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Welcome Remarks ........................................ 6

General Information ..................................... 7
    Registration, Social Events, Speaker Ready Room,
    Internet Café, Evaluations

Daily Schedule

Saturday, June 6 ........................................ 10
    Educational Courses –
        Introduction to Imaging Genetics
        Dynamic Models in Systems Neuroscience
        EEG/MEG: Practical Tools for Advanced Analysis
        Multimodal Neuroimaging: Examples,
        Benefits and Challenges
        Diffusion and Structural MRI
        Advanced fMRI
        Opening Ceremony and Talarach Lecture

Monday, June 7 ........................................ 21
    Scientific Program

Tuesday, June 8 ........................................ 28
    Scientific Program

Wednesday, June 9 ................................... 35
    Scientific Program

Thursday, June 10 ..................................... 43
    Scientific Program

Exhibitor List ........................................... 49

Exhibitor Floor Plan ................................... 55

Council and Committees ................................ 56

Abstract Review Committee .......................... 57

Acknowledgments ....................................... 59

Trainee Abstract Travel Award Winners ........... 60

Catalonia Palace of Congresses Floor Plans ....... 61
### ALL DAY EDUCATIONAL COURSES

**Introduction to Imaging Genetics**  
8:00 - 17:00  
Sala H2

**Dynamic Models in Systems Neuroscience**  
8:00 - 18:00  
Sala H1

**EEG/MEG: Practical Tools for Advanced Analysis**  
8:00 - 17:00  
Sala H3

**Multimodal Neuroimaging: Examples, Benefits and Challenges**  
8:00 - 17:00  
Sala A

**Diffusion and Structural MRI**  
8:15 - 17:00  
Sala J

**Advanced fMRI**  
8:30 - 17:30  
Sala F

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### Opening Ceremonies and Talairach Lecture

18:00 - 19:30  
Oscillation-Assisted Internally Generated Cell Assembly Sequences Support Cognition  
György Buzsáki  
Auditorium

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### Welcome Reception

19:30 - 21:30  
The Gardens

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### Sunday, June 6

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### Monday, June 7

#### Morning Workshops

9:00 - 10:15  
**Why Should I Believe Your Model?**  
How to be a Sceptical Neuroimager  
H1 & 2

**Cut the Edge of NIRS/OT Technique Toward Synthesis for the Next Generation**  
J & H3

**Art and the Brain: Perception and Aesthetics of Paintings & Music**  
Auditorium

---

#### LOC Symposium

10:30 - 12:00  
The Legacy of Ramon y Cajal from Brain Structure to Cognitive Function: The Spanish School Version  
Auditorium

---

#### Keynote Lecture

12:00 - 12:30  
From Monkey to Human and From Human to Monkey: What Do We Learn?  
Wim Vanduffel  
Auditorium

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#### Poster Session (Odd numbered posters present)

12:30 - 13:30  
Exhibit Hall and Multifunction Area

---

#### Lunch

13:30 - 14:45

---

#### Poster Session (Even numbered posters present)

14:45 - 15:45  
Exhibit Hall and Multifunction Area

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#### Symposium

16:00 - 17:15  
Decoding Information Conveyed by Cortical Columns: Mechanisms & Advanced Methods for Investing Higher-Order Cognitive Functions  
Auditorium

---

#### Keynote Lecture

17:15 - 17:45  
Decoding Memories  
Eleanor Maguire  
Auditorium

---

#### Oral Sessions

18:00 - 19:15  
**O-M1:** Memory and Learning  
J & H3

**O-M2:** Modeling and Analysis: Brain Networks  
H1 & 2

**O-M3:** Disorders of the Nervous System: Psychiatry  
Auditorium
Tuesday, June 8

Morning Workshops
9:00 - 10:15
Auditorium

Human Intra-Cranial Electrophysiology (ICE) in Mind/Brain Mapping-Linking Levels of Analysis from Cells to Psychology
J & H3

Connectivity in the Developing Brain
Auditorium

Oral Sessions
10:30 - 11:45
O-T1: Imaging Techniques: Structural Connectivity
J & H3
O-T2: How Genes Map the Brain
H1 & 2
O-T3: Language
Auditorium

Keynote Lecture
12:00 - 12:30
Psychiatric Neuroimaging: From Maps to Mechanisms
Andreas Meyer-Lindenberg
Auditorium

Poster Session (Odd numbered posters present)
12:30 - 13:30
Exhibit Hall and Multifunction Area

Lunch
13:30 - 14:45

Poster Session (Even numbered posters present)
14:45 - 15:45
Exhibit Hall and Multifunction Area

Symposium
16:00 - 17:15
The Dopamine Midbrain
Auditorium

Keynote Lecture
17:15 - 17:45
The Brain’s Default Network
Randy Buckner
Auditorium

Oral Sessions
18:00 - 19:15
O-T4: Emotion and Motivation 1: Reward, Decision Making, and Learning
Auditorium
O-T5: Cognition and Attention: Brain Plasticity and Aging
H1 & H2
O-T6: Imaging Techniques: Functional MRI
J & H3

Poster Reception
19:30 - 20:30
Exhibit Hall and Multifunction Area

Club Night: Razzmatazz Nightclub
21:00 - 1:00

Wednesday, June 9

Morning Workshops
9:00 - 10:15
Data-Driven Mapping of Functional Architecture & Functional Ontologies
Auditorium

Multi-Subject Surface-Based Analysis of fMRI
Data: Challenges, Solutions & Limitations
H1 & 2

Gene Function Meets Brain Function
J & H3

Oral Sessions
10:30 - 11:45
O-W1: Cognition and Attention: Perception, Attention & Imagery
Auditorium
O-W2: Disorders of the Nervous System: Neurology
H1 & 2
O-W3: Brain Development
B1 & 2
O-W4: Imaging Techniques: Multimodal Approaches
J & H3

Keynote Lecture
12:00 - 12:30
Using fMRI to Detect Conscious Awareness
Adrian Owen
Auditorium

Poster Session (Odd numbered posters present)
12:30 - 13:30
Exhibit Hall and Multifunction Area

Lunch
13:30 - 14:45

Poster Session (Even numbered posters present)
14:45 - 15:45
Exhibit Hall and Multifunction Area

Symposium
16:00 - 17:15
Top-Down Modulation in Visual Processing
Auditorium

Town Hall Meeting
17:15 - 17:45
Auditorium

Keynote Lecture
17:45 - 18:15
Electrophysiological Imaging of the Attention Network
Pascal Fries
Auditorium

Oral Sessions
18:30 - 19:45
O-W5: Emotion and Motivation 2: Pharmacology and Neurotransmitters
J & H3
O-W6: Modeling and Analysis: Brain Networks II
H1 & 2
O-W7: Cognition and Attention: Perception, Attention and Imagery II
Auditorium

Closings and Meeting Highlights
17:30 - 18:30
Auditorium

Closing Comments and Meeting Highlights
18:30 - 19:30
Exhibit Hall and Multifunction Area

Thursday, June 10

Morning Workshops
9:00 - 10:15
Measuring Consciousness in Disorders of Connectivity
H1 & 2

fMRI in Clinical Trials: Promises, Progress and Path Forward
J & H3

Prospects for Noninvasive Microstructural Parcellation of Human Cortex: The Challenge of an In Vivo Brodmann Atlas
Auditorium

Oral Sessions
10:30 - 11:45
O-Th1: Motor Behavior
Auditorium
O-Th2: Brain Structure and Anatomy
J & H3
O-Th3: Disorders of the Nervous System: Development
H1 & 2

Keynote Lecture
12:00 - 12:30
Real Time Functional Connectivity Assessed Using Transcranial Magnetic Stimulation (TMS) Methods
John Rothwell
Auditorium

Poster Session (Odd numbered posters present)
12:30 - 13:30
Exhibit Hall and Multifunction Area

Lunch
13:30 - 14:45

Poster Session (Even numbered posters present)
14:45 - 15:45
Exhibit Hall and Multifunction Area

Oral Sessions
16:00 - 17:15
O-Th4: Brain Stimulation
J & H3
O-Th5: Sensory Systems
Auditorium
O-Th6: Modeling and Analysis: Anatomy & Inter-Subject Variability
H1 & 2

CLOSING COMMENTS AND MEETING HIGHLIGHTS
17:30 - 18:30
Auditorium

Farewell Poster Reception
18:30 - 19:30
Exhibit Hall and Multifunction Area
WELCOME TO THE 16TH ANNUAL MEETING OF THE ORGANIZATION FOR HUMAN BRAIN MAPPING IN BARCELONA, SPAIN. This year, the traditional OHBM combination of exciting scientific programs and social events combines with the exciting atmosphere that can only be created by the city of Barcelona. Barcelona, the capital of Catalonia, is one of the most popular tourist destinations in Europe. The city, on the Mediterranean coast, has a wealth of unique historic and modern architecture. The modernist movement, with Antoní Gaudí as its most prominent member, left its mark on the city with magnificent buildings such as la Sagrada Familia, Casa Milà and Casa Batlló. It is a beautiful city full of markets, shops, museums and churches, and attendees will find it a wonderful city to explore.

