Lille - 2017

October 11-12:

Symposium

Image Perception and Visual Field Deficiency

October 12-13:

11th GDR Vision Meeting

Program

Symposium
Image Perception and Visual Field Deficiency

Wednesday 11:

12:45 Introduction
13:00 Keynote 1 – Allison McKendrick
14:00 Coffee
14:15 Keynote 2 – Carole Peyrin
15:15 Coffee
15:45 Keynote 3 – Michael B. Hoffmann
16:45 Coffee
17:05 Talk Session - Quentin Lenoble, Aurélie Calabrèse
18:30 End of the day

Thursday 12:

09:00 Welcome
09:30 Keynote 4 – Ricardo Gameiro
10:30 Coffee
11:00 Keynote 5 – David Crabb
12:00 Lunch

GDR Vision Meeting

Thursday 12:

12:00 Welcome
13:15 Introduction
13:30 Keynote 1 – Suliann Ben Hamed
14:30 Talk Session 1 - Laura Dugue, Bilge Sayim, Eric Castet
15:30 Coffee
16:00 Talk Session 2 - Denis Pelisson, Mark Harwood, Cécile Vullings, Thérèse Collins, Jean Lorenceau, Anne Guerin-Dugue
18:00 Coffee
18:30 Keynote 2 – Natalie Hempel de Ibarra
19:30 End of the day
20:00 Dinner

Friday 13:

09:00 Welcome
09:30 Keynote 3 – Jenny Read
10:30 Coffee – Posters
12:00 Talk Session 3 - Benoit Cottereau, Bruno Rossion, Ivo Vanzetta
13:00 Lunch – Posters
14:20 Talk Session 4 - Camille Breuil, Andrei Gorea, Claudio Simoncini, Nikos Gekas
15:40 Coffee – Business
16:00 End of the meeting

Sponsored by

Laboratoire Psychologie de la Perception, UMR 8242, Université Paris Descartes
Laboratoire de Psychologie et NeuroCognition, UMR 5105, Grenoble
Laboratoire de psychologie cognitive, UMR 7290, Marseille
Institut de neurosciences de la Timone, UMR 7289, Marseille
Centre de Recherche en Neuroscience de Lyon, INSERM U1028, CNRS UMR5292, Lyon
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SCALab, UMR 9193, Lille
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Université de Lille
Projet International de Coopération Scientifique - CNRS
Maison Européenne des Sciences de l'Homme et de la Société

Talks
Image Perception and Visual Field Deficiency

Wednesday 11

Wednesday 11, 13:00 - Keynote
Contrast processing in ageing vision and glaucoma
Allison McKendrick
Clinical Psychophysics Unit, University of Melbourne

Wednesday 11, 14:15 - Keynote
Scene categorization in normal and pathological vision
Carole Peyrin,
Laboratoire de Psychologie et NeuroCognition, CNRS Grenoble

Wednesday 11, 15:45 - Keynote
Organization and function of the human visual system in congenital visual pathway abnormalities
Michael B. Hoffmann
Department of Ophthalmology, Visual Processing Laboratory, Otto-von-Guericke-University Magdeburg

Wednesday 11, 17:05
Can I pass through the door? A study with glaucoma patients
Quentin Lenoble, Sébastien Szaffarczyk, Jean-François Rouland
Sciences Cognitives et Sciences Affectives (France)

Wednesday 11, 17:25
A Vision Enhancement System to Improve Face Recognition with Central Field Loss
Aurélie Calabrèse (1), Carlos Aguilar (2), Eric Castet (1)
Laboratoire de Psychologie Cognitive (France), 2 - Bases, Corpus, Langage (France)

Thursday 12

Thursday 12, 9:30 - Keynote
Exploration and Exploitation in Human Visual Processing
Ricardo Gameiro
Institut für Kognitionswissenschaft Universität Osnabrück

Thursday 12, 11:00 - Keynote
Glaucoma – through the eyes of the patient
David Crabb
City University of London

Talks
GDR Vision Meeting

Thursday 12

Thursday 12, 13:30 - Keynote
The spatial and temporal dynamics of attention: insights from the real-time decoding of the attentional spotlight
Suliann Ben Hamed
Centre de Neuroscience Cognitive, CNRS, Bron

Thursday 12, 14:30
Attention reorients at the theta frequency
Mehdi Senoussi (1), Niko Busch (2), Laura Dugué (3)
1 - ISAE-Supaéro (France), 2 - WWU Münster (Allemagne), 3 - Laboratoire Psychologie de la Perception (France)

Thursday 12, 14:50
Capturing appearance in crowded peripheral vision
Bilge Sayim (1) (2), Natalia Melnik (2), Zeynep Yildirim (2), Daniel Coates (3)
1 - SCALab, Université de Lille (France), 2 - Institute of Psychology, University of Bern (Suisse), 3 - University of Houston (États-Unis)

Thursday 12, 15:10
Crowding, visual span and reading speed in adults with dyslexia
Eric Castet, Ambre Denis-Noël, Carlos Aguilar, Pascale Colé, Chotiga Pattamadilok
Laboratoire de psychologie cognitive (France)

Thursday 12, 16:00
Cerebral substrates of immediate and lasting effects of adaptation of saccadic eye movements
Denis Pelisson, Ouazna Habchi, Muriel Panouillères, Charles Hernoux, Alessandro Farne
Centre de recherche en neurosciences de Lyon (France)

Thursday 12, 16:20
Pacing effects on saccades in the young, the old, and Parkinson's disease.
Mark Harwood (1), Annabelle Blangero (2)
1 - University of East London, UK (Royaume-Uni), 2 - City College of New York (États-Unis)

Thursday 12, 16:40
Reinforcement can reduce the size-latency phenomenon
Cécile Vullings (1), Mark Harwood (2), Laurent Madelain (3) (1)
1 - Univ. Lille, UMR 9193 - SCALab (France), 2 - Department of Psychology, University of East London, UK (Royaume-Uni), 3 - Institut de Neurosciences de la Timone (France)

Thursday 12, 17:00
Variability of memory-guided saccades in the human superior colliculus
Thérèse Collins (1), Françoise Vitu (2)
1 - Laboratoire Psychologie de la Perception (France), 2 - Laboratoire de psychologie cognitive (France)

Thursday 12, 17:20
CobEYE: projet d'étude épidémiologique de l'oculomotricité
Lorenceau Jean
Institut de la Vision (France)

Thursday 12, 17:40

Enregistrement conjoint EEG et oculométrique : estimation des potentiels évoqués et application en exploration visuelle et en lecture

Anne Guerin-Dugue (1), Emmanuelle Kristensen (1), Aline Frey (2), Nathalie Guyader (1), Hélène Devillez (3), Gelu Ionescu (1), Raphaëlle Roy (4), Bertrand Rivet (1)
1 - Grenoble Images Parole Signal Automatique (France), 2 - Cognitions Humaine et ARTificielle (France), 3 - Department of Psychology and Neuroscience (États-Unis), 4 - ISAE (France)

Thursday 12, 18:30 - Keynote

Insect vision: when and why small body size matters

Natalie Hempel de Ibarra
Centre for Research in Animal Behaviour (CRAB), University of Exeter

Friday 13

Friday 13, 9:30 - Keynote

The neural basis of stereopsis: understanding how binocular disparity is encoded in primary visual cortex

Jenny Read (presenting), Sid Henriksen, Dan Butts & Bruce Cumming
Institute of Neuroscience, Newcastle University

Friday 13, 12:00

Emergence of binocular disparity selectivity through spike-timing dependent plasticity

Tushar Chauhan, Timothée Masquelier, Alexandre Montlibert, Benoit R Cottereau
Laboratoire Cerco (France)

Friday 13, 12:20

Fast and automatic visual categorization of faces in the human ventral occipito-temporal cortex with intracerebral recordings

Bruno Rossion (1) (2), Corentin Jacques (1), Joan Liu-Shuang (1), Hélène Brissart (2), Sophie Colnat-Coulbois (2), Louis Maillard (2), Jacques Jonas (2)
1 - University of Louvain (Belgique), 2 - Centre Hospitalier Universitaire de Nancy (France)

Friday 13, 12:40

Visual stimulation quenches global alpha range activity in awake primate V4

Thomas Deneux (1), Timothée Masquelier, Maria Bermudez, Guillaume Masson, Gustavo Deco, Ivo Vanzetta (2)
1 - Unité de neurosciences intégratives et computationnelles (France), 2 - Institut de Neurosciences de la Timone (France)

Friday 13, 14:20

Detecting color in natural scenes

Camille Breuil, Simon Barthelmé, Nathalie Guyader
Grenoble Images Parole Signal Automatique (France)

Friday 13, 14:40

Awareness of the outcome of self-initiated pointing actions

Andrei Gorea
Laboratoire Psychologie de la Perception (France)

Friday 13, 15:00

Spatial Integration for Perception and Smooth Pursuit Eye Movements depend on the Visual Stimulation.

Claudio Simoncini
Institut de Neurosciences de la Timone (France)

Friday 13, 15:20

Perceptual effects of adaptation to dynamically changing stimulus statistics
Nikos Gekas (1), Kyle Mcdermott (2), Pascal Mamassian (1)
1 - Laboratoire des Systèmes Perceptifs (France), 2 - Vizzario, Inc. (États-Unis)

Poster sessions

Friday 13, 10:30 and 13:00

Estimating and anticipating a dynamic probabilistic bias in visual motion direction
Chloé Pasturel, Jean-Bernard Damasse, Anna Montagnini, Laurent Perrinet
Institut de Neurosciences de la Timone (France)

Exploration des composantes de la perception lors d'un expérience mélant art et science
Laurent Perrinet (1), Etienne Rey
1 - Institut de Neurosciences de la Timone (France)

Saccadic and Movement Reaction Time discrimination in humans
Valentina Vencato (1) (2), Joan López-Moliner (3), Laurent Madelain (1) (2)
1 - SCALab, Lille (France), 2 - Institut de Neurosciences de la Timone (France), 3 - Universitat de Barcelona (Espagne)

Perceived timing of a visual event is affected by eccentricity
Ljubica Jovanovic, Pascal Mamassian
Laboratoire des systèmes perceptifs, Département d'études cognitives, École normale supérieure, PSL Research University, CNRS, 75005 Paris, France (France)

Metacognition of temporal selection during the Attentional Blink
Samuel Recht (1), Vincent De Gardelle (2), Pascal Mamassian (1)
1 - Laboratoire des systèmes perceptifs, Département d'études cognitives, École normale supérieure, PSL Research University, CNRS, 75005 Paris, France (France), 2 - Centre d'économie de la Sorbonne (France)

Voluntary tracking the moving clouds: Effects of speed variability on human smooth pursuit
Kiana Mansour Pour
Institut de Neurosciences de la Timone (France)

Reward contingencies and smooth pursuit eye movements in healthy participants and Parkinson's disease
Jean-Bernard Damasse (1), Miriam Spering (2), Anna Montagnini (1)
1 - Institut de Neurosciences de la Timone (France), 2 - Computer Science Department (Canada)

Integrating motion predictive information across different time scales: an eye-movement and transcranial random noise stimulation (tRNS) study
Anna Montagnini, Florian Herpich, Lorella Battelli
Institut de Neurosciences de la Timone (France)

tereomotion processing in the non human primate brain
Yseult Héjja-Brichard, Samy Rima, Jean-Baptiste Durand, Benoit R. Cottereau
Centre de recherche cerveau et cognition (France)

The effect of conflicting binocular and monocular cues on stereoscopic acuity
Anne-Emmanuelle Priot, Florian Domergue, Justin Plantier, Pascaline Neveu
Institut de recherche biomédicale des armées (France)

Temporal processing of scene gist between central and peripheral vision
Clément Beugnet, Sébastien Szaffarczyk, Muriel Boucart
Unité de Recherche en Sciences Cognitives et Affectives (France)

