificial Intelligence

May 19-20, 2025

Saclay, France


NeuroPSI
NeuroPSI is the joint Neuroscience Institute of the CNRS and Université Paris-Saclay, the leading science-focused University in France
The 25 teams / 250 people of the institute aim to understand the organization and operation of the neural circuits that control behavior using multidisciplinary and multi-scale approaches
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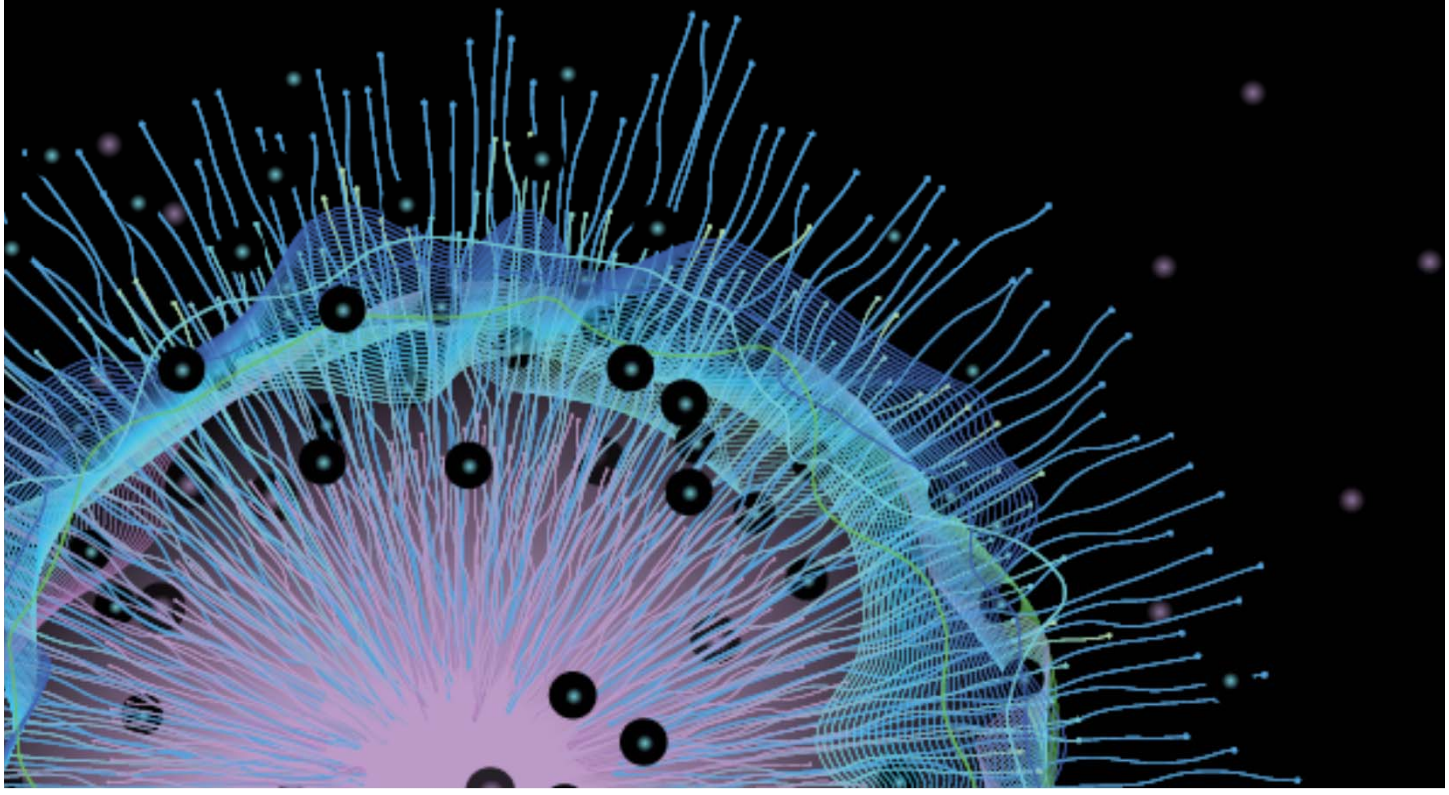


Program

Starts at	Duration	Day 1 Monday May 19 - SOCIAL COGNITION AND ADAPTIVE BEHAVIOR		
09:15	00:05		François Rouyer	Welcome to NeuroPSI
09:20	00:10		Yan Li	The Chen Institute
09:30	00:45	**Session 1** Social cognition and emotion *Chair: Cyrille Vaillend*	Christian KEYSERS	A cross-species approach to the neural bases of empathy and prosociality.
10:15	00:45		Ewelina KNAPSKA	Emotional echoes: how negative and positive emotions of others shape environmental adaptation.
11:00	00:30		Coffee break	
11:30	00:45		Jacqueline CLAUSS	Mapping Fear Generalization as Risk for Psychiatric Disease.
12:15	00:45		Marion RIVALAN Diane PICARD	Short talk: Mouse aggression and socialization in the home cage: a role for central serotonin Short talk: Effects of smile impairment in facial emotion perception
13:00	02:00	Lunch + posters		
15:00	00:45	**Session 2** Social decision-making *Chair: Nastasia Mirofle*	Sylvie GRANON	Interplay between social and non social decision-making.
15:45	00:45		Diego SCHEGGIA	Neural circuits for social decision-making.
16:30	00:30		Coffee break	
17:00	00:25		Marwen BELKAID	Short talk: Subjective valuation from individual decision-making to joint action
17:25	00:45		Lola CAÑAMERO	Emotion, Social Cognition, Decision Making and Communication: Where Can Robots and Neuroscience Meet?
18:10	00:50	Posters		
19:00	03:00	Dinner at Golf de Marivaux, Janvry 19:30 *Bus service leaves NeuroPSI at 19:00* *Return bus at 23:00 to Paris Porte d'Orléans and Le Guichet RER station*		

Starts at	Duration	Day 2 Tuesday May 20 - COMMUNICATION & LANGUAGE		
09:30	00:45	**Session 3** Language *Chair: Christophe Pallier*	Simon TOWNSEND	Evolution of syntax: insights from great ape communication.
10:15	00:45		Adrien MEGUERDITCHIAN	The origins of human language: Insight from neuroethology of gestural communication in nonhuman primate.
11:00	00:30		Coffee break	
11:30	00:45		Jean-Rémi KING	Towards a neural code for language.
12:15	00:45		Tadeusz KONONOWICZ Alexandra MARTIN	Short talk: Spatio-temporal dynamics of in group interactions in macaques Short talk: Is the mouse auditory cortex necessary for discriminating communication sounds in noise?
13:00	02:00	Lunch + posters		
15:00	00:45	**Session 4** Social communication *Chair: Nicolas Giret*	Isabelle CHARRIER	Onset of individual vocal recognition in Pinnipeds.
15:45	00:45		Richard HAHNLOSER	Algorithm of birdsong learning.
16:30	00:30		Coffee break	
17:00	00:25		Arthur LEFEVRE	Short talk:Primate ACC encodes the cocktail party effect during natural communication
17:25	00:45		Jan CLEMENS	Uncovering the secret social live of fruit flies with computational tools.
18:10	00:10	Cyrille VAILLEND Concluding remarks of the Organizing Committee		

About our Invited Speakers

Lola Cañamero

Lola Cañamero is Full Professor and INEX Chair of Neuroscience and Robotics at CY Cergy Paris University, which she joined as a member of the ETIS Lab (UMR8051) in September 2020, after having spent 20 years at the University of Hertfordshire in the UK. She holds an undergraduate degree ("Licenciatura") in Philosophy from the Complutense University of Madrid, Spain, and a PhD in Computer Science (Artificial Intelligence) from the University of Paris-XI, France. She turned to Embodied AI and robotics as a postdoctoral fellow in the groups of Rodney Brooks at MIT (USA) and of Luc Steels at the VUB (Belgium). Since 1995, her research has investigated the interactions between motivation, emotion and embodied cognition and (inter-)action from the perspectives of adaptation, development and evolution, using autonomous and social robots and artificial life simulations. She has played a pioneering role in nurturing the emotion modeling community. She is author or co-author of over 150 peer-reviewed publications in the above topics.