This year’s program features the Talairach Lecture given by Gyorgy Buzsaki of Rutgers University, Newark, NJ, and Keynote Lectures by Wim Vanduffel, Eleanor Maguire, Andreas Meyer-Lindenberg, Randy Buckner, Adrian Owen, Pascal Fries, and John Rothwell.

Over 3000 posters will be presented throughout the meeting. There will be two 60-minute poster sessions Monday through Thursday, with each poster being displayed for two full days. The morning poster session will be from 12:30-13:30, and the afternoon session will be from 14:45-15:45. Tuesday and Thursday will conclude with a 60-minute poster reception, where authors from both of the day’s sessions will be present to answer questions.

A Board of Councilors, elected by the membership, governs the OHBM and will be present at this year’s meeting. We welcome and encourage those researchers who are attending this meeting for the first time, and are not yet members, to join the organization and to participate in its future growth. One characteristic of the organization is that the leadership feels it is essential to include a broad base of members in order to achieve its scientific goals. This year’s meeting reflects this philosophy by including member-proposed workshops and three member-initiated symposia.

Please be sure to visit the exhibit booths located in the Exhibit Hall (Level 0), and thank the representatives for their support of the OHBM meeting.

The annual meeting will feature parallel oral sessions that will allow for more discussion of original work, and encourage the participation of younger investigators. In addition, three morning workshop sessions will be presented from 9:00 – 10:15 from Monday through Thursday. On Sunday, six full-day educational courses will also be offered:

- Introduction to Imaging Genetics
- Computational Neuroscience & Modeling of Neurodynamics
- EEG/MEG: Practical Tools for Advanced Analysis
- Multimodal Neuroimaging
- Diffusion & Structural MRI
- Advanced fMRI

The 16th Annual Meeting of the Organization for Human Brain Mapping promises to be a memorable event from both a scientific and social perspective. We are glad you have joined us and look forward to your involvement.

Sincerely,

Russ Poldrack
Chair, OHBM Council

Denis Le Bihan
Chair, OHBM Program Committee

Emiliano Ricciardi
Jean-Baptiste Poline
Co-Chairs, Local Organizing Committee
CONFERENCE VENUE
Catalonia Palace of Congresses
Av. Diagonal, 661-671, 08028
Barcelona, Spain
Phone: +34 933 644 400
Fax: +34 933 644 401
All events will take place in the Catalonia Palace of Congresses, unless otherwise noted.

REGISTRATION HOURS
Registration Area (Level 0)
Saturday, June 5:  15:00 – 18:00
Sunday, June 6:  7:30 – 19:30
Monday, June 7:  8:30 – 19:30
Tuesday, June 8:  8:30 – 19:30
Wednesday, June 9:  8:30 – 20:00
Thursday, June 10:  8:30 – 18:30

EXHIBIT HOURS
Exhibit Hall (Level 0)
Monday, June 7:  12:30 – 18:00
Tuesday, June 8:  12:30 – 20:30
Wednesday, June 9:  12:30 – 18:30
Thursday, June 10:  12:30 – 19:30

TOWN HALL MEETING
Wednesday, June 9, 17:15 – 17:45
Auditorium (Level 0)
All OHBM meeting attendees are encouraged to participate in this open forum where you will have an opportunity to ask questions and give the OHBM leadership feedback. Updates on future meeting sites and council elections will be presented.

WELCOME RECEPTION
Sunday, June 6, 19:30 – 21:30
The Gardens
Join us for hors d’oeuvres and a selection of local wines and beers at the Welcome Reception. The reception will be held in the Historic Gardens of Hotel Rey Juan Carlos I, immediately following the Opening Ceremonies and Talairach Lecture on Sunday, June 6. The party is complimentary to registrants, but a ticket must be requested upon registration. Additional guest tickets are 50€.

CLUB NIGHT
Wednesday, June 9, 21:00 – 1:00
Razzmatazz Nightclub
Almogàvers 122
Barcelona, Spain 08018
Spend an evening at Razzmatazz, Barcelona’s famous nightclub. Razzmatazz is a multi-floored discoteque and concert venue, where all of the hippest acts in Europe and the US have played at some point. Entertainment will feature live music by Mother Groove as well as a DJ. Club Night is complimentary to registrants, but a ticket must be requested upon registration. Additional guest tickets are 50€.

SPEAKER READY ROOM
Press Room 2 (Level 1)
Hours:
Saturday, June 5:  15:00 – 18:00
Sunday, June 6:  7:30 – 19:30
Monday, June 7:  8:30 – 19:30
Tuesday, June 8:  8:30 – 19:30
Wednesday, June 9:  8:30 – 19:30
Thursday, June 10:  8:30 – 17:00

INTERNET CAFE
Foyer (Level 0)
A limited number of complimentary terminals will be available.
Hours:
Sunday, June 6:  7:30 – 19:30
Monday, June 7:  8:30 – 19:30
Tuesday, June 8:  8:30 – 19:30
Wednesday, June 9:  8:30 – 19:30
Thursday, June 10:  8:30 – 16:00

E-POSTERS
New this year! The top ranked abstracts, as well as presentations from the oral sessions, will be highlighted online as electronic posters. Please go to www.aievolution.com/hbm1001 to view the e-posters, or stop by the kiosks located outside the exhibit hall.
WIRELESS CONNECTION
Wireless connection will be available throughout the Catalonia Palace of Congresses. You do not need a username and password to access the network.

EVALUATIONS ONLINE!
New this year! In an effort to conduct a greener meeting, the evaluations will be done electronically this year. Each day, an email will be sent to you in an effort to gauge the effectiveness of that day’s presentations. At the end of the meeting, an overall meeting evaluation will also be sent. You may also go to www.humanbrainmapping.org/Barcelona2010 to complete the evaluations for the 2010 conference. It is only through attendee’s feedback that we can continue to improve the content, format, and schedule of the meeting. Your input is very important to us, and we urge you to fill out these quick surveys.

TWITTER HASH TAG
Want to know what is happening at the OHBM annual meeting? Check out what others are saying, and connect to attendees. Join the conversation on Twitter - #OHBM2010

ACCME ACCREDITATION

CME CREDIT: This activity has been planned and implemented in accordance with the Essential Areas and Policies of the Accreditation Council for Continuing Medical Education (ACCME) through sponsorship of the Organization for Human Brain Mapping. The OHBM is accredited by the ACCME to provide continuing medical education for physicians.

The Organization for Human Brain Mapping designates this educational activity for a maximum of 42.50 PRA Category 1 Credit(s)™. Physicians should only claim credit commensurate with the extent of their participation in the activity. CME Forms will only be available online at www.humanbrainmapping.org/CME2010.

EDUCATIONAL COURSES
Introduction to Imaging Genetics (Full Day) ........ 8.00
Dynamic Models in Systems Neuroscience
(Full Day) ........................................ 8.50
EEG/MEG: Practical Tools for Advanced Analysis
(Full Day) ........................................ 7.00
Multimodal Neuroimaging: Examples,
Benefits and Challenges (Full Day) ............ 8.00
Diffusion and Structural MRI (Full Day) ........ 7.75
Advanced fMRI (Full Day) ....................... 8.00

Total # of possible credits earned at Educational Courses .......................... 8.5

ANNUAL MEETING CREDITS
Talairach Lecture ................................... 0.75
Keynote Lectures (7) .............................. 0.50 each
Morning Workshops (4) ......................... 1.25 each
Oral Sessions (7) ................................. 1.25 each
Poster Sessions (8) ............................. 1.00 each hour
Symposia (4) .................................... 1.25 each
Poster Receptions (2) ......................... 1.00 each hour
Closing Comments ............................. 1.00

Total # of possible credits earned at Annual Meeting .................. 34

TOTAL NUMBER OF POSSIBLE CREDITS ........ 42.50
Advanced fMRI
Sala F (Level -1)

ORGANIZERS
Tor D. Wager, University of Colorado, Boulder, CO, USA
Nikolaus Kriegeskorte, MRC Cognition and Brain Sciences Unit, Cambridge, UK

Functional magnetic resonance imaging (fMRI) has taken a central role in the study of human brain function and its relationship to animal models. fMRI is inherently cross-disciplinary, and data acquisition and analysis are constantly evolving. Thus, there is a need for continuing education on new methods and cutting-edge neuroscientific applications of fMRI. This course addresses this need and is intended for an audience of research scientists with intermediate to advanced knowledge of fMRI techniques, who wish to extend the breadth and depth of their understanding of the current state of the art.

This year features a special emphasis on pattern-information analysis, an approach that has gathered a lot of momentum in recent years and is thought to target the information represented in regional neuronal population codes by analyzing differences in the fine-grained patterns of activity across many voxels within a brain region or across multiple regions.

Learning Objectives
Having completed this course, participants will be able to:
1. Understand the potential and limitations of fMRI;
2. Understand basic MRI physics and the physiological underpinnings of fMRI;
3. Understand statistical brain mapping techniques, including advanced multi-level univariate analysis, functional connectivity and pathway analyses, and causal modeling; and
4. Understand multivariate pattern-information analyses, including pattern-classifier decoding, voxel-based encoding models, and representational similarity analysis.

