# CIMeC Seminars 2014

Transfer-Learning Project Seminar
December 29th at 11.30 am
Conference Room, Mattarello
*Speaker*:

- Nikki Sullivan, Computation & Neural Systems, California Institute of Technology, Pasadena CA

*Title:* **The neural computational basis of self-control success and failure**
*Abstract*:
Many choices in life have two features: trade-offs and future consequences. For example, selecting carrots instead of a brownie may require self-control, but will pay off in the long run. Similar trade-offs exist when saving for retirement. How and why some individuals are better at these choices than others? This talk will present two studies in two domains requiring control: dietary and inter-temporal choice. In the first study, we combine a dietary choice task with a novel form of computer mouse tracking. This allows us to pinpoint when different attributes of the choice (such as the taste and healthiness of the foods) are being integrated into the choice processes with millisecond temporal resolution. We find that 20 - 40% of observed individual differences in self-control ability can be explained by differences in the relative speed with which taste and health attributes are processed. In the second study, we compare brain activity during an inter-temporal choice task across adolescent, adult, and elderly age groups to understand how monetary self-control changes with age. We find that discounting decreases monotonically with age, and that age-related changes in brain structure and functional activation and connectivity help explain this age-related increase in control.
*Hosted by: Giorgio Coricelli*
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

Transfer-Learning Project Seminar
December 22nd at 11.30 am
Conference Room, Mattarello
*Speaker*:

- David Jimenez-Gomez, MIT Department of Economics, Cambridge, MA

*Title:* **Cooperative and Competitive Reasoning: From Games to Revolutions**
*Abstract*:
I propose a model of algorithmic reasoning which contains Level-k and team reasoning as special cases. The model offers an explanation for why in 2x2 games with two Nash equilibria, the Pareto dominant equilibrium is often chosen over the risk dominant one; and why adding small asymmetries to a symmetric game prevents coordination. I extend the model to games of incomplete information, with applications to several interesting situations. i) In the Email game, players coordinate successfully when they receive enough messages. ii) The model's predictions coincide with experimental evidence on global games, none of which can be accounted by the theory of global games itself: coordination on Pareto dominant equilibria happens more often than expected; there is more coordination with public vs. private signals; behavior is similar to the complete information case when noise is small. iii) Public events are crucial in revolutions: a self-interested government prevents the generation of common knowledge among the citizenry when times are bad; and sunspots help citizens coordinate on the revolution even if they do not add new information about payoffs.
*Hosted by: Giorgio Coricelli*
This talk is carried out within the framework of Transfer-Learning, an ERC-funded project

PREMESOR Project Seminar
November 27th at 11am
CIMeC Ex Manifattura, Main Hall, piazza Manifattura 1, Rovereto.
*Speaker*:

- Matteo Caffini, Dipartimento di Elettronica, Informatica e Bioingegneria - Politecnico di Milano (Milano, Italy)

*Title:* **Analysis of fNIRS data**
*Abstract*:
Data analysis for functional Near InfraRed Spectroscopy (fNIRS) has evolved in the last twenty years, from well-known saturation-like analysis to modern Diffuse Optical Tomography (DOT). Moreover, anatomically informed fNIRS can now complement the classical fNIRS analysis and help the cortical localization of the brain signals. In this presentation, after a quick introduction about fNIRS principles and instrumentation, we will fly over data analysis of functional information, in particular discussing time analysis, depth analysis and space analysis of fNIRS data.
*Hosted by: Giorgio Vallortigara*

PREMESOR Project Seminar
November 24th at 10.30am
CIMeC Ex Manifattura, Main Hall, piazza Manifattura 1, Rovereto.
*Speaker*:

- Sara Basso Moro, Ph.D student in "Ultrastructural and Molecular Imaging", Department of Life, Health & Environmental Sciences, University of L'Aquila, Italy

*Title:* **The fNIRS cortical monitoring in the assessment of cognitive functions and in neurorehabilitation**
*Abstract*:
Functional near-infrared spectroscopy (fNIRS) is a non-invasive neuroimaging technology that measures concentration changes of oxygenated-hemoglobin (O2Hb) and deoxygenated-hemoglobin (HHb) in cerebral microcirculation blood vessels by means of the characteristic absorption spectra of hemoglobin in the near-infrared range. The neuronal activation, in response to cognitive, motor or somatosensory stimulations, causes an increase in regional cerebral blood flow, which is characterized by an increase in O2Hb and a decrease in HHb in the region of the activated cortical area. In the last twelve years several studies highlighted fNIRS as a valuable tool for monitoring brain functions in healthy subjects and patients during cognitive and motor tasks, thanks to its high experimental adaptability with respect to other neuroimaging tecniques. Considering the numerous applications of fNIRS in the monitoring of the cerebral activity, we developed new fNIRS cortical activation protocols, utilized in combination with virtual reality methodologies, to be applied in the field of cognitive assessment and of neurorehabilitation..
*Hosted by: Giorgio Vallortigara*

PREMESOR Project Seminar
November 20th at 10am
Palazzo Fedrigotti, Sala Convegni 1st floor, Rovereto
*Speaker*:

- Prof. Carel Ten Cate, professor in Animal Behaviour Leiden, Institute of Biology & Leiden Institute for Brain and Cognition, Leiden University, Leiden, NL

*Title:* **What are the linguistic skills of birds?**
*Abstract*:
Songbirds have relatively complex, well structured, learned vocalizations and for that reason birdsong is seen as the closest animal analogue for language. I am interested in whether this similarity is also present in the cognitive skills of birds, in particular in the processing of phonetic or syntactic features. In both areas there is debate on whether specific abilities are uniquely human, and evolved in consort with language, or whether they originate from more general cognitive abilities that might also be present in other animal species, either by common descent or by independent evolution. In our studies we use the zebra finch as a model species to examine such questions and in my presentation I will discuss some of our studies, concentrating on two subjects. One concerns the human ability to recognize words regardless of individual variation across speakers. The other topic is the ability, already present in young infants, to derive abstract 'syntactical' rules from exposure to strings of meaningless vocal elements, ordered according to specific algorithms that are assumed to be relevant in linguistic contexts. Using this Artificial Grammar Learning paradigm, we explore the presence and scope of rule learning abilities in

zebra finches. I will discuss our findings in relation to those obtained in other bird species, in mammals and in humans.
*Hosted by: Giorgio Vallortigara*
The talk is carried out within the framework of PREMESOR, an ERC-funded project