Isabelle Charrier

Isabelle Charrier is a CNRS Director of Researcher at the Paris Saclay Institute of Neuroscience.
She is an internationally renowned researcher mostly focused on the study of vocal communication system and social structure in pinnipeds.
All her work is conducted on free-ranging wild animals by performing behavioural experiments in the field in an uni- and multi-modal context.

Jacqueline Clauss

Dr. Jacqueline (Jacci) Clauss is an Assistant Professor and a child, adolescent, and adult psychiatrist at the Maryland Psychiatric Research Center, Department of Psychiatry, University of Maryland Medical School and a staff psychiatrist at Massachusetts General Hospital (MGH). She earned a BA in Neuroscience from Johns Hopkins University, a PhD in Neuroscience at Vanderbilt University in the laboratory of Dr. Jennifer Blackford, and an MD at Vanderbilt University School of Medicine. She completed her adult, child, and adolescent psychiatry clinical training at MGH and McLean Hospital. She is the Chen Institute Transformative Scholar in Neuroscience at MGH. Her research focuses on using structural and functional MRI to identify trajectories of risk and resilience among individuals with early psychotic symptoms

Jan Clemens

2002-2007 Studies of Biology at Humboldt-University in Berlin, Germany
2007-2012 Phd in Computational Neuroscience at the Bernstein Center for Computational Neuroscience in Berlin, Germany
2012-2017 Postdoc with Mala Murthy at the Princeton Neuroscience Institute, USA
2017-2023 Independent Junior Group Leader at the European Neuroscience Institute in Göttingen, Germany
since 2023 Professor of Auditory Neuroscience at the Dept. of Neuroscience, Oldenburg University, Germany

Sylvie Granon

After a PhD in Marseille in 1995, a first postdoc in Cambridge and a second postdoc in the Pasteur institute in Paris, **S. Granon** obtained a tenure position in the Pasteur institute in 2001 followed by a professorship position in Paris Sud university (now Paris-Saclay) in 2008 to establish her own team. The research of her team is dedicated to the understanding of the neural and neurochemical bases of decision-making thanks to the design of novel behavioral tasks in mice. In particular, she designed social tasks and a Mouse Gambling Task which allows the manipulation of probabilistic reward delivery. With her team, she unraveled individual strategies and showed that they rely on individual levels of regional brain monoamines and on the interplay between the prefrontal cortex, the reward system and limbic circuits. The team now investigates how manipulations of these circuits by exposure to various environmental factors (social environment, sleep restriction, stress or specific food rewards) can trigger, shape or reshape, at different ages of life, individual decision-making strategies.

Richard Hahnloser

Prof. Richard Hahnloser is a Full Professor at the University of Zurich and ETH Zurich. He co-directs the Institute of Neuroinformatics. He leads a songbird research group since 2003. His research focuses on neuroscience, computational modeling, and birdsong learning. He serves on the Steering Committee of the NCCR Evolving Language and is the creator of VoCallBase https://vocallbase.evolvinglanguage.ch/. He is also interested in natural language processing and has developed tools such as https://endoc.ethz.ch/ to assist with scientific discovery.

Christian Keysers

Prof. Dr. Christian Keysers is a social neuroscientist at the Netherlands Institute for Neuroscience, and full professor for Social Neuroscience at the University of Amsterdam. His work combines rodent and human studies to understand how the brain makes us empathic and prosocial. His work was cited >39'000 times. He is an ERC laureate, member of the Academia Europaea, Fellow of the Association for Psychological Science and authored of the award-winning book The Empathic Brain.

Jean-Rémi King

I am a CNRS researcher at École Normale Supérieure currently detached to Meta AI, where I lead the Brain & AI team. This team aims to identify the brain and computational bases of human intelligence, with a focus on language. For this, we develop deep learning algorithms to decode and model brain activity recorded with MEG, EEG, electrophysiology and fMRI.

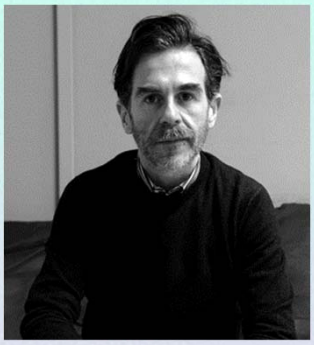
Ewelina Knapska

Prof. Ewelina Knapska is a neuroscientist specializing in the neural mechanisms of social behavior and emotions. She leads a research group at the Nencki Institute of Experimental Biology in Warsaw, where she investigates empathy-like behaviors, social learning, and neuroplasticity. Prof. Knapska has served as Vice President of the Centre of Excellence for Neural Plasticity and Brain Disorders (BRAINCITY). She is the current president of the European Brain and Behaviour Society (EBBS) and an advocate for science outreach and diversity in research.

Adrien Meguerditchian

CNRS Researcher, Primatologist, at the Center of Recherche in Psychology & Neurosciences (CRPN, CNRS/Univ Aix-Marseille) in team DePhy (Development & Phylogeny)
Research on the communicative gestural system of nonhuman primates and its cerebral specialization within a comparative approach with human language
Lecturer in comparative cognition, comparative neuropsychology and ethology at the CNRS, INSERM, ISRP, Université Aix-Marseille, Université Lumière Lyon 2, Université Toulouse III Paul Sabatier, and l'Université Paris Sorbonne.
Laureat : Fyssen Foundation, ANR 2012, ERC Starting 2016, Prix Paoletti CNRS 2017, Médaille de Bronze CNRS 2021, ANR 2023

Diego Scheggia



Born and raised in the rolling hills of Marche, Italy, Diego Scheggia moved to Parma where he completed his undergraduate studies in Biological Sciences. As part of his undergraduate program, he studied at the University of Groningen in The Netherlands, where he developed a strong interest in neuroscience and psychology. His growing fascination with the influence of genetics on behavior led him to pursue doctoral studies in neuroscience. In 2013, he obtained his Ph.D. from the Italian Institute of Technology in Genoa under the supervision of Francesco Papaleo. Following his doctoral studies, he joined the Center for Psychiatric Neuroscience at CHUV Hospital in Lausanne, Switzerland, in 2014 as a postdoctoral researcher under the mentorship of Ron Stoop. During this period, his research focused on investigating the role of the basolateral amygdala in emotion-driven decision-making processes.

After a short time as senior researcher at the Italian Institute of Technology, Diego Scheggia was appointed Assistant Professor on tenure track at the Department of Pharmacological and Biomolecular Sciences, University of Milan, in 2020. His current research focuses on understanding the fundamental mechanisms that govern social behavior and decision-making processes. He serves as a member of the Ethical Review Board for Animal Welfare and is also a former Veronesi and MSCA fellow, and Cariplo Independent Investigator.