COURSE SCHEDULE
8:30 – 8:40
Introduction
Tor D. Wager, University of Colorado, Boulder, CO, USA
Nikolaus Kriegeskorte, MRC Cognition and Brain Sciences Unit, Cambridge, UK

Part I. Fundamental Principles of fMRI and Pattern-Information Analysis
8:40 – 9:10
Minds, Brains, and Classifiers
Russ Poldrack, University of Texas, Austin, TX, USA
9:10 – 9:40
What Should be Known on MRI Physics for fMRI and DTI Studies
Larry Wald, Martinos Center for Biomedical Imaging, Boston, MA, USA
9:40 – 10:10
The Neuronal and Hemodynamic Origins of fMRI Signals and fMRI-Based Decoding
Amir Shmuel, MNI, McGill University, Montreal, Canada
10:10 – 10:40
High-Field, Hi-Res fMRI and Pattern-Information Analysis: A Marriage Made in Heaven
Kamil Ugurbil, University of Minnesota, Minneapolis, MN, USA
10:40 – 10:50
Break

Part II. Current Directions in fMRI Design and Analysis
10:50 – 11:20
Hierarchical Linear Modeling of fMRI Activity
Martin Lindquist, Columbia University, New York, USA
11:20 – 11:50
Causal Modeling and Effective Connectivity
Klaas Enno Stephan, Functional Imaging Laboratory, UCL, London, UK
11:50 – 12:20
Single and Multi-Level Path Modeling in fMRI
Tor D. Wager, University of Colorado, Boulder, CO, USA
12:20 – 13:30
Lunch
Part III. Pattern-Information Analysis and its Neuroscientific Applications

13:30 – 14:00
Methods and Principles of fMRI Decoding
Yuki Kamitani, ATR Computational Neuroscience Laboratories, Kyoto, Japan

14:00 – 14:30
Characterizing the Primate IT Code with Representational Similarity Analysis
Nikolaus Kriegeskorte, MRC Cognition and Brain Sciences Unit, Cambridge, UK

14:30 – 14:40
Break

14:40 – 15:10
Decoding Primary and Higher Visual Representations by fMRI Pattern Classification
Frank Tong, Vanderbilt University, Nashville, TN, USA

15:10 – 15:40
Voxel-Based Encoding Models and Their Use in Decoding
Jack Gallant, University of California, Berkeley, CA, USA

15:40 – 16:10
Cross-Subject Alignment of Representational Spaces
James Haxby, Dartmouth University, Hanover, NH, USA

16:10 – 16:20
Break

16:20 – 16:50
Multivariate Decoding of Conscious and Unconscious Mental States
John-Dylan Haynes, Bernstein Center for Computational Neuroscience, Berlin, Germany

16:50 – 17:20
Multivariate fMRI-based Applications to Clinical Diagnosis
Vince Calhoun, Mind Research Network and University of New Mexico, Albuquerque, NM, USA

17:20 – 17:30
Wrap-up and Questions/Discussion
Diffusion and Structural MRI
Sala J (Level -1)

ORGANIZER
Heidi Johansen-Berg, University of Oxford, Oxford, UK

This course intends to provide a critical overview of classical and imaging methods for neuroanatomy and to illustrate diverse examples of these methods in practice. It is aimed at a multidisciplinary audience, and will provide some basic introduction to all methods discussed, as well as a discussion of their advantages, disadvantages and potential pitfalls. Session one will consist of methodological talks on classical neuroanatomical techniques. Session two will include methods talks on imaging methods for neuroanatomy, covering acquisition and interpretation. Session 3 will focus on practical issues for design and analysis of structural MRI experiments including discussion of artefact correction, multi-centre and longitudinal studies, statistical comparisons, voxel-based morphometry, tract-based spatial statistics, and tractography. Finally, session 4 will provide example applications of anatomical neuroimaging techniques to clinical and healthy populations.

Learning Objective
Having completed this course, participants will be able to:
1. Understand the principles, advantages, and limitations of classical techniques for neuroanatomy including tract tracing, receptor mapping, and cytoarchitectonics;
2. Understand methods for acquisition of structural MRI data and discuss interpretation of the measures they provide;
3. Understand methods for design and analysis of structural MRI experiments;
4. Give examples of applications of structural MRI to understanding brain function and dysfunction

Target Audience
The prime target audience for the whole day includes researchers with limited previous experience in structural/diffusion imaging. Certain sessions may be useful to those with more experience (e.g., Session 1 on classical neuroanatomy and session 4 on applications would be suitable for any imaging scientists; Sessions 2 and 3 on methodology would be suitable for experienced MRI researchers with little technical expertise).
Part III: Designing and Analyzing Structural Imaging Studies

13:00 – 13:30
Practical Considerations for Diffusion Imaging Studies: Experimental Design, Processing, Artifacts, Issues in Multi-Centre and Longitudinal Studies
Carlo Pierpaoli, National Institutes of Health, Bethesda, MD, USA

13:30 – 14:00
Techniques for Analysis of GM Structure: VBM, DBM, Cortical Thickness
Jason Lerch, Toronto Centre for Phenogenomics, Toronto, Canada

14:00 – 14:30
Break

14:30 – 15:00
Statistical Analysis of Structural Brain Images
Stephen Smith, University of Oxford, Oxford, UK

15:00 – 15:30
Introduction to Diffusion Tractography
Tim Behrens, University of Oxford, Oxford, UK

Part IV. Applications of Neuroanatomy in Imaging

15:30 – 16.00
Variation in Cortical Structure in Development and Disease
David Van Essen, Washington University School of Medicine, St Louis, MO, USA

16:00 – 17:00
Question and Answer panel discussion with all speakers
Dynamic Models in Systems Neuroscience  
Sala H1 (Level -1)

ORGANIZERS  
Michael Breakspear, Queensland Institute of Medical Research, Brisbane, Australia  
Stefan Kiebel, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

This course is designed to guide both cognitive neuroscientists and modellers through a variety of computational approaches. The talks introduce and motivate dynamic systems theory and other mathematical concepts as tools for modelling various neuroscience phenomena, ranging from the single neuron to the macroscopic network level. The participants do not require an explicit mathematical background to follow the course but need to bring a healthy interest in how ubiquitous neuroscience phenomena can be explained mechanistically. Examples will be given of how such approaches lead to the design and analysis of cognitive neuroscience experiments.

Learning Objectives
Having completed this course, participants will be able to:

1. Summarize the use of dynamic systems theory in modelling neuroscience phenomena, ranging from single neuron models to macroscopic modelling of networks;
2. Summarize new developments and research questions in dynamic models of the brain;
3. Understand the link between models of cortical activity and theories of brain function;
4. Understand the meaning and significance of stochastic processes in cortical systems; and
5. Discuss how such computational approaches can lead to the design and analysis of cognitive neuroscience experiments.

COURSE SCHEDULE

Part I: Dynamic Systems Approach

Chair: Stefan Kiebel, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

8:00 – 8:10  
Introduction: Modelling in Cognitive Neuroscience  
Stefan Kiebel, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

8:10 – 9:00  
Neuronal and Neural Ensemble Dynamics  
Michael Breakspear, Queensland Institute of Medical Research, Brisbane, Australia

9:00 – 9:10  
Discussion

9:10 – 9:55  
Models for Dynamics from the Neural Microcircuit to Cortical Regions  
Thomas Wennekers, University of Plymouth, Plymouth, UK

9:55 – 10:05  
Discussion

10:05 – 10:20  
Break

Part II: From Dynamics to Computational Neuroscience

Chair: Michael Breakspear, Queensland Institute of Medical Research, Brisbane, Australia

10:20 – 11:05  
Neural Masses, Cortical Fields and Connectivity  
Viktor Jirsa, CNRS, Marseille, France

11:05 – 11:15  
Discussion

11:15 – 12:00  
Slow Feature Analysis  
Laurenz Wiskott, Ruhr University Bochum, Bochum, Germany

12:00 – 12:10  
Discussion

12:10 – 13:20  
Lunch
Part III: Bayesian-Based Methods
Chair: Karl Friston, Wellcome Trust Centre for Neuroimaging, London, UK

13:20 – 14:05
Dynamic Causal Modelling (Bayesian Inference, Model Selection)
Jean Daunizeau, Wellcome Trust Centre for Neuroimaging, London, UK

14:05 – 14:15
Discussion

14:15 – 15:00
Model-Based Inference on (Patho)Physiological Brain Connectivity and Synaptic Plasticity
Klaas Stephan, University of Zurich, Zürich, Switzerland

15:00 – 15:10
Discussion

15:10 – 15:25
Break

Part IV: Integrative models
Chair: Viktor Jirsa, CNRS, Marseille, France

15:25 – 16:10
Temporal Scales in the Brain
Stefan Kiebel, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

16:10 – 16:20
Discussion

16:20 – 17:05
Models in Cognitive Neuroscience
Gustavo Deco, Universitat Pompeu Fabra, Barcelona, Spain

17:05 – 17:15
Discussion

17:15 – 18:00
Summary, Discussion, and Farewell
Karl Friston, Wellcome Trust Centre for Neuroimaging, London, UK
Michael Breakspear, Queensland Institute of Medical Research, Brisbane, Australia
Stefan Kiebel, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany
EEG/MEG: Practical Tools for Advanced Analysis
Sala H3 (Level -1)

ORGANIZERS
Ole Jensen, Donders Institute for Brain, Cognition and Behavior, Nijmegen, The Netherlands
Joachim Gross, Centre for Cognitive Neuroimaging, University of Glasgow, UK

Given the richness of the EEG/MEG data sets there is an unlimited number of ways that its analysis can be performed. This provides a challenge for new users of EEG/MEG or experienced users who want to try out new techniques. In the first part of the course we will introduce the tools for EEG/MEG analysis that have been used in cognitive/applied research; i.e. tools that have proven to work. The second part will focus on how to analyze EEG/MEG from a practical point of view. There are a number of non-commercial toolboxes being made available to the research community. As the techniques are advancing these toolboxes are becoming increasingly important in cognitive neuroscience research. The developers will briefly introduce the toolboxes. Following lunch there will be hands-on demonstrations in parallel in smaller groups.

