# ant

## NEUROMEETING

### 2020

**15-18**
January

**29**TH EDITION

**Beaune, Burgundy France**

# Scientific & Social Program

## ant neuro
inspiring technology

inspiring technology for the human brain

# General Information

Head of Organization ANT Neuromeeting 2020
Ina Barić, MSc

**Organizer**

ANT Neuro b.v.
Welbergweg 74
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The Netherlands

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**Visitor badges**

Only registered participants will be admitted to the program symposiums, workshops, meals and other meeting activities. Name badges that participants receive at check-in should be worn at all times.

**Venue**

Hotel Le Panorama
74 Route De Pommard
21200 Beaune, France

T: + 33 (0)3 80 26 22 17
E: beaune-panorama@kyriadprestige.fr
I: www.le-panorama.com

Symposiums, workshops and product demos will be held in the conference building which is adjacent to the main building of Hotel Le Panorama. Lunch and dinner, with the exception of the gala dinner, will be served at the restaurant of Hotel Le Panorama. Free Wi-Fi is available in the hotel and all meeting rooms.

**Gala dinner**

Our Friday gala dinner will take place outside the conference venue, at Restaurant Ermitage de Corton (www.ermitagecorton.com). Transport to and from the gala dinner will be provided.

**Bought wine to take home?**

If you order wine during wine tasting, please don't forget to pick it up and pay by cash or card the next day (Thursday or Friday), during lunch. If you are not able to take wine with you, we are happy to ship it to your address after the conference, in which case you need to cover the shipping costs.
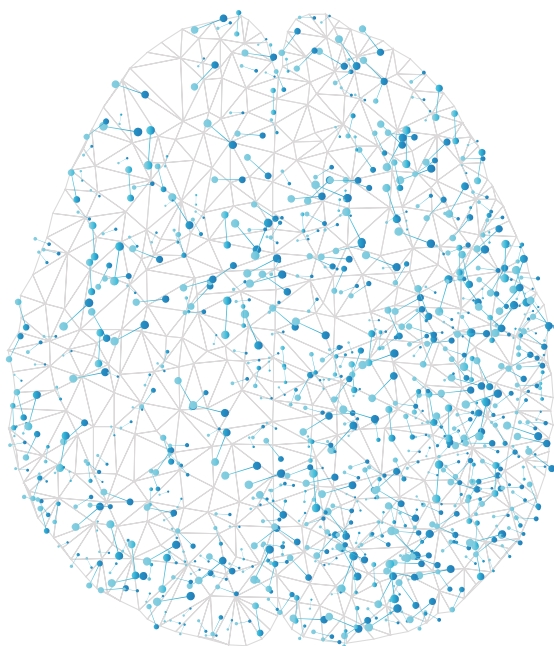
# Table of content

# Hotel Le Panorama

WiFi is freely available in the hotel and meeting rooms.



RÉCEPTION
ENTRÉES & SORTIES
+ INFORMATIONS

RESTAURANT
AVEC TERRASSE
+ PETIT DÉJEUNER / BAR

CHAMBRES
CLASSIQUES

PISCINE
EXTÉRIEURE

VILLA
& PISCINE PRIVATIVE

SUITES
AVEC BALCON

SALLES
DE SÉMINAIRE
+ SALLE DE SPORT

CHAMBRES
SUPÉRIEURES

## By car

- 5 min from the crossover of motorways A6, A31 (to Dijon, Lille, Nancy) and A38 (to Besançon, Basel)

- 40 min from Dijon (A31)

- 1 h from Besançon (A36)

- 1 h 30 min from Lyon (A6)

- 2 h 15 min from Geneva (A6 and A40)

- 2 h 30 min from Nancy (A31) and Annecy (A6 and A40)

## By train

- 1 h 40 min from Lyon

- 1 h 45 min from Mulhouse

- 2 h from Paris

## By plane

- Dijon-Bourgogne Airport

- Dole-Jura Airport

- Lyon-Saint-Exupéry Airport

# A very warm welcome to the 29th annual ANT Neuromeeting!
## 15-18 January 2020

**We are pleased that you have chosen to take part in this rich tradition of gathering together to dive into the topic of neuroscience. For those of you with whom I have not yet had the pleasure to meet, my name is Greg Accetturo and I am ANT Neuro's Director of Marketing. I joined the company back in March of 2019 and come into this position with 35 years of experience in the medical device industry. I am looking forward to getting to know the followers of ANT Neuro and the ANT Neuromeeting.**

At this year's ANT Neuromeeting, we will once again press into learning from top experts in research and clinical neuroscience. Also, let us not forget to soak up the beauty of Beaune which is often described as the wine capital of Burgundy. When it comes to wine, whether you are a casual sipper or an oenophile I am told this capital city of wine will not disappoint.

Like many of you, this is my first time experiencing all that this meeting has to offer, and it is our goal to assure that you are satisfied with every aspect of the meeting. The planning for this year's meeting has been underway for quite some time. My colleagues at eemagine and ANT Neuro have worked diligently to continue the long tradition of providing our guests with a program that informs and shares new insights into the field of neuroscience from leaders in academia, clinical practice, and industry. Whether this is your first time or your 29th time, we hope that you are equally excited to learn from each other as we are surrounded by experts in this field.

As part of the overall experience, it is our pleasure to share Beaune's wonderful culinary traditions and the aforementioned fine wines. We hope you will enjoy what we believe is a balanced program featuring scientific presentations, workshops on various related topics, plenty of fine food and wine, discussions, and social interaction.

In closing, it is my hope that this 29th edition of ANT Neuromeeting provides for an intense exchange of knowledge during our symposia intermixed with a casual atmosphere during lunch and evening programs. The resulting outcome will then be that this edition of Neuromeeting will be event to remember!

Kind Regards,

Greg Accetturo
*Director of Marketing, ANT Neuro*

# Meeting Overview

| | Wed, 15 January ⌄ | Thu, 16 January ⌄ | Fri, 17 January ⌄ | Sat, 18 January ⌄ |
|---|---|---|---|---|
| **morning** | Arrival | **08:30 - 12:00 Neonatology/ Neurology Symposium** *(co-organized with the INFANS Project)* 09:50 - 10:10 ☕ *Chaired by: Prof. Mark Richardson* *Keynote talk by: Dr. Jeroen Dudink* | **08:50 - 11:50 Neuroscience Symposium** 10:10 - 10:30 ☕ *Chaired by: Dr. Georgios Michalareas* | **09:20 - 12:00 New Technologies Symposium** 10:40 - 11:00 ☕ *Chaired by: Dr. Lucia Talamini* |
| **afternoon** | **15:00 - 18:00** INFANS Workshop 16:30 - 16:45 ☕ *(co-organized with the INFANS Project)* | **12:00 - 14:00** Lunch | 11:50 - 12:00 📷 **12:00 - 13:50** Lunch | **12:00 - 14:00** Self-service lunch |
| | | **14:00 - 16:50 Mental Health Symposium** 15:50 - 16:10 ☕ *Chaired by: Dr. Martin Brunovsky* **16:50 - 17:10** Poster presentations **17:15 - 18:15** nTMS Workshop | **13:50 - 17:10 Mobile Brain/ Body Imaging Symposium** 15:50 - 16:10 ☕ *Chaired by: Prof. Klaus Gramann* **17:15 - 18:15** EEG Workshop | Departure |
| **evening** | **18:30 - 20:00** Wine tasting **20:00** ANT Neuromeeting 2020 welcome dinner | **18:30 - 20:00** Wine tasting + poster session **20:00** Dinner | **18:30 - 19:45** Social gathering **19:45 - 20:00** Meet-up in lobby for bus shuttle to gala dinner **20:30** Gala dinner | |