PREMESOR Project Seminars
November 5th at 3pm
Palazzo Fedrigotti, Sala Convegni 1st floor, Rovereto
*Speakers*:

- Prof. Dr. Michael Herzog, Professor for Psychophysics, BMI, EPFL, Switzerland - Director of the doctoral program EDNE at EPFL
- Dr. Richard Walker, Senior Research Associate and Senior Science Writer for the Blue Brain Project and the Human Brain Project at EPFL, Switzerland

*Title:* **How good Gestalt determines low level vision** - prof. Dr. Michael Herzog
*Abstract*:
In classical models of vision, vision proceeds in a hierarchical fashion, from low-level analysis (edges and lines) to figural processing (shapes and objects). Low-level processing determines high-level processing. Here, we show that, to the contrary, shape processing determines basic visual processing. For example, we presented a vernier stimulus and asked observers to indicate its offset direction. Performance strongly deteriorated when the vernier was surrounded by a square, in line with most models of vision. Surprisingly, performance improved when more squares were added. This improvement of performance can hardly be explained by classical models of vision, which predict a further deterioration of performance. We propose that shape interactions precede low-level processing in a recurrent fashion. Using high density EEG and trans-cranial magnetic stimulation (TMS), we show how good Gestalt emerges during recurrent, unconscious processing within 420ms. The outcome of this processing, i.e., the conscious percept, determines, paradoxically, the first stages of visual processing.

*Title:* **Human origins: evolution of culture and evolution of the brain** - Dr. Richard Walker
*Abstract*:
In the last 100.000 years, humans have colonized a vast range of habitats, effectively dominating the planet. This talk compares alternative explanations for their success, and suggests an alternative explanatory strategy that shifts the focus from allegedly unique features of human cognition, to unique features of human social structure. After a brief description of the evolution of the hominid lineage over last 7 million years, and the emergence of Anatomically Modern Humans c. 200,000 years ago - I examine explanations of the "human exception" from archaeology and cognitive psychology and argue that the evidence for these proposals is weak. The talk outlines an alternative approach based on three inter-connected hypotheses. (1) The proximate cause of human success is "cumulative cultural evolution": a process of "niche construction", absent in non-human animals, in which successive generations build on the material and symbolic culture created by previous generations. (2) Cumulative cultural evolution in human evolution depends crucially on the unique topology of the "knowledge networks" through which symbolic and material culture is transmitted within and between human social groups. (3) Human culture is not just a result of humans' large brains – it has actively driven the expansion of the human brain and human cognition. The talk will review evidence for the plausibility of these hypotheses –which is still largely anecdotal. However, rapid progress in genomics, studies of animal behaviour and other disciplines is making it possible, for the first time, to quantify and compare the structure of information transmission in different human societies and in non-human social groups. I outline how we can use this data to model real-life knowledge networks, and test their role in facilitating or preventing cumulative cultural evolution.
*Hosted by: Giorgio Vallortigara*
These talks are carried out within the framework of PREMESOR, an ERC-funded project

PREMESOR Project Seminar
October 6th at 10am
Palazzo Fedrigotti, Sala Convegni 1st floor, Rovereto
*Speaker*:

- Ludwig Huber, Messerli Research Institute University of Veterinary Medicine Vienna, Medical University of Vienna

*Title*: **Social and technical intelligence in kea (Nestor notabilis)**
*Abstract:*
Many non- human animals are extractive foragers, some having even advanced manipulatory skills, but only very few use tools in the wild. This is a big puzzle in cognitive biology. What is the relationship between tool use and intelligence? If intelligence or general cognition is defined as the ability to change behaviour in novel situations and to generate (invent) new behaviours, one should find innovative species being the most potent problem solvers. One line of research to answer this question would be to test individuals of such innovative species in a broad range of technical or physical tasks. The kea, a New Zealand parrot, is a particularly good example. These birds show high levels of curiosity, object exploration and manipulation, and extractive foraging behavior. In this talk I will review findings from laboratory experiments and field observations of keas revealing surprising cognitive capacities in the physical domain. I will also present studies about social learning in kea and finally discuss the relationship between social and technical intelligence in the evolution of cognition.
*Hosted by: Giorgio Vallortigara*
This talk is carried out within the framework of PREMESOR, an ERC-funded project

PREMESOR Project Seminar
September 26th at 10am,
Pal. Ex Manifattura, Main Hall, piazza Manifattura 1, Borgo Sacco
*Speaker*:

- Yuri Bozzi, Research Scientist, CNR Institute of Neuroscience On-contract Professor of Physiology - Laboratory of Molecular Neuropathology, Centre for Integrative Biology (CIBIO), University of Trento
- Giovanni Provenzano, Teaching Assistant, Laboratory of Physiology, Faculty of Science, University of Trento

*Title*: **Molecular, anatomical and cognitive deficits in the Engraile-2 mouse model of autism**
*Abstract:*
Several studies indicate the transcription factor Engrailed-2 (En2) as a candidate gene for autism spectrum disorders (ASD); accordingly, En2 expression is altered in the cerebellum of ASD. Mice lacking the En2 gene (En2-/- mice) are a well established model to study ASD pathogenesis. En2-/- mice display neuropathological and behavioural changes relevant to ASD, including reduced social interactions, defective spatial learning and increased seizure susceptibility. These deficits are accompanied by neuropathological changes relevant to ASD. Specifically, we showed a partial loss of cortical and hippocampal GABAergic interneurons. In the cerebral cortex, this loss is paralleled by a delayed maturation and altered plasticity in vivo. In addition, we recently showed that several genes related to ASD are markedly deregulated in the cerebellum and hippocampus of En2-/- mice. Among these, NF1, FMR1 and mGLUR5 are of great interest, since dysfuntion of their pathway have been associated to syndromic forms of ASD. In this seminar, Yuri Bozzi will discuss the importance of the En2 model in investigating the neurodevelopmental basis of ASD, and Giovanni Provenzano will focus on recent studies of the laboratory focusing on the molecular basis of cognitive deficits of En2 mutants.