Learning Objectives
Having completed this course, participants will be able to:
1. Understand the established analysis techniques applied in cognitive neuroscience. This includes: Time domain analysis (ERPs/ERFs), frequency domain analysis, dipole and distributed source modeling, and statistical considerations;
2. Understand possibilities and limitations applying measures of functional connectivity;
3. Appreciate emerging applications of EEG/MEG in brain-computer interfacing;
4. Make an informed choice when selecting non-commercial software toolboxes for data analysis

Target Audience
This course targets cognitive neuroscientists with an applied focus; this includes researchers new to EEG/MEG but with some background in brain imaging as well as somewhat experienced EEG/MEG researchers with an interest in learning advanced analysis.

COURSE SCHEDULE
8:00 – 8:15
Introduction
Ole Jensen, Donders Institute for Brain, Cognition and Behavior, Nijmegen, The Netherlands
Joachim Gross, Centre for Cognitive Neuroimaging, University of Glasgow, UK

8:15 – 9:00
ERPs in Cognitive Neuroscience
Charan Ranganath, University of California-Davis, Davis, CA, USA

9:00 – 9:45
Dipole Modeling Applied in Cognitive Neuroscience
Riitta Salmelin, Helsinki University of Technology, Helsinki, Finland

9:45 – 10:00
Break

10:00 – 10:45
Evoked Responses: Distributed Source Modeling
Sylvain Baillet, Medical College of Wisconsin, Milwaukee, WI, USA

10:45 – 11:30
Oscillatory Brain Activity: From Raw Data to Group Averages using Beamformer Approaches
Barbara Haendel, Maastricht University, Maastricht, The Netherlands

11:30 – 12:15
Break

12:15 – 13:00
Assessing Functional Connectivity by EEG and MEG: From Methodology to Interpretation
Karim Jerbi, INSERM, Lyon, France

13:00 – 14:00
Lunch
14:00 – 14:45
Non-Commercial Software Toolboxes for
EEG/MEG Analysis

Fieldtrip
Room H3
Saskia Haegens, Donders Institute, Nijmegen,
The Netherlands

BrainStorm
Room B1
Sylvain Baillet, Medical College of Wisconsin,
Milwaukee, WI, USA
Francois Tadel, CNRS, Marseille, France

MNE-suite
Room K1
Matti Hamalainen, Massachusetts General Hospital,
Boston, MA, USA

EEGLab
Room K2
Scott Makeig, University of California-San Diego,
San Diego, CA, USA

Nutmeg
Room K3
Leighton Hinkley, University of California-
San Francisco, San Francisco, CA, USA

SPM
Room K4
Vladimir Litvak, University College London,
London, UK

14:45 – 15:00
Break

15:00 – 17:00
Rotating Workshop – Toolboxes are Presented
Introduction to Imaging Genetics
Sala H2 (Level -1)

ORGANIZERS
Thomas Nichols, University of Warwick, Coventry, UK
Jean Baptiste Poline, Neurospin, CEA, Paris, France

This course will introduce the fundamentals of “Imaging Genetics,” the process of modeling and understanding genetic variation in brain image data. The course begins with a four-lecture genetics tutorial in the morning, designed to give imaging practitioners a quick overview of key genetics concepts and terminology. The remainder of the course covers how imagers can use genetic variables in their analyses. Specific topics include voxel-wise genome-wide models, joint multivariate modeling of imaging and genetic data, and heritability analyses of cortical surface and thickness data. The course concludes with two case studies highlighting current imaging genetics research.

Learning Objectives
Having completed this course, participants will be able to:
1. Understand the fundamentals of the molecular basis of genetic variation, and how that variation is modeled in traditional genetics studies;
2. Understand the difference between linkage, association and heritability analyses;
3. Understand the relative strengths & weaknesses of each different type of brain imaging phenotype used to find genetic association; and
4. Understand how imaging genetics can be applied to an area like reward

Target Audience
The course is designed for neuroimaging practitioners who do not necessarily have a background in genetics.

COURSE SCHEDULE
8:00 – 8:15
Introduction
Thomas Nichols, University of Warwick, UK
Jean-Baptiste Poline, Neurospin, CEA, Paris, France

8:15 – 9:00
Molecular Basis of Genetic Variation
Trygve Bakken, University of California-San Diego, San Diego, CA, USA

9:00 – 9:45
Structure and Analysis of Genetic Variation
Fabio Macciardi, University of California-Irvine, Irvine, CA, USA

9:45 – 10:00
Break

10:00 – 10:45
Quantitative Traits: Heritability, Linkage & Association
David Glahn, Yale University, New Haven, CT, USA

10:45 – 11:30
Epistasis: Machine Learning Approaches
Kristin Nicodemus, Kings College, London, UK

11:30 – 12:00
What Brain Imaging Has to Offer Genetics, and Vice Versa
Andreas Meyer-Lindenberg, Central Institute of Mental Health, Mannheim, Germany

12:00 – 13:00
Lunch

13:00 – 13:30
Overview of Neuroimaging Phenotypes
Roberto Toro, Institut Pasteur, Paris, France

13:30 – 14:05
Univariate Approaches: Multiple Testing & Voxelwise WGA
Jason Stein, University of California-Los Angeles, Los Angeles, CA, USA

14:05 – 14:40
Multivariate Approaches: Joint Modeling of Imaging & Genetic Data
Giovanni Montana, Imperial College, London, UK

14:40 – 14:55
Break

14:55 – 15:30
Heritability: Unique Genetic Contributions to Cortical Volume & Thickness
Anderson Winkler, Yale University, New Haven, CT, USA

15:30 – 16:00
Case Study: Genetic Control of Reward System
Christian Büchel, University of Hamburg, Hamburg, Germany

16:00 – 16:30
Case Study: Genetic Control of Aversive Processing in the Amygdala
Anne Beck, Charité University, Berlin, Germany

16:30 – 17:00
Panel Discussion
Multimodal Neuroimaging: Examples, Benefits and Challenges
Sala A (Level -1)

ORGANIZERS
Vince Clark, Mind Research Network and University of New Mexico, Albuquerque, NM, USA
Elia Formisano, Maastricht University, Maastricht, The Netherlands

Multimodal neuroimaging offers many potential benefits. By combining data from different modalities, it may be possible to achieve a description of human brain activity with a combination of spatial and temporal precision that is impossible to achieve using any single imaging modality. It might also provide a means to gain a better understanding of the underlying nature of data obtained from individual imaging modalities. It may also help to elucidate the complex relationships between the structure, chemistry, neurophysiology and vascular supply of the brain, and their relationship to cognition and behavior. Multimodal imaging also presents many challenges. It is inherently more difficult and can be more expensive. It requires more data collected from subjects, the coordination of data obtained across different imaging platforms, and often requires the close collaboration among groups of scientists coming from different backgrounds and philosophies. Ultimately the potential for novel discoveries is very high, and multimodal neuroimaging may eventually become a standard of human brain mapping. This course will cover both the broad conceptual and analysis issues covering any combination of imaging modalities, as well as detailed issues particular to specific combinations of modalities including EEG, MEG, fMRI, MRS and PET.

Learning Objectives
Having completed this course, participants will be able to:
1. Understand possibilities and limitations of multimodal imaging;
2. Understand the basic technical and organizational issues associated with performing multimodal imaging studies;
3. Learn about algorithms designed to facilitate the comparison of different imaging modalities.
4. Examine some specific examples of multimodal imaging;
5. Make informed choices when setting out to perform a multimodal study; and
6. Understand when multimodal imaging is necessary to answer a specific question and when it is not

Target Audience
This course targets cognitive neuroscientists with experience in the use of one or more imaging modalities; this includes researchers new to multimodal imaging but with a firm background in brain imaging using a single imaging modality, as well as more experienced researchers with an interest in learning advanced methods of multimodal data collection and analysis.