# Workshops

**INFANS Workshop:** **Biomedical signal processing**

Wednesday, 15 January - 15:00 - 18:00
Time: 180 minutes
Organized in collaboration with the INFANS Project.
More information on page 8

**Navigated TMS Workshop:** **Neuronavigation for TMS brain mapping**

Thursday, 16 January - 17:15 - 18:15
Time: 60 minutes
Products: **vi**sor2, **smart**move
Dr. Farnoosh Safavi, Sebastian Carstens
More information on page 9

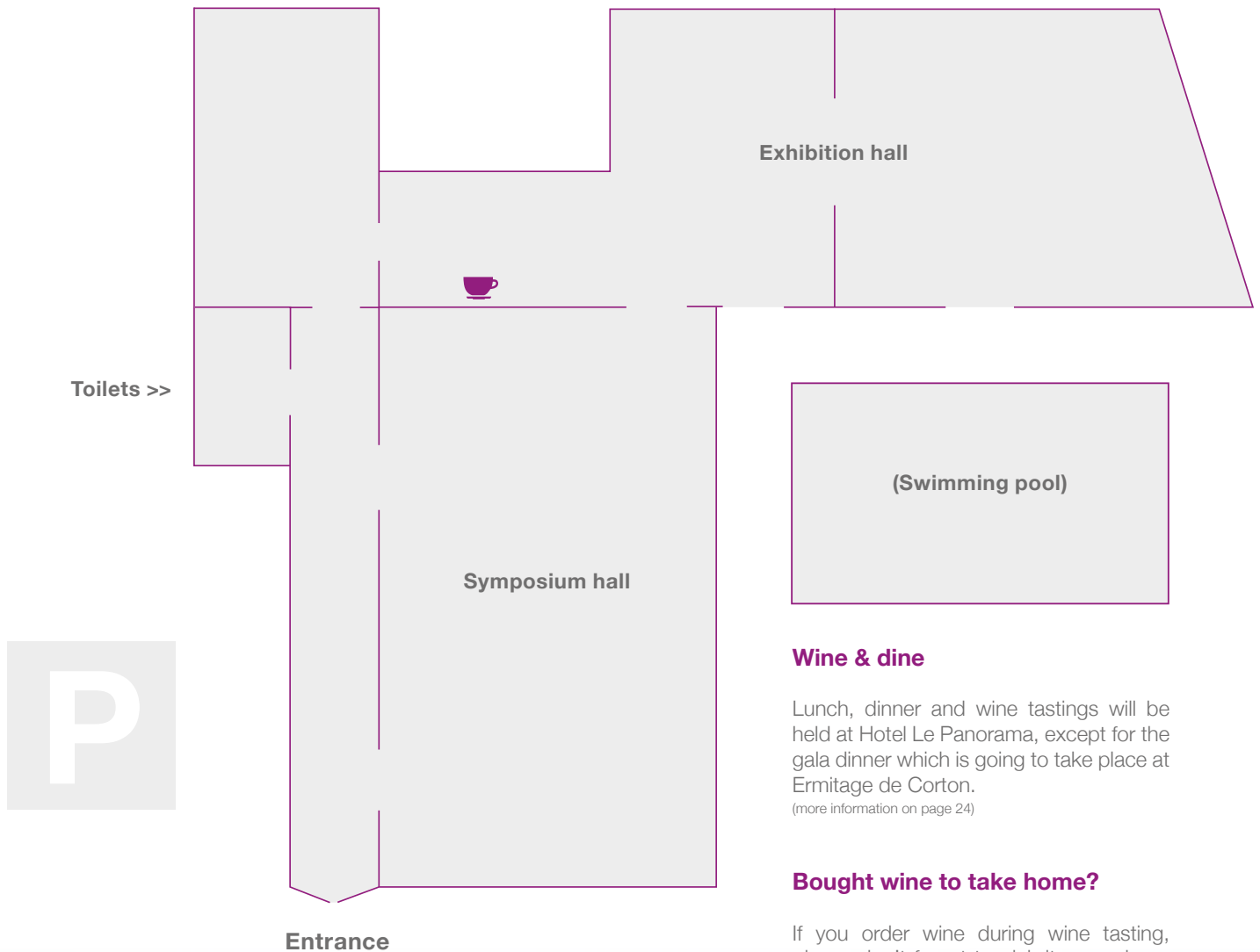**EEG Workshop:** **Multimodal data acquisition and analysis**

Friday, 17 January - 17:15 - 18:15
Time: 60 minutes
Products: **eego**, **wave**guard, **asa**, **vi**sor2
Dr. Patrique Fiedler, Dr. Farnoosh Safavi
More information on page 10

# Floor Plan

**Exhibition hall**

**Toilets >>**

☕

**Symposium hall**

**(Swimming pool)**

**P**

**Entrance**

## Wine & dine

Lunch, dinner and wine tastings will be held at Hotel Le Panorama, except for the gala dinner which is going to take place at Ermitage de Corton.
(more information on page 24)

## Bought wine to take home?

If you order wine during wine tasting, please don't forget to pick it up and pay by cash or card the next day (Thursday or Friday), during lunch. If you are not able to take wine with you, we are happy to ship it to your address after the conference, in which case you need to cover the shipping costs.

# Wednesday, 15 January

**Arrival**

**INFANS Workshop**

Wednesday, 15 January, Afternoon - 15:00 - 18:00
Time: 180 minutes
Location: Symposium hall
Organized in collaboration with the INFANS Project.

Co-organized with the INFANS project, this satellite event will open ANT Neuromeeting 2020 with sessions on biomedical signal processing. The INFANS project is an EU funded Marie Skłodowska-Curie Innovative Training Network, aiming to develop a novel neonatal brain monitoring system, based on dry electrode technology, functional infrared spectroscopy, and comprehensive methods for automated signal processing and analysis. For more information, please visit www.infansproject.eu.