*Hosted by: Giorgio Vallortigara*
This talk is carried out within the framework of PREMESOR, an ERC-funded project

CIMeC Seminar

September 5th at 4pm
third floor seminar room of Palazzo Fedrigotti
*Speaker*:

- Anne Roefs, Faculty of Psychology & Neuroscience, Maastricht University, the Netherlands

*Title*: **Food and the Power of Mind**
*Abstract:*

People in the Western world live in an 'obesifying' environment in which high caloric foods are omnipresent. Yet, not everyone is overweight. One explanation is that high caloric foods are more attractive for overweight people, which manifests as increased hedonically oriented cognitive processing. Quite some research found evidence that obese and overweight people show an increased BOLD response in reward-related areas of the brain as compared to healthy-weight people when presented with visual food cues (e.g., Stoeckel et al., 2008). However, it has also been shown that cognitive factors moderate the results. For example, overweight participants only showed increased reward-related brain activity as compared to healthy- weight participants when their task while in the scanner focused them on palatability, but not during an unbiased viewing condition (Frankort et al., 2012). That is, participants' current mindset may influence the reward value of food, as reflected in the brain. Following a similar line of reasoning, an attention bias for food has been linked to craving and overeating theoretically. Research results are equivocal though, with evidence for attentional approach (e.g., Castellanos et al., 2009) as well as attentional avoidance of high-caloric foods in obese people (Werthmann et al., 20110. Moreover, an attentional bias toward high-caloric food in eating disordered (ED) samples was observed as well (e.g., Brooks, Prince, Stahl, Campbell, & Treasure, 2011; Dobson & Dozois, 2004; Smeets, Roefs, van Furth, & Jansen, 2008). I propose that this lack of consistency stems from the double-sided nature of high-caloric food perception: these foods have a high hedonic value and at the same time can lead to weight/health problems. People's attentional set may alternate between focusing on hedonics versus on weight/health consequences. So, possibly participants' mindsets fluctuated between and within experiments, causing the complex picture of results. In the talk, it will be attempted to not only present relevant empirical findings, but also to propose a possible way forward, to further elucidate the cognitive factors that play a role in determining eating behavior.

CIMeC Seminar

September 5th at 3pm
third floor seminar room of Palazzo Fedrigotti
*Speaker*:

- Pascal van Gerven, Faculty of Psychology & Neuroscience, Maastricht University, the Netherlands

*Title*: **Making sense of age-related distractibility**
*Abstract:*
In daily life, selective attention is not confined to the visual modality. It involves multiple modalities, particularly also the auditory one. Moreover, it involves both "unimodal" settings (i.e., selective attention within one modality) and "cross-modal" settings (i.e., attending to one modality while ignoring the other). Yet, the bulk of research into selective attention is aimed at visual selective attention with purely visual paradigms (e.g., the Stroop task, the flanker task, and the reading-with-distraction task). Unsurprisingly, therefore, the pervasive idea that old age is accompanied by impaired selective attention is mostly based on unimodal visual, and – to a lesser extent – unimodal auditory selective attention studies. Some time ago, we have critically reviewed the literature on selective attention and aging by summarizing the results of studies aimed at each combination of visual or auditory target information and visual or auditory distractor information (laid out in a fully crossed, two-by-two matrix). The general pattern of results indicated that age differences in selective attention become apparent if (1) targets and distractors are presented through the same sensory modality rather than through different modalities and (2) distractors are visual rather than auditory (Guerreiro et al., 2010). However, until recently, this had never been studied in a fully crossed design with equivalent, or at least comparable, tasks across conditions. We have tried to bridge this gap with four behavioral studies, one fMRI, and one EEG study. In my talk, I will give a brief overview of the results from these studies. In short, it appears that older adults especially show impaired performance in auditory selective attention tasks with visual distraction. This pattern of results was not seen in spatial selective attention tasks, however, where there were no age-related differences. Moreover, these results were not mirrored by the results from the fMRI and EEG studies. If anything, we see a trend in the fMRI study suggesting that the ability to modulate – specifically, enhance, not suppress – the processing of stimuli from the auditory modality in the temporal voice area is impaired in old age, which seems to downplay inhibition as the usual suspect in age-related decline of selective attention. In the near future, we intend to investigate modality-dependent distractibility in prodromal Alzheimer's patients. We also intend to study to what extent selective attention – or resistance to distraction – can be trained in these patients. In my talk, I will provide a glimpse of these future plans as well.

*Reference*
Guerreiro, M. J. S., Murphy, D. R., & Van Gerven, P. W. M. (2010). The role of sensory modality in age-related distraction: A critical review and a renewed view. Psychological Bulletin, 136, 975-1022

PREMESOR Project Seminar
Monday August 4th at 10am
Pal. Ex Manifattura, Main Hall, piazza Manifattura 1, Borgo Sacco
*Speaker*:

- prof. Mandyam V. Srinivasan, Queensland Brain Institute And School of Information Technology and Electrical Engineering, University of Queensland

*Title*: **More than a Honey Machine: Vision and Navigation in Honeybees and Applications to Robotics**
*Abstract:*
Flying insects are remarkably adept at seeing and perceiving the world and navigating effectively in it, despite possessing a brain that weighs less than a milligram and carries fewer than 0.01% as many neurons as ours does. Although most insects lack stereo vision, they use a number of ingenious strategies for perceiving their world in three dimensions and navigating successfully in it.
The talk will describe how honeybees use their vision to stabilize and control their flight, and navigate to food sources. Bees and birds negotiate narrow gaps safely by balancing the apparent speeds of the images in the two eyes. Flight speed is regulated by holding constant the average image velocity as seen by both eyes. Visual cues based on motion are also used to compensate for crosswinds, and to avoid collisions with other flying insects. Bees landing on a surface hold constant the magnitude of the optic flow that they experience as they approach the surface, thus automatically ensuring that flight speed decreases to zero at touchdown. Foraging bees gauge distance flown by integrating optic flow: they possess a visually-driven 'odometer' that is robust to variations in wind, body weight, energy expenditure, and the properties of the visual environment. Mid-air collisions are avoided by sensing cues derived from visual parallax, and using appropriate flight control maneuvers.
Some of the insect-based strategies described above are being used to design, implement and test biologically-inspired algorithms for the guidance of autonomous terrestrial and aerial vehicles. Application to manoeuvres such as attitude stabilization, terrain following, obstacle avoidance, automated landing, and the execution of extreme aerobatic manoeuvres will be described.
This research was supported by ARC Centre of Excellence in Vision Science Grant CE0561903, ARC Discovery Grant DP0559306, and by a Queensland Smart State Premier's Fellowship.