COURSE SCHEDULE
8:00 – 8:30
Introduction
Vince Clark, Mind Research Network and University of New Mexico, Albuquerque, NM, USA

8:30 – 9:30
Prospects and Challenges of Hybrid (f)MRI-PET
Jon Shah, Jülich Institute of Neurosciences and Medicine, Jülich, Germany

9:30 – 9:45
Break

9:45 – 10:45
MR Spectroscopy/Molecular Imaging
Rolf Gruetter, École Polytechnique Fédérale de Lausanne, Lausanne, Switzerland

10:45 – 11:45
Combining Micro-Stimulation and fMRI in the Monkey: Behavioral and Brain-Wide Functional Consequences of Focal and Reversible Cortical Perturbations
Wim Vanduffel, Harvard Medical Center, Charlestown, MA

11:45 – 12:45
Lunch

12:45 – 13:45
Combining MEG/EEG with fMRI
Matti Hamalainen, Massachusetts General Hospital, Boston, MA, USA

13:45 – 14:45
Simultaneous EEG and fMRI in Humans
Tom Eichele, University of Bergen, Bergen, Norway

14:45 – 15:00
Break

15:00 – 16:00
Algorithms for Combined EEG-fMRI Analysis
Vince Calhoun, Mind Research Network and University of New Mexico, Albuquerque, NM, USA

16:00 – 17:00
Integrating Multiple Imaging Modalities via Neural Network Modeling
Rainer Goebel, Maastricht University, Maastricht, The Netherlands
OPENING CEREMONIES

18:00 – 19:30
Auditorium (Level 0)

Please join us for the OHBM Scientific Program Opening Ceremonies. The Wiley Young Investigator Award will be presented, as well as the presentation of the “Editor’s Choice Awards”.

TALAIRACH LECTURE
Oscillation-Assisted Internally Generated Cell Assembly Sequences Support Cognition
Gyorgy Buzsaki, Rutgers University, Newark, NJ, USA

Large-scale recording of neuronal ensembles in the hippocampus and prefrontal cortex of rodents reveal perpetually changing assembly sequences even in the absence of changing environmental inputs. Identical initial conditions trigger a similar assembly sequence, whereas different conditions gave rise, uniquely, to different sequences, thereby predicting behavioral choices, including errors.

19:30 – 21:30
WELCOME RECEPTION
The Gardens

Join us for hors d’oeuvres and a selection of local wines and beers at the Welcome Reception. The reception will be held in the Historic Gardens of Hotel Rey Juan Carlos I, immediately following the Opening Ceremonies and Talairach Lecture on Sunday, June 6. Registrants receive one complimentary ticket upon request and guest passes may be purchased for 50€.

Hotel Rey Juan Carlos I is surrounded by 25 hectares of 19th century Mediterranean gardens. The gardens create a tranquil oasis in the heart of vibrant Barcelona. Unwind after a busy day amongst the native pines, palm trees and serene ponds in the gardens.

The reception will include a variety of entertainment acts that are characteristic of the Barcelona Region. Attendees will enjoy music, dancing, as well as life figures directly from Las Rambas.
From the beginnings of fMRI in the early 1990s, statistics and statistical signal processing have played an important role. But the methodology area is dominated, and likely always will be, by researchers without formal training in these areas. Because very sophisticated statistical signal processing methods are now appearing at HBM, it has become imperative to educate researchers about the practice and pitfalls of statistical modeling. Neuroscience, of course, is grounded in experiment, and experiments have provided a background for formulating models from the beginning (e.g. the early work of Boynton and others showing that linearity and time invariance are good first approximations for BOLD modeling). But once one commits to a particular model to analyze a particular data set, is that the end of the story? Most Neuroimaging researchers no longer question its validity. However, the statistical community has long since developed, and continues to develop, methods for assessing deviations from the model, based on the data and the model fit; sometimes called model criticism or residuals analysis. Despite strenuous attempts by individual statisticians, these methods have not entirely penetrated the Neuroimaging community.

A workshop provides an ideal venue to raise these issues and to show the principles and provide examples of how it can be done from the point of view of several practitioners. To emphasize the centrality of the issues we open the workshop with a non-statistician/signal processor who will raise a set of questions and concerns which have naturally come up in his own research and refereeing activities. This will be followed with discussion of these and many other issues from a group of statisticians/signal processors.

**Learning Objectives**

Having completed this workshop, participants will be able to:

1. Understand methods of statistical model criticism; and
2. Understand methods of dealing with misspecified (i.e. wrong) models
physiological signals in a wide spectrum of psychiatric diagnosis beyond the scope of authentic neuroimaging techniques. Together, we try to visualize the shape of NIRS/OT research to come in the next generation.

Learning Objectives
Having completed this workshop, participants will be able to:
1. Describe the impetus for future NIRS/OT research;
2. Understand state-of-the-art NIRS/OT techniques beyond elementary introduction; and
3. Understand how NIRS/OT data can be compared to other neuroimaging data

Evolution of Optical Topography: Neuroimaging to Go
Atsushi Maki, Hitachi, Ltd., Hatoyama, Saitama, Japan

Statistical Parameter Mapping for Near Infrared Spectroscopy using NIRS-SPM
Jong Chul Ye, Korea Advanced Institute of Science and Technology (KAIST), Daejon, Korea

Probabilistic Spatial Registration of NIRS/OT Data with Crossmodal Perspective
Ippeita Dan, Jichi Medical University, Shimotsuke, Tochigi, Japan

Enlightening the Brain? Placing Optical Imaging in Cognitive Neuroscience
Matthias L. Schroeter, Max-Planck-Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

9:00 – 10:15
Auditorium (Level 0)

MORNING WORKSHOP
Art and the Brain: Perception and Aesthetics of Paintings and Music
Chair: Alumit Ishai, University of Zurich, Zurich, Switzerland

Viewing art compositions and listening to music elicits not only sensory responses in the human brain, but, importantly, emotional and aesthetic reactions. In this symposium, we will present several studies in which the neural correlates of perceiving works of art and making aesthetic judgments about them were investigated. Our symposium will cover converging empirical evidence from recent fMRI studies, as well as theoretical aspects of aesthetic preference. Specifically, we will address questions such as how does the brain interpret abstract and indeterminate paintings, and to what extent various forms of aesthetic judgments and feelings are mediated by dissociated neural mechanisms. Taken collectively, our data suggest that perceiving paintings and music is not a mere bottom-up process, but, rather, influenced by top-down mechanisms that mediate the emotional and affective components, which comprise the subjective experience of art. Our increased understanding of the neural processes involved in the experience of art provides important clues to one of the most intriguing questions in biology: What caused the so-called “creative explosion” some 50,000 to 70,000 years ago, leading to the creation of objects of art by homo sapiens.

Learning Objectives
Having completed this workshop, participants will be able to:
1. Introduce the topic and review recent studies in the field; and
2. Explore implications for future research

Neural Correlates of Object Indeterminacy in Art Compositions
Alumit Ishai, University of Zurich, Zurich, Switzerland

Neuroaesthetics of Visual Art: Lessons in Causation from Aristotle
Oshin Vartanian, University of Toronto at Scarborough, Scarborough, Ontario, Canada

Investigating the Elusive Aesthetic Sense with Neuroimaging
Martin Skov, Copenhagen University Hospital, Hvidovre, Denmark

It's Sad, But I Like It: On the Aesthetic Dissociation Between Preference and Basic Emotions in Music
Elvira Brattico, University of Helsinki, Helsinki, Finland
The Legacy of Ramon y Cajal: From Brain Structure to Cognitive Function – The Spanish School Version
Chairs: Emiliano Ricciardi, University of Pisa, Pisa, Italy
Maria Victoria Sanchez-Vives, University of Alicante, Alicante, Spain

The work of the Spanish neuroscientist Ramón y Cajal studying the microanatomy of virtually the entire central nervous system, his observations regarding degeneration and regeneration, together with his theories about the function, development and plasticity of the nervous system had a profound impact on researchers of his era. More importantly, these studies represent the roots of what are today some of the most exciting areas of discovery in terms of the structure and function of the brain in both health and disease. Recently, methodologies utilized to study in vivo brain function have given us an additional powerful ‘microscope’ to dissect the intimate molecular aspects of brain function. The goal of this symposium is to highlight distinguished Spanish neuroscientists that preserve and expand Cajal’s focus on unraveling the extraordinary complexity of the nervous system, and on defining the manner in which information flows through this finely organized synaptic network. The importance of electrophysiological and metabolic measures in mediating mnemonic and linguistic processes will be discussed, and the first comprehensive attempt to reverse-engineer the mammalian brain to understand brain function and dysfunction through detailed simulations, the Blue Brain Project, will be introduced.