**15:00 - 16:30 Biomedical signal processing I**
- Blind source separation Prof. Sabine Van Huffel
- EEG artifact removal with fingerprinting Prof. Silvia Comani
- Spatial harmonic decomposition Dr. Uwe Graichen

**16:30 - 16:45** *Coffee break*

**16:45 - 18:00 Biomedical signal processing II & neonatology**
- NIRS signal analysis Dr. Jörn M. Horschig
- Introduction to neonatology Prof. Gunnar Naulaers

**16:45 - 18:00 Hands-on session with nëo**
- ANT Neuro solution for aEEG and EEG monitoring of infants

# Thursday, 16 January

## Morning – Neonatology/Neurology Symposium

| | |
|---|---|
| **Session chair:** | **Prof. Mark Richardson**, <br> Head of the Division of Neuroscience, King's College London |
| **Keynote speaker:** | **Dr. Jeroen Dudink**, Associate Professor <br> Department of Neonatology, University Medical Center Utrecht |
| **Topics:** | **clinical research, epilepsy, stroke, MEG, neurosurgery, neurorehabilitation, neuroprotection in the NICU** |
| **Location:** | **Symposium hall** |

08:30   Opening speech Dr. Martijn Schreuder, neuromotion bv COO, ANT Neuro GmbH CEO
08:50   aEEG in the NICU: a neonatologist perspective Dr. Jeroen Dudink, *keynote speaker*
09:10   Advanced solutions for neonatal sleep analysis and perinatal stress monitoring Prof. Sabine Van Huffel
09:30   Novel ways to assess sleep and brain maturation in the newborn Prof. Sampsa Vanhatalo
09:50   *Coffee break*
10:10   Modelling brain network dynamics to predict clinical outcomes in epilepsy Prof. Mark Richardson, *session chair*
10:40   Epileptic network analysis using MEG in pediatric epilepsy surgery subjects Prof. Gretchen Von Allmen, Dr. Pablo Cuesta
11:00   Epilepsy network models based on single pulse electrical stimulation Prof. Geertjan Huiskamp
11:20   AnyWave: a software tool to help presurgical decision making in epilepsy surgery? Mr. Bruno Colombet, Mr. Samuel Medina Villalon
11:40   Outcome prediction in acute monohemispheric stroke by means of Electroencephalography Prof. Filippo Zappasodi
12:00   *Lunch*

## Afternoon – Mental Health Symposium

| | |
|---|---|
| **Session chair:** | **Dr. Martin Brunovsky**, Head of Brain Electrophysiology Research Programme, National Institute of Mental Health, Czech Republic |
| **Topics:** | **depression, ADHD, autism, Alzheimer's disease, schizophrenia, biomarkers, navigated TMS, healthy aging, addiction** |
| **Location:** | **Symposium hall** |

14:00   qEEG in mood disorders: From biomarkers and predictors of treatment response
        to a new era of psychedelic research Dr. Martin Brunovsky, *session chair*
14:40   EEG correlates of acute and delayed Ketamine brain effects Prof. Martin Walter
15:00   Towards the use of a multi-components ERP battery for screening the clinical evolution of mental diseases Dr. Salvatore Campanella
15:30   Sleep, neuroplasticity and mental health Dr. Jana Kopřivová
15:50   *Coffee break*
16:10   Coil positioning in navigated transcranial magnetic stimulation feasibility in depression patients trial (CONFIDENT)
        Prof. Lothar Krinke
16:30   A randomized controlled trial investigating the effectiveness, mechanisms of action, and moderators of mindfulness-based
        cognitive therapy combined with TMS in preventing depressive relapse or recurrence Prof. Nikos Konstantinou
16:50   *Poster presentations*
17:15   Navigated TMS Workshop: Neuronavigation for TMS brain mapping
18:30   *Wine tasting + poster session*
20:00   *Dinner*

### Navigated TMS Workshop: Neuronavigation for TMS brain mapping

Thursday, 16 January, Afternoon - 17:15 - 18:15
Time: 60 minutes
Products: **vi**sor2, **smart**move
Location: Exhibition hall
Dr. Farnoosh Safavi, Sebastian Carstens

In this workshop, we will provide you with the principles of navigated TMS as well as the overview of therapeutic and diagnostic applications. Moreover, we will walk you through the practical workflows of general neuronavigation, motor and speech mapping for therapeutic and diagnostic applications. You'll also be introduced to **smart**move™ coil-positioning robot and gain insights on our exciting future development plans.

# Friday, 17 January

## Morning – Neuroscience Symposium

**Session chair:** **Dr. Georgios Michalareas**, Senior Research Fellow – Department of Neuroscience, Max Planck Institute for Empirical Aesthetics, Frankfurt

**Topics:** **memory, attention, cognition, brain connectivity, event-related potentials, linguistics**

**Location:** **Symposium hall**

08:50 Functional signatures of hierarchy in the human visual cortex Dr. Georgios Michalareas, *session chair*
09:30 Localizing cortical correlates of non-invasive brain stimulation effects Prof. Thomas Knösche
09:50 Is the speed of feedback processing delayed in Autism Spectrum Disorder? Prof. John J. Foxe
10:10 *Coffee break*
10:30 Feasibility of dry electrode EEG cap in patients with Parkinson's disease and deep brain stimulation Prof. Ute Gschwandtner
10:50 Atypical response inhibition in 22q11.2DS: diminished error registration and awareness Prof. Sophie Molholm
11:10 Benefits of emotion regulation by unconscious acceptance: behavioral and ERP evidence Prof. Jia Jin Yuan
11:30 Inferring source extent using the Okada constant Prof. John Mosher
11:50 *Gathering for group photo*
12:00 *Lunch*

## Afternoon – Mobile Brain/Body Imaging Symposium

**Session chair:** **Prof. Klaus Gramann**, Chair Professor – Institute of Psychology and Neuroergonomics, Technische Universität Berlin
Professor – School of Computer Science, University of Technology Sydney; Center for Advanced Neurological Engineering, University of California San Diego

**Topics:** **virtual reality, multimodality, mobile EEG, hyperscanning, behavioral science**

**Location:** **Symposium hall**

13:50 Mobile EEG and mobile brain/body imaging - new methods, new results? Prof. Klaus Gramann, *session chair*
14:20 Brain/neural-machine interfaces for assistance and beyond Prof. Surjo Soekadar
14:50 Multinetwork visuomotor training to synth-music investigated with mobile EEG Prof. Joseph DeSouza
15:10 MoBI: Neural measures of cognitive motor interference during task-switching Prof. Edward Freedman
15:30 Evoked potentials during the gait cycle in a 10 m walking test Prof. Thordur Helgason
15:50 *Coffee break*
16:10 **eego** sports in the search of mental states related to top performance Prof. Guy Cheron
16:30 Brain dynamics during visual anticipation in sport Prof. Maurizio Bertollo
16:50 Classification of cortical activity elicited by whole-body balance perturbations suggests involvement of the theta rhythm in feedback control of balance and posture Dr. Teodoro Solis-Escalante
17:15 EEG Workshop: Multimodal data acquisition and analysis
18:30 *Social gathering*
19:45 *Meet-up in the lobby for transport to gala dinner*
20:30 *Gala dinner*