Saccadic gain modulation by manipulating a visual discrimination task
Sohir Rahmouni (1), Anna Montagnini (2), Laurent Madelain (1) (2)
1 - Univ. Lille, CNRS, CHRU Lille, UMR 9193 - SCALab - Sciences Cognitives et Sciences Affectives, F-59000 Lille, France (France), 2 - Institut de Neurosciences de la Timone (France)

The attentional fields of visual search in healthy individuals and following bilateral superior parietal dysfunction: toward understanding visual forms of developmental dyslexia
Laure Pisella
Centre de recherche en neuroscience de Lyon (France)

How do we spatially and physiologically code other's emotional state?
Alice Cartaud (1), Yann Coello (1), Tina Iachini (2), Gennaro Ruggiero (2)
1 - Univ. Lille, CNRS, CHU Lille, UMR 9193 - SCALab - Sciences Cognitives et Sciences Affectives, F-59000 Lille (France), 2 - Second University of Naples-Caserta (Italie)

Testing saccadic adaptation under naturally paced conditions
Alexis Cheviet, Camille Farcy, Denis Pélisson
Centre de recherche en neurosciences de Lyon (France)

Gesture parameters and goal processing during the recognition of actions among distractors: Evidence from eyetracking
Jérémy Decroix, Solène Kalénine
Unité de Recherche en Sciences Cognitives et Affectives (France)

Saccadic Adaptation Increases brain excitability : a MEG study
Judith Nicolas (1), Aline Bompas, Romain Bouet, Olivier Sillan (1), Eric Koun, Christian Urquizar, Alessandro Farnè (2), Aurélie Bidet-Caulet (3), Denis Pelisson (3)
1 - Centre de recherche en neurosciences de Lyon (France), 2 - Centre de Recherche en Neurosciences de Lyon (France), 3 - Centre de recherche en neurosciences de Lyon (France)

Does eye dominance strength modulate the global effect on saccade accuracy?
Jérôme Tagu (1), Karine Doré-Mazars (1), Dorine Vergilino-Perez (1) (2)
1 - Vision Action Cognition (France), 2 - Institut Universitaire de France (France)

Development of oculomotor control from infants to toddlers: temporal and spatial parameters of voluntary saccades
Christelle Lemoine-Lardennois, Nadia Alahyane, Mallaury Hamon, Clara Ferrari, Karine Doré-Mazars
Vision Action Cognition (France)

Saccades toward faces are not only faster but also larger
Nathalie Guyader (1), Camille Breuil (1), Alan Chauvin (2), Carole Peyrin (2), Anne Guérin-Dugué (1), Muriel Boucart (3)
1 - Grenoble Images Parole Signal Automatique (France), 2 - Laboratoire de Psychologie et NeuroCognition (France), 3 - Laboratoire des Sciences Cognitives et Sciences Affectives (France)

Scale invariance does not hold for high dynamic range images, but is reestablished by early retinal nonlinearities
Antoine Grimaldi, David Kane, Marcelo Bertalmío
Universitat pompeu fabra (Espagne)

Consequences of motor actions and social context determine the representation of peripersonal space
Yann Coello (1), François Quesque (2), Maria Francesca Gigliotti (1), Ekaterina Shemakova (1), Laurent Ott (1), Jean-Luc Bruyelle (1)
1 - Univ. Lille, CNRS, CHU Lille, UMR 9193 - SCALab - Sciences Cognitives et Sciences Affectives, F-59000 Lille (France), 2 - Inserm U1028 - CNRS UMR 5292 - University Lyon 1 (France)

Neurophysiological correlates of conflict between gesture representations during object perception
Yannick Wamain, Aïsha Sahaï, Jérémy Decroix, Yann Coello, Solène Kalénine
Univ. Lille, CNRS, CHU Lille, UMR 9193 - SCALab - Sciences Cognitives et Sciences Affectives, F-59000 Lille (France)

Calibration of peripheral perception of shape with and without saccadic eye movements
Céline Paeye (1), Thérèse Collins (2), Patrick Cavanagh 3), Arvid Hervig (4) (5)
1 - Vision Action Cognition (France), 2 - Laboratoire Psychologie de la Perception (France), 3 - Department of Psychological and Brain Sciences (France), 4 - Department of Psychology, Bielefeld University (Allemagne), 5 - Cognitive Interaction Technology - Excellence Cluster (Allemagne)

Reading without spaces revisited: The role of sentence-level constraints
Jonathan Mirault, Joshua Snell, Jonathan Grainger
Laboratoire de psychologie cognitive (France)

Retrospective cueing affects conscious access to masked words
Daphné Rimsky-Robert, Claire Sergent
Laboratoire Psychologie de la Perception (France)

Short-term monocular deprivation could be driven by an interocular contrast gain control mechanism
Alexandre Reynaud, Jiawei Zhou, Robert Hess
McGill Vision Research (Canada)

Abstracts
Image Perception and Visual Field Deficiency

Contrast processing in ageing vision and glaucoma
Allison McKendrick
Clinical Psychophysics Unit, University of Melbourne

Standard clinical assessments typically measure the ability to resolve small targets in central vision (visual acuity), or measure contrast thresholds for stimuli presented on uniform backgrounds. In natural vision however, the visual system typically encounters complex visual scenes and is required to extract supra-threshold contrast features of objects that occur embedded within complex contrast backgrounds. In this talk, a series of studies will be discussed that explore how contrast adaptation and surround suppression of contrast are altered in the healthy ageing visual system and in people with visual damage due to glaucoma. Data from behavioural, electrophysiological and neuroimaging will be presented. Contrast adaptation and spatial contrast interactions form key building blocks for object perception. This talk will highlight why age related changes to contrast mechanisms need to be considered in the interpretation of behavioural performance on tasks that use complex visual stimuli to assess the elderly and those with vision loss.

Scene categorization in normal and pathological vision
Carole Peyrin,
Laboratoire de Psychologie et NeuroCognition, CNRS Grenoble

Theories on visual perception agree that scenes are processed in terms of spatial frequencies. Low spatial frequencies (LSF) carry coarse information whereas high spatial frequencies (HSF) carry fine details of the scene. However, how and where spatial frequencies are processed within the brain remain unresolved questions. Results from a number of neuroimaging studies on healthy subjects showed that spatial frequency processing is retinotopically mapped in the occipital cortex. There also evidence that spatial frequency processing is lateralized in the occipital cortex, with the right and left occipital cortices predominantly involved in the categorization of LSF and HSF scenes, respectively. In addition to neuroimaging studies on healthy subjects, patients with retinal disorders constitute pathological models which enable the specific investigation of retinotopic mapping of spatial frequency processing in the occipital cortex through the relationship between the position of the lesion on the retina and the processing of spatial frequencies. Similarly, patients with unilateral lesion of the occipital cortex constitute pathological models which enable the investigation of hemispheric differences at the level of the occipital cortex. We specifically explored the relationship between central retinal damage (age-related macular degeneration), peripheral retinal damage (glaucoma), left and right occipital damage (homonymous hemianopia) and the processing of spatial frequencies during scene categorization.

Organization and function of the human visual system in congenital visual pathway abnormalities

Michael B. Hoffmann
Department of Ophthalmology, Visual Processing Laboratory, Otto-von-Guericke-University Magdeburg

In albinism the temporal retina projects erroneously to the contralateral hemisphere, in achiasma the nasal retina projects erroneously to the ipsilateral hemisphere. Consequently, in both conditions the early visual cortex processes sizable proportions of the ipsilateral visual field. Here, a series of studies will be presented, detailing the projection abnormality, its consequence on cortical organisation and visual perception [1]: In albinism the representation abnormality (i) is organised as a retinotopic cortical map, (ii) is relevant for visual perception, (iii) does not interfere with perception in the contralateral hemifield, and (iv) leaves major lateralisation patterns in the primary motor and the somato-sensory cortex unaffected. (v) In albinism and achiasma the abnormal cortical representation of the ipsilateral visual field is superimposed as a retinotopic mirror-symmetric overlay onto the normal cortical retinotopic representation of the contralateral visual field. This indicates that in both conditions the abnormal input to the visual cortex does not undergo a topographic reorganization of the geniculo-striate projection. It is concluded that neural plasticity at the cortical level makes the abnormally represented information available for correct visual perception.

Can I pass through the door? A study with glaucoma patients

Quentin Lenoble, Sébastien Szaffarczyk, Jean-François Rouland
Sciences Cognitives et Sciences Affectives (France)

Previous researches have shown that locomotion through cluttered environments is predominantly a perceptual process (Cinelli et al. 2008, Hackney et al. 2013). The aim of the study was to determine whether visual judgment of glaucomatous patients for the passability through an aperture is related to the loss of vision, the perceived critical aperture and the shoulder width. We recruited 10 patients with binocular glaucoma (visual acuity 6/10 or higher and a visual defect > 12 db in each eye, mean age 68±7), 10 age-matched (mean age 67±8) control participants and 15 young. Participants had to estimate the minimal aperture of a virtual door for their passability. The experiment was programmed and run on a wide touch screen of 2m large simulating a sliding door on a wall. We manipulated the luminance (15%; 50%, 100%) and the distance to the door. The eye movements of the participants were recorded during the experiment. The participants can respond directly on the tactile screen for a distance of 50cm and with a joystick for the 1m and 2m distance). The results indicate an overestimation of + 12% (ratio between the shoulder width and the estimation response given on the screen) by the patients compare to the old participants: they judged that they could pass through a smaller aperture than their own shoulder. The distance and the luminance level do not affect this ratio. The patients did larger saccade but less saccade than controls. The visual field defect was correlated with the number of saccade (r=-0.7) and the size of the saccade (r=0.6). The response time of the patients was increase compare to the age matched group (+600ms) and particularly for the 15 % level of luminance (+ 900 ms). Our results suggest that glaucoma lead to impairment in the estimation of the passability through an aperture with consequences on locomotion abilities.

A Vision Enhancement System to Improve Face Recognition with Central Field Loss

Aurélie Calabrèse (1), Carlos Aguilar (2), Eric Castet (1)
Laboratoire de Psychologie Cognitive (France), 2 - Bases, Corpus, Langage (France)

Purpose: A new visual aid, using gaze-contingent visual enhancement, and primarily intended to help reading with central field loss, was recently designed and tested with simulated scotoma (Aguilar et al. 2016). Here, we present a validation of this system carried out with AMD patients during a face recognition task. Methods: 15 individuals with binocular central field loss from AMD (mean age = 79 ± 7, mean acuity = 0.66 ± 0.16) were recruited and tested on a face pairing task. On each trial, a test face was surrounded by 8 reference faces, among which, only one matched the test face. Participants were asked to explore the screen until they can report which reference face matched the test face. During the visual enhancement condition and at any moment while exploring the screen, a simple button press would allow the participant to magnify the fixated face (located at the PRL, thanks to an eye-tracker collecting gaze position in real-time). The enhanced face would be enlarged to fit the entire screen until the participant would decide to revert to normal viewing by releasing the button. During the natural exploration condition, participants also performed the pairing task but without the visual aid. Response time and accuracy were analyzed with mixed effect models to: 1- compare the performance with and without visual aid; 2- estimate any speed-accuracy tradeoff. Results: On average, the percentage of correct response for the natural exploration condition was 45%. This value was significantly increased to 64% with visual enhancement

Exploration and Exploitation in Human Visual Processing

Ricardo Gameiro
Institut für Kognitionswissenschaft Universität Osnabrück

Due to the importance of visual perception to navigate in our environment, it is no wonder that eye movement research has become a highly active and productive research field during the last decades. In my talk, I will discuss how fixation locations are selected in varying situations. In particular, I will wrap up some studies that investigate the trade-off between exploitation (whether to process a certain fixation point) and exploration (progressing to the next fixation). Hereby, I will focus on three major factors affecting visual behavior: bottom-up & top-down factors, as well as spatial image features. With a simple but powerful model, I will show that when presenting two images simultaneously, we can well predict which images attract more exploration based on individual global image salience. By manipulating the observers' state, we will see that this exploration as well as exploitation adapts in a specific manner. E.g. by adding emotions, we find that exploration shifts towards negative image scenes. Further, sleep deprivation reduces spatial exploration. In order to understand how spatial image information relates to visual behavior, I will show how exploration and exploitation is affected depended on the overall amount of visual information received by the visual field. We will see that patients suffering from a peripheral degeneration of the visual field generally follow similar visual behavior as healthy controls with only individual adaptions. However, adapting the image size from very small to very large changes exploration and exploitation in terms of spatial biases and fixation distribution. With results of the latter part, I will also shortly peak into the future showing new challenges when bringing eye movement research to virtual reality and the real world.