Learning Objectives
Having completed this symposium, participants will be able to:
1. Learn about the attempts to create a physiological simulation of cerebral cortex for biomedical applications;
2. Understand the usefulness of electrophysiological methods to track the time-course of bilingual speech production;
3. Increase their knowledge of the interplay between brain oscillations and memory building; and
4. Understand the clinical value of using MEG in the diagnosis of neurodegenerative disorders

The Cajal Blue Brain Project: Three-dimensional Electron Microscope Imaging of the Cerebral Cortex
Javier de Felipe, Instituto Cajal, Madrid, Spain

Role of Brain Oscillations in Mediating Encoding and Retrieval Processes
Mercedes Atienza, University Pablo de Olavide, Seville, Spain

Role of MEG in the Early Diagnosis of Alzheimers Disease
Fernando Maestu, Complutense University of Madrid, Madrid, Spain

Tracking the Cognitive Processes Involved Speech Production
Albert Costa, Universitat Pompeu Fabra, Barcelona, Spain

12:00 – 12:30
Auditorium (Level 0)
KEYNOTE LECTURE
From Monkey to Human and From Human to Monkey: What Do We Learn?
Wim Vanduffel, Harvard Medical Center, Charlestown, MA, USA

First, Wim Vanduffel will review fMRI data showing that focal and reversible perturbations of functional networks result in widespread compensatory mechanisms in the monkey. Secondly, he will present a completely novel, model-free and data-driven method to determine functional homologies between human and monkey cortex based on temporal characteristics of fMRI signals.
12:30 – 13:30

**POSTER SESSION**

*Exhibit Hall (Level 0)*

- **#1-589 MT-AM** (Odd numbered posters present)
- **Brain Stimulation**: TDCS, Brain Stimulation-other, Deep Brain Stimulation
- **Cognition and Attention**: Executive Function, Perception, Imagery, Awareness, Reasoning and Problem Solving, Space, Time and Number Coding
- **Disorders of the Nervous System**: Epilepsy, Mood and Anxiety Disorders, Parkinson’s Disease and other Basal Ganglia, Schizophrenia

*Multifunction Area (Level -1)*

- **#591-1593 MT-AM** (Odd number posters present)
- **Disorders of the Nervous System**: Stroke and Recovery of Function

**Emotion and Motivation**: Reward, Sexual Behavior, Social Behavior

**Imaging Techniques and Contrast Mechanism**: Multi-Modal Integration, Optical Imaging/NIRS/MRS, Perfusion MRI, PET, TMS

**Language**: Production, Reading/Writeing

**Memory and Learning**: Plasticity (Normal and Following Pathology), Working Memory

**Modeling and Analysis**: Functional Connectivity & Structural Equation Modeling, Motion Correction/Spatial Normal, Atlas Construction, Multivariate Modeling, PCA and ICA, Non-Bold fMRI, Task-Independent Activity, Univariate Modeling, Linear and Nonlinear

**Motor Behavior**: Cerebellum, Hand Movements, Locomotion, Motor-Premotor Cortex / Motor Cortical Functions

**Neuroanatomy**: DTI Studies, Application

**Physiology, Metabolism and Neurotransmission**

**Sensory Systems**: Pain and Autonomic Function, Tactile/Somatosensory, Vision

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**fMRI in children: imaging for the next generation**

*Lunch Symposium sponsored by Philips Healthcare*

**Neonatal fMRI**

Profi. Dr. Henning Böcker  
Professor of Clinical Functional Neuroimaging, University of Bonn, Bonn, Germany

**Autism: behavioral and imaging studies**

Dr. Stewart Mostofsky MD  
Pediatric Neurologist & Director of the Laboratory for Neurocognitive and Imaging Research, Kennedy Krieger Institute and Johns Hopkins University, Baltimore USA.

*Philips fMRI Lunch Symposium*

- **Monday 7th June, 13.30 - 14.45**
- **Rooms H1/H2, Level -1**
- **Lunch will be provided for the first 250 attendees**

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24 | HBM 2010 Program
13:30 – 14:45
LUNCH

14:45 – 15:45
POSTER SESSION
Exhibit Hall (Level 0)
#2-588 MT-PM (Even numbered posters present)
Brain Stimulation: TDCS, Brain Stimulation-other, Deep Brain Stimulation
Cognition and Attention: Executive Function, Perception, Imagery, Awareness, Reasoning and Problem Solving, Space, Time and Number Coding
Disorders of the Nervous System: Epilepsy, Mood and Anxiety Disorders, Parkinson’s Disease and other Basal Ganglia, Schizophrenia

Multifunction Area (Level -1)
#590-1592 MT-PM (Even numbered posters present)
Disorders of the Nervous System: Stroke and Recovery of Function
Emotion and Motivation: Reward, Sexual Behavior, Social Behavior
Imaging Techniques and Contrast Mechanism: Multi-Modal Integration, Optical Imaging/NIRS/MRS, Perfusion MRI, PET, TMS
Language: Production, Reading/Writing
Memory and Learning: Plasticity (Normal and Following Pathology), Working Memory
Motor Behavior: Cerebellum, Hand Movements, Motor-Premotor Cortex / Motor Cortical Functions
Neuroanatomy: DTI Studies, Application
Physiology, Metabolism and Neurotransmission
Sensory Systems: Pain and Autonomic Function, Tactile/Somatosensory, Vision

16:00 – 17:15
Auditorium (Level 0)
SYMPOSIUM
Decoding Information Conveyed by Cortical Columns:
Mechanisms and Advanced Methods for Investigating Higher-Order Cognitive Functions
Chair: Amir Shmuel, MNI, McGill University, Montreal, QC, Canada; CMRR, University of Minnesota, USA

Multivariate machine learning algorithms have demonstrated powerful capacity to decode information represented in functional MR images of the human brain. They have been used successfully to decode mental state, perceived sensory information, representation of words, and other information conveyed by all lobes of the brain. In several studies, machine learning algorithms decoded information conveyed by cortical columns, e.g. ocular dominance and orientation of visual stimuli. The symposium will present analysis of the mechanisms of decoding information represented in cortical columns using functional imaging data of sub-millimeter resolution. It will feature advanced paradigms of decoding, i.e. modular decoding approaches and recursive feature elimination, and their use for investigating cognition. We will demonstrate means by which decoding can be exploited to study the use of cortical columns in visual cognition. The symposium will emphasize the tremendous potential of fMRI pattern classification, not only for investigating basic sensory processes, but also for studying the neural bases of higher-order cognitive functions.

Learning Objectives
Having completed this symposium, participants will be able to:
1. Understand the sources of selective signals exploited by multivariate classification to decode information conveyed by cortical columns;
2. Learn advanced decoding paradigms, including modular decoding and feature elimination; and
3. Become familiar with means by which decoding can be exploited to investigate the neural bases of higher-order cognitive functions.

Visual Image Reconstruction from Human Brain Activity:
A Modular Decoding Approach
Yukiasu Kamitani, Keihanna Science City, Japan

Decoding Voice, Speech and Sounds from Distributed Patterns of Activity in Lower Auditory Areas: The Role of Advanced Feature Selection in fMRI Data Analysis
Federico Demartino, Maastricht University, Maastricht, The Netherlands
SYMPOSIUM
Decoding Information Conveyed by Cortical Columns: Mechanisms and Advanced Methods for Investigating Higher-Order Cognitive Functions, continued

Mechanisms of fMRI-Based Decoding of Information Conveyed by Cortical Columns
Amir Shmuel, MNI, McGill University, Montreal, QC, Canada; CMRR, University of Minnesota, USA

Decoding the Contents of Visual Feature Perception, Attention, and Working Memory
Frank Tong, Vanderbilt University, Nashville, TN, USA

17:15 – 17:45
Auditorium (Level 0)
KEYNOTE LECTURE
Decoding Memories
Eleanor Maguire, University College London, London, UK

In recent years, multivariate pattern classification has been performed on fMRI data permitting prediction of mental states from local patterns of BOLD signal across voxels. Here I will describe how we have applied this approach to spatial and episodic memories to investigate their representation in the medial temporal lobes.

18:00 – 19:15
ORAL SESSIONS
Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

J & H3 (Level -1)
O-M1: Memory and Learning
Chair: Donna Rose Addis, The University of Auckland, Auckland, New Zealand

18:00
910 MT-PM: Spatial and Temporal Dynamics of Learning-Induced Functional and Structural Plasticity
Marco Taubert, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

18:15
1174 WTh-PM: Seed-Based and Model-Free Connectivity in Shallow Sleep after Learning
Eelco van Dongen, Radboud University Nijmegen, Donders Institute (RU/DI-BCB), Nijmegen, Netherlands

18:30
1168 WTh-PM: When are Anti-Correlations Bad? Large-Scale Network Dynamics Supporting Contextual Recollection
Alex Fornito, University of Cambridge, Cambridge, UK

18:45
1169 WTh-AM: Episodic Memory Retrieval Dissociates Posterior from Anterior Nodes of the Default Mode Network
Carlo Sestieri, University of Chieti-Pescara, Chieti, Italy

19:00
1172 WTh-PM: Theta Oscillations Reflect the Dynamics of Interference in Episodic Memory Retrieval
Tobias Staudigl, University of Magdeburg, Magdeburg, Germany

H1 & 2 (Level -1)
O-M2: Modeling and Analysis: Brain Networks I
Chair: Edward Bullmore, University Of Cambridge, Cambridge, UK

18:00
1267 WTh-AM: Interpretable Multivariate Models for Whole-Brain fMRI
Logan Grosenick, Stanford University, Stanford, CA, USA

18:15
1273 WTh-AM: A Hierarchical Generative Model for Percept Reconstruction
Marcel van Gerven, Institute for Computing and Information Sciences, Nijmegen, Netherlands

18:30
1292 WTh-PM: Inter-Subject Hyperalignment of Neural Representational Spaces to Derive Common Categorical Patterns
Jyothi Swaroop Guntupalli, Dartmouth College, Hanover, NH, USA