*Hosted by: Giorgio Vallortigara*
This talk is carried out within the framework of PREMESOR, an ERC-funded project

CIMeC Seminar
Monday July 28 at 11am
MEG Seminar room, Mattarello
*Speaker*:

- Tommaso Fedele, Neurophysics Group in Charité - University Medicine Berlin, Department of Neurology and Clinical Neurophysiology

*Title*: **Ultraslow and ultrafast brain oscillations. The spectral extension of EEG signal detection**
*Abstract:*

Part I: "High-frequency electroencephalography (hf-EEG): Non-invasive detection of spike-related brain activity"

Brain dynamics generate electric fields, whose projections can be recorded at the level of the scalp. Electroencephalography (EEG), given its low-cost, portability, and millisecond range temporal resolution, is the more widespread non-invasive technology in use for the investigation and the monitoring of

neurophysiological activity. The complex ensemble of ongoing neural electro-chemical interactions relies on action potentials propagation and synaptic transmission in a variety of cortical and subcortical structures. Spatial extension and temporal synchronization of these events define their non-invasive detectability, quantified in terms of Signal-to-Noise Ratio (SNR). In particular, slower potentials belong to larger neural substrates, and express higher SNR, while faster events are more localized and often buried by noise. For this reason, standard EEG recordings (<100 Hz) mainly reflects mass post-synaptic potentials, which are the input of the neural networks processing, but generally miss correlated spiking activity, representing the net computational output. Recent intracranial EEG recordings revealed that frequencies above 100 Hz convey signals highly informative for application scenarios as movement decoding for BCI, dissociating spatial attention from movement preparation in motor cortex, and focus localization in neocortical epilepsy. While such novel neurophysiological concepts are advancing rapidly, they are compromised by a progressively decreasing SNR for higher frequencies. Nevertheless, it was shown that bursts in the range of 600 Hz, mimicking spiking activity, can be isolated in somatosensory evoked potential (SEP) non-invasive recordings in healthy humans by means of median nerve stimulation. These fast oscillatory patterns represent an excellent workhorse for the improvement of noninvasive detection of human high-frequency EEG. The aim of this thesis is to analyze the factors hindering the high-frequency neural signatures, systematically breaking down their contribution along the measurement system chain, from the sensor applied to the scalp to the recording system requirements. The detection and characterization of highfrequency EEG components will be pursued by integrating the physiological paradigm of 600 Hz SEP bursts with the recent progress in low-noise amplifier technology, and multi-variate data analysis of scalp potential distribution, in order to achieve a novel integrated neurotechnology for the noninvasive monitoring of cortical population spikes.

Part II: "Monochromatic Ultra-Slow (~0.1Hz) Oscillations in the human electroencephalogram and their relation to hemodynamics"

Previous studies demonstrated the presence of Monochromatic Ultra-Slow Oscillations (MUSO) in human EEG. In my group, we explored the biological origin of MUSO by simultaneous recordings of EEG, Near-Infrared Spectroscopy (NIRS), arterial blood pressure, respiration and Laser Doppler flowmetry. We used a head-up tilt test in order to check whether MUSO might relate to Mayer waves in arterial blood pressure, known to be enhanced by the tilting procedure. MUSO were detected in 8 out of 10 subjects during rest and showed a striking monochromatic spectrum (0.07-0.14Hz). The spatial topography of MUSO was complex, showing multiple foci variable across subjects. While the head-up tilt test increased the relative power of Mayer waves, it had no effect on MUSO. On the other hand, the relative spectral power of 0.1Hz oscillations in EEG, NIRS and blood pressure signals were positively correlated across subjects in the tilted condition. Eight subjects showed a coherence between MUSO and NIRS/arterial blood pressure. Moreover, MUSO at different electrode sites demonstrated coherence not reducible to volume conduction, thus indicating that MUSO are unlikely to be generated by one source. We related our experimental findings to known biological phenomena being generated at about 0.1Hz, i.e.: arterial blood pressure, cerebral and skin vasomotion, respiration and neuronal activity. While no definite conclusion can yet be drawn as to an exact physiological mechanism of MUSO, we suggest that these oscillations might be of a rather extraneuronal origin reflecting cerebral vasomotion.

*Hosted by: Nathan Weisz*

CIMeC Seminar
Friday, July 11 at 10.30am
Seminar room, 3rd floor, Palazzo Fedrigotti
*Speaker*:

- Ella Striem Amit. Postdoctoral fellow, Department of Psychology, Harvard University

*Title*: **Sensory substitution and functional specialization in the visual cortex of the blind**
*Abstract:*

What happens to the functional specialization patterns of the visual cortex without visual experience? Is visual experience during development necessary for visual cortex proper functional architecture to emerge?

We tested these questions using a visual-to-auditory sensory substitution algorithm, and taught a group of congenitally fully blind adults to successfully recognize complex visual stimuli using soundscapes - sounds topographically representing images. Using fMRI, we examined the functional division-of-labor of the visual cortex to category-selective regions in the ventral visual cortex.

We found preserved category preferences in the visual cortex of the blind such that the visual word-form area (VWFA) retained its selectivity for letters and the extrastriate body area (EBA) showed preference for body-shapes. These areas were located at the same location as in the normally sighted, suggesting strong biases for the development of these selectivities in the visual cortex. Functional connectivity analysis shows that each of these centers is further connected to other areas in the brain within the relevant neural networks: i.e. the VWFA is connected to the left inferior frontal cortex and temporal language areas, and the EBA is connected to temporo-parietal body-image and theory-of-mind areas.

Therefore, category selectivity of at least some areas in the visual cortex does not depend exclusively on visual features or prior visual experience during early development, but reflects a flexible task-specific and sensory-modality -independent computations, which may be driven by connectivity patterns.