Simon Townsend

I received my bachelors in Biological Sciences from the University of Oxford in 2005. I then moved to Scotland to conduct my PhD with Klaus Zuberbuhler in the School of Psychology at the University of St Andrews. The focus of my research was on the vocal communication skills of wild chimpanzees in the Budongo Forest, Uganda. In 2008 I took up a post-doc position with Marta Manser at the University of Zurich to work on meerkat vocal communication and cognition at the Kalahari Meerkat Project in South Africa. In 2015, I returned to the UK as an Assistant Professor in Language and Learning, in the Department of Psychology, University of Warwick. I remain an Associate Professor at the University of Warwick but in 2017 accepted a Swiss National Science Foundation-funded Professorship in the Department of Comparative Linguistics, University of Zurich. In 2023 I was promoted to Associate Professor in the Department of Evolutionary Anthropology, UZH where my Comparative Communication and Cognition group is now based.

Abstracts of selected short talks

Monday, May 19th

Marion Rivalan1,2,3, Lucille Alonso1,2,4, Patrik Bey1,5, York Winter1,2, Natalia Alenina6

Mouse aggression and socialization in the home cage: a role for central serotonin

[1] *:Charité – Universitätsmedizin Berlin, Germany*
[2] *:Humboldt University Institute of Biology, Berlin, Germany*
[3] *:Institute of Neuroscience Paris-Saclay, CNRS UMR9197 France*
[4] *:University of Bordeaux,France*
[5] *:Berlin Institute of Health at Charité, Berlin, Germany*
[6] *:Max Delbrück Center, Berlin, germany*

Among social behaviours eliciting emotions, aggression is one important adaptive social behavior for the survival of the individual but also the stability and prosperity of social groups. When uncontrolled, aggression leads to pathological violence that disrupts group structure and individual wellbeing. The comorbidity of uncontrolled aggression across different psychopathologies makes it a potential endophenotype of mental disorders with the same neurobiological substrates. Serotonin plays a critical role in regulating impulsive and aggressive behaviors. Mice lacking in brain serotonin, due to the ablation of tryptophan hydroxylase 2 (TPH2), the rate-limiting enzyme in serotonin synthesis, could serve as a potential model for studying pathological aggression. Automated Home cage monitoring allows for the continuous observation and quantification of social and non-social behaviors in group-housed, freely-moving mice. Using an ethological approach, we investigated the impact of central serotonin ablation on the everyday expression of social and non-social behaviors and their correlations in undisturbed, group-living Tph2-deficient and wildtype mice. By training a machine learning algorithm on behavioral time series, "allogrooming", "struggling at feeder", and "eating" emerged as key behaviors dissociating one genotype from the other. Although Tph2-deficient mice exhibited characteristics of pathological aggression and reduced communication compared to wildtype animals, they still demonstrated affiliative huddle behaviors to normal levels. Altogether, such a distinct and dynamic phenotype of Tph2-deficient mice influenced the group's structure and the subsequent development of its hierarchical organization. These aspects were analyzed using social network analysis and the Glicko rating methods. The short talk I propose to give at the TCCI -NeuroPSI conference, will focus on the main results of this study which provide insights into the neurobiological substrate of pathological aggression as it expresses in everyday life environment and its potential role in complex brain disorders. As a secondary but equally important aim I will demonstrate with this study the importance of the ethological approach for understanding the global impact of pathological aggression on various aspects of life, both at the individual and group levels. Home cage monitoring allows the observation of the natural behaviors of mice in a semi-natural habitat, providing an accurate representation of real-world phenomena and pathological mechanisms.

Diane Picard[1], Elodie Lannadère[1] , Frédéric Tankéré[1], Peggy Gatignol[2],

Effects of smile impairment in facila emotion perception

[1] *: AP-HP, ENT Department of Pitié-Salpêtrière University Hospital, Paris, France*
[2]*: Sorbonne Université , INSERM, UMRS1158, Paris, France*

Purpose of the Study: Patients with Bell's palsy suffer from functional deficits and cannot convey their emotion through the face as well as they used to. According to embodied cognition, automatic mimicry and facial feedback modulates emotion perception. The aim of our study was to determine the impact of Bell's palsy on facial emotion perception. Facial motor skills and anxiety were the two variables of interest.

Materials and Methods: 60 patients completed Emotest-VA, an assessment tool of facial emotion perception and affective questionnaires. Facial perception scores of patients were compared to the normative data provided by Emotest-VA. Relationships between facial motor skills, anxiety and perceptual abilities were carried out with regression analyses and Pearson's correlations.

Results: Patients were more ambiguous than normative population to perceive emotion ($t(23)=4.14$, $p < .001$). Furthermore, perception accuracy scores were abnormal for 12% of patients. Happiness arousal was negatively correlated to smile asymmetry ($r=-.294$, p.022). State anxiety decreased when patients could improve their horizontal smile ($r=-.440$, $p < .001$). Patients who received botulinum toxin were more accurate to perceive disgust ($Z=3.60$, $p < .001$).

Conclusion: Bell's palsy impaired sensorimotor simulation, thereby reducing emotional contagion. Smile measures could indicate patients' recovery and patients' anxiety. It could also predict patient's perceptual abilities. Physical therapy consists of exercises that enhance patients' functional abilities. It is also relevant to improve emotional contagion both in its productive and perceptive aspects through facial feedback.

Uma Navare[1], Marwen Belkaid[1],
Subjective valuation from individual decision-making to joint action
[1] : Equipes Traitement de l'Information et Systèmes CY Cergy-Paris Université, ENSEA, CNRS

Individuals choose between available options based on their respective subjective values. Importantly, acting jointly implies processing action values for both self and partner to take them in account in the decision process. Yet, the computational mechanisms underlying subjective valuation in joint action contexts remain unclear. In this study, we developed a task in which two partners had to select among paired objects. Taking inspiration from recent studies in individual decision-making, we designed reward contexts with different achievable outcomes so as to manipulate subjective valuation. Participants performed this task with a human partner (confederate; N=34) or with a robot partner (pre-programmed; N=37). Crucially, only partners' outcome varied over trials while participants' outcome remained equal on average. Our results show individual differences in whether participants' choices took their partners into account. In both conditions, participants could be split into roughly equal groups, collaboratively, competitively or not processing other-rewards. Choice rates and explicit object ratings were correlated in all groups, showing that valuation always reflected decision strategies. Choice rates also indicated a trend toward subjective valuation. Computational model simulations and a follow-up experiment instructing to behave collaboratively provided further evidence of the use of subjective valuation in our joint action task. Thus, this study is a first step in understanding how subjective valuation operates in joint action.