18:45
1140 MT-PM: Functional Assessment of Intrinsic Connectivity Networks
Angela Laird, University of Texas Health Science Center San Antonio, San Antonio, TX, USA
19:00
985 MT-AM: Googling the Brain: Measures for Capturing Centrality and Neural Information Flow
Xi-Nian Zuo, Phyllis Green and Randolph Cowen Institute for Pediatric Neuroscience at the NYU Child Study Center, New York, USA

Auditorium (Level 0)
O-M3: Disorders of the Nervous System: Psychiatry
Chair: Cameron Carter, University of California-Davis, Davis, CA, USA

18:00
933 WTh-AM: Emotion Recognition and Neural Connectivity Modulation by Insula Self-Regulation in Schizophrenia
Sergio Ruiz, Institute of Medical Psychology and Behavioral Neurobiology, Tübingen, Tübingen, Germany

18:15
427 MT-AM: Glutamate in pgACC Predicts its Resting State Connectivity with Anterior Insula in Major Depression
Dorothea Horn, Otto-von-Guericke University Magdeburg, Magdeburg, Germany

18:30
372 MT-PM: Differences in Early and Late Brain Responses to Phobic Stimuli between Subtypes of Specific Phobia
Xavier Caseras, Cardiff University, Cardiff, UK

18:45
1047 MT-AM: Altered Functional Connectivity in Psychopathy: A Resting-State fMRI Analysis
Benjamin Shannon, Washington University, Saint Louis, MO, USA

19:00
283 WTh-AM: Structural and Functional Convergent Evidence that Cocaine Alters Medial Prefrontal Regions
Yihong Yang, National Institute on Drug Abuse, Baltimore, MD, USA
9:00 – 10:15  
H1 & 2 (Level -1)  
**MORNING WORKSHOP**  
Retinotopic Mapping: Techniques, Current Concepts and Research Trends  
Chairs: Mark M. Schira, *Prince of Wales Medical Research Institute, Sydney, Australia* and Serge O. Dumoulin, *Utrecht University, Utrecht, The Netherlands*

A key property of visual cortex is the existence of multiple retinotopic maps. These maps are not simply an anatomical property, but a key principle in the functional organization of information processing. Reconstructing these maps in vivo, Retinotopic mapping provides insight into cortical organization, but also are a prerequisite for many investigations of the visual system. Retinotopic maps further serve as a model to elucidate more general principles of brain function, such as plasticity and interspecies comparisons. In this symposium we will introduce recent developments of retinotopic mapping techniques such as i) high resolution, ii) 7T and iii) model-based pRF techniques. We will discuss current concepts and interspecies differences of retinotopic cortex in humans and non-human primates including the foveal confluence. Finally, we will highlight some recent insights on clinical manifestations and cortical plasticity based on current retinotopic concepts.

**Learning Objectives**  
Having completed this workshop, participants will be able to:  
1. Understand techniques and methods used in contemporary retinotopic mapping;  
2. Learn the implications of the visual field maps organization on general brain functions;  
3. Discuss the comparisons between human and non-human visual cortex; and  
4. Understand some of the clinical implications of retinotopic mapping

*The Foveal Confluence, Organization, Algebraic Modeling Functions, Simple Mapping Techniques*  
Mark M. Schira, *Prince of Wales Medical Research Institute, Sydney, Australia*

9:00 – 10:15  
J & H3 (Level -1)  
**MORNING WORKSHOP**  
Human Intra-Cranial Electrophysiology (ICE) in Mind/Brain Mapping – Linking Levels of Analysis from Cells to Psychology  
Chair: Ned T. Sahin, *University of California-San Diego, La Jolla, CA, USA*

**Description**  
This session will overview advantages of Intra-cranial Electrophysiology (ICE) and highlight results in four cognitive domains that were uniquely achievable with ICE. The study of human cognition is severely limited by current methods. Neuroimaging has transformed our gamut of addressable questions yet still imposes limitations of temporal, spatial, and physiological resolution. These translate into a limitation on ‘algorithmic resolution’ or the types of computation that we can observe in the brain. While direct recordings from brain tissue are generally not possible in humans, and aspects of cognition (e.g. language) have no useful animal model, patients with electrodes implanted in their brains for surgery (and who have normal cognitive abilities) provide a unique opportunity to Link the Levels of inquiry. ICE allows measurements from single unit activity (SUA) up to local-field and brain-surface potentials (ICE ERPs). In conjunction with non-invasive methods, it also allows us to ask what level(s) actually best reveal mechanisms of cognition – since more resolution is not always better. Finally, fine-scale ICE results can inform non-invasive methods. For instance, if disparate mental functions are traced to the same neural circuit, but are compartmentalized in time rather than space, paradigms for fMRI can and must be designed to manipulate those functions temporally.
Dr. Canolty will link recordings in humans and macaque – of brain surface potentials down to SUA – and demonstrate how neural oscillations solve two main problems: multi-scale integration and long-range communication. He will show how high-gamma oscillations relate to information processing within brain regions, and slower oscillations relate to transfer of information across brain regions. Dr. Lachaux will continue the theme of oscillations, overviewing recent discoveries of gamma-band suppression and its relation to the Default Mode network. He will also help alleviate some popular misconceptions about the ICE methodology. Dr. Bidet-Caulet will report recordings from the cortical surface as well as deep within auditory cortex and show how attention modifies the way we process sounds. She will demonstrate different effects at different points in time and in different subregions of our auditory cortex. Dr. Sahin will continue the theme of information separation in time more than space, with a discovery that neuronal populations within the storied Broca’s area process three aspects of language – meaning, structure, and sound – overlapping in anatomical space but separated in time. He will also connect with the oscillations theme, and reveal an information flow chart for read and speaking, with processing stages linked but separated in time, space and oscillatory frequency.

Learning Objectives
Having completed this workshop, participants will be able to:

1. Identify capabilities and advantages of intracranial electrophysiology (ICE) for investigating the mechanisms of human cognition, at multiple levels of abstraction;
2. List several recent high-profile advances in human language, auditory attention, “default-mode” brain states, and large-scale network connectivity, which have been uniquely enabled by ICE; and
3. Design and interpret fMRI experiments (or other neuroimaging) in frameworks informed by spatiotemporal results from ICE, in order to move further beyond anatomical structure-to-function mapping

Using Neuronal Oscillations to Investigate Large-Scale Brain Networks
Ryan T. Canolty, University of California - Berkeley, Berkeley, CA, USA

Intra-Cranial Electrophysiology (ICE) as a Mind Mapping Tool; and Specific Links Between Gamma-Band Suppression and the Default-Mode Network
Jean-Philippe Lachaux, INSERM U821, Lyon, France

Auditory Attention: Insights from Cortical and Intra-Cortical EEG Recordings in Human
Aurélie Bidet-Caulet, University of California - Berkeley, Berkeley, CA, USA

From Cells to Psycholinguistics – It is a Matter of Time
Ned T. Sahin, University of California - San Diego, La Jolla, CA, USA

9:00 – 10:15
Auditorium (Level 0)
MORNING WORKSHOP
Connectivity in the Developing Brain
Chair: James R. Booth, Northwestern University, Evanston, IL, USA

The goal of this symposium is to investigate organizational principles underlying brain maturation in typical and atypical development. Research in this area is beginning to converge on several principles that seem to characterize development including selective increases in critical long-range connections (integration) and decreases in anatomically close short-range connections. There also seems to be greater separation of networks as there is greater segregation of cortical from sub-cortical systems and of the default from task-related networks. Findings also show developmental increases in hierarchical organization in which convergence zones receive greater top-down modulation and bottom-up input. These organizational principles are investigated in resting state data and also within a variety of cognitive domains including mathematical processing, cognitive control, reading and language. A variety of analytical techniques are highlighted, including graph theory, small world analyses, effective connectivity, and combination of functional connectivity with tractography from diffusion tensor imaging (DTI). These organizational principles are extended to understand the role of experience and the nature of atypical development including Autism, Tourette’s Syndrome, Attention Deficit Hyperactivity Disorder (ADHD) and Reading Disability, among other neuro-developmental disorders.
Learning Objectives
Having completed this workshop, participants will be able to:
1. Understand general principles that characterize connectivity in the developing cortex in typical and atypical populations;
2. Understand the development of core cognitive functions; and
3. Understand different analytical approaches for studying development

Development of Large-Scale Functional Brain Networks in Children
Vinod Menon, Stanford University, Palo Alto, CA, USA

Maturing Functional Brain Networks in Typical and Atypical Development
Damien Fair, Oregon Health and Science University, Portland, OR, USA

Pathways to Language: Brain Structural Prerequisites for Language Functions
Angela D. Friederici, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany and Jens Brauer, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

Effects of Age and Skill on Effective Connectivity Within and Between Hemispheres During Language Processing in Children
Tali Bitan, Haifa University, Haifa, Israel and James R. Booth, Northwestern University, Evanston, IL, USA

10:30 – 11:45
ORAL SESSIONS
Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

J & H3 (Level -1)
O-T1: Imaging Techniques: Structural Connectivity
Chair: Yaniv Assaf, Tel Aviv University, Ramat Aviv, Israel

10:30
1462 WTh-PM: The Human Connectome: Exploring Nerve Fiber Tracts at a Micrometer Scale by Means of Polarized Light
Markus Axer, Institute of Neuroscience and Medicine (INM-1), Research Centre, Jülich, Germany