Glaucoma – through the eyes of the patient

David Crabb
City University of London

Successful clinical management of glaucoma should not simply be about control of intraocular pressure, but must equate to correct decisions about intensifying treatment when patients are at risk of developing 'visual disability'. Yet little is known about what visual field defects, at different stages of glaucoma, specifically affect patients' abilities to perform everyday visual tasks. One way to do this is to measure patient performance in tasks in a lab setting. Another way is to ask patients themselves. The latter can be revealing and demystify views about how patients perceive the world.

Abstracts Talks
GDR Vision Meeting

The spatial and temporal dynamics of attention: insights from the real-time decoding of the attentional spotlight

Suliann Ben Hamed
Centre de Neuroscience Cognitive, CNRS, Bron

As early as 1890, William James, defined attention as the cognitive process by which the mind takes possession in clear and vivid form of one out of what seem several simultaneous objects or trains of thought. Since then, this cognitive function has been explored by experimental psychologists and neuroscientists alike and the knowledge we have gained onto this process up to now is based on indirect task-based inferences on attention, rather than on where attention is actually being placed by the subject. I will present a new approach to the study of attention, based on the real-time tracking of covert spatial attention spotlight from the ongoing activity of bilateral prefrontal dense neuronal recordings in the non-human primate and I will show that this approach is instrumental to characterize the spatial and temporal dynamics of attentional processes.

Attention reorients at the theta frequency

Mehdi Senoussi (1), Niko Busch (2), Laura Dugué (3)
1 - ISAE-Supaéro (France), 2 - WWU Münster (Allemagne), 3 - Laboratoire Psychologie de la Perception (France)

Voluntary attention enhances visual processing at the attended location. In particular, attentional reorienting, i.e. the displacement of the attention focus in space, allows processing at other locations, critical in an ever-changing environment. Over the years, lots of researchers have characterized the spatio-temporal dynamics of attentional orienting. However, little is known about the spatio-temporal dynamics of attentional reorienting and its underlying mechanisms. In this experiment, we used a well-established psychophysics protocol to do so. We manipulated covert, endogenous attention, i.e. the allocation of attention to a particular location without eye movements, using a central cue. Participants performed a 2-AFC orientation discrimination task in which they had to report the orientation of a target grating (clockwise or counter-clockwise relative to vertical). Trials could be valid, when the target is at the attended location (75% of the trials) or invalid, when the target is at the unattended location requiring participants to reorient their attention to the opposite location (25% of the trials). Two probes (Landolt C's squares or rectangles; 12 possible probes) were then flashed after a variable delay after stimulus offset. Performance in reporting the probes was used to infer attentional deployment to those locations. By solving a second-degree equation, we determined the probability of probe report at the most (P1) and least (P2) attended locations on a given trial. Because P1 was higher than P2, we show that processing was nonuniformly distributed across locations in both valid and invalid trials. Interestingly, we showed that this attentional deployment was periodically modulated over time at 4 Hz (theta) in the invalid condition, i.e. when attention needs to be reoriented to the opposite location. We argue that attentional reorienting samples the space periodically at 4 Hz. This is consistent with our previous studies of attentional reorienting in cueing task (Dugué et al., 2017a) and attentional exploration during visual search tasks (Dugué et al., 2015 & 2017b).

Capturing appearance in crowded peripheral vision

Bilge Sayim (1) (2), Natalia Melnik (2), Zeynep Yildirim (2), Daniel Coates (3)
1 - SCALab, Université de Lille (France), 2 - Institute of Psychology, University of Bern (Suisse), 3 - University of Houston (États-Unis)

Object perception in the periphery is impaired by crowding, the harmful effect of flankers on target discrimination. The magnitude and spatial extent of crowding has been exhaustively measured using target identification experiments. However, the impact of crowding on stimulus appearance has received far less attention. Therefore, our goal was to capture appearance in peripheral vision and crowding directly, by letting observers adjust spatial properties of probes to perceptually match complex multiline configurations. Subjects adjusted the number, position, orientation, and size of the line segments. Items were presented in the fovea and at 10 degrees in the periphery. There were three location conditions: foveal match to peripheral target, peripheral match to foveal target, and peripheral match to peripheral target (in opposite visual fields). Each condition was tested both with and without flankers ('X's). General error patterns resembled those seen with traditional methods, including feature mislocalizations such as the perception of flanker elements at the target location. With foveally-viewed targets, peripheral matches were poorly positioned, but contained accurately sized and oriented segments. For peripherally-viewed targets, segments were typically shortened and often omitted (ie, target diminishment) from both peripheral and foveal matches. Whole element omissions were most frequent when the overall Gestalt of the target did not rely on the missing segment (quantified by the vertices leading to minimal change in the convex hull). By letting subjects make highly flexible feature adjustments to match their percepts, our results capture phenomenologically valid representations of peripheral vision, and reveal fundamental properties of form perception.

Crowding, visual span and reading speed in adults with dyslexia

Eric Castet, Ambre Denis-Noël, Carlos Aguilar, Pascale Colé, Chotiga Pattamadilok
Laboratoire de psychologie cognitive (France)

Excessive crowding may be a determinant factor of reduced reading speed in dyslexia ("crowding hypothesis" hereafter). Although controversial, this hypothesis implicitly relies on one main causal link: excessive crowding induces a smaller visual span (VS) which in turn induces reduced performance in eye-mediated reading. The VS in reading is the number of letters, arranged horizontally, that can be recognized reliably without moving the eyes and without any linguistic context. However, clear evidence supporting the link between VS and reading speed for dyslexics and non-dyslexics is still missing. Here we investigated this issue with dyslexic and skilled adult readers who were matched in non-verbal IQ, vocabulary knowledge, chronological age, gender and educational level but differed in reading level. In both groups of 28 participants, reading speed was assessed through sentence reading. Adaptive staircase procedures were used to estimate participants' VS using trigrams of letters presented for 100 ms at different locations across the horizontal meridian (while observers had to fixate a central dot). Participants had to report the middle letter of trigrams. Results show that both groups differ in two clear-cut ways: skilled readers have a significantly higher reading speed (by about 50 words/min) and a larger VS (by about 2 letters) than dyslexic readers. However, a mediation analysis shows that the group difference in reading speed is not mediated by VS. In conclusion, the controversial ?crowding hypothesis? in dyslexia still needs an explicit causal link between crowding and reading speed in order to offer a testable and coherent model.

Cerebral substrates of immediate and lasting effects of adaptation of saccadic eye movements

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Understanding reciprocal interactions between perception and action represents a major neuroscientific challenge. During recent years we have been investigating the effects onto visual perception of oculomotor changes brought about by sensorimotor adaptation processes. Saccadic adaptation maintains the accuracy of saccades by reducing errors in case of enduring physiological or pathological perturbations to the visuo-oculomotor system. Here, I will argue that saccadic adaptation not only occurs through motoric changes that better align the eye with the target, but also through changes in sensory representations which may aim at maintaining consistency between visual and oculomotor representations. Complementing behavioral evidence of effects of adaptation on performance in visuo-spatial perception, we revealed through functional magnetic resonance imaging an activation of the cerebral cortex during saccadic adaptation (Gerardin et al Neuroimage 2012). Such cortical substrate overlapped with the cortical substrate of visuo-spatial attention described by Corbetta and Shulman (2002), with notably the involvement of the intra-parietal sulcus areas of the dorsal (endogenous) attention system in relation with adaptation of voluntary saccades (with a causal role demonstrated by transcranial magnetic stimulation-TMS: Panouill□res et al Cerebral Cortex 2014) whereas the right temporo-parietal junction (rTPJ) of the ventral (exogenous) attention system was activated during adaptation of reactive saccades. In agreement with this last observation, we demonstrated using a behavioral approach that adaptation of reactive saccades improves the performance in a visual detection task involving exogenous attention (Habchi et al Front Hum Neuro 2015) and, through Magneto-encephalography, that such adaptation-attention coupling is accompanied by brain oscillation changes (Nicolas et al in preparation). We next used a TMS approach to determine the causal role of rTPJ in reactive saccades adaptation. Contrary to our expectations, this study failed to disclose any reliable effect of TMS over the rTPJ onto adaptation strength. Quite remarkably however, we incidentally discovered a strong effect of TMS onto the retention of reactive saccades' adaptation measured about 10 days after the adaptation session. Indeed, adaptation retention showed a 2 to 3.8 fold increase compared to retention measured in two subsequent control experiments (TMS over Vertex, and no-TMS). To our knowledge, this study is the first that begins disclosing the neural substrates of the medium-to long-term retention of saccadic oculomotor memories, by providing evidence for a role of the right temporo-parietal junction. Taken together, these studies concur to the view that saccadic adaptation processes, with both immediate and lasting effects, involve cortically-mediated changes in sensory representations.

Pacing effects on saccades in the young, the old, and Parkinson's disease.

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The involuntary and steteotyped kinematics of saccadic eye movements have inspired many optimisation models, and allowed for slow velocity saccades to be a useful clinical diagnostic. Faster velocity, “supra-optimal”, saccades can be elicited via explicit reward paradigms. Recent, but limited data, also suggests that faster saccades can be facilitated by simply increasing the pacing of trials (reduced inter-trial intervals). One explanation of this pacing effect is that the accumulated implicit reward of landing on target increases with faster pacing, and that this is mediated by dopaminergic neurons in the basal ganglia. We parametrically explore this phenomenon in young healthy adults, older controls and patients with Parkinson's disease. We find robust pacing increases in saccadic velocity in healthy participants, and essentially absent pacing effects in Parkinson's patients. We conclude that changes in saccade velocity with pacing may be a more useful diagnostic marker in Parkinson's disease than saccade velocity alone.

Reinforcement can reduce the size-latency phenomenon

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Saccadic latencies are known to change as a function of target eccentricity. Recently, it has been shown that latencies may be evaluated in terms of the amplitude of the step in proportion to the size of the target, and consistently change according to this step-size ratio with smaller ratios producing longer latencies (Madelain et al., 2005; Harwood et al., 2008; De Vries et al., 2016). This effect, called the size-latency phenomenon, might be seen as a function of a cost-benefit relationship: the difference in latencies might be explained by the ?cost' of making a saccade while the target mostly remains within the attentional field. Here, we probe this hypothesis by manipulating the cost-benefit relationship using a reinforcement procedure. Six subjects (including two authors) tracked a visual ring target stepping horizontally with an amplitude ranging from 1.2 to 10.5 deg. The size (diameter) of the ring varied as a function of the target step such that the step-size ratio was equal to either 0.3 or 1.5. Trials with saccadic latencies outside a [80;500] ms range or saccadic gains outside [0.5;2] were discarded. We used a dynamic reinforcement criterion based on the median computed over a 50-trial moving window in 2 blocked conditions. In the 0.3 ratio condition, any latency shorter than the criterion was reinforced. In the 1.5 ratio condition, any latency longer than the criterion was reinforced. During baseline, we observed the size-latency phenomenon with large differences in latencies depending on the ratio (e.g. 152 ms and 204 ms, respectively for 1.5 and 0.3). After training (4800 reinforcement trials), distributions shifted toward the shorter or longer value (e.g. 223 ms and 169 ms, respectively for 1.5 and 0.3). On average, latencies decreased by 31 ms and increased by 75 ms according to the ongoing reinforcement contingencies. These changes in saccadic latencies were not explained by changes in saccadic amplitudes. Reinforcement reduced the size-latency phenomenon, although it was not entirely suppressed. Our results indicate that reinforcement contingencies can considerably affect saccadic latency distributions, and support the idea of a cost-benefit evaluation for saccade triggering.