Tuesday, May 20th

Tadeusz Kononowicz[1], Felipe Rolando[2] , Lucas Maigre[2] , Angela Sirigu[2], Jean-René Duhamel[2] , Sebastien Ballesta[3] , Sylvia Wirth[2]
Spatio-temporal dynamics of ingroup interactions in macaques
[1]: Polish Academy of Science & Institut des Neurosciences Paris-Saclay Université Paris-Saclay, Centre National de la Recherche Scientifique, UMR9197, 91400 Saclay, France
[2] : Institut des Sciences Cognitives, 67 boulevard Pinel, 69500, Bron, France.
[3] : Centre de Primatologie, 67207, Niederhausbergen, France

When sharing a space with others, many species including humans evolved a compromise regulating occupancy influenced by social determinants. For example, students in a classroom tend to sit close to their friends, keeping the same spots across days, revealing the social structure in the classroom. This place preference suggests that factors such as social hierarchy and affiliation can shape space utilization; contrasting with random walk models of agents moving at random in any given direction. Here, we asked whether spatial occupancy of macaques (Macaca fascicularis and M. mulatta) within a unisex group, reveals a structured space utilization beyond simple spatial affordance within the finite space. To this end, in two groups of four animals, we analyzed the simultaneously recorded positions of each individual while the group roamed in an enclosure. The data was gathered using automated devices that allow measuring accurate concomitant positions and calculate precise inter-individual distance, which is impossible in classical ethology even using GPS devices. Thus, our setup opens new possibilities using modelling approach, to characterize social interaction dynamics in small enclosures. We found that (1) The identity of each animal could be decoded from its individual pattern of spatial occupancy, revealing that each animal sustained a spatial footprint across multiple days. (2) Average distance between monkeys was a proxy of their social hierarchy, confirming that interpersonal distance is correlated to affiliation and dominance hierarchy. (3) Alternating the social context by removing one of the monkeys revealed that only removing the closest social partner influenced occupancy. (4) Finally, the distribution of distance between pairs of monkeys was bimodal and was modeled using random walk approach with an additional parameter reflecting propensity to stay in close proximity, which was again related to dominance hierarchy. These analyses reveal that space utilization is structured as a function of social determinants in macaques and simple modeling approach to further study group organization in neuro-ethological settings.

Alexandra Martin[1], Chloé Huetz[1], Jean-Marc Edeline[1]

Is the mouse auditory cortex necessary for discriminating communication sounds in noise?

[1] : *Institut des Neurosciences Paris-Saclay Université Paris-Saclay, Centre National de la Recherche Scientifique, UMR9197, 91400 Saclay, France*

In many species, discriminating vocalizations is an essential component of acoustic communication. Yet animals and humans are constantly exposed to noisy environments. The auditory system is supposed to provide the neural basis for this discrimination, and the literature tends to attribute this ability to auditory cortex (ACx). Indeed, over the last decade, a large number of studies have looked for correlations between auditory cortex responses and behavioral performances in various species and different training paradigms (Narayan et al 2007; Shetake et al 2011; Town et al 2018). This led to the popular concept of robust, invariant, cortical representation of stimulus identity. However, very few studies have tried to compare the quality of neural discrimination obtained when recording cortical versus subcortical neurons. We evaluated the neuronal discrimination performance of guinea pig cortical neurons and three subcortical structures - the auditory thalamus (MGv), the inferior colliculus (IC) and the cochlear nucleus - at presentation of four conspecific vocalizations presented in quiet and in various levels of noise (Souffi et al 2020, 2021, 2023). Recently, we replicated this experiment in CBA/J mice by recording cortical neurons, MGv and IC neurons at the presentation of those same four guinea pig vocalizations in the same noise levels. Both in guinea pig and mice, the IC neurons showed higher discrimination abilities than the thalamic and cortical neurons, and their responses were more robust to noise than the cortical and thalamic ones. To go further, we assessed whether behavioral performance indeed relies on cortical or subcortical activity by pharmacologically inhibiting auditory cortex during training. In several mice, discrimination performances were intact both in quiet and in noise during cortical silencing. Together, these data raise questions about the role of auditory cortex during behavioral discrimination performance in situations of acoustic degradations.

Arthur Lefevre[1], Vikram Pal Singh, Timothee Tyree, Jingwen Li, Jean-René Duhamel, Cory Miller,

Primate ACC encodes the cocktail party effect during natural communication

[1]. Institut des Sciences Cognitives (ISC) CNRS : UMR5229, Université Claude Bernard - Lyon I (UCBL) 67, boulevard Pinel 69675 BRON, France

The Cocktail Party Effect (CPE) is amongst the most pervasive real-world challenge for communication. How the brain resolves this issue remains poorly understood, because of the scarcity of neurobiological studies examining the CPE in the acoustically dynamic, naturalistic environments where the phenomenon was first described. Instead, research has often relied on controlled psychoacoustic paradigms, which may overlook brain computations that only emerge in natural contexts. We hypothesized that the Anterior Cingulate Cortex (ACC), a region involved in vocalization production and perception, as well as social monitoring, is encoding the CPE and thus critical to natural communication. To test this, we studied interacting pairs of marmoset monkeys freely behaving in complex social environments, while recording neurons in their ACC wirelessly with brush arrays and Neuropixel probes. We found that in addition to encoding vocalizations at the unit level, ACC neuronal population could be used to decode vocalization type regardless whether they were self-produced or perceived, suggesting an abstract representation. Furthermore, analyses revealed that neurons in this limbic cortex exhibit mechanisms integral to resolving the CPE, including parsing conversational partners from other callers in the environment and encoding turn-taking dynamics. These results highlight the need to reconsider the role of the ACC in acoustic communication. We suggest that this structure regulates dynamic vocal interactions in complex socio acoustic environments by encoding call types and caller identity, notably with a network of neurons dedicated to the partner.

Abstracts of selected posters

Social cognition and adaptive behavior

P1 - Haozhou Jiang[1], Arnaud Maupas[1], Muntasir Callachand[1], Sebastien Ballesta[2], Julia Sliwa[1]
The encoding of the social networks' topology in the monkey brain
[1] : Sorbonne Université, Institut du Cerveau - Paris Brain Institute - ICM, Inserm, CNRS, AP-HP, Hôpital de la Pitié Salpêtrière, Paris, France
[2] : Primate Center of the University of Strasbourg, LNCA (UMR 7364), Strasbourg, France

Primates live in highly structured societies shaped by kinship, hierarchy, and affiliative bonds. While humans spontaneously extract social network properties and represent their own position within the group, it remains unknown whether non-human primates encode such social topologies. We characterized the social network of a semi free-ranging rhesus macaques (N=18); 4 macaques were selected for functional magnetic resonance imaging involving viewing individuals who varied in network topology variables of social distance, centrality and constrains in the group (controlling for age, gender, kinship and hierarch). Using whole-brain searchlight representational similarity analysis, we hypothesize that homologous areas to the human will be involved in encoding social network topological variables, though the specific features encoded may reflect species-specific relevance. Face and body patches in macaques exhibit selective activation in response to social interaction stimuli, implicating their functional role in social cognition. We further predict that neural activity in these patches will correlate with an individual's centrality and/or constraint within the social network. This study aims to elucidate how the primate brain represents social structure, bridging evolutionary and neural perspectives on social cognition.

P2 - Clarisse Abherve[1], Victoire Martignac[1], Feimeng Wu[1], Arnaud Maupas[1], Juliette Dessertine[1], Géraldine Lucchi[2], Julia Sliwa[1]
The odour of frienship and personality in non-human primates
[1]: Sorbonne Université, Institut du Cerveau - Paris Brain Institute - ICM, Inserm, CNRS, AP-HP, Hôpital de la Pitié Salpêtrière, Paris, France
[2]: Plateforme Chemosens, Centre des Sciences du Goût et de l'Alimentation, Dijon, France

Social olfaction has been relatively well studied in non-human primates who use scent-marking, however it is relatively unknown in monkey species that does not use scent-marking. Further, olfaction, personality and friendship have not yet been studied together in those species. In this study, we asked how odour and personality compare to friendship links in 3 monkey species; and if personality can be perceived through olfaction. We collected odours from three groups of monkeys (rhesus macaques, tonkean macaques and saimiri) for which the social group was computed, including the relationship each monkey shared inside the group. Personality was measured by the Hominoid Personality Questionary (Weiss et al, 2009). Preliminary results in rhesus macaques suggest that similarity of personality and odour depends on age proximity relatively more than on relationship. Correlations were also found between some odour compounds and different dimensions of personality.