*Hosted by: Alfonso Caramazza and Olivier Collignon*

CIMeC Seminar
Friday, July 11 at 3pm
Seminar room, 3rd floor, Palazzo Fedrigotti
*Speaker*:

- Dollyane Muret (Lyon Neuroscience Research Center, U1028, IMPACT Team, France)

*Title*: **Investigating the limits of adaptive somatosensory plasticity**
*Abstract:*
Cortical plasticity is known to occur in the adult brain, but the rules governing adaptive plasticity induced by increasing rather than decreasing sensory inputs remain unknown despite its potential importance for rehabilitation. Here we used a repetitive somatosensory stimulation (RSS) protocol to investigate whether pure somatosensory plasticity experimentally-induced at a specific location can cross somatotopically-defined boundaries and functionally affect other body-part regions. We found that three hours of RSS applied at the right index fingertip of healthy participants led to a significant improvement of tactile discrimination not only at the stimulated fingertip but also at both sides of the upper lip area and at the right cheek, without affecting discrimination at other fingertips. These results suggest that RSS-induced adaptive plasticity crosses the hand-face boundary by spreading its functional consequences in a 'non-competitive' way. After describing the behavioral results, I will briefly present some preliminary imaging results.
*Hosted by: Francesco Pavani*

CIMeC Seminar
Wednesday July 9th, 2PM  Conference Room 1st floor, Palazzo Fedrigotti, Rovereto
*Speaker*:

- Gavin Buckingham, Heriot-Watt University, Edinburg (http://www.sls.hw.ac.uk/staff-directory/dr-gavin-buckingham.htm)

*Title*: **Errors, expectations, perception, and action**
*Abstract:*
In most circumstances, individuals are able to make relatively accurate predictions about how heavy an object will be, even if they have never lifted it before. These expectations of how heavy an object is likely to have dramatic effects on both how the object is lifted and how heavy it feels to the lifter. In the context of weight illusions, I will first outline experiments showing how lifters' expectations of heaviness can reliably and persistently affect our perception of how heavy an object feels, and how they are distinct from the processes which allow us to rapidly adapt our fingertip forces to an object's veridical mass. Finally, I will describe experiments showing how observation of sensorimotor errors can supplement normal motor learning processes in experimental object lifting tasks and virtual reality surgical training.
*Hosted by: Angelika Lingnau*

CIMeC ITPAR Seminar
Friday, July 4 at 2.30 pm
*Speaker*:

- Narayanan Srinivasan (Allahabad University, India)

*Title*: **Intentions and event-control influence perception**
*Abstract:*
In the first part of the talk, I will discuss two studies with intentions that show that having an intention influences perception of duration between an action and its effect, as well the duration of the effect itself. In the second part, I will briefly discuss the event-control approach and its implications of intentional binding (IB), mainly in terms of control hierarchy and in the larger context of event binding. I will discuss two experiments that utilize an online control task to investigate the effects of hierarchy and event binding.
*Hosted by: David Melcher*
*Sponsor: India-Trento Program for Advanced Research (ITPAR)*

MADVIS Project Seminar
Monday, June 23 at 2.30pm
Seminar room at the ground floor (ex-chiesa), Palazzo Fedrigotti
*Speaker*:

- Xiaoqing Gao. Postdoctoral fellow, Centre for Vision Research, York University

*Title*: **Learning to See Faces**
*Abstract:*
For smooth social interactions, we need to simultaneously recognize people whom we know and read the feelings displayed on their faces. In this talk, I will present a set of approaches that I developed to measure developmental changes in children's skills at processing faces. Specifically, I measured developmental changes in the ability to recognize subtle facial expressions and the selective use of spatial frequency information in recognizing facial expressions and facial identities. Recently, I have used both behavioural and neuroimaging paradigms to investigate how statistical regularities are learned from faces and how they are represented in the brain. Collectively, these studies indicate that with experience, children learn to use the most relevant information in faces to help them interact smoothly with people.

*Hosted by: Olivier Collignon*
This talk is carried out within the framework of MADVIS - MApping the Deprived VIsual System: Cracking function for prediction, an ERC-funded project

PREMESOR Project Seminar
Tuesday, June 17 at 5pm
Pal. Ex Manifattura, Main Hall, piazza Manifattura 1, Borgo Sacco
*Speaker*:

- Irina Sinakevitch, School of Life Sciences, Arizona State University

*Title*: **Could the social insect honey bee be the model animal to study the Fragile X mental retardation gene function?**
*Abstract:*
Fragile X syndrome (FXS) is the most common form of inherited mental retardation. In its most extreme manifestation it can lead to severe intellectual disability and autism. The pathogenesis of FXS involves two stages. One affects functional neural circuits of the mature brain, and the other affects brain development via glutamatergic (mGluR 1/5)/gabaergic (GABAR) signaling. However, the precise mechanism of FMRP action in either of these stages is still an important focus of research. The study of the structural differences of FMR1 protein in different species can shed light on the function of the FMR1 protein in neurons. In the fruit fly Drosophila melanogaster, deletion of the dFMR1 ortholog recapitulates a number of Fragile X phenotypes and in adults it can impair formation of Long-term Memory (LTM) in

behavioral conditioning experiments. In the honey bee, as in the fruit fly, there is only one gene encoding the fragile X mental retardation syndrome-related protein1 with two predicted isoforms: Fmr1 protein isoforms 1, Genbank accession number XM_003250257.1, and isoform 2 XM_394058. The Fmr1 protein from the honey bee has a highly conserved domain in the RNA binding box when compared with that of fruit flies and humans. We have cloned a fragment of FMR1 in the honey bee brain, which encompasses 350 bp in the C-terminal region. We aligned our fragment with dFMR1 of Drosophila and the predicted AmFMR1 isoform C of the honey bee. These results suggest that we cloned a splice variant of AmFMR1 that encodes one of the isoforms of AmFMR1. The data are discussed in the context of providing a platform for further characterization of the downstream pathways of AmFMR1 and to reveal the role of FMR1 in learning and memory in the honey bee. (Irina Sinakevitch, Maria Bocanegra, Martin Helmkampf, Ying Wang, and Brian H. Smith)

*Hosted by: Albrecht Haase and Giorgio Vallortigara*

CIMeC Seminar
June 16 at 3pm
Conference Room, basement, Mattarello
*Speaker*:

- Simona Monaco, Post-doctoral fellow, Center for vision research – York University, Toronto (Canada)
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*Title*: **Involvement of ventral and dorsal stream areas in processing three-dimensional object properties for grasping**
*Abstract:*
The brain harnesses the remarkable ability to process large amounts of information from our surroundings and this allows us to effectively interact with objects in our environment. In everyday life, our most common way to interact with objects is by grasping and manipulating them, like we do when we pick up a pen from our desk to write on a piece of paper. Although this sounds like a simple task, the properties of the pen, such as its location, size and shape, need to be processed in order to allow an accurate grasping movement and subsequent manipulation. Several brain areas work in concert to process this information and implement a motor plan in a few hundred milliseconds. How are these processes orchestrated? With my research, I use functional magnetic resonance imaging (fMRI) to examine this question. The aim of my work is to contribute to the mapping of brain functions underlying the production of visuo-motor behaviours by investigating the interactions that occur between our perception of objects in the environment and our goal-directed actions..