Variability of memory-guided saccades in the human superior colliculus

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The superior colliculus (SC) is a mid-brain structure situated on the roof of the brain stem. It is a major player in the programming of saccades: neurons fire just before and during a saccade, and their stimulation leads to saccades of preferred amplitude and direction. The SC contains topographic, though distorted, representations of visual and motor spaces, with greater surfaces of tissue devoted to saccades of smaller amplitude than to larger amplitudes. The efferent mapping function (relating locus of the population of recruited neurons to the metrics the ensuing saccade) has been quantified in monkeys. Recently, the same efferent function has been applied to human saccades: the increase in variability with saccade amplitude in visual space cancels out in collicular space (Vitu et al., 2017), suggesting that the variability of visually-guided saccades reflects translation-invariant jitter in human SC population activity. Memory-guided saccades are more variable than visually-guided saccades of comparable amplitude, and we wanted to determine to what extent this variability may also be represented in the SC. To this end, we asked healthy human adults to perform visually and memory-guided saccades of different amplitudes. Our data replicate those found previously: the distribution of visually-guided saccades to a simple target conforms to the collicular mapping function. However, memory-guided saccades presented some interesting deviations from the predicted collicular mapping, with asymmetric saccade landing position distributions. We hypothesize that these asymmetric distributions may be due to the imprecision of memory representations of the saccade goal, upstream of the SC.

CobEYE: projet d'étude épidémiologique de l'oculomotricité
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Je présenterai brièvement le projet « CobEye » qui vise à collecter les activités oculomotrices d'un grand nombre d'individus de tout âge, d'analyser et de traiter ces données pour en extraire des « invariants » et des « variantes », et de croiser ces données avec d'autres facteurs (âge, genre, niveau socio- professionnel,etc.) pour déterminer les origines des différences interindividuelles et identifier des biomarqueurs comportementaux de pathologies (et de prédicteurs de l'occurrence de pathologies). Le projet « CobEye » repose sur deux aspects innovants : 1. L'utilisation de bornes interactives automatisées, mobiles et autonomes, permettant une utilisation dans de très nombreux contextes (écoles, EPHAD, hôpitaux, etc.) 2. L'utilisation de « jeux sérieux » (« Serious Eye-Games ») pour la collecte de données. Ces jeux engagent tout le répertoire oculomoteur pour la réalisation d'actions ludiques (ex. fixer des cibles -images de Smileys ou autres- pour les faire disparaitre le plus vite possible). Ces jeux permettent de tester les fonctions oculomotrices de base ainsi que différentes fonctions cognitives (attention, décision, mémoire, etc..). Ce projet est en cours de développement en partenariat avec : La cohorte « Constances » (200 000 volontaires, voir http://www.constances.fr/) Un consortium de 9 équipes de recherche réparties à Lille, Paris, Lyon, Grenoble, Marseille, Toulouse, Dijon

Enregistrement conjoint EEG et oculométrique : estimation des potentiels évoqués et application en exploration visuelle et en lecture
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L'acquisition conjointe des activités électroencéphalographiques et oculaires d'un participant pendant une tâche visuelle est présenté depuis plusieurs années comme une solution expérimentale très attractive, et supportant des protocoles expérimentaux plus « ecologiques ». Par la complémentarité des deux modalités expérimentales acquises à résolution temporelle élevée, Il est ainsi possible d'analyser le décours temporel des activités neuronales au rythme des fixations oculaires. La technique des potentiels évoqués à l'apparition de stimuli externes (ERP « Event Related Potential ») est étendue aux potentiels évoqués à chaque fixation ou saccade (EFRP/ESRP « Eye Fixation/Saccade Related Potential »). Si les premières études utilisant ce couplage datent des années 1950 (Gastaut, 1951), ce n'est que bien plus tard que cette technique été reprise avec les dispositifs actuels pour l'étude des mécanismes para-fovéaux durant la lecture fluide (Baccino, & Manunta, 2005). Depuis, force est de constater que le nombre d'études publiées utilisant cette technique d'enregistrement conjoint est bien inférieur à l'attente suscitée. Malgré l'apparente simplicité d'un couplage ne fournissant finalement que quatre canaux supplémentaires (positions X Y des deux yeux) aux signaux EEG sur 32 ou 64 électrodes (par exemple), se cachent de nombreuses difficultés et questions méthodologiques (Dimigen, et al., 2011; Nikolaev, et al., 2016). En particulier, nous nous focaliserons sur la difficulté d'estimer les EFRP/ESRP pour deux raisons principales : (1) la durée des potentiels évoqués est souvent plus longue que l'intervalle entre deux fixations ou saccades, il en résulte des recouvrements temporels entre les potentiels évoqués successifsÊ; (2) le signal EEG étant extrêmement bruité, l'estimation des potentiels nécessite la réplication d'un grand nombre d'essais durant lesquels les fixations/saccades sélectionnées seront supposées évoquer un même potentiel, fournissant ainsi une hypothèse restrictive devant la forte variabilité du motif oculométrique durant la résolution de la tâche. Pour faire face à la première difficulté, des travaux récents (Dandekar, et al., 2012, Bardy, et al., 2014, Smith, & Kutas, 2015Ê; Kristensen, et al., 2017) ont convergé pour proposer l'utilisation de la régression linéaire multiple afin de déconvoluer les potentiels évoqués successifs. Par une utilisation adaptée du modèle, on peut

montrer qu'il apporte également une solution intéressante à la deuxi□me difficulté en permettant une meilleure estimation avec une prise en compte des possibles facteurs confondants liés aux données oculométriques comme les amplitudes et directions de saccade (Guérin-Dugué, et al., 2017). Tout ceci sera illustré par des résultats obtenus durant des tâches d'exploration visuelle et de lecture.

Insect vision: when and why small body size matters

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Animals vary greatly in body size which defines to a large extent the resolution of their sensory systems and how their brains process sensory information. This is particularly evident when comparing different designs of eyes across the animal kingdom. Insects are small in size, have low-resolution eyes yet sophisticated vision that enables them to solve a range of perceptual and navigational tasks. I will present ideas and current work that investigates how bees acquire and learn visual information for spatial orientation and localisation of flowers, whilst controlling their flight movements in a three-dimensional space.

The neural basis of stereopsis: understanding how binocular disparity is encoded in primary visual cortex

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Primate stereopsis is remarkably precise and can break camouflage, revealing structures that are monocularly invisible. This ability depends on matching up the two eyes' images, a process which begins with disparity-sensitive neurons in primary visual cortex, V1. The currently accepted model of these neurons is a 3-layer linear/nonlinear neural network. The weights from the input layer to the hidden layer represent binocular simple-cell receptive fields. These simple cells then converge onto a single V1 complex cell. With the right parameters, this model can reproduce many general properties of V1 neurons, notably their attenuated responses to anticorrelated images. Here, contrast is inverted in one eye, meaning there are many false local matches but no global depth. However, attempts to fit these models to V1 neurons using spike-triggered covariance have not shown this attenuation. Thus it is unclear whether this model really describes how V1 works. We have used a new machine learning approach to train models on correlated, uncorrelated and anti-correlated random-line patterns with a range of disparities. Despite being given only raw images – not disparity or correlation – as input, the model predicts disparity tuning curves well for all three correlations. This shows for the first time that these models can describe individual V1 neurons. However, many neurons show very high activity for one preferred disparity, which the models cannot capture. This suggests that the real puzzle of V1 neurons may not be how they attenuate their response to false matches, but how they boost their signal for one preferred disparity.

Emergence of binocular disparity selectivity through spike-timing dependent plasticity
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There is converging evidence supporting the claim that the visual systems of animals adapt their limited resources to the regularities of the surrounding environment. This efficient coding model has been shown to successfully predict units with Gabor-like receptive fields close to those observed in V1 simple-cells. However, most of these studies remain limited in their scope because they rely on 2-D statistics of natural images, while the scene is 3-D. Here, we propose a novel model based on a spiking neural network which uses a biologically inspired plasticity rule (spike-timing dependent plasticity or 'STDP') to simulate the learning of binocular properties from natural stereoscopic images. First, the stereoscopic images were convolved with ON/OFF centre-surround filters to characterize retinal ganglion cells and LGN activity. These responses were converted to spikes and thresholded such that only the most active units could fire. spatial pools from this retina/LGN layer were then used to train an STDP based neural network composed of 300 integrate-and-fire neurons with lateral inhibition. Our results show that for both eye, most units develop Gabor-like receptive fields similar to those observed in binocular simple-cells of macaque V1. These receptive fields exhibit a mixture of phase and position coding of disparity, in line with neurophysiological reports. When tested with phase-shifted sine gratings or random-dot stereograms, the units were also found to show disparity-tuning curves close to those observed in single-cell recordings from cat or macaque. Binocular disparity selectivity was principally observed along the horizontal dimension, where it ranged between and . Interestingly, statistics at the population level showed that selectivity in our neural network reflects biases observed in visual environment. Overall, our model describes a biologically plausible mechanism for the emergence of binocular neurons in species with stereoscopic vision.

Fast and automatic visual categorization of faces in the human ventral occipito-temporal cortex with intracerebral recordings
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The neural basis of human visual categorization remains poorly understood, essentially because of difficulties in measuring this fast and automatic process inside the human brain with direct recordings of neural activity. Here we extend the findings of a recent study (Jonas et al., 2016) by reporting local neurophysiological activity from a total of about 3300 contact electrodes implanted in the grey matter of the ventral occipito-temporal cortex (VOTC) in a large group of temporal epileptic patients (N=61). In this paradigm, widely variable natural object images alternate at a rapid fixed rate (6 images per second: 6 Hz), with natural images of faces interleaved as every 5th stimulus (1.2 Hz). High signal-to-noise ratio face-selective responses are objectively (i.e., exactly at the face stimulation frequency) identified across the whole VOTC. In line with previous intracranial studies, we report a wide distribution of these responses, bilaterally across the whole VOTC. Beyond this wide distribution, quantification of face-selective responses in anatomically defined regions in individual brains reveals local peaks of activity. The lateral section of the right middle fusiform gyrus shows the largest face-selective response by far, revealing a "fusiform face area" (FFA) with direct measures neural measures of activity, therefore supporting two decades of fMRI research in this field. In addition, three novel regions with large face-selective responses are disclosed in the right ventral anterior temporal lobe, a region that is undersampled in fMRI due to magnetic susceptibility artifacts. A high proportion of contacts responding only to faces (i.e., "face-exclusive" responses) are found in these regions, suggesting that they contain populations of neurons dedicated to the visual category of faces. These observations provide original evidence for hemispheric and regional specialization of visual category-selectivity in the human brain with direct measures of brain activity and pave the way for understanding the neural basis of higher level functions such as individual face

recognition. They also provide strong support for the validity of the epileptic brain to understand visual recognition and brain function in general.