P3 - Amandine Dervy[1], Jade Lanfranchi[1], Nathalie Angeard[1]
Contribution of executive functions to empathy development in typically developing children aged 3 to 12 years old.
[1] : Laboratoire Mémoire, Cerveau et Cognition, Université Paris Cité, Paris, France

Empathy enables us to share and understand the emotional states of others (Decety, 2021). This ability gradually specializes from early infancy to adulthood in two main dimensions -affective and cognitive- but little is known about the contribution of executive functions to its development. The present study aimed to (1) evaluate EmpaDev2.0, a modified experimental computerized task designed to assess both dimensions of empathy in children while manipulating varying levels of flexibility and (2) investigate the developmental trajectory of empathy and explore the contribution of executive functions to its progressive modularization. The study involved 23 developing children divided in three age groups: 3-4 years old (n=6), 5-6 years old (n=7) and 7-12 years old (n=10). Participants completed three subtests from Wechsler's scales to assess global cognitive efficiency, the Hearts and Flowers task to measure executive functions and EmpaDev2.0 to evaluate cognitive and affective empathy while manipulating cognitive flexibility (high/ low demand). Â As anticipated, affective empathy abilities remained stable across age groups, while cognitive empathy scores significantly increased with age. Additionally, the results confirmed an effect of executive functions on cognitive empathy capacities. Â This study contributes to a deeper understanding of the developmental trajectory of empathy and the key role that executive functions play in this process. It also highlights the importance of a common task to capture both cognitive and affective empathy components. EmpaDev2.0 is a playful yet effective tool for measuring these complex functions, offering promising potential for evaluating empathy in pediatric population with neurogenetic vulnerabilities.

P4 - Léa Ceschi[1], Jeanne Espinosa[1], Inès Haddam[1], Rubèn Miranda[2], Sylvie Granon[1], Cyrille Vaillend[1]
Socio-emotional and emotional-transfer impairments in a mouse model of Duchenne muscular dystrophy
[1] : Institut des Neurosciences Paris-Saclay Université Paris-Saclay, Centre National de la Recherche Scientifique, UMR9197, 91400 Saclay, France
[2] : Department of Psychobiology and Methodolody in Behavioral Science, Complutense University of Madrid, Spain

Duchenne muscular dystrophy (DMD) is an X-linked neurodevelopmental syndrome caused by mutations in the DMD gene and subsequently the loss of dystrophin proteins. Beyond its well-documented impact on muscle degeneration, DMD is increasingly recognized for its neurological and cognitive manifestations. Individuals with DMD frequently present brain-related comorbidities, including intellectual disability (ID) and neuropsychiatric disorders such as autism spectrum disorder (ASD), anxiety, and attention deficit hyperactivity disorder (ADHD). Social withdrawal, theory of mind deficits, and facial affect recognition impairments are prominent phenotypes in DMD, observable even in the absence of ID and ASD. These disturbances significantly impact social functioning, daily life and standards of care for DMD. In the present study, we investigated the behavioral processes underlying emotional and social disturbances in DMD, using a mouse model that carries a mutation similar to that found in 60% of patients. Our study reveals social behavior disturbances that vary depending on the social contexts, such as during dyadic interactions and social competition. We further show a strong association between emotional reactivity and social behavior in this DMD model, which led us to investigate emotional contagion and affective discrimination processes. We demonstrate that these mice display maladaptive responses to the emotional states of conspecifics. Since emotion recognition is a fundamental process for developing appropriate social behaviors, disruptions in this ability could contribute to the broader social dysfunctions observed in DMD.

P5 - Tom Lakomy[1,2], Tony Barbay[3] , Martine Guillermier[1,2], Gwennaelle Auregan[2], Vivien Letenneur[2], Fanny Petit[2], Pauline Gipchtein[2], Rémi Bos[3], Carole Escartin[1,2], Lucile Ben Haim[1,2]
Modulation of mouse socio-sexual behavior by hippocampal astrocytes through the JAK-STAT signaling
[1] : Institut des Neurosciences Paris-Saclay Université Paris-Saclay, Centre National de la Recherche Scientifique, UMR9197, 91400 Saclay, France
[2] : Laboratoire des Maladies Neurodégénératives - UMR 9199, Molecular Imaging Research Center, Centre National de la Recherche Scientifique, Fontenay-aux-Roses, France
[3] : Institut de Neurosciences de la Timone, Aix Marseille Université : UMR7289, Centre National de la Recherche Scientifique : UMR7289, Marseille, France.

The JAK-STAT pathway is a well-known regulator of astrocyte reactivity in various pathological contexts yet its physiological roles remain overlooked. We found that this signaling is induced in astrocytes of the ventral hippocampus (vHPC) after social interaction. To probe the cellular link between astrocyte JAK-STAT signaling and social behavior, we used astrocyte-specific viral vectors to express a constitutively active JAK2 (JAK2ca) in the vHPC and replicate social interaction-induced activation. Using electrophysiological recordings in acute slices, we found that JAK2ca increased pyramidal neuron excitability in the vHPC. Additionally, we used brain-wide c-Fos mapping to assess cellular activation after social interaction and found that JAK2ca significantly changed c-Fos expression in limbic brain regions. These results indicate that JAK-STAT signaling modulation in vHPC astrocytes induces both local and long-range effects on neuronal circuits involved in emotional behaviors. Consistently, JAK2ca selectively enhanced male behaviors toward females, including social preference and mating attempts. Surprisingly, blocking the canonical JAK2-STAT3 signaling by overexpression of its endogenous inhibitor did not modify male-female interactions, suggesting that the upstream activator might be distinct from gp130-mediated signaling. We are currently investigating whether the Î±7 nicotinic acetylcholine receptor (Î±7nAchR)-JAK-STAT axis, described in other systems, could regulate socio-sexual behaviors through astrocytic JAK-STAT signaling.