*Hosted by: Luca Turella luca.turella@unitn.it*

MADVIS Project Seminar
Friday, June 6 at 11 am
Palazzo Fedrigotti 3rd floor seminar room
*Speaker*:

- Daniel Casasanto, Department of Psychology, University of Chicago

*Title*: **Experiential Origins of Mental Metaphors**
*Abstract:*
People not only talk metaphorically, we also think metaphorically, conceptualizing countless abstract domains like time, value and mathematics in terms of more concrete domains like space. Where do our mental metaphors come from? Metaphor theorists posit that hundreds of metaphors in language and thought have their basis in bodily interactions with the physical world. Yet, the origins of most mental metaphors are difficult to discern, because the patterns of linguistic, cultural, and bodily experience that could give rise to them appear mutually inextricable. In this talk, I'll discuss three mental metaphors for which the contributions of language, culture, and the body can be distinguished unambiguously. By analyzing the distinct ways in which politics, time, and emotional valence come to be metaphorized in

terms of left-right space, it is possible to illustrate the distinct linguistic, cultural, and bodily origins of the mental metaphors that scaffold our thoughts, feelings, and choices.

*See also*:
Casasanto, D. (2013). Experiential Origins of Mental Metaphors: Language, Culture, and the Body. In The Power of Metaphor: Examining Its Influence on Social Life. M. Landau, M.D. Robinson, & B. Meier (Eds.). Washington, DC: American Psychological Association Books. Pdf

Casasanto, D. & Bottini, R. (2014). Spatial language and abstract concepts. WIREs Cognitive Science, 5, 139–149. doi: 10.1002/wcs.1271 Pdf

*Hosted by: Olivier Collignon*

This talk is carried out within the framework of MADVIS - MApping the Deprived VIsual System: Cracking function for prediction, an ERC-funded project

Win2Con Project Seminar
Wednesday May 28 at 4.30 pm
Palazzo Fedrigotti 3rd floor seminar room
*Speaker*:

- Juliane Britz, Fundamental Neuroscience Dept. of the University Medical School of Geneva.

*Title*: **Building Blocks of Consciousness - assessing consciousness with EEG microstates**
*Abstract:*
The EEG topography is a global measure of the momentary brain state, and its configuration remains stable for brief periods (~70 – 100 ms), the so- called EEG microstates. One characteristic feature of EEG microstates is the rapid transition from one stable scalp field topography into another. Their temporal dynamics and local syntax are altered in different neurological and psychiatric conditions, and they are malleable by psychotropic drugs, which lead to the hypothesis that they constitute the "basic building blocks of cognition" or "atoms of thought" underlying spontaneous conscious cognitive activity.
I will report data using two complementary approaches using EEG microstates to assess correlates of consciousness. One approach assesses how the momentary brain state indexed by the pre-stimulus microstate determines differences in perceptual awareness for physically identical stimuli such as perceptual reversals of ambiguous figures and during binocular rivalry and the emergence of awareness of near-threshold stimuli. The other approach assesses how the intrinsic spatio-temporal dynamics of the EEG microstate sequences can be related to differences in consciousness. Using simultaneous EEG/fMRI, we identified EEG microstates as the electrophysiological correlate of four fMRI resting state networks, this link could be established because the EEG microstates are mono-fractal and show scale-free properties from tenths of seconds to tens of seconds. Their sequence is neither random nor determined but chaotic: it follows clearly defined rules without being predictable, analogous to how all natural languages follow a generative grammar. This is the key feature that permits the brain to rapidly adjust to unexpected events and to successfully interact with the environment, which can be considered as a necessary prerequisite for consciousness. This property changes with changes of consciousness during anesthesia in humans and monkeys.
*See also*:
- Britz J, Landis T, Michel CM. (2009) Right parietal brain activity precedes perceptual alternation of bistable stimuli. Cerebral Cortex, 19(1), 55-65
- Britz J, Pitts MA, Michel CM. (2011) Right parietal brain activity precedes perceptual alternations during binocular rivalry, Human Brain Mapping, 32, 1432-1442.
- Britz J, Diaz-Hernandez L., Ro T,. & Michel CM. EEG-microstate-dependent emergence of perceptual awareness. Frontiers in Behavioral Neuroscience (in press)
- Pitts MA, Britz J. (2011) Insights from intermittent binocular rivalry and EEG. Frontiers in Human Neuroscience,5 Special Topic "Binocular rivalry: a gateway to consciousness"
- Britz J, van de Ville D, Michel CM. (2010) BOLD correlates of EEG topography reveal rapid resting-state dynamics, NeuroImage, 52(4), 1162-1170
- Van de Ville D, Britz J, Michel CM. (2010) EEG microstate sequences in healthy humans at rest reveal scale-free dynamics, Proceedings of the National Academy of Sciences, USA 107(42):18179-84

*Hosted by: Nathan Weisz*

*This project is funded within the framework on Win2Con, an ERC funded project.*

CIMeC Seminar
May 20 at 10 am
Palazzo Fedrigotti, Sala Seminari 2nd floor, Rovereto
*Speaker*:

- dott.sa Giovanna Ponte, Stazione Zoologica Anton Dohrn, Napoli

*Title*: **OCTO…AMINES, A SHORT OVERVIEW ON OCTOPUS BRAIN AND BIOGENIC AMINES**
*Abstract:*
Vittorio Erspamer, an Italian pharmacologist and chemist, discovered in 1948 the "octopamine", by analizing compounds present in the salivary glands of the cephalopod mollusc Octopus vulgaris, the common octopus. From that time on, it has been well studied and its functional role characterized mostly in arthropods and in a few gastropod species. Octopamine serves as a neurotransmitter and hormone. It is considered the invertebrate functional homologue of the vertebrate adrenergic transmitters.

It is remarkable that over the last 66 years the presence/localization/role of octopamine has rarely been reported in the original taxon, where it was first discovered. I will describe my results that, for the first time, contribute to fill this gap and depict a revisited overview of the presence and localization of octopamine in the octopus.