Visual stimulation quenches global alpha range activity in awake primate V4

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Increasing evidence suggests that sensory stimulation not only changes the level of cortical activity with respect to baseline but also its structure. Despite having been reported in a multitude of conditions and preparations (for instance, as a quenching of intertrial variability, Churchland et al., 2010), such changes remain relatively poorly characterized. Here, we used optical imaging of voltage-sensitive dyes to explore, in V4 of an awake macaque, the spatiotemporal characteristics of both visually evoked and spontaneously ongoing neuronal activity and their difference. With respect to the spontaneous case, we detected a reduction in large-scale activity (cortical extent > 1 mm) in the alpha range (5 to 12.5 Hz) during sensory inflow accompanied by a decrease in pairwise correlations. Moreover, the spatial patterns of correlation obtained during the different visual stimuli were on the average more similar one to another than they were to that obtained in the absence of stimulation. Finally, these observed changes in activity dynamics approached saturation already at very low stimulus contrasts, unlike the progressive, near-linear increase of the mean raw evoked responses over a wide range of contrast values, which could indicate a specific switching in the presence of a sensory inflow.

Detecting color in natural scenes

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The human visual system processes both luminance and chrominance information from our environment. Three types of retinal photoreceptors (L, M and S cones) convert light into three channels: a luminance and two chrominance channels through cone-opponent mechanisms. These channels are further processed by the cells of the primary visual cortex. Several psychophysical studies have modeled these post-receptoral channels by linear combinations of cone-contrast values. However, when considering natural scenes, cone-contrast definitions appear to be arguably unsuitable, mainly because adaptations levels of cones are likely to vary across the image. To perform pixel-based analyses on luminance and chrominance information in natural scenes, some studies referred to a non-linear "shadow-removing" definition of chrominance proposed by P‡rraga et al. (1998) and included a divisive normalization of the color-opponent channels by luminance. In the proposed study, we access the relevance of this divisive model to the perception of natural scenes. To tackle this issue, we introduced three experiments where we manipulated luminance and chrominance channels contents of natural scene images and studied their relationship with perceived information. In a first experiment, using a 2AFC paradigm, subjects were asked to decide which of the two displayed images of the same scene contained color (each image having the same luminance information). Our data show that color detection threshold increases with the mean luminance level of the image. To account for these data, we suggest a simple but effective model for color detection in our task. Our model has two variants: one is based on a linear color space, while the other features divisive normalization of chrominance by luminance (along the lines of P‡rraga et al.). We found an advantage for the divisive definition, but further analysis showed that a misalignment of individual cone-opponent channels with our color space cardinal directions could also account for our results. To discard this explanation, we conducted two additional experiments of luminance and chrominance detection in natural scenes. Our findings suggest that divisive definitions of color-opponent channels are indeed more appropriate than linear definitions when considering performance on detecting color in natural scenes. However, another model could also

account for our data: if each cone logarithmic signal independently follows a von Kries adaptation procedure over the image, it produces results very similar to a divisive model, raising the question of which mechanistic description of cortical color vision is the most relevant.

Awareness of the outcome of self-initiated pointing actions

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Are we aware of the outcome of our actions? The participants pointed rapidly at a screen location marked by a transient visual target (T), with and without seeing their hand, and were asked to estimate (E) their landing location (L) using the same finger but without time constraints. We found that L and E are systematically and idiosyncratically shifted away from their corresponding targets (T, L), suggesting unawareness. Moreover, E was biased away from L, toward T (21% and 37%, with and without visual feedback), in line with a putative Bayesian account of the results, assuming a strong prior in the absence of vision. However, L (the assumed prior) and E (the assumed posterior) precisions were practically identical, arguing against such an account of the results. Instead, the results are well accounted for by a simple model positing that the participants' E is set to the planned rather than the actual L. When asked to estimate their landing location, participants appeared to reenact their original motor plan.

Spatial Integration for Perception and Smooth Pursuit Eye Movements depend on the Visual Stimulation.

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Humans use smooth pursuit eye movements to track moving objects of interest. In order to track an object accurately, motion signals from the target have to be integrated and segmented from motion signals in the visual cortex. Here we tested the ability of the pursuit and the perceptual system to integrate motion signals by small to large areas of the visual field across different visual stimuli, e.g. grating, random-dot kinematograms and natural statistic images. We measured ocular movements and perceptual discrimination decisions and found that the mechanism of spatial integration changes as a function of visual stimulation. In addition we found that the center-surround mechanisms, evidenced in previous works (Tadin et al., 2005, 2008; Lappin et al. 2009), are valid only in certain specific cases.

Perceptual effects of adaptation to dynamically changing stimulus statistics

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A well-known effect of adaptation to a visual stimulus is the negative correlation between the current percept and previous percepts. However, we have argued that the negative correlation between the current percept and recent ones is accompanied by a positive correlation with events occurring further in the past (Chopin and Mamassian, Current Biology, 2012). Here, we design a novel psychophysical experiment to measure the perceptual effects of adapting to dynamically changing stimulus statistics. Observers are presented with a series of oriented Gabor patches from a range of orientations and are asked to attend to their orientations and wait for a reference to appear after a random number of stimuli. Then, they are asked to judge whether the orientation of the last stimulus in the series was clockwise or counter-clockwise from the reference orientation. Unbeknownst to the observers, the test stimuli are always at the point of subjective equality as measured at the start of the experiment, i.e. they are highly ambiguous. The orientations of the stimuli before each test stimulus are randomly drawn from a Gaussian distribution whose mean changes slowly in time following a sinusoidal pattern. Moreover, the frequency of the sine wave increases or decreases as the experiment progresses, thus affecting the rate of mean orientation change. We measure the bias in observers' responses over the course of thousands of trials and hundreds of responses.Ê Our results suggest that a negative tilt after-effect for short timescales gradually changes into a positive effect, though relatively weaker, for trials further in the past. We are able to quantify the relation between the presented stimulus and the observers' responses in a non-parametric way using a deconvolution process. Furthermore, using a reverse time analysis, we show that the positive correlation is not an artefact of the stimulus pattern but a genuine effect of adaptation to the stimulus statistics.

Abstracts Posters
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Estimating and anticipating a dynamic probabilistic bias in visual motion direction
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Humans are able to accurately track a moving object with a combination of saccades and smooth eye movements. These movements allow us to align and stabilize the object on the fovea, thus enabling high-resolution visual analysis. When predictive information is available about target motion, anticipatory smooth pursuit eye movements (aSPEM) are efficiently generated before target appearance, which reduce the typical sensorimotor delay between target motion onset and foveation. It is generally assumed that the role of anticipatory eye movements is to limit the behavioral impairment due to eye-to-target position and velocity mismatch. By manipulating the probability for target motion direction we were able to bias the direction and mean velocity of aSPEM, as measured during a fixed duration gap before target ramp-motion onset. This suggests that probabilistic information may be used to inform the internal representation of motion prediction for the initiation of anticipatory movements. However, such estimate may become particularly challenging in a dynamic context, where the probabilistic contingencies vary in time in an unpredictable way. In addition, whether and how the information processing underlying the buildup of aSPEM is linked to an explicit estimate of probabilities is unknown. We developed a new paired-task paradigm in order to address these two questions. In a first session, participants observe a target moving horizontally with constant speed from the center either to the right or left across trials. The probability of either motion direction changes randomly in time. Participants are asked to estimate "how much they are confident that the target will move to the right or left in the next trial" and to adjust the cursor's position on the screen accordingly. In a second session the participants eye movements are recorded during the observation of the same sequence of random-direction trials. In parallel, we are developing new automatic routines for the advanced analysis of oculomotor traces. In order to extract the relevant parameters of the oculomotor responses (latency, gain, initial acceleration, catch-up saccades), we developed new tools based on best-fitting procedure of predefined patterns (i.e. the typical smooth pursuit velocity profile).

Exploration des composantes de la perception lors d'un expérience mélant art et science
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La vision utilise un faisceau d'informations de différentes qualités pour atteindre une perception unifiée du monde environnant. Nous avons utilisé lors de plusieurs projets art-science (voir http://invibe.net/LaurentPerrinet/EtienneRey) des installations permettant de manipuler explicitement des composantes de ce flux d'information et de révéler des ambiguités dans notre perception. Dans l'installation *Tropique*, des faisceaux de lames lumineuses sont arrangés dans l'espace assombri de l'installation. Les spectateurs les observent grace à leur interaction avec une brume invisible qui est diffusée dans l'espace. L'ensemble des faisceaux évolue comme autant de lames lumineuses à partir de 6 video-projecteurs placés dans l'espace de l'installation, suivant une dynamique autonome. En même temps, la position des spectateurs est captée et permet d'alterner entre une vision de ces scultures d'un point de vue introceptif à un point de vue exteroceptif. Dans *Elasticité* dynamique, 25 longs mirroirs (3m de haut) sont arrangés verticalement sur une ligne horizontale et peuvent être orientés indépendamment grâce à un système de moteurs. Suivant la dyamique qui est imposé à ces moteurs, la perception de la scultpure permet de faire passer d'un arrangement propre à la sculpture, par exemple en simulant une vague de propagation, à une perception des jeux de lumière et de reflexions en utilisant des configurations géométriques ou prenant la forme d'une lentille de Fresnel. Enfin, dans *Trames,* nous explorons l'interaction de séries périodiques de points placées sur des surfaces transparentes. Dans de premières expérimentations utilisant une technique novatrice de sérigraphie, ces trames de points sont placées afin de faire

émerger des structures selon le point de vue du spectateur. De manière générale, nous montrerons ici les différentes méthodes utilisées et aussi les résultats apportés par une telle collaboration.

Saccadic and Movement Reaction Time discrimination in humans

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We have previously established that saccadic reaction times (SRTs) may depend on reinforcement contingencies. It follows that one must be able to discriminate one's own latencies to adequately assign credit to one's actions. In two different experiments we used an adaptive procedure to test the limit of both saccadic and manual reaction time (MRTs) in ten subjects for each experiments. In the first experiment we trained ten participants in a “staircase paradigm” or “up and down procedure” to determine their 75% perceptual threshold of SRTs. On each trial they had to saccade to a stepping target. In a 2-AFC task they had to choose the number representing the actual SRT while the second number was a made-up value which proportionally differed from this SRT. The relative difference between the two options was computed by either adding or subtracting one of the percentage values of a decreasing fixed staircase range. The percentage value was larger at the beginning of the task (starting at 50%) and decreased following the participant's discrimination performance that determined the position in the staircase range. To encourage learning a feedback was provided after each response. In the MRTs experiment the participant had to reach a target and judge his own reaction time in a 2AFC task. The protocol was similar to the SRTs experiment, except that instead of using a fix staircase to set the difference between the two numbers, we used a double staircase in a QUEST procedure. In this case the relative difference between the two numbers quickly converge to the threshold. 75% threshold was computed by fitting a psychometric function for both experiments. Results reveal a very accurate perception both of SRTs and MRTs: 75% threshold range from 13% for the best performance to the 37% for the worst one in the SRTs discrimination and from 12% to 36% for MRTs perception. This indicates that our participants can discriminate very small SRT differences, providing support for the possibility that the credit assignment problem may be solved even for short reaction times.

Perceived timing of a visual event is affected by eccentricity

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Reaction time to a visual event increases with eccentricity (Osaka, 1976; Tynan & Sekuler, 1982), but surprisingly, speed of visual processing increases across visual field (Carrasco et al., 1999).ÊIn the work reported here we investigated if perceived timing of a visual event is also affected by eccentricity. We used a novel paradigm that enables us to study perceived timing of a single visual event. Participants were initially familiarized with a fixed interval duration by watching the hand of a clock rotating at a constant speed, one cycle in 2 seconds. In the rest of the experiment, the hand was no longer presented and the clock face was represented as a circle. A stimulus was then briefly flashed within the interval duration, and participants had to place a cursor on the circle at the location where the hand would have been at the time of the flash. Stimuli were white discs presented at different eccentricities around the fixation. ÊWe varied horizontal position of the stimuli in 5 logarithmically equally spaced steps (from 0° to 36°). On each trial, two stimuli were simultaneously presented at the both sides of the fixation, except when a single stimulus was presented at the fixation (20% of the trials). Different eccentricities were tested in separate blocks. Estimated timing of a visual event was affected by position in the visual field. Events presented at the small eccentricity (4.5°) were perceived to occur before than events presented in the fovea. Furthermore, the bias gradually decreased across the periphery. These results suggest that estimated timing of a

visual event is affected by different processing latencies across visual field (Carrasco et al., 1999; White, Linares & Holcombe, 2008; Williams & Lit, 1983).