### EEG Workshop: Multimodal data acquisition and analysis

Friday, 17 January, Afternoon - 17:15 - 18:15
Time: 60 minutes
Products: **eego**, **wave**guard, **asa**, **vi**sor2
Location: Exhibition hall
Dr. Patrique Fiedler, Dr. Farnoosh Safavi

In this workshop, we will discuss two aspects of multimodal data acquisition and recording: the simultaneous acquisition of EEG in combination with further physiological sensor data and environmental sensor data, as well as simultaneous EEG during navigated TMS stimulation. We will outline principal requirements, practical workflows recommendations and demonstrations for both applications. The workshop will conclude with an overview of analysis approaches.

# Saturday, 18 January

## Morning – New Technologies Symposium

**Session chair:** **Dr. Lucia Talamini**, Principal Scientist/Lecturer Memory and Sleep group, University of Amsterdam, the Netherlands

**Topics:** **machine learning, closed-loop applications, dry EEG, BCI, neuroengineering**

**Location:** **Symposium hall**

09:20 Sleep and memory manipulation through closed-loop neurostimulation Dr. Lucia Talamini, *session chair*
10:00 ANT Neuro's journey towards new solutions in neuroscience and brain healthcare: the founder's perspective Dr. Frank Zanow, *neuromotion bv CEO*
10:20 Understanding and controlling trial-to-trial variability in TMS Prof. Stefan Götz
10:40 *Coffee break*
11:00 The new CTF MEG Dr. Sam Doesburg
11:20 NEUROCORT: Advanced technologies for neuromarkers of brain disorders Dr. Mahmoud Hassan
11:40 Dry EEG in sports sciences: Individual alpha peak frequency changes induced by physical effort Dr. Patrique Fiedler
12:00 *Self-service lunch*
14:00 *Departure*

## Posters

**Poster 1:** Featureless automatic classification of independent components in multi-channel electrophysiological brain recordings by deep convolutional neural networks
Dr. Pierpaolo Croce

**Poster 2:** Towards a generic workload estimation for human robot interaction in real world applications
Mathias Trampler

**Poster 3:** Differential modulation of brain responses to face stimuli after exposure to urban versus forest environments
Eszter Toth

**Poster 4:** Alcohol binge drinking during adolescence induce functional alterations in the bran network integrity
Dr. María Ángeles Correas

**Poster 5:** Influence of expertise on source level hyperbrain functional connectivity in interactive juggling
Dr. Gabriella Tamburro

**Poster 6:** Interactive settings for interacting brains: EEG implementation in the Art-Science-Interaction Lab
Mattia Rosso

**Poster 7:** Presurgical functional language mapping
Dr. Farnoosh Safavi

**Poster 8:** Identifying neonatal seizures
Dr. Martina Ly

**Poster 9:** ERP in clinical psychiatry
Dr. Marco Rotonda

**Poster 10:** Tactile robot for TMS with innovative sensors
Sebastian Carstens

**Poster 11:** Simultaneous, synchronous EEG and fNIRS
Dr. Antonia Thelen, Ivan Lazarov, Dr. Patrique Fiedler

**Poster 12:** Fast HD-EEG with dry electrodes
Dr. Patrique Fiedler, Dr. Antonia Thelen, Dr. Frank Zanow, Prof. Jens Haueisen

More information on page 46

All posters can be found at:

neuromeeting.ant-neuro.com/poster-session

or scan the QR code to visit the page.

# Members of the Scientific Committee

**Dr. Jeroen Dudink**
**Keynote speaker of the Neonatology/Neurology Symposium**
Associate Professor, Department of Neonatology, University Medical Center Utrecht, the Netherlands
E-mail address: j.dudink@umcutrecht.nl

Jeroen Dudink, MD, PhD, is a neonatologist at the Department of Neonatology of the Wilhelmina Children's Hospital (University Medical Centre Utrecht, the Netherlands). He earned his MD degree at the University Hospital Leuven in Belgium, and specialized in Pediatrics at the Leiden University Medical Centre. He was trained as a neonatologist at the Erasmus Medical Centre (Rotterdam, the Netherlands) and worked there for 10 years as a neonatologist. He received his PhD on the topic "Diffusion Weighted Imaging of the Neonatal Brain" in 2010, for which he spent a year as a research fellow at the Imperial College London. In 2013, he earned a master's degree in Neuroscience at the Erasmus University Medical Center. He is currently working as a neonatologist and Associated Professor at the Department of Neonatology of the Wilhelmina Children's Hospital in Utrecht. He is a member of the European Neonatal Brain Club. His current research interests are studying the effects of early life cerebellar injury on cortical development, and the effects of disturbed preterm sleep on brain development.

## aEEG in the NICU: a neonatologist perspective

Preterm birth (e.g. being born before 37 weeks of pregnancy) is very common and can pose several challenges for parents and health care professionals. Although survival rates are improving across the Western World, optimizing long-term neurodevelopmental outcome in these very vulnerable infants is still a major concern (especially in infants born extremely preterm; <28 weeks of gestation).

What makes the developing brain so fragile? What are major risk factors of brain injury? How are we using neuromonitoring to steer treatment? What could be the future of neonatal neuromonitoring?

The department of Neonatology of the Wilhelmina Children's Hospital of the University Medical Center Utrecht, is a Dutch center of expertise in Neonatal Neurology. It is specialized in combining advanced neonatal neuroimaging and neuromonitoring. Several neuroprotection intervention trials are being conducted and there is a close collaboration with different (inter-) national research groups. During this lecture I will discuss how I, as a neonatologist, view current and future neonatal neuromonitoring on the NICU.

### Prof. Mark Richardson
**Session chair of the Neonatology/Neurology Symposium**
Head of the Division of Neuroscience King's College London, United Kingdom
E-mail address: mark.richardson@kcl.ac.uk

Prof. Mark Richardson completed an undergraduate degree in Medical Sciences at the University of Cambridge, and graduated in Medicine at the University of Oxford, UK. He undertook clinical training in Neurology in London and a PhD at UCL Institute of Neurology, Queen Square. Prof. Richardson is the Head of the Division of Neuroscience at the Institute of Psychiatry, Psychology & Neuroscience, at King's College London. His current work focuses on the dynamics of seizure occurrences. This is addressed through two different areas of work: (1) using EEG, fMRI, DTI and other data from people with epilepsy and healthy subjects, combined with methods from connectomics and dynamics-on-networks, to model and understand how normal brain activity can make a transition to seizure activity, and (2) using wearable and implantable sensor systems in people with epilepsy, combined with time-series analysis methods, to track the trajectory of epilepsy-relevant brain states, with a view to automatically detect and predict clinical endpoints.