*Hosted by: Elisa Frasnelli and Giorgio Vallortigara*

CIMeC Seminar
Tuesday, May 6 at 4 pm, Palazzo Fedrigotti 3rd floor seminar room
*Speaker*:

- Sebastiaan Mathôt, Laboratoire de Psychologie Cognitive at the CNRS / Aix-Marseille université

*Title*: **The Active Pupil: Pupil size in attention and active vision**
*Abstract:*
When the eyes are exposed to an increased influx of light, the pupils constrict. The pupillary light response (PLR) is traditionally believed to be purely reflexive and not susceptible to cognitive influences. In this talk, I will present a series of recent studies that show that this reflexive view is incomplete. I will focus in particular on how the PLR is modulated by visual attention, inhibition of return, and eye-movement preparation. Unlike the effect of arousal on pupil size, attentional modulation of the PLR is location-specific (i.e. tied to particular stimuli/ locations) and can therefore be used to track the spatial focus of attention over time. I will argue that the PLR is neither fully reflexive, nor under complete voluntary control, but is a stereotyped response that is modulated by visual attention. In general, the PLR is an integral aspect of active vision, and has many similarities with saccadic and smooth-pursuit eye movements.
*See also*:
- Mathôt, S., van der Linden, L., Grainger, J., & Vitu, F. (2013). The pupillary response to light reflects the focus of covert visual attention. PLoS ONE, 8(10), e78168. doi:10.1371/journal.pone.0078168
- Mathôt, S., Van der Linden, L., Grainger, J., & Vitu, F. (2014). The pupillary light response reflects eye-movement preparation. PeerJ PrePrints, 2, e238v1. doi:10.7287/peerj.preprints.238v1

*Hosted by: Wieske Van Zoest*

CIMeC Workshop
May 7th, 9:00- 12:00
Aula Multimediale, Palazzo Fedrigotti
*Speaker*:

- Sebastiaan Mathôt, Laboratoire de Psychologie Cognitive at the CNRS / Aix-Marseille université

*Title*: **An introduction to experiment building with OpenSesame**

OpenSesame is a free and cross-platform experiment builder that combines a graphical interface with Python scripting. This workshop will focus on creating a simple, but realistic experiment. No prior experience with OpenSesame or Python will be assumed. In the first part of the workshop I will give a short presentation about experiment building in general, and OpenSesame in particular. In the second part, we will create a simple, but realistic experiment. This experiment will even run on your Android phone or tablet! Time allowing, there will be opportunity to learn how you can include Python scripting in your experiment, or to work on your own experiment.

Tutorial resources: http://osdoc.cogsci.nl/rovereto2014/
OpenSesame documentation: http://osdoc.cogsci.nl/
OpenSesame forum: http://forum.cogsci.nl/

*Hosted by: Wieske Van Zoest*

CIMeC Seminar
7th May 2014 3.30 pm
Conference Room of the Maso building-Mattarello
*Speaker*:

- Markus van Ackeren, Department of Psychology, University of York

*Title*: **Oscillatory neuronal activity at different frequencies reflects lexical-semantic feature integration at different cortical scales**
*Hosted by: Olivier Collignon*

CIMeC Seminar
9th May 2014 11am
Seminar Room, 3° floor, Fedrigotti, Rovereto
*Speaker*:

- prof. Jay J. Pillai - Director of Functional MRI, Associate Professor - Neuroradiology Division, The Russell H. Morgan Department of Radiology and Radiological Science, Johns Hopkins University School of Medicine

*Title*: **Neurovascular uncoupling and its impact on BOLD fMRI**
*Abstract*:
The phenomenon of neurovascular uncoupling (NVU) and how it may affect the BOLD signal will be discussed from pathophysiologic, theoretical and practical standpoints. Different ways of assessing NVU in the setting of brain tumors or vascular malformations will be addressed including cerebrovascular reactivity (CVR) mapping using breath-hold and exogenous gas administration methods, functional field mapping and MR perfusion imaging. Clinical application of these approaches (especially breath hold CVR mapping and perfusion imaging) will be demonstrated using case examples from Johns Hopkins Hospital. Explanation of the importance of NVU detection in presurgical mapping will be conducted in the context of these clinical cases. Although most of this talk will focus on standard 3 Tesla applications of CVR mapping, some examples will be shown of higher field applications (at 7 Tesla) of both qualitative and quantitative CVR mapping as well as relevance of CVR mapping even in the context of resting state BOLD analysis.

*Hosted by: Jorge Jovicich*

PREMESOR Project Seminar
19th March 2014 10am
Sala conferenze affrescata, 1° floor, Fedrigotti, Rovereto
*Speaker*:

- prof. Irene Maxine Pepperberg, Research Associate, Dept. of Psychology, Harvard University

*Title*: **Grey parrots cognition and perception**
*Abstract*:
Grey parrot abilities for visual inferential reasoning by exclusion were tested in two experiments. The first replicated a study of Mikolasch et al. (2011), which in turn replicated that of Premack and Premack (1994) with apes, to learn if our subjects could succeed on this task. Here parrots watched an experimenter hide two equally desirable foods under two separate opaque cups, surreptitiously remove and then, in view of the birds, pocket/eat one of the foods, leaving birds to find the still baited cup. The experiment contained controls for various alternative explanations for the birds' behavior, but birds might still have avoided a cup from which something had been removed rather than specifically tracking the eaten food. Thus, in the second experiment, some trials were run with one food slightly more preferred than the other, during which two items of each type were hidden and only one of the items were removed from one cup. Sessions also included Experiment 1-type trials to see if birds tracked when and when not to use exclusion. Thus birds would be rewarded for attending closely to all the experimental aspects needed to infer how to receive their preferred treat. Three of four birds succeeded fully.

If time permits, data will also being presented showing how one Grey parrot, Griffin, can infer the labels of shapes in drawings of occluded and Kanizsa figures after being trained to identify real object figures (polygons of wood, flannel, plastic and paper).