Metacognition of temporal selection during the Attentional Blink

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To which extent does temporal attention affect confidence judgment? Visual confidence refers to one's ability to estimate one's own performance in a considered task. As it relates to the second order representation of a primary decision, visual confidence might be considered as a form of metacognition. Temporal attention has been extensively studied through a phenomenon coined the ?Attentional blink?: when two targets are displayed too close in time in a RSVP stream, the second target is often missed. This miss does happen less frequently for the item immediately following the first target - an effect called “lag-1 sparing” - but usually occurs for the second and third items in the stream and progressively vanishes for later items. This “blink” has been considered as an argument in favour of a limited capacity model of attentional selection, but participant's ability to introspect on the Attentional Blink has not been fully considered yet. Here, we are interested in the effect of attention on confidence, and specifically whether confidence can track the temporal change of performance due to attention. Recent studies tend to suggest that in the spatial domain, attention-related uncertainty can be efficiently incorporated into confidence judgments (Denison, Adler, Carrasco, & Ma, 2017; Recht, de Gardelle, & Mamassian, 2017), but the effects of temporal attention on confidence have not been considered yet. In the present study, we adapted a RSVP task used to probe temporal selection in the attentional blink (Vul, Nieuwenstein, & Kanwisher, 2008). The impact on confidence of three dimensions known to be affected during the blink was analysed: namely the suppression, delay and precision of temporal selection. Results showed (1) a successful capture of suppression, except for lag-1 sparing (“confidence blink”), (2) a significant difference in how delay impacts accuracy and confidence following the blink, and (3) a tendency for confidence to mirror the precision of temporal selection, leading to sub-optimality in metacognition.

Voluntary tracking the moving clouds: Effects of speed variability on human smooth pursuit

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It is still not fully understood how global motion speed is estimated by the visual system under complex, variable naturalistic conditions. We have investigated the effects of local speed variability (i.e. speed bandwidth) on voluntary pursuit eye movements in human participants. We used a well-controlled class of broadband random-texture stimuli called Motion Clouds (MCs) with continuous naturalistic spatiotemporal frequency spectra (1,2). MCs allow manipulating visual motion signal distributions along both spatial and temporal frequencies as well as along the speed axis. Subjects were instructed to track a large (5° diameter) patch of moving clouds (mean speed=10 or 20°/s), presented with different speed bandwidths (ranging from 0.05 to 8 °/s). Speed bandwidth had no effect upon pursuit latency but non-linearly affected initial eye velocity: response amplitude remained constant for small bandwidth but rapidly decreased for increasing bandwidth above a cut-off value of (7 °/s). Tracking responses became largely transient at these values. These nonlinear relationships remained largely unchanged when varying the mean or bandwidth of spatial frequency MC distributions. These results allow estimating the width of speed tuned channels across a broad range of spatiotemporal frequencies.

Reward contingencies and smooth pursuit eye movements in healthy participants and Parkinson's disease

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Historically, the pursuit system has been described as a servo-system (Robinson, 1986) yielding an accurate match between the eye and a moving target's speed. Recently, the analysis of the effects of reinforcement contingencies on different parameters of eye movements has provided convincing evidence that voluntary eye movements are an operant behavior (e.g. Madelain et al, 2011). Only few studies have addressed the sensitivity of smooth pursuit to reward contingencies, pointing at different effects of the latter during different phases of smooth motion tracking and depending on whether a single or multiple moving objects were presented. Joshua & Lisberger (2012) reported an influence of pre-cued reward contingencies already on vector average pursuit initiation on monkeys. Using a single moving target, Brielman and Spering (2015) have shown that human participants's smooth pursuit is affected by expected reward across the whole time-course, whether the stimulus-reward association is pre-cued or not. We proposed here a novel task to address the role of reward contingencies during different phases of smooth pursuit with two competing motion signals (Lisberger and Ferrera 1997) in healthy participants and Parkinson's Disease (PD) patients (On and Off medication). In our task, each of the targets' motion direction is associated to different reward weighting rules similar to an Iowa gambling task (IGT) (Bechara et al., 1994). Recent studies on smooth pursuit in PD (see Fukushima et al, 2017) have highlighted a multi-faceted pattern of impairments. In addition, Parkinson-related impairments in decision process have clearly been demonstrated in IGT tasks (see Evens et al, 2016), but it is not clear whether such impairments would appear already for short-latency visuomotor decisions or they would only arise for higher-level responses. We then performed a standard vector-average smooth pursuit experiment as a baseline and then, in the main experiment, manipulated the “IGT similar” reward contingency rules to each pursuit direction. Factors like aging and PD result in noisy oculomotor data and large inter-subjects variability. Nonetheless, our first results point to differences across groups in several smooth pursuit phases, namely an increase in the vector average latency between healthy control participants and patients in the baseline task: this latency difference seems to decrease in the experimental paradigm. The analysis of choice-strategy also suggests that decision-making impairment in PD is also found in an oculomotor tracking task.

Integrating motion predictive information across different time scales: an eye-movement and transcranial random noise stimulation (tRNS) study

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Predictive information about target motion can strongly bias tracking eye movements. Previous evidence suggests that eye movements can be efficiently adjusted to predictive information integrated either over a short (single-trial) or long time-scale (trial-sequence), and that two key areas (parietal and frontal) play a direct role in these tasks. We ask whether different sources of predictive information are combined across different time-scales to control tracking eye movements. Second, we probed the role of key cortical areas in the control of predictive eye movements, by applying tRNS over the frontal, parietal, and occipital cortex as a control, in separate sessions. We recorded eye-movements from eight participants during a smooth pursuit task, where the probability of motion was either uniform across directions, or biased in favor of one direction. In half the trials (blank) the moving target was transiently occluded for 800ms. As expected, (a) robust anticipatory pursuit was observed before motion onset in the biased condition and (b) pursuit velocity was reduced during the target blank. In the direction-biased condition, sustained predictive pursuit during blank was stronger in the more likely direction, suggesting that information integrated over a long trial-sequence can be combined with the within-trial visuomotor memory. Interestingly, tRNS over parietal cortex facilitated the occurrence of predictive saccades during blank, while tRNS over the frontal cortex facilitated trial-sequence effects, as measured by the

variability in predictive pursuit as a function of the direction of previous trials. Mean predictive pursuit velocity wasn't modulated by tRNS either during blanking or during anticipation.

Stereomotion processing in the non human primate brain

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Motion perception is a fundamental property of the visual system in most animal species. Although numerous studies examined how the primate brain processes 2D motion, much less is known about how it encodes 3D motion. A few neuroimaging investigations in human found that stereomotion is mostly processed within the hMT+ complex and its neighborhood. Here, we extend this work to non-human primate. Functional MRI data were recorded in two behaving macaques at 3 Teslas during a passive fixation task. Our main condition (changing disparity over time, CDOT) consisted of a central disk filled with dynamic random dots (diameter = 19¡, refresh rate = 30Hz). The dots' binocular disparity changed over time along opposite directions in the upper and lower parts of the disc (triangular functions between +/- 23 arcmin at 1 Hz). In two control conditions, we scrambled the temporal (TS) or spatial (SS) structure of the CDOT condition. All conditions were monocularly identical, shared the same disparity distributions but only the CDOT condition had uniform and continuous motions in depth. We interleaved those conditions with a baseline (fixation point) in a bloc-design paradigm. From a general linear model computed using SPM 12, we found that the CDOT condition led to stronger responses than the control conditions in the superior temporal sulcus, the parieto-occipital cortex and the posterior part of the intraparietal sulcus. Our results suggest that multiple regions process stereomotion in macaque and encourage further investigations in human.

The effect of conflicting binocular and monocular cues on stereoscopic acuity

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When binocular disparity is the only cue to depth, stereoscopic acuity is proportional to the interpupillary distance (IPD). Telestereoscopic viewing which increases the effective IPD by a factor of N is expected to increase binocular disparity (and as a result, stereoscopic acuity) by the same factor N. Our study sought to investigate stereoscopic acuity under telestereoscopic viewing when secondary visual cues to depth are available. In that case, depth is specified by conflicting altered binocular disparity and unaltered monocular cues. Stereoscopic acuity was assessed using a Howard-Dolman test. 31 participants had to set a vertical rod to appear in the same frontal plane as another fixed rod placed at three meters. Stereoscopic acuity was assessed for three effective IPD (unchanged, two and four times the participants' natural IPD), in two testing conditions: A standard test condition, and an enriched test condition in which several monocular cues to depth (motion parallax, relative size and shadows) were introduced. In the standard test condition, increasing the effective IPD significantly increased stereoscopic acuity. The multiplying factor (x1.6 on average) was however lower than the expected factor (x4) based on geometry. Conversely, stereoscopic acuity did not depend on effective IPD in the enriched test condition. We ascribe the absence of telestereoscopic viewing effect in the enriched test condition to a down-weighting of disparity contribution relative to those of the monocular cues. In addition, the lower gain in stereoscopic acuity according to multiplying factor is likely due to residual monocular cues in the standard Howard-Dolman test.

Temporal processing of scene gist between central and peripheral vision

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Scene gist recognition only necessitates few dozens of milliseconds in central vision. This process has been shown to be still efficient in peripheral vision. However, little is known about the spatio-temporal processing of scene gist between central and peripheral vision. We investigated rapid scene categorization manipulating the relationships and asynchrony between central and peripheral information. In a mixed design, 384 scenes belonging to either natural or man-made categories were showed for 33ms on a 180¡ panoramic screen. Using a window/scotoma paradigm (10° or 30° radii), the peripheral part of the scenes was displayed according to a varying SOA from the central part [-150 ; -84; 0 ; +84 ; +150 ms]. The relation between central and peripheral parts was congruent (same scene or same super-category) or incongruent (different super-category). Participants were asked to categorize the central part of the scenes as fast as they could. Preliminary results on response times (N=14) seem to show a peripheral contamination on the central information presented before. Previous but also concomitant peripheral information tend to impair more severely central scene gist processing. Scene congruency influence is still studied.

Saccadic gain modulation by manipulating a visual discrimination task

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Saccadic adaptation reflects the ability of the oculomotor system to quickly adapt to changes in sensorimotor contingencies. It has been shown that an arbitrary reinforcer such as an auditory tone or seeing the target on the fovea can control changes in saccade gains. That reinforcement learning can induce saccade adaptation in the absence of a visual position error suggests that conventional saccade adaptation might involve general learning mechanisms rather than specific motor calibration mechanisms.Ê The present study asks whether adaptation-like modulations in saccade amplitude may be induced by the ability to perform a visual discrimination task using a new gaze-contingent paradigm. A 4AFC task was designed in which subjects were instructed to report which symbol was briefly (60ms) displayed across the whole screen immediately after a saccade. The possibility to perform the discriminative task was contingent on meeting a specific saccade amplitude criterion: when saccades did not meet the criterion, one of four irrelevant symbols was displayed such that the participant could not perform the discriminative task. In four participants the criterion first encouraged an increase then a decrease in horizontal gain. The percentages of gain change were computed with respect to the mean of 200 baseline trials. We found a mean horizontal gain increase of 27% on average, followed by a decrease of 16%. We conclude that saccades are operant behavior that may be reinforced by the ability to perform visual discrimination tasks. These results extend the functional significance of saccadic adaptation well beyond motor calibration.