### Modelling brain network dynamics to predict clinical outcomes in epilepsy

Electroencephalography (EEG) is a rich and complex signal, reflecting the summated activity of postsynaptic potentials in populations of neurons. EEG provides both a readout of local brain dynamics and interactions between brain regions. There is increasing interest currently in how microscale abnormalities in epilepsy – such as gene mutations in components of neuronal ion channels – give rise to anomalies in mesoscale and macroscale brain dynamics, resulting in transitions between normal brain activity and seizure. Over the last decade, we have developed and implanted a modelling framework to allow insights into macroscale brain dynamics, using conventional clinical 10-20 EEG.

An early observation in our work was that the functional brain network inferred in a low-alpha frequency band (6-9Hz) differed between patients with Genetic Generalised Epilepsy (GGE) and healthy control subjects; and that unaffected first-degree relatives of GGE patients also showed some of the abnormal network features. Subsequently, we demonstrated in theoretical work how the abnormal network connectivity might predispose to epilepsy. More recent work has revealed that the spatial distribution of relatively high power in the 6-9Hz band associates with focal epilepsy as well as GGE, and associates with poorer seizure control.

In an influential theoretical study, we showed that the pattern of seizure onset – whether it appears focal or generalised on EEG – is not entirely determined by the presence or absence of an abnormally excitable focal brain region, but depends on the interplay between focal excitability and the pattern of brain network connectivity. We have used this modelling framework to inspire a translational tool intended to better predict the outcome of epilepsy surgery. In this approach, we use intracranial EEG from interictal epochs to create a connectivity model, and then apply "in silico resection" to explore which network components should be removed to best reduce the likelihood the network can generate seizures.

**Dr. Martin Brunovsky**
**Session chair of the Mental Health Symposium**
Head of Brain Electrophysiology Research Programme National Institute of Mental Health, Czech Republic
E-mail address: martin.brunovsky@nudz.cz

Martin Brunovsky, M.D., Ph.D., is the Head of the Brain Electrophysiology research programme at the National Institute of Mental Health in Czech Republic, and Assistant Professor at the Department of Psychiatry and Medical Psychology at the Third Faculty of Medicine of the Charles University Prague. He received his M.D. grade at the P. J. Safarik University in Kosice (Slovakia) in 1999 and his Ph.D. at the Charles University in Prague (Czech Republic) in 2004. After finishing his residency, he became a neurologist and neurophysiologist at the Prague Psychiatric Center and Assistant Professor at the Charles University in Prague. His research involves the application of brain imaging techniques, particularly qEEG, moving it from the analysis of waveforms to a neuroimaging tool (i.e. LORETA) with a special interest in the evaluation of CNS drug effects in pharmaco-EEG, sleep, and event-related potentials studies, as well as in the qEEG prediction of response to psychopharmacological treatment. His research interests and clinical experience are mostly oriented to ethiopathogenesis, diagnosis and treatment of schizophrenia, Alzheimer's disease, affective disorders, cognitive disorders and sleep disorders. Dr. Brunovsky is the Vice President of the International Pharmaco EEG Society (www.ipeg-society.org), a member of the EEG & Clinical Neuroscience Society, and a member of the European Psychiatric Association.

## qEEG in mood disorders: from biomarkers and predictors of treatment response to new era of psychedelic research

Electrophysiological assessment of the brain's functions in patients with affective disorders reveals various state- and trait-dependent findings (and their changes induced by different therapeutic approaches), reflecting complex regional and network-based interactions that are topographically distributed over the heterogeneous brain areas.

The first part of this presentation will focus on the elucidation of vulnerability QEEG markers related to emotional processing induced by autobiographic script in remitted patients with bipolar affective disorder and healthy controls. I will show that the mood challenge paradigm can unmask the trait-marker in remitted patients with bipolar disorder and that this finding can be interpreted within the framework of aberrant fronto-cingular connectivity revealed during induced sadness in euthymia patients. Moreover, the topographically similar QEEG pattern is also observed in offspring of parents with bipolar disorder (compared to healthy controls) where significant changes of current densities and functional connectivity may reflect the early neurophysiological trait marker of bipolar disorder.
The second part of the presentation will summarize the results of our studies in patients with major depressive disorder focused on various QEEG predictors of response to antideppressive treatment. ROC analysis of our pooled data from more than 200 patients showed that the decrease of prefrontal theta EEG cordance after one week of new treatment represents a robust and promising tool predicting the response to various antidepressants as well to rTMS and tDCS.

In the final part of my talk I will slightly change topics and discuss some recent work looking at the therapeutic use of psychedelic compounds. After almost 40 years of prohibition these substances found a way back to the human clinical research and nowadays we are witnesses of the renaissance of clinical studies focusing on their therapeutic potential. I will briefly present the results of our QEEG studies with ketamine in patients with depressive disorder as well as some recent QEEG findings with psilocybin, ayahuasca and rapé in healthy subjects.

**Dr. Georgios Michalareas**
**Session chair of the Neuroscience Symposium**
Senior Research Fellow Department of Neuroscience, Max Planck Institute for Empirical Aesthetics, Frankfurt
E-mail address: g.m@ae.mpg.de

Dr. Georgios Michalareas obtained his degree in Electrical Engineering and Electronics at the University of Liverpool, followed by a Master of Science in Telecommunications at the University of Surrey. Finally, he received his PhD in Mathematical Modelling at the University of Southampton. He has spent most of his career working on signal processing, time-series analysis and mathematical modelling. He first applied his skills in neuroscience in 2008 while doing research under the wing of Prof. Joachim Gross at the University of Glasgow, with a focus on estimating effective connectivity between brain areas from MEG data. Dr. Michalareas continued his research with Prof. Pascal Fries at the Ernst Strüngmann Institute, where he studied functional signatures of bottom-up and top-down processing in the human visual system using MEG. For the last four years he has been a senior researcher under Prof. David Poeppel at the Department of Neuroscience of the Max Planck Institute for Empirical Aesthetics in Frankfurt. His research is split into two main foci: the study of how a single brain learns statistical regularities, and what brain processes are altered when humans operate within groups. For the latter, he is currently setting up a mobile EEG laboratory where people will be studied in groups and in naturalistic conditions.