*Hosted by: Giorgio Vallortigara*

This talk is carried out within the framework of PREMESOR - Predisposed mechanisms for social orienting: A comparative neuro- cognitive approach, an ERC-funded project

PREMESOR Project Seminar
11th March 2014 10am
Palazzo Fedrigotti, Seminar Room, 3° floor, Rovereto
*Speaker*:

- prof. Harald Luksch, Full professor and Chair of Zoology at the Technische Universität München, Munich, Germany

*Title*: **The vertebrate midbrain: Cells, Circuits, Concepts**
*Abstract*:
The vertebrate dorsal midbrain (superior colliculus in mammals, optic tectum in all other vertebrate classes) is a central interface between sensory stimuli and behavioral motor patterns. It receives a strong retinal projection that forms a map of visual space in the upper layers. This map acts as a master coordinate system for other sensory afferents (auditory, somatosensory etc.), leading to a multimodal representation of the sensory environment. With a high degree of structural order, identifiable cell types and known input and output connectivity, the analysis of the tectum with a combined experimental-computational approach can provide a mechanistic understanding of sensory computation.

Recent advances have been made in the analysis of feedback loops formed between the optic tectum and a group of nuclei in the isthmic area in several bird species. The function of these circuits is considered to be a bottom-up attentional system that identifies the most salient object and allows for both orienting movements as well as fast motor responses in, for example, escape behaviours. These functions are not restricted to visual computation, but deal predominantly with spatial coordinates to identify potential

targets through a saliency-based process. I will present recent data from intracellular work, imaging studies in brain slices, and modelling and discuss the functional implications of the circuits.

*Hosted by: Giorgio Vallortigara and Uwe Mayer (PREMESOR Project Seminar)*

CIMeC Seminar
6 February 2014 2pm,
Palazzo Fedrigotti, Sala Convegni, 1° floor, Rovereto
*Speaker*:

- Marina Boccardi - Psychobiologist, PhD LENITEM – IRCCS S.Giovanni di Dio – Fatebenefratelli

*Title*: **Using structural neuroimaging findings as biomarkers.**
*Abstract*:
Current neuroimaging research tools allow to detect neural circuits associated to even subtle personality traits. However, the goal of using such findings in everyday practice poses relevant methodological problems, from the use of group statistics for single case diagnosis, to the scanty normative data for the normal population, or the inconsistent sensitivity and specificity figures. Recently, MRI hippocampal volumetry, associated with clinical, CSF and brain function parameters, has been recognized as a biomarker for diagnosing Alzheimer's disease (AD). Even in this case, the large heterogeneity among the available segmentation protocols hampers direct comparison of results from different laboratories, and thus the use of hippocampal volume as a biomarker.
In order to define a standard procedure for manual hippocampal segmentation (current gold-standard method for hippocampal volumetry), we extracted the landmarks differences among the most popular protocols in the AD literature1. We operationalized them into "segmentation units" and collected quantitative information regarding their segmentation reliability and informative value for AD2. A panel of 16 international experts evaluated these data and defined the optimal set of landmarks for a standard procedure in 5 rounds of Delphi consultations3. The consensual protocol so defined has been validated versus current protocols and versus pathology. Reliability across 14 tracers from remote laboratories was higher for the consensual protocol (Absolute ICC= 0.88) than for currently used protocols (ICC=0.44; $p<0.01$)4. Correlations of volume estimates with AD pathology were significant for Braak staging ($\rho$=-0.76, $p=0.001$) and the other pertinent measures5.
The implementation of this standard procedure into concrete use still requires the definition of certification criteria for new tracers and automated algorithms, standard tools and settings for visualization and segmentation, and a standard method to estimate cranial size and correct hippocampal volumes. A branch of applied research is required, to fill a wide range of methodological hurdles and allow an appropriate and concrete use our wealth of neuroimaging findings.
*References*
1 Boccardi M et al. J Alzheimers Dis. 2011;26 Suppl 3:61-75
2 Boccardi M et al. Alzheimers Dement. 2013; doi: 10.1016/j.jalz.2013.03.001
3 Boccardi M et al. Neurology, 2012:78 Suppl 1
4 Boccardi M et al. Alzheimers Dement – 2013; 9(4):S868
5 Apostolova L et al. Alzheimers Dement – (2013-Submitted; MS ADJ-D-13-00496)
*Hosted by: Jorge Jovicich*

CIMeC Seminar
24 January 2014 2pm
Palazzo Fedrigotti, Sala Convegni, 1° floor, Rovereto
*Speaker*:

- Roel Willems, Donders Institute for Brain, Cognition and Behaviour & Max Planck Institute for Psycholinguistics, Nijmegen

*Title*: **Simulation in language comprehension**
*Abstract*:
A debated issue in language understanding is whether language is understood via sensori-motor simulation of its semantic content. Evidence in favor as well as evidence against this idea has been collected within cognitive neuroscience, and it is only fair to say that we have limited understanding of how sensori-motor areas play a role in language understanding. In this talk I will evaluate some recent

work that we did that tries to refine how sensori-motor systems play a role in language comprehension. I will present results from studies in which participants read single words, as well as from our most recent work in which we study sensori-motor simulation during the understanding of narratives. Finally I will end with some thoughts on how studying language comprehension at the more naturalistic level of narrative might give us insights into simulation which goes beyond what we get from experimentation at the single word or sentence level.
*Hosted by: Uri Hasson*

CIMeC Seminar
24 January 2014 3pm
Palazzo Fedrigotti, Sala Convegni, 1° floor, Rovereto

*Speaker*:

- Jared Medina (University of Delaware, USA)

*Title*: **Cognitive Neuropsychology of Body Representations**
*Abstract*:
Individuals with impairments after amputation (phantom limbs) and brain damage have contributed to the concept of a "body schema" – an online, multisensory representation of the body in space. While the concept of the body schema has been of some heuristic value, its utility is limited by a lack of specificity. To that effect, we have proposed a new account of sensorimotor body representation – dissociating the traditional "body schema" into different subsystems. In this talk, I will discuss how evidence from individuals with brain damage can contribute to a greater understanding of how we represent the body in space. First, I will present evidence for rapid, experience-dependent shifts in tactile localization after primary somatosensory damage, and discuss how deficits in tactile localization after brain damage provide evidence for a higher-order representation of body size and shape. Next, I will use evidence from individuals with tactile and crossmodal synchiria to understand the role of interhemispheric inhibition in representing stimuli on and around the body. Finally, I will present evidence from a novel mirror illusion demonstrating the effects of action on multisensory integration and embodiment. These findings have implications for developing testable cognitive models and theoretically motivated clinical interventions for deficits in body representation.
*Hosted by: Francesco Pavani*