The attentional fields of visual search in healthy individuals and following bilateral superior parietal dysfunction: toward understanding visual forms of developmental dyslexia

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To date, it remains disputed whether the Superior parietal lobule (SPL) lesion disrupts object or space perception. We asked healthy participants to perform different visual search tasks of variable difficulty using different gaze-contingent visible window sizes, and also tested a patient with simultanagnosia. This allowed us to determine the size of the attentional field used for each visual search task; only visible windows that were smaller than the specific attentional span used for the task resulted in a cost in reaction times to find the search target. To determine whether this attentional field varied according to objects or space, we also modulated the number of objects and whether they were similar (as in classical feature-absent tasks) or all different as in reading processes. When the distractors were all the same, for healthy participants and for the patient, we found that each visual search task was performed with a specific attentional field depending on the difficulty of visual object processing but not on the number of objects falling within this space. For the patient with simultanagnosia, we found a reduced attentional field compared to controls but only for search tasks with objects that were made up of separable features. When the distractors were all different, the cost of size-constant gaze-contingent visible windows depended on the number of distractors indicating that the attention was rather allocated to a certain number of objects that could be processed simultaneously. Thus, we conclude that bilateral damage to the SPL impairs the spatial integration of separable features (within-object processing), shrinking the attentional field within which a target can be detected when all distractors are similar and can thus be grouped visually, or the attentional span if all objects are different.

How do we spatially and physiologically code other's emotional state?

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Objective: Recent researches have shown that peripersonal space (dedicated to action) and interpersonal space (dedicated to social interactions) share common mechanisms (Quesque et al., 2016) and that they can both be modulated by the emotional context and other's emotional state (Iachini et al., 2014). Other studies have revealed that positive and negative stimuli can modulate observer's electrodermal response. Using virtual reality, the aim of this study was to quantify the physiological response (EDA) triggered by point-light-displays presented with different facial expressions in the peripersonal/extrapersonal space and the relation with comfortable interpersonal distances when moving towards the observers. Apparatus: 40 healthy participants stood up in front of a 4 m x 2 m vertical screen on which stereoscopic images were projected. In the first task, a male or female point-light-display with either a happy, neutral or angry face stood in front of the participants, at different distances from them. Participants had to judge if they could reach the point-light-displays or not while their electrodermal activity was recorded. During the second task, the same point-light-displays were walking towards the participants and crossed them with different inter-shoulder distances. Participants had to judge whether the crossing distance was comfortable or not. Results: We observed that electrodermal activity depended on the facial expression of the point-light-displays when presented in the peripersonal space. Furthermore, comfort distance depended on the facial expression of the point-light-displays. Conclusion: Considered together, and in relation with previous works on the protective role of the peripersonal space, these results suggest that other's emotional state can modulate the existing link between peripersonal action space and interpersonal distances.

Testing saccadic adaptation under naturally paced conditions

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Ocular saccades allow us to shift our gaze quickly from one position to another. These eye movements are extremely frequent (roughly 2-3 times per second) so that the duration of ocular fixation phases is very short (~200-400 msec). Unfortunately, this rapid pace is not taken sufficiently into account in most eye movement's studies, leading to non-ecological, long and monotonous testing sessions. This is especially problematic when a large number of trials is required, as it is the case when studying sensorimotor adaptation of saccadic eye movements. Saccadic adaptation corresponds to progressive adjustments of the saccadic amplitude when repetitive discrepancies between landing positions and intended targets occur. The double-step paradigm is commonly used to study this phenomenon: participants execute a saccade towards a target that constantly jumps to another position either in the saccade direction (forward adaptation) or in the opposite direction (backward adaptation) during the saccade execution. However, since this 'classical' protocol uses many trials (> 150) with a long duration of ocular fixation, this becomes problematic, notably with patients or subjects showing fatigue/alertness/attention problems. Gray et al. (2014) developed a 'fast' saccadic adaptation protocol with ecologically paced saccades. In this approach, the displaced position of the target is used as fixation point for the next trial and its duration is drastically reduced to 250 msec. The authors reported that adaptation reached after only 2 min was as strong as that induced in a classical procedure of ~15 min duration. However, their comparison was based on data collected in two sessions 24 hours apart, and their conclusion may have been biased by the known residual saccadic modifications observed until 5 days after adaptation (Alahyane and Pelisson, 2005). The goal of the current study was to rule out this possible bias by implementing a longer inter-session interval (at least 7 days apart). Our objective is to compare the two protocols ('fast' vs 'classical') in a ?backward adaptation' condition in 6 subjects and in a ?forward adaptation' condition in 6 other subjects. To verify the effect of adaptation on saccadic amplitude, we have implemented 'pre' and 'post' phases with no target jump. Preliminary results on 6 subjects show that backward saccadic adaptation still occurs in the fast protocol with a significant paired Student t-test ($t(5) = 4{,}03$; $p < .01$) modification of the saccadic amplitude (14%) between pre and post phases.

Gesture parameters and goal processing during the recognition of actions among distractors: Evidence from eyetracking

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Sensorimotor and predictive approaches of action understanding make alternative predictions about the timing and importance of gesture parameters and goal processing during action decoding. Whereas sensorimotor approaches that consider action recognition can be achieved through bottom-up propagation from gesture activation, predictive accounts claim that a prediction about the goal of the actor is first required. In previous priming experiments, we used action photographs containing grip and/or goal violations to manipulate the similarity between object-directed actions in terms of grip or goal. For short prime durations (66, 120, 220 ms), priming effects were observed for goal but not for grip, supporting predictive accounts of action decoding. Using eyetracking, this study aimed at further specifying the early temporal dynamics of gesture parameters and goal processing during recognition of actions among distractors. Twenty healthy adults had to find the correct action picture among four pictures displayed in the corners of the screen (>13°) while eye movements were recorded. Target actions were correct with regard to the typical use of the object. Distractor actions were incorrect by virtue of grip violations, goal violations or both. Thus, distractors could share the same goal or the same grip with the target or neither one. Analysis of fixation proportion over time showed a greater probability of fixating distractors with similar action goals than dissimilar distractors from the first fixations after picture display. Analysis of landing position of the first saccade displays a similar pattern with a higher probability for eye movements to land on distractors sharing similar action goals with the target in comparison with the other

conditions. A control experiment in which participants had to do the task while fixating the center of the screen rules out the possibility that this early effect was only explained by low-level visual differences between stimuli. Without moving their eyes, participants were able to accurately select the target and correctly reject photographs with both incorrect grip and goal information (incorrect condition). Overall, results suggest that actions with similar goals compete for attention very early during target action visual search, in accordance with predictive accounts of action understanding.

Saccadic Adaptation Increases brain excitability : a MEG study

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Attention and saccadic adaptation are critical components of visual perception, the former enhancing sensory processing of objects of interest, the latter maintaining the accuracy of saccadic eye movements toward these objects. Recent studies propelled the hypothesis of a tight functional coupling between these two mechanisms. Indeed adaptation of reactive saccades towards the left hemifield increases the processing speed of unpredictable stimuli (Habchi et al., 2015), conversely attentional load boosts saccadic adaptation (Gerardin et al. 2015) and finally, their neural substrates (Gerardin et al. 2012, Corbetta and Shulman 2002) partially overlap. Here, we used magnetoencephalography to gain understanding of the neurophysiological bases of this coupling. We compared visual discrimination performance of 12 healthy subjects before and after an adaptation or control task involving reactive saccades. Eye movements and magnetic signals were recorded continuously. The neurophysiological analysis focused on gamma band power during the pre-target period of the saccadic adaptation and the discrimination tasks. Although attentional modulations by saccadic adaptation failed to impact behavioral performance in our paradigm, they could be demonstrated at the electrophysiological level as an increase of gamma band power within an extended brain network. These results suggests that gamma oscillations mediate the coupling between attention and saccadic adaptation.

Does eye dominance strength modulate the global effect on saccade accuracy?

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The dominant eye is the one chosen to perform a monocular task. Vergilino-Perez et al. (2012) showed with binocular recordings that participants could exhibit weak or strong eye dominance. The dominant eye is known to be preferentially related to the ipsilateral primary visual cortex (V1). Recently, we have shown that for participants with strong eye dominance, the influence on saccade accuracy of a distractor proximal to the target ("global effect") is reduced in the hemifield controlateral to the dominant eye compared to the ipsilateral hemifield (Tagu et al., 2016). We concluded that for strong eye dominance, the relationship between dominant eye and ipsilateral V1 induces a better selection of the saccadic target in the hemifield controlateral to the dominant eye. Interestingly, this result was enhanced for strong left eye dominance and reduced for strong right eye dominance. We proposed this difference could be due to the co-occurrence of a leftward attentional bias giving more weight to the distractor because of the right hemispheric specialization for visuo-spatial attention. A way to test this interpretation is to dissociate the saccade target selection process linked to eye dominance from the leftward attentional bias. Here we examine the global effect as a function of saccade preparation duration across paradigms known to induce short (gap-200 and step) and long (overlap-600) saccade latencies. Preliminary results on 52 participants (i) confirm the controlateral advantage on saccade accuracy when eye dominance is strong (ii) show that both the saccade target selection and attentional bias increase with saccade latency.

Development of oculomotor control from infants to toddlers: temporal and spatial parameters of voluntary saccades

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During the first years of life, eye movements represent a vital means to interact with the environment but the development of oculomotor control is still poorly known. We developed a novel paradigm to investigate reactive saccade performance in infants and toddlers (Alahyane et al., 2016). Our results revealed that saccade reaction time decreases with age and that saccade accuracy improves over the 160 trial session. Here, we adapted this paradigm to elicit voluntary saccades, based on an overlap procedure. In some trials ('double target'), while the participant is fixating a stimulus, two remote peripheral stimuli appear simultaneously at a 10¡ eccentricity, at unpredictable locations. When one of the two stimuli is selected as the saccade target, the other stimuli disappear. The saccade target becomes then the fixation point of the following trial. In some other trials ('single-target'), only one peripheral stimulus is displayed to examine the 'remote distractor effect' (e.g., Walker et al., 1997). Voluntary saccade performance (amplitude, reaction time) in young participants (6-42 months-old) will be compared to a group of adults. Performance in single target trials will also be compared to our previous reactive saccade data.

Saccades toward faces are not only faster but also larger

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Recent studies showed that we are able to initiate reliable saccades toward an image of a human face in just 100-120 ms (Crouzet et al., 2010). Consistent with a coarse-to-fine processing of visual information, our previous results suggest that extremely fast saccades towards faces could be initiated by low spatial frequencies (Guyader et al., 2017). These experiments used a saccadic choice task during which two images were presented side-by-side on the left and right of the screen. One image contained a face and the other one a vehicle. Participants were asked to saccade as fast as possible toward the face during one session (face session) and the vehicle in another session (vehicle session). Surprisingly, when we analyzed the amplitude of saccades of our previous experiment (Guyader et al., 2017), we observed that error saccades were smaller than correct saccades and this difference is greater for face than for vehicles. Error saccades were saccades toward vehicle for the face session and toward face for the vehicle session. In a new study, twelve participants performed two experimental sessions (face and vehicle sessions). As previously, we observed very fast saccades toward faces compared to saccades toward vehicles. More interestingly, whereas images were always displayed at the same position 8¡ eccentricity, correct saccades are on average larger than error saccades for both vehicle and face targets. Moreover, correct saccades are larger for face target than vehicle target. Whereas saccades are commonly considered as ballistic movements, with an endpoint pre-determined at the saccade start, it has be shown that new visual information can influence a saccade if it occurs 70 ms or more before its initiation (Double Step tracking). This suggests that an internal reference signal is used to make small on-line corrections during the generation process (Quaia, Lefévre, & Optican, 1999). Our results are in favor of such a model. Finally, recently twelve new participants took part in the same experiment and we recorded both the eye movements and the EEG signals. The aim is to analyze ERP (Event related potentials) triggered on image onset and to compare ERPs for correct and error saccades.