## Functional signatures of hierarchy in the human visual cortex

Communication between brain areas is subserved by rhythmic neuronal synchronization. Invasive animal studies have found inter-areal rhythmic synchronization to be particularly prominent in the alpha/beta and the gamma band. In visual cortex, local gamma-band synchronization predominates in superficial layers, and alpha/beta band synchronization in deep layers. Layer-wise anatomical connections differentiate between feedforward and feedback directions: The feedforward (feedback) output of an area originates primarily in superficial (deep) layers, and this preference is stronger for projections traversing more hierarchical levels. We investigated whether also in the human brain feedforward and feedback signalling are subserved by distinct frequency bands. To do this for the human brain, we recorded 36 subjects with MEG, source-projected the signals and calculated Granger-causal (GC) influences between 7 visual areas for which homologous anatomical connectivity is known for the macaque brain. The correlation between macaque anatomical and human functional connectivity demonstrated that inter-areal gamma-band synchronization subserves feedforward communication, and inter-areal alpha/beta-band synchronization subserves feedback communication in the human brain. Finally, based on functional connectivity we estimated the hierarchy of a total of 26 visual human areas.

**Dr. Lucia Talamini**
**Session chair of the New Technologies Symposium**
Principal Scientist/Lecturer Memory and Sleep group, University of Amsterdam, the Netherlands
E-mail address: L.M.Talamini@uva.nl

Dr. Lucia Talamini received her master's degree in Biology in 1991 (University of Leiden, specializations in Medical Biology and Neurobiology). Over the following three years she worked on growth factor-induced neural plasticity (Institute of Neurobiology, Rome, with L. Aloe and R. Levi-Montalcini) and NMDA receptor plasticity (Univ. of Amsterdam, with W. Kamphuis and F. Lopez Da Silva). Dr. Talamini obtained her PhD in 2000 from the University of Groningen, after developing an animal model that implicates abnormal mediotemporal lobe (MTL) development in the pathogenesis of schizophrenia, and links cognitive symptomatology to MTL pathology (with J. Korf). Today Dr. Talamini heads the Sleep and Memory Lab at the University of Amsterdam. Her research on sleep and memory occurs at the interface of neuroscience, psychology and technology. The Sleep and Memory Lab has a strong emphasis on neurotech development, including advanced methods to read and influence brain activity. Dr. Talamini collaborates with several partners in academia and industry to develop clinical as well as non-clinical applications based on the lab's findings. She has authored over 70 scientific publications, holds two patents and has been awarded many grants including a VIDI innovation grant.

## Sleep and memory manipulation through closed-loop neurostimulation

Over recent years we have developed a pioneering technique that allows us to interact with the brain in real-time. An automated loop, involving real-time modeling and prediction of oscillatory brain signals, targets stimuli to specific patterns in ongoing brain activity. This sophisticated form of manipulation, termed closed-loop neurostimulation (CLNS), enables innovative experimentation and exciting applications.

We used CLNS to demonstrate that sleep-related memory reactivation and consolidation are specifically linked to the depolarized phase of slow oscillations (SO's). Participants were exposed to a foreign vocabulary-learning task in the evening and tested for vocabulary acquisition the next morning. During sleep, memory reactivation was induced through subtle, auditory presentation of foreign words, locked to a specific phase of the slow oscillation.

Using this approach, we showed that the alignment of memory cues to the SO depolarising slope enhances memory for cued vocabulary items. Conversely, cues targeted to the down-going slope promote forgetting. Moreover, subtle auditory stimuli locked to SO zero-crossings can boost the slow oscillation dynamic, inducing long SO trains that effectively increase the duration and percentage of deep sleep across the night.

These results importantly enhance our understanding of sleep-related memory processing. They, moreover, show that declarative memory traces can be either enhanced or suppressed during sleep, depending on the precise alignment of reactivating cues to specific neural activity patterns. Finally, we show for the first time that sleep, as whole, can be deepened using intermittent, SO phase-locked acoustic stimulation during NREM sleep.

Besides the fundamental relevance, these findings point the way to possible applications of CLSN in the treatment of sleep problems and disorders involving maladaptive memories, such as PTSD, phobia and addiction.

# nëo™
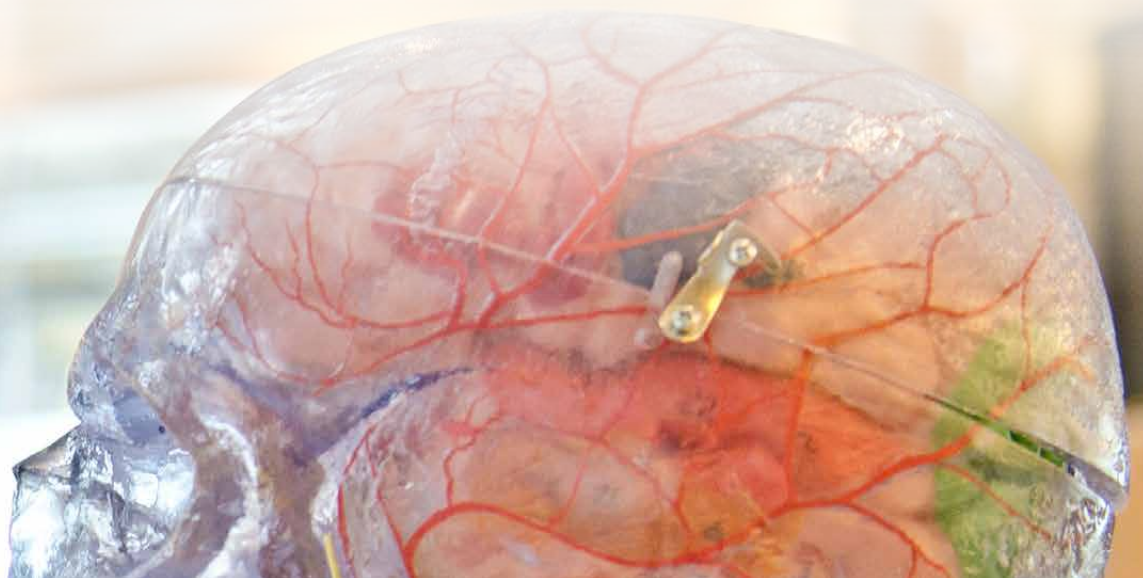
## simplify neonatal care

**The easiest-to-use cerebral function monitor (CFM) solution that provides the highest flexibility in recording channels and optimized signal quality for general NICU application in neonates born preterm and with hypoxic ischemic encephalopathy (HIE).**

## 1.2 New features

- Greyscale feature of amplitude integrated EEG (aEEG)
- Automatic impedance checks, option to only record with needles, improved visualization during impedance checks
- Increased patient privacy
- Enhanced cybersecurity network connection
- Enhanced flexibility in viewing aEEG and EEG data
- Artifact annotations added when non-physiological data is detected

## Interested in a live demonstration or have any questions?

Please speak to Mr. Bernd Tebje, *Director of International Sales,* and Dr. Martina Ly, **n**ëo *Product Manager,* during ANT Neuromeeting 2020.