P6 - Marion Rivalan[1,2,3], Lucille Alonso[1,2,4], Patrik Bey[1,5], York Winter[1,2], Natalia Alenina[6]

Mouse aggression and socialization in the home cage: a role for central serotonin

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Among social behaviours eliciting emotions, aggression is one important adaptive social behavior for the survival of the individual but also the stability and prosperity of social groups. When uncontrolled, aggression leads to pathological violence that disrupts group structure and individual wellbeing. The comorbidity of uncontrolled aggression across different psychopathologies makes it a potential endophenotype of mental disorders with the same neurobiological substrates. Serotonin plays a critical role in regulating impulsive and aggressive behaviors. Mice lacking in brain serotonin, due to the ablation of tryptophan hydroxylase 2 (TPH2), the rate-limiting enzyme in serotonin synthesis, could serve as a potential model for studying pathological aggression. Automated Home cage monitoring allows for the continuous observation and quantification of social and non-social behaviors in group-housed, freely-moving mice. Using an ethological approach, we investigated the impact of central serotonin ablation on the everyday expression of social and non-social behaviors and their correlations in undisturbed, group-living Tph2-deficient and wildtype mice. By training a machine learning algorithm on behavioral time series, "allogrooming", "struggling at feeder", and "eating" emerged as key behaviors dissociating one genotype from the other. Although Tph2-deficient mice exhibited characteristics of pathological aggression and reduced communication compared to wildtype animals, they still demonstrated affiliative huddle behaviors to normal levels. Altogether, such a distinct and dynamic phenotype of Tph2-deficient mice influenced the group's structure and the subsequent development of its hierarchical organization. These aspects were analyzed using social network analysis and the Glicko rating methods. The short talk I propose to give at the TCCI -NeuroPSI conference, will focus on the main results of this study which provide insights into the neurobiological substrate of pathological aggression as it expresses in everyday life environment and its potential role in complex brain disorders. As a secondary but equally important aim I will demonstrate with this study the importance of the ethological approach for understanding the global impact of pathological aggression on various aspects of life, both at the individual and group levels. Home cage monitoring allows the observation of the natural behaviors of mice in a semi-natural habitat, providing an accurate representation of real-world phenomena and pathological mechanisms.

P7 - Laure Lemercier[1], Frédéric Chauveau[2], Sylvie Granon[1], Marion Rivalan[1]

Developmental alterations following early life stress in the limited bedding and nesting protocol

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Child neglect is a form of early life stress (ELS) and is associated with an increased vulnerability in adulthood to developing psychiatric disorders. Children who are victims of it often exhibit developmental delays or cognitive impairments, including difficulties in social interaction, motor abilities, problem-solving, and communication. Because the majority of victims go largely unnoticed, preclinical rodent models are particularly valuable to study the life long effects of ELS under standardized conditions. The Limited Bedding and Nesting (LBN) model mimics maternal neglect through fragmented maternal care, between the postnatal day 4 and 11, thereby creating a stressful environment for the pups. While most behavioral studies in rodent models have been conducted in adulthood, early postnatal phenotype remains understudied. Here, we aimed to identify early physiological and behavioral markers of pups during and shortly after early life stress. In this aim, we monitored several aspects of postnatal development. This included daily measurements of body weight, eye and ear canal opening, onset of locomotion, righting reflex, and other sensory-vestibular reflexes. Emotional state and communication toward the dam were assessed through ultrasonic vocalizations (USV) recordings during a 2 min maternal separation. Additionally, basal plasma corticosterone concentrations were quantified after LBN exposure to evaluate stress hormone regulation. LBN-exposed pups showed significant developmental delays compared to controls during and after LBN rearing. They exhibit reduced body weight gain and a delay by several days of sensorimotor maturation such as eye and ear canal opening and the onset of locomotion. Affective communication assessed via the USV was also altered in LBN pups who emitted a higher number of calls, with longer durations and shorter latency to the first call, suggesting a change in the pup's emotional state and communication pattern toward the dam. Furthermore, basal plasma corticosterone levels were significantly decreased in LBN pups compared to controls, indicating an early dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis. Together these findings highlight the direct impact of early life stress on early physiological and behavioral alterations during and shortly after early life stress, supporting the relevance of identifying early markers as predictive indicators of vulnerability to stress-related psychopathologies emerging later in life.

P8 - Eglantine Allain[1], Assunta Pelosi and Louise-Laure Mariani

Behavioural effects of dopaminergic agonist use in the 6-OHDA mouse model of Parkinson's disease

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Parkinson's disease (PD) is characterized by the loss of dopaminergic neurons in the *Substantia Nigra pars compacta*, leading PD patients to take dopamine agonists (DAs) to compensate for the missing dopamine. However, Impulse Control Disorders (ICDs) can occur when these drugs are used. These are uncontrolled excessive impulsive behaviours (gambling, binge eating, compulsive shopping…) that considerably alter patients' lives, leading them to make risky decisions for themselves and those around them. So far, the understanding of the underlying mechanisms of ICDs development are limited. Thus, it is necessary to establish a relevant model to study the biological basis of the onset of these non-motor adverse effects of dopamine agonists. These medications are used in patients with Parkinson's disease, but also other disorders without dopamine denervation, such as restless leg syndrome, pituitary adenomas and depression. Thus, it is relevant to investigate whether the degenerative component of dopaminergic neurons is a key factor to develop ICDs or not.

The aim of our study was to investigate the role of this component in the development of DA-induced impulsive behaviours in a murine model of non-motor symptoms of PD, obtained by bilateral injection of 6-OHDA in the striatum, and treated chronically with the DA pramipexole (PPX). Wild-type adult mice were divided into 4 groups according to surgery and allocated treatment (SHAM- or 6-OHDA-lesioned, and vehicle or PPX treatment). Impulsivity was assessed using the CAR (Cliff Avoidance Reaction) and VDS (Variable Delay to Signal) tests, and motor phenotype was assessed using the Cylinder and Catwalk tests.

The CAR test showed a tendency for PPX-treated mice to increase the distance covered, as well as an increase in the number of falls, a sign of motor impulsivity. The VDS test, more complex, showed no evidence of impulsivity in the same mice, but the number of omissions, response latency and total time required to complete the task were increased. Exploration of attention capacity did not suggest any potential attention deficit. As expected, no motor deficits were identified.

In conclusion, the dopaminergic denervation component did not appear to have any impact on the development of an impulsive phenotype secondary to PPX intake. The effect of PPX was similar in 6-OHDA-lesioned and SHAM-lesioned mice. Although, these results reported only a slight impulsivity, several other parameters in the VDS test, strongly linked to DA intake, were affected. These results suggest deeper consequences on, motivation, decision making or reward circuits requiring further studies to better understand their underlying mechanisms.

P9 - Nastasia Mirofle[1], Alexis Faure[1], Sylvie Granon[1]

Predictive links between early social behaviours and decision-making strategies in male and female mice: impact on brain maturation

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Introduction: Decision-making is a fundamental process for individuals' survival that needs to stay flexible to adapt to the environment constraints. This study questions if this adaptive decision-making, or flexibility, could be shaped through life by early decision-making experience. There are especially two types of decisions based on uncertainty and relying on flexibility: when facing new congener, and in a risk assessment task (Mouse Gambling Task).
As decision in a social context is one of the first decisions experienced during life, we thus suggest that early social novelty experience could shape individual risky decision making and flexibility through development that would lead once adult to specific monoaminergic features. This would allow us to predict from early social behaviour the risky and flexible behaviour when adult and monoamines metabolites levels in mature brain. This study also assessed sex differences in these questions.

Results: We first confirmed the existence of three distinct social profiles in adolescent healthy mice (previous data unpublished) with specific characteristic regarding dominance, submission and interaction. These social behaviours differences are not solely explained by the sex factor, even though adolescent males are more in the submissive group, while females are more in the dominant and interactive group. For the first time we characterized female's risky decision making. When facing uncertainty, female mice adopt two distinct strategies: one where they rapidly develop an automatization, and another indecisive which consists of delaying the moment of choice and prioritize explorative behaviour. Male individuals showed similar dynamic and strategies as we observed previously (ref). However, the distribution of subgroups changed, with a larger proportion of risk avoider mice. These results confirm our hypothesis that social experience prior to risk taking modifies risk assessment. Furthermore, we show that adolescent dominance level predicts adult flexibility level in MGT: adolescent individuals that are more dominant are statistically more likely to display more flexible behaviour when facing uncertain and risky situations. On the opposite, individuals more submissive at adolescence are more likely to develop automatic rigid choices later in life and to exaggeratedly avoid risky options.