Scale invariance does not hold for high dynamic range images, but is reestablished by early retinal nonlinearities

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The statistics of real world luminances have been extensively investigated for images captured with single exposure photography, which are therefore of standard dynamic range (DR). One commonly reported feature is that the average Fourier amplitude falls off as a function of one over the spatial frequency, a property that implies the scale invariance of natural images. However, it has been reported (Dror et al. 2001) that this 1/f statistic does not hold for some images with a high dynamic range (HDR). We investigate this topic using a HDR natural image database (Adams et al., 2016) and corroborate that the 1/f law commonly fails for natural images of medium and high DR. We fitted the power spectrum with a second order polynomial and find that the leading term is negatively correlated with DR. For HDR images, this value becomes significantly nonzero making the power spectrum fit concave. Taking these images as input to our visual system, we then study the effect on them of two successive processes: light scattering in the eye, modeled by the eye's point spread function (PSF), and the photoreceptors response, modeled by the Naka-Rushton equation. While convolution with the eye's PSF reduces DR, the resulting images still don't follow the 1/f rule. However, the nonlinearity of the photoreceptors' response ensures that the 1/f statistic is recovered at the retinal level for all images tested.

Consequences of motor actions and social context determine the representation of peripersonal space

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Peripersonal space is a multisensory representation of the environment around the body in relation to the motor system underlying the interactions with the physical and social world. Although changing body properties and social context have been shown to alter the functional processing of space, little is known about the effect of changing the value of objects on the representation of peripersonal space. In two experiments, we tested the effect of modifying the spatial distribution of reward-yielding targets on manual reaching actions and peripersonal space representation. Before and after performing a target-selection task consisting of manually selecting a set of targets on a touch-screen table, participants performed a two-alternative forced-choice reachabilityjudgment task. In the target-selection task, half of the targets were associated with a reward (change of colour from grey to green, providing 1 point), the other half being associated with no reward (change of colour from grey to red, providing no point). In Experiment 1, the target-selection task was performed individually and the distribution of the reward-yielding targets was either 50%, 25% or 75% in the proximal and distal spaces. In Experiment 2, the target-selection task was performed in a social context involving interaction between two participants, and the distribution of the rewardyielding targets was 50% in the proximal and distal spaces. Results showed that changing the distribution of the reward-yielding targets or introducing the social context modified concurrently the amplitude of self-generated manual reaching actions and the representation of peripersonal space. However, a decrease of the amplitude of manual reaching actions caused a reduction of peripersonal space when resulting from the distribution of reward-yielding targets, whereas it caused an increase of peripersonal space when resulting from the social interaction context. We conclude that reward-dependent modulation of objects values in the environment modifies the representation of peripersonal space, when resulting from either self-generated motor actions or observation of motor actions performed by a cooperative partner.

Neurophysiological correlates of conflict between gesture representations during object perception

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Whereas several recent studies have evidenced a competition between distinct gesture representations during planning and execution of object-directed actions, very little work has focused on the existence of such a competition during mere object observation. Nevertheless, a similar conflict seems to be at play during manipulable object perception, which slows down object visual processing. The aim of the present EEG study was to investigate the neurophysiological correlates of conflict between gesture representations during object perception. The impact of the conflict between evoked gestures on the activation of the motor neural network was specifically tested. Fifteen participants performed a reach-to-grasp and a semantic judgment task on conflictual (with competing structural and functional gestures) and non-conflictual (with similar structural and functional gestures) objects. Objects were presented at difference distances in a 3D virtual environment while EEG was recorded. Time-frequency decomposition was used to compute the power change induced by object presentation on the 8-12 Hz frequency band recorded in the central region (μ rhythm) known to reflect the activation of the motor neural network. Results revealed that μ rhythm desynchronization was reduced when the observed object evoked distinct gesture representations. More specifically, reduction of μ desynchronization for conflictual objects was selectively observed when objects were presented in peripersonal space, where both structural and functional gestures are potentially relevant. However, the effect was independent from the task performed by the participants. Findings demonstrate that conflict between evoked gesture representations reduces the involvement of motor neural network during visual perception of objects.

Calibration of peripheral perception of shape with and without saccadic eye movements

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The cortical representation of a visual object differs radically across saccades. Several studies claim that the visual system adapts the peripheral percept to better match the foveal view (Bompas & O'Regan, 2006; Valsecchi & Gegenfurtner, 2015; Herwig & Schneider, 2014). Recently Herwig, Wei§ and Schneider (2015) found that the perception of shape demonstrates this saccade-contingent learning effect. Here, we ask whether this learning actually requires saccades and propose that a more general learning process is involved. We first replicated Herwig et al.'s (2015) study in 16 participants who were also required to perform a fixation condition. In a learning phase (of the saccade condition) participants were exposed to simple triangular or circular objects whose shape systematically changed during a saccade. In the fixation condition the same stimuli were displaced from the periphery to the fovea while participants maintained their gaze at the center of the screen. Following acquisition, objects were perceived as less (more) curved if they previously changed from more circular (triangular) in the periphery to more triangular (circular) in foveal vision. This pattern was seen for both conditions, with and without saccades. We then tested (in 32 other participants) whether a variable delay (0, 250, 500 or 1000 ms) between the presentations of the peripheral and foveal objects would affect their association ? hypothetically weakening it at longer delays. Again, we found that shape judgments depended on the changes experienced during the learning phase and that they were similar in both the saccade and fixation conditions. Surprisingly, they were not affected by the delay between the two object presentations. These results indicate that even a delay of 1000 ms between the presentation of peripheral and foveal objects supports learning of the correspondence between these two retinal stimulations. These results suggest that a general

associative learning process, independent of saccade execution, contributes to the peripheral perception of shape and our impression of object uniformity across saccades.

Reading without spaces revisited: The role of sentence-level constraints
Jonathan Mirault, Joshua Snell, Jonathan Grainger
Laboratoire de psychologie cognitive (France)

Prior research has shown that skilled readers can read text that is printed without extra spacing between words, albeit more slowly and less accurately than normally spaced text. Here we examined the role of top-down sentence-level constraints in facilitating the reading of unspaced text. We compared reading of grammatically correct sentences and shuffled versions of the same words presented both with normal spacing and without spaces. We found an interaction between word order and spacing in eye movement measures that reflect overall reading difficulty (total reading time per sentence, and number of refixations and regressions). There was an increased deleterious impact of removing inter-word spaces when reading shuffled text compared with intact sentences. This interaction was not found in measures that reflect the decision where to move the eyes during forward saccades (initial landing position and word skipping probability). Furthermore, we found that the length of the currently fixated word determined the amplitude of forward saccades leaving that word during the reading of unspaced text, and did so independently of grammatical structure. This further highlights the role of word identification processes in guiding eye movements in reading unspaced text. We conclude that the relative ease with which skilled readers can read unspaced text is due to a combination of bottom-up word recognition and top-down sentence-level constraints, with the latter factor only influencing comprehension processes and not impacting on oculomotor control.

Retrospective cueing affects conscious access to masked words
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It has been classically considered that cueing attention towards a stimulus after its presentation influences memory consolidation, but not subjective visibility. However, recent studies conducted by Sergent et al. (Sergent et al., Current Biology 2013) have shown that post-cueing attention towards a stimulus at threshold contrast can improve both objective and subjective report of a single item. These findings suggest that conscious access to perceptual information can be triggered retroactively. Here, we tested whether retrospectively cueing one aspect of a complex stimulus could trigger conscious acces to all its attributes. Our experiment was conducted using masked words, written in upper or lowercase, followed by an auditory attentional cue 215 ms later. This cue was a spoken word, semantically related or unrelated to the masked stimulus. Subjects were asked to identify the masked words, their case (upper or lower), and report their subjective visibility. Our preliminary results indicate a significant increase in subjects' ability to name masked words when followed by sematically related cues, confirming results by Bernstein et al. (Bernstein et al., 1989). Beyond this semantic effect, subjects reported higher visibility of the words when they were followed by semantically related cues. These results suggest that retrospective semantic influence prompts conscious access to high-level semantic attributes (word identification) of visually masked words which were not consciously accessed to begin with. These results are in favor of a major role of top-down influence on the emergence of conscious access to the diverse attributes that compose a percept.

Short-term monocular deprivation could be driven by an interocular contrast gain control mechanism

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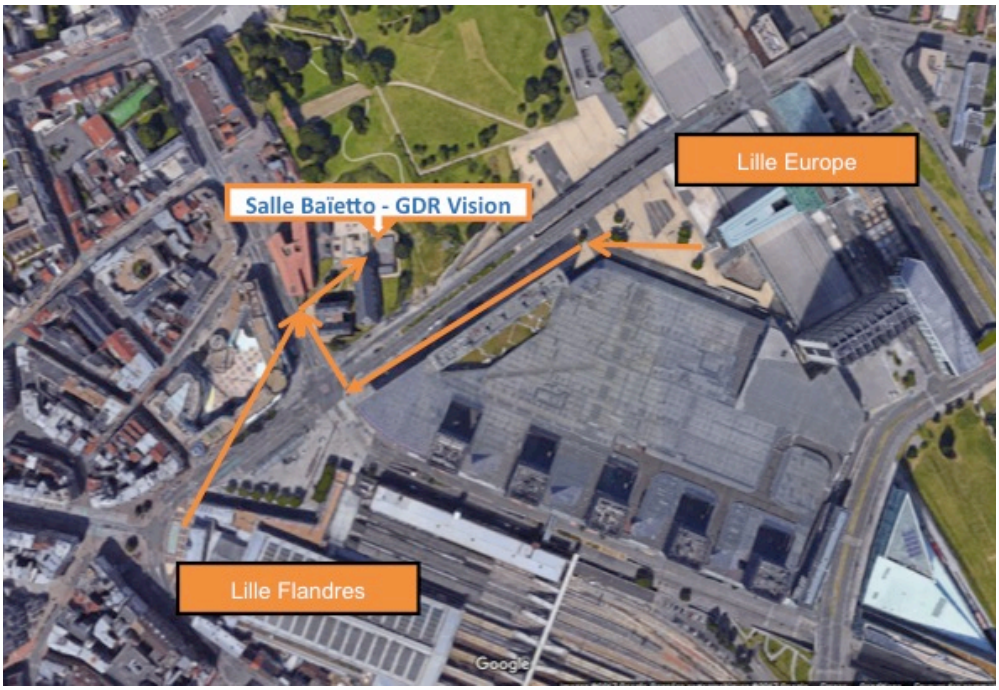
Short-term monocular deprivation induces a shift in the interocular balance in favor of the previously deprived eye. In order to test if this effect could be driven by an interocular contrast gain control mechanism, we designed a protocol where participants were viewing filtered dichoptic movies during 2 hours. The dominant eye was fully deprived, seeing mean gray, and the other one was stimulated at different contrasts 12%, 24%, 50% or 100% in four different sessions. Each eye's contribution was measured with a phase combination task before and after the viewing period. Our results show that the shift induced in the interocular balance depends on the interocular contrast difference during the viewing period. The bigger the contrast difference, the bigger the shift. These observations indeed suggest that these effects are driven by an interocular contrast gain control mechanism.

Directions for Wednesday 11 and Thursday 12:

Salle Baïetto Maison Européenne des Sciences de l'Homme et de la Société (USR 3185) 2 rue des Canonniers 59002 Lille



Directions for Friday 13:

Amphi B7, Université Lille SHS, Pont-de-bois, Villeneuve d'Ascq