# Neuroscience solutions of ANT Neuro

## eego™ mylab

### The new frontier in multimodal brain research

**With up to 16 kHz sampling rate, 32-256 EEG channels and many unique software features, eego mylab gives you an unprecedented in-depth understanding of the human brain.**

- **NEW** SpO2 sensor integration
- **NEW** receive triggers from Tobii Glasses II eye tracker
- **NEW** simultaneous remote control of multiple recording stations
- **NEW** integrated LSL streaming of EEG and events
- Available in 4 versions, for recordings from 32 to 256 EEG channels

## eego™ sports

### The new frontier in mobile EEG

**eego sports is now available with up to 128 EEG channels and the new modular eego backpack solution, fully untethering your high-resolution eego acquisition system.**

- **NEW** high spatial resolution solution with up to 128 EEG channels
- **NEW** simultaneous remote control of multiple recording stations
- **NEW** modular backpack with integrated cable management
- **NEW** powerful tablet computer for safe local data storage and control
- Compact and light-weight system for use in clinical as well as research settings.
- Fully battery powered for up to 5 hours of recording
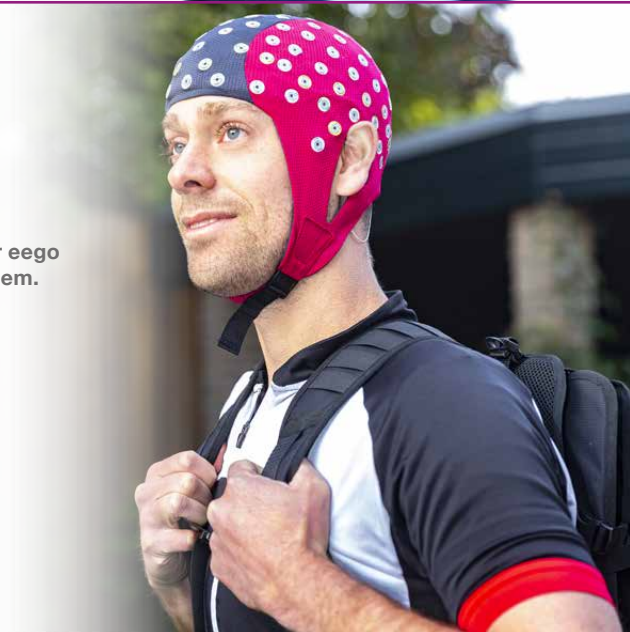
## asa™

### EEG & MEG analysis and MRI integration

**asa™ is a highly flexible software tool combining functional brain imaging with the visualization and integration of morphological and functional information obtained from MRI and fMRI. It includes a variety of source localization methods, signal analysis and MRI processing features for application in noninvasive functional EEG/MEG brain imaging.**

- Interaction with programs such as Matlab and other advanced analysis packages
- EEG/MEG review capabilities and support of most EEG/MEG file formats: paging, scrolling, event marker review, different editable montages, filters
- Fuse MRI images comprising inverse solutions with fMRI, CT and SPECT images
- Export of frequency dipoles – e.g. sLoreta results – as ASCII files
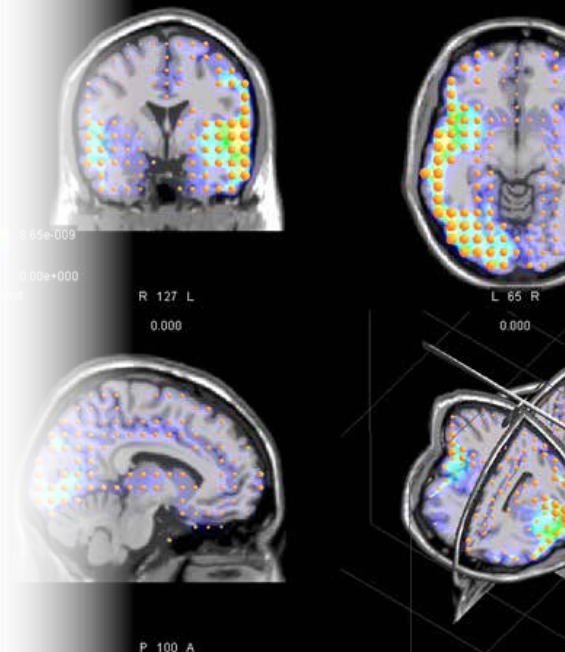
# Neuromodulation solutions of ANT Neuro

## **vi**sor2™

### Complete solution for navigated rTMS, functional mapping and EEG/EMG

**visor2 offers industry-leading precision and reliability in TMS for the highest possible quality in clinical procedures.
It enables you to reproduce stimulation sessions and navigate to the motor cortex within minutes!
The visor2 is CE Class IIa marked inside the European Union.**

- High precision MRI-guided e-field neuronavigation with real-time visuallization of stimulated brain areas on standard MRI or individual patient MRI imports
- Accurate real-time 3D neuronavigation, simultaneous EEG/TMS recording
- Intuitive workflow concept for all related procedures including MRI head segmentation
- Colored DICOM export of mapped functional hotspots
- Compatible with the leading stimulators from manufactor companies
- **NEW** Up to 64 EEG and 8 EMG channels are supported during multi-channel EMG recordings
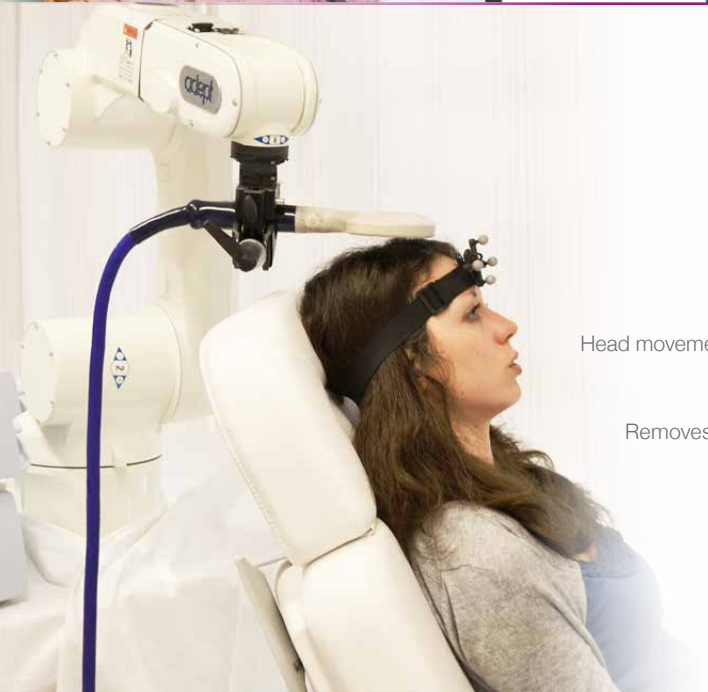
## **smart**move™