Conclusion & Perspectives: These results suggest that adolescent dominance behaviour is linked to adult strategies regarding risk in decision making tasks. Future work still needs to be done on the characterisation of the social and gambling profiles of monoamines brain metabolites levels to confirm the impact of early social experience on reward network maturation.

P10 - Nicolas Darcel[1], Patrick Taillandier [2]

Investigating the influence of individual preferences, social factors, and environmental cues on meal composition decisions in university restaurants using agent-based modeling

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Context: This study aimed to investigate how individual preferences, social influences, and environmental factors collectively shape meal choices in the context of a university restaurant.
Methods: We utilized agent-based modeling and in-situ measurements of meal choices, considering individual dish preferences, social influence from other agents, and environmental factors such as sensory perceptions and waiting time. In-situ observations were conducted in two university restaurants, recording the meal choices of 336 students during lunchtime, complemented with anthropometric data and subjective decision criteria collected through self-reported questionnaires. Table compositions were noted to assess familiarity among individuals. Such participant characteristics were used as initial parameters in simulations, which were then compared with real participant data to evaluate the relative importance of preferences, social influences, and environmental factors.
Results: Despite most respondents denying influence from others, the best-fit models indicated a significant role for social influence in decision-making, with variations in this parameter affecting different meal components differently.
Conclusions: This research highlights the effectiveness of a multi-agent simulation approach in characterizing the influencing factors in complex decision-making problems, particularly in meal composition within natural consumption situations.

P11 - Andrew Jeyathasan[1], Emile Butzbatch[1,2], Sabir Jacquir[2], Alain Destexhe[2], Swati Banerjee[1]

How Frugal is the Brain? Understanding the MSI process using Haptic-Audio-Visual cues and sensory network modelling

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The human brain processes vast amounts of sensory information in real-time, integrating inputs from different modalities such as vision, hearing, touch, and proprioception to form a coherent perception of the environment. The adaption and decision-making process is very Frugal in nature and has been an interesting topic to study. With rapid progression in immersive technologies there is a constant need for development of novel Brain Computer Interfaces (BCI) techniques specifically adapted to cater the varied need of the technology that is being deployed for human intervention. In this context it is important to consider that majority of the BCIs employ single modality presentation. However, in the natural or simulated environment stimuli are not that isolated.
In this work we have incorporated multiple unimodal tasks into a single trimodal cue based forced choice tasks. This type of paradigm engages the three sensory modalities allowing for a more comprehensive investigation of sensory processing and attentional mechanisms. When a subject(s) receives a signal/cue from several sensory channels, his/her neuronal activity can be enhanced leading to better perception. This work thus investigates the Multisensory Integration (MSI) phenomenon while using ambient interfaces or simulated environment especially when Haptic-Audio-Visual (HAV) cues are presented. Once this behavioural data is being collected, we modelled this using sensory network brain modeling techniques.
Sensory network brain modeling seeks to replicate this complex neural architecture, using computational tools to simulate the pathways and dynamics of sensory systems. In this work, we attempted to understand the (HAV) cue based sensory integration using Adex models. A comprehensive literature review showed the gaps in the existing research in modeling these modalities simultaneously. Therefore, we built a neural field network to study the integration time of these multisensory stimuli with a phase resetting perspective. The model has realistic behavior and gives interesting insights into the timescale of human reaction time. The network activity should be linked further to experimental data, and the phase-synchrony measurements need to be refined, but this work is a proof of concept to build a biologically realistic model of HAV-integration. By modeling sensory networks, neuroscientists can explore fundamental questions about perception, attention, and cognition, as well as inform the design of artificial intelligence systems and neuroprosthetics. The scope of this study gives us a broader understanding of the filtering and detanglement of the information flow in the sensory pathways and hence addressing the issue of Multisensory Integration (MSI) process.

Communication and language

P12 - Eloïse C. Déaux[1,2], Théophane Piette[1], Anne-Lise Giraud[1,3]

The neuro-evolution of rhythmic acoustic communication

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Acoustic signals are temporally organised—a feature essential for vocal recognition, predator avoidance, and mate choice—yet the selective forces driving the evolution of this feature remain poorly understood. Here, we present the findings of two studies investigating the neural and evolutionary foundations of rhythm in animal communication. Using acoustic data from 98 species spanning mammals, birds, amphibians, insects, reptiles, and fish, we compared phylogenetic models and found that the rhythm of animal acoustic signals did not diversify over evolutionary time, but rather remained conserved around a common optimum of ~2.9 Hz. This challenges the prevailing view that rhythmic patterns arise primarily from biomechanical or environmental constraints, suggesting instead a shared basic receptive neural constraint. Further, to explore auditory processing, we recorded neural responses (EEG) and behavioural markers of comprehension in pet dogs listening to speech. Our results show that dogs' comprehension of human speech relies primarily on the successful tracking of the speech stimuli via delta oscillations (1–4 Hz), which aligns with their own (and other species) production rhythm and contrasts with the faster theta-band tracking typical of humans. Additionally, comparative acoustic analyses reveal that dog owners naturally slow down their speech when talking to their dogs, adjusting to a rhythm that falls within the delta range. Collectively, these findings reveal that auditory system constraints shape rhythmic acoustic production and that this neural determinant has been conserved throughout evolution, allowing for intra- and cross-specific signalling.

P13 - Andréa Thiebault[1, 2], Chloé Huetz[1], Thierry Aubin[1], Lorien Pichegru[2], Tegan Carpenter Kling[2,3] Alistair Mcinnes[2,3], Isabelle Charrier[1]

Contact and recruit – the foundations of an acoustic foraging network in a flightless seabird

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In the marine environment, seabirds use various sensory cues to navigate and locate prey and can use other predators as cues of the presence of inconspicuous prey. Transfers of social information have been conceptualised in flying seabirds in the form of foraging networks, with visual signals being efficiently used over few kilometres. In flightless seabirds, visual signals are limited at the sea surface so we hypothesised that acoustic signals would be the primary form of communication in these species. We investigated the sea-surface vocalisations used by foraging African penguins to experimentally assess if vocal communication facilitated the implementation of a foraging network. We analysed the at-sea acoustic communication process in this species, from the production of signals (acoustic structure of vocalisations) to the reception of signals (behavioural response to vocalisation playbacks) through their propagation phase (sound degradation). Our results revealed two functions of African penguins' sea-surface vocalisations: a contact function (vocal responses) and a recruitment function (approaches). We suggested the existence of an acoustically foraging network in that species, allowing individuals to maintain contact with distant conspecifics over few hundreds of meters and to recruit them on foraging grounds. The importance of group foraging behaviour and vocal communication in penguins must be considered in conservation management strategies. With populations decreasing, species may be sensitive to an Allee effect, putting them further at risk. In addition, marine noise pollution may reduce the propagation distance of acoustic signals, affecting the ability of individuals to perceive them and thus to forage efficiently.

P14 - Océane Cossu Doye[1], Carla Aimé-Jubi[1], Rana Esseily[1], Cécilia Houdelier[2] , Hélène Meunier [3, 4], Isabelle George[5], Justine Defranoux[4, 6], Louise Goupil[8], Sophie Lumineau[2] , Dalila Bovet[1]

Studying non-human animal musicality: the need to compose species-specific stimuli

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The origin of music has been the subject of debate for many years. In animals, the effects of music on behaviour remain largely unknown. However, researchers have been able to show a certain sensitivity to music in different species. Musicality is a trait that is more present in birds than in the great apes, which are phylogenetically closer to us, suggesting an evolutionary origin and a convergent one at that, between different groups. The discovery of musicality in animals led us to explore several evolutionary theories. One of the theories is the Social Bonding Hypothesis. Moreover, if birds are sensitive to music, then it could, as in humans, have effects on their behaviour, and more specifically on social interaction. By promoting the cohesion of social groups, these effects could represent an adaptive advantage that would explain the evolution of musicality in both groups.
While studies have shown that music has a significant impact on human social behaviour, we still need to determine whether the same is true for other animals. For this purpose, we are going to carry out behavioural observations experiments under different musical and social conditions. We will study four bird species: canaries, zebra finches, cockatiels, and Japanese quails and four primate species: pied tamarins, pygmy marmosets, northern white-cheeked gibbons and southern white-cheeked gibbon. Until now, the music used for animals has been created by and for humans. However, perceptive capacities and sensitivities vary from one species to another. It is therefore important to use stimuli adapted to our species. To achieve this, we have created a tailor-made music based on the physiological properties, such as heart rate, audible frequency spectrum and vocalizes ranges and vocal melodies, of each species. By understanding the proximal relationship between music and social behavior in humans and other species, this approach will enable us to investigate the phylogenetic origins of musicality and the selective pressures that led to its development.

P15 - Nelson Smith[1], Catherine Del Negro[1], Nicolas Giret[1].

Role of offline periods in sensorimotor learning in adult zebra finches.

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Offline periods play a crucial role in memory consolidation. During these periods, specific neuronal activity occurs spontaneously and studies have highlighted its contribution to learning. Here we aim to determine the contribution of this activity to sensorimotor learning in adult zebra finches. The zebra finch is a songbird species that shares striking similarities to human in its capacity for vocal learning. Like speech, birdsong learning involves a progressive control of vocal musculature through a process of trial and error and thus relies crucially on auditory feedback. In adult birds, once the song is crystallized, they can still adapt some feature of their song e.g. the fundamental frequency (pitch) to avoid aversive auditory cues. The zebra finch's brain has a well delineated network dedicated for song learning, production and maintenance that include an anterior forebrain pathway (AFP) that is homologous to mammalian basal ganglia-thalamocortical loop. The output of the AFP loop, the lateral magnocellular nucleus of the anterior nidopallium (LMAN) plays a central role in song learning. Prior studies have shown that some LMAN neurons can exhibit singing-related activity and can respond selectively to the bird's own song during passive listening. However, LMAN neurons are insensitive to auditory feedback perturbations during song production raising the possibility that information processing occurs during offline period. To address this issue, we trained birds to modify their song while disrupting spontaneous neuronal activity in LMAN. In parallel, LMAN neurons activity has been recorded. Our preliminary data indicate that disrupting spontaneous neuronal activity during offline periods alters learning acquisition.

P16 - Luciana Lopez-Jury[1], Alison Barker[1]
The neurobiology of vocal communication in naked mole-rats
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Naked mole-rats live in large, hierarchical colonies with specialized roles, resembling eusocial insects like ants and bees. These rodents are constantly vocalizing and they appear to learn colony-specific dialects to recognize each other (Barker et al., 2021). Their vocal behaviour also includes structured turn-taking, with vocal exchanges influenced by social hierarchy (Yosida & Okanoya, 2009). The ability to learn dialects and coordinate vocalizations likely relies on the integration of auditory and motor information in the brain. This audio-motor interaction is observed in other species, such as songbirds, singing mice, and humans, during vocal learning and communication. We aim to approach this from a neuroethological perspective by integrating behavioural and electrophysiological techniques. First, through a behavioural study, we seek to precisely identify the acoustic cues that trigger vocalizations in naked mole-rats and determine whether this interaction is context-dependent. Next, we aim to map intracortical projections between the auditory and motor cortices and investigate how vocal exchanges are encoded in the brain through invasive electrophysiological recordings of these areas within the cortex.

P17 - Alexandra Martin[1], Chloé Huetz[1], Jean-Marc Edeline[1]
Is the mouse auditory cortex necessary for discriminating communication sounds in noise?
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In many species, discriminating vocalizations is an essential component of acoustic communication. Yet animals and humans are constantly exposed to noisy environments. The auditory system is supposed to provide the neural basis for this discrimination, and the literature tends to attribute this ability to auditory cortex (ACx). Indeed, over the last decade, a large number of studies have looked for correlations between auditory cortex responses and behavioral performances in various species and different training paradigms (Narayan et al 2007; Shetake et al 2011; Town et al 2018). This led to the popular concept of robust, invariant, cortical representation of stimulus identity. However, very few studies have tried to compare the quality of neural discrimination obtained when recording cortical versus subcortical neurons. We evaluated the neuronal discrimination performance of guinea pig cortical neurons and three subcortical structures - the auditory thalamus (MGv), the inferior colliculus (IC) and the cochlear nucleus - at presentation of four conspecific vocalizations presented in quiet and in various levels of noise (Souffi et al 2020, 2021, 2023). Recently, we replicated this experiment in CBA/J mice by recording cortical neurons, MGv and IC neurons at the presentation of those same four guinea pig vocalizations in the same noise levels. Both in guinea pig and mice, the IC neurons showed higher discrimination abilities than the thalamic and cortical neurons, and their responses were more robust to noise than the cortical and thalamic ones. To go further, we assessed whether behavioral performance indeed relies on cortical or subcortical activity by pharmacologically inhibiting auditory cortex during training. In several mice, discrimination performances were intact both in quiet and in noise during cortical silencing. Together, these data raise questions about the role of auditory cortex during behavioral discrimination performance in situations of acoustic degradations.

P18 - Wetekam Johannes[1], Herbst Sophie[1]

From Deviance Detection to Temporal Predictions: Neural Mechanisms of Predictive Auditory Processing

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Auditory perception relies not only on processing sensory inputs but also on predictive mechanisms that anticipate upcoming acoustic events. Such predictions operate both in the sensory dimension (˜WHAT" will occur?) and in the temporal dimension (˜WHEN" will it occur?). Here, I will integrate insights from my PhD research on sensory deviance detection with my ongoing postdoctoral work examining temporal predictions in auditory perception. My PhD research investigated how early auditory structures, specifically the brainstem, encode statistical regularities in acoustic sequences. Auditory brainstem responses (ABRs) recorded from bats and humans - two species characterised by sophisticated vocal abilities - revealed that neural responses at subcortical levels are modulated by stimulus probability. These findings demonstrate that predictive processes are already active at initial stages of auditory processing, supporting the rapid detection of behaviourally relevant acoustic events. In my recently started postdoctoral research, I am investigating how temporal predictions facilitate auditory perception in humans. Specifically, my focus is on how predictions regarding the timing of auditory events guide attention and modulate perceptual sensitivity. Although behavioural advantages of temporal predictions are increasingly recognised, the underlying neural mechanisms and their interactions with other predictive cues, such as spectral predictions, remain incompletely understood. The poster outlines behavioural and neuroimaging approaches designed to clarify these questions, guided by the hypothesis that temporal predictions arise implicitly through a statistical (Bayesian) learning process.

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