### Next-generation robotized TMS solution

**smartmove is a collaborative TMS solution with modern robot arm
to support the safe, fast and ultra-precise application of TMS.**

- Head movement compensation to constantly keep position and orientation during stimulation
- Simple and fast TMS coil targeting with robot-aided manual targeting mode
- Support of complex stimulation protocols with grid-based, automatic targeting
- Removes constraints from patients and only requires minimum attention of the operator
- Mobile solution with all hardware on one cart and short setup time

# Neurocare solutions of ANT Neuro

# **wave**guard™ EEG caps

## The reference in comfort and signal quality

**waveguard original and connect caps combine easy and reliable application, highest patient comfort and exceptional signal quality for a wide range of electrode layouts and compatible amplifier models**

- **NEW** clinical 25 channel IFCN conform cap models
- **NEW** extended range of caps with equidistant electrode layouts
- the most suitable caps for AC and DC coupled recordings in research and clinical settings
- 11 different sizes to fit neonates to adults
- 5 up to 256 channels
- optional active shielding technology for highest signal quality demands

# **wave**guard™touch

## The new frontier in dry EEG

**waveguard touch is the dry electrode EEG cap, incorporating the latest developments in dry electrode technology. The unique Ag/AgCl coated soft polymer electrodes provide stable, research-grade EEG signals while maintaining subject comfort and minimizing preparation efforts.**

- **NEW** 128 channel HD dry EEG cap
- **NEW** 32 channel 10-20 layout cap
- Coated Ag/AgCl EEG electrodes provide stable, research-grade dry EEG
- Soft, multi-pin electrode design ensures consistent contact quality, even through hair
- Active shielding technology and **eego** software artefact correction for clean EEG signals
  www.ant-neuro.com/products/waveguard-touch/research-grade-eeg
- CE-certified

# **cogni**trace™

## Clinical neuro-psychiatry system

**The system applies dedicated recording hardware and analysis protocols for quantitative EEG (QEEG) and event-related potential (ERP) data. Topographical maps and the event-related brain responses are linked to gain objective data that help psychiatrists and neurologists in their diagnostic process.**

- Spontaneous EEG (eyes open/closed condition, hyperventilation, flash presentation): indication for possible neurological issues
- Visual Evoked Potential (VEP): response of the brain's visual system
- Auditory Evoked Potential (AEP): cortical (long latency) response of the auditory system
- Contingent Negative Variation (CNV, Bereitschaftspotential): response anticipation
- FFT spectral power and ERP topographic map generation
- Auditory oddball paradigm (P300): capacity to process relevant and ignore irrelevant information
- Patient management
- Report generation

# Get a taste of Burgundy!

**Wednesday, 15 January**

18:30
20:00

# WINE TASTING

Location: Hotel Le Panorama lobby

For those who wish to buy wine, wine order forms will be available.

If you order wine during wine tasting, please don't forget to pick it up and pay by cash or card the next day (Thursday or Friday), during lunch. If you are not able to take wine with you, we are happy to ship it to your address after the conference, in which case you need to cover the shipping costs.



20:00

# WELCOME DINNER

Parsley ham, remoulade celery with mustard seed

***

Beef parmentier with wine sauce

***

3 cheese platter | Nuts and dried grapes

***

Blackcurrant vacherin, red berries coulis

# Get a taste of Burgundy

**Thursday, 16 January**

| 12:00<br>14:00 | LUNCH MENU |
|---|---|

Cassolette of Escargots with Chardonnay sauce and Fricassee des Bois

\*\*\*

Guinea Fowl Supreme Epoisses sauce, Fondant potatoes

\*\*\*

Crème brûlée with Gingerbread

| 18:30<br>20:00 | WINE TASTING |
|---|---|

Location: Hotel Le Panorama lobby

For those who wish to buy wine, wine order forms will be available.
If you order wine during wine tasting, please don't forget to pick it up and pay
by cash or card the next day (Thursday or Friday), during lunch. If you are not able to take
wine with you, we are happy to ship it to your address after the conference,
in which case you need to cover the shipping costs.

| 20:00 | DINNER MENU |
|---|---|

Butternut velvet and chopped nuts, whipped cream with truffle oil

\*\*\*

Catfish soufflé with crayfish, lobster sauce, wild rice, floret

\*\*\*

3 cheese platter | Nuts and dried grapes

\*\*\*

Frozen Parfait with Marc de Bourgogne

# Get a taste of Burgundy!

**Friday, 17 January**

| 12:00<br>13:50 | # LUNCH MENU |
| --- | --- |

Marbled poultry with vegetables, mustard seed mayonnaise

***

Braised veal loin with Givry sauce, mushroom fricassee & Gratin comtois

***

Meringue blackcurrant pie, custard

| 20:30 | # GALA DINNER MENU |
| --- | --- |

Feuilletés apéritifs
Appetizers Crémant de Bourgogne

***

Boeuf charolais aux radis red meat pressé au brillât savarin
chantilly d'avocat
Red Meat radish Charolais beef pressed with brillât savarin avocado whipped cream

🍷 Petit Chablis 2016 Domaine William Fèvre

***

Noix de saint jacques en transparence
oeuf de hareng fumés + topinambour / cazette du Morvan
scallops in transparency
smoked herring eggs + Jerusalem artichoke, Morvan's « Cazette »

***

Filet de canette de Bresse au foie gras + beurre de sésame
patate jaune au parfum d'agrumes
Bresse duckling fillet and foie gras + sesame butter yellow potatoe / citrus fruit scent

🍷 Chorey-lès-Beaune 2015 Domaine Romain Pertuzot

***

Assiette de fromages affinés
Matured cheeses

***

Vacherin au Grand Marnier orange confite à la grenadine
Meringue à l'anis de Flavigny Grand Marnier vacherin
Orange candied with grenadine / Flavigny anise meringue

***

Café et mignardises
Coffee and mignardises

# ant neuro

## inspiring technology

"

It is rare to attend a conference that keeps together
scientific excellence and the friendliest atmosphere
for sharing ideas and discussing collaborations.
ANT Neuromeeting 2019 certainly achieved this.

**- Prof. Stefano Seri -**
*Aston University; Birmingham, United Kingdom*

"

# neuromotion

## neuroscience - neurocare - neuromodulation

Members of the neuromotion group:
ANT Neuro b.v. (Hengelo - The Netherlands)
ANT North America (Philadelphia, PA - USA)
ANT Benelux (Hengelo - The Netherlands)

ANT Asia Pacific (Hong Kong)
ANT Neuro UK (London - United Kingdom)
ANT Neuro GmbH (Berlin - Germany)
eemagine GmbH (Berlin - Germany)