10:45
830 WTh-PM: Diffusional Kurtosis Imaging Tractography of Crossing Fibers
Mariana Lazar, New York University School of Medicine, New York, NY, USA

11:00
1469 WTh-AM: Correspondence Between In Vivo Axonal Diameter and Cortical Connectivity of the Corpus Callosum
Flavio Dell’Acqua, Natbrainlab, Institute of Psychiatry, King’s College London, London, UK

11:15
813 WTh-AM: Diffusion Tractography in Ex Vivo Human Brains: Steady-State Free Precession Outperforms Spin Echo
Karla Miller, University of Oxford, Oxford, UK

11:30
1370 MT-PM: Connectivity-Based Segmentation of Human Amygdala Nuclei using Probabilistic Tractography
Zeynep Saygin, Massachusetts Institute of Technology, Cambridge, MA, USA

H1 & 2 (Level -1)
O-T2: How Genes Map the Brain
Chair: Jay Giedd, NIMH, Bethesda, MD, USA

10:30
1196 MT-PM: Genetic Analyses of Resting-State Studies in Adolescent Twins: Preliminary Results
F. Xavier Castellanos, Phyllis Green and Randolph Cowen Institute for Pediatric Neuroscience at the NYU Child Study Center, New York, USA
10:45
744 WTh-PM: BDNF Effects on Brain Fiber Microstructure Replicated in Two Twin Samples (N=455)
Ming-Chang Chiang, Laboratory of Neuro Imaging, Dept. of Neurology, UCLA School of Medicine, Los Angeles, CA, USA

11:00
726 WTh-PM: Voxelwise Genome-Wide Association Study (vGWAS)
Jason Stein, UCLA, Los Angeles, CA, USA

11:15
248 WTh-PM: Variation in Rates of Nicotine Metabolism is a Predictor of Neural Reactivity to Smoking Cues
Deborah Tang, McGill University, Montreal, PQ, Canada

11:30
554 MT-PM: Genetic Variation in NOS1 Predicts Presynaptic Dopamine Synthesis
Daniel Eisenberg, National Institutes of Health, Bethesda, MD, USA

10:30
1085 WTh-AM: Do We Click? Speaker-Listener Neuronal Coupling Underlies Successful Communication
Lauren Silbert, Princeton University, Brooklyn, NY, USA

10:45
908 MT-AM: Experience-Dependent Brain Structural Plasticity in Simultaneous Language Interpreters
Narly Golestani, University of Geneva, Geneva, Switzerland

11:00
1581 MT-AM: Anatomy of the Arcuate Fasciculus is Associated with Phonology and Reading Skills in Children
Jason Yeatman, Stanford University, Stanford, CA, USA

11:15
1056 WTh-PM: Empathy Matters for Social Language Processing: ERP Evidence from Individuals With and Without ASD
Danielle van den Brink, Radboud University Nijmegen, Donders Institute (RU/DI-BCB), Nijmegen, Netherlands

11:30
1538 MT-AM: Medial Frontal Network Attenuates Cortical Response During Auditory Feedback in Speech
Ingrid Christoffels, Leiden University, Leiden, Netherlands

12:00 – 12:30
Auditorium (Level 0)
KEYNOTE LECTURE
Psychiatric Neuroimaging: From Maps to Mechanisms
Andreas Meyer-Lindenberg, Central Institute of Mental Health, Mannheim, Germany

Using psychotic disorders as an example, we discuss a research strategy where the integration of neuroimaging data with information from genetics and epidemiology provides mechanistic insights not only into the cognitive neuropsychology, but also into the molecular pathophysiology and aetiology of these illnesses that create a basis for novel treatments.

12:30 – 13:30
POSTER SESSION
Exhibit Hall (Level 0)
#1-589 MT-AM (Odd numbered posters present)
Brain Stimulation: TDCS, Brain Stimulation-other, Deep Brain Stimulation
Cognition and Attention: Executive Function, Perception, Imagery, Awareness, Reasoning and Problem Solving, Space, Time and Number Coding
Disorders of the Nervous System: Epilepsy, Mood and Anxiety Disorders, Parkinson’s Disease and other Basal Ganglia, Schizophrenia
Multifunction Area (Level -1)
#591-1593 MT-AM (Odd numbered posters present)
Disorders of the Nervous System: Stroke and Recovery of Function
Emotion and Motivation: Reward, Sexual Behavior, Social Behavior
Imaging Techniques and Contrast Mechanism: Multi-Modal Integration, Optical Imaging/NIRS/MRS, Perfusion MRI, PET, TMS
Language: Production, Reading/Writing
Memory and Learning: Plasticity (Normal and Following Pathology), Working Memory
Motor Behavior: Cerebellum, Hand Movements, Locomotion, Motor-Premotor Cortex / Motor Cortical Functions
Neuroanatomy: DTI Studies, Application
Physiology, Metabolism and Neurotransmission
Sensory Systems: Pain and Autonomic Function, Tactile/Somatosensory, Vision
13:30 – 14:45
LUNCH

14:45 – 15:45
POSTER SESSION
Exhibit Hall (Level 0)
#2-588 MT-PM (Even numbered posters present)
Brain Stimulation: TDCS, Brain Stimulation-other,
Deep Brain Stimulation
Cognition and Attention: Executive Function, Perception,
Imagery, Awareness, Reasoning and Problem Solving, Space,
Time and Number Coding
Disorders of the Nervous System: Epilepsy, Mood and Anxiety
Disorders, Parkinson’s Disease and other Basal Ganglia,
Schizophrenia

#590-1592 MT-PM (Even numbered posters present)
Disorders of the Nervous System: Stroke and Recovery
of Function
Emotion and Motivation: Reward, Sexual Behavior,
Social Behavior
Imaging Techniques and Contrast Mechanism: Multi-Modal
Integration, Optical Imaging/NIRS/MRS, Perfusion MRI,
PET, TMS
Language: Production, Reading/Writing
Memory and Learning: Plasticity (Normal and Following
Pathology), Working Memory
Modeling and Analysis: Functional Connectivity & Structural
Equation Modeling, Motion Correction/Spatial Normal, Atlas
Construction, Multivariate Modeling, PCA and ICA, Non-Bold
fMRI, Task-Independent Activity, Univariate Modeling, Linear
and Nonlinear
Motor Behavior: Cerebellum, Hand Movements,
Motor-Premotor Cortex / Motor Cortical Functions
Neuroanatomy: DTI Studies, Application
Physiology, Metabolism and Neurotransmission
Sensory Systems: Pain and Autonomic Function,
Tactile/Somatosensory, Vision

16:00 – 17:15
SYMPOSIUM
The Dopamine Midbrain
Chair: David H. Zald, Vanderbilt University,
Nashville, TN, USA

The dopamine system is critically involved in motivation,
movement and learning, and dysfunction of the dopamine
system is implicated in a range of neuropsychiatric disorders
ranging from Parkinson’s to addiction and schizophrenia.
The dopaminergic midbrain, comprising the substantia nigra,
ventral tegmental area and retrorubral fields, provides
dopamine to most areas of the forebrain and as such lies at
the core of understanding dopamine neurotransmission.
Elucidating the specific characteristics of midbrain activity is
critical to understanding the functions served by dopamine.
However, only in the last few years have neuroimaging
researchers begun to examine the functional characteristics of
this region in humans. In parallel, neuroanatomical and
neurophysiological studies in nonhuman primates have
provided increasing detail regarding the structure,
connections, and firing properties of the dopamine midbrain.
The proposed symposium details this rapidly emerging field
by bringing together experts on the neuroanatomy,
neuropysiology and cognitive neuroscience of midbrain
functions in nonhuman and human primates. The aim is to
provide audience members with state of the art coverage of
recent findings and methodological advances in the
exploration of the dopamine system, with a particular
emphasis on making translational connections between
animal studies and human neuroimaging.

Learning Objectives
Having completed this symposium, participants will be
able to:
1. Understand the neurocircuitry of dopamine midbrain;
2. Understand the functional characteristics and
correlates of dopamine midbrain activity; and
3. Understand recent advances in neuroimaging of the
dopamine midbrain

Integrative Neuroanatomy of Dopamine Midbrain Projections
to the Striatum
Suzanne Haber, University of Rochester, New York, NY, USA

Temporal Discounting Suggests Subjective Rather than
Objective Reward Value Coding in Primate Dopamine
Neurons and Human Ventral Striatum
Wolfram Schultz, Cambridge University, Cambridge, UK
On the Relationship Between Hemodynamic Responses of the Substantia Nigra/Ventral Tegmental Area (SN/VTA) and Dopamine Release
Emrah Duzel, University College London, London, UK

Personality and Behavioral Correlates of Dopamine Midbrain Functioning
David H. Zald, Vanderbilt University, Nashville, TN, USA

17:15 – 17:45
Auditorium (Level 0)
KEYNOTE LECTURE
The Brain’s Default Network
Randy Buckner, Harvard University, Cambridge, MA, USA

Left without an immediate task that demands full attention, our minds wander. During these moments, a consistent set of brain regions – known as the default network – is preferentially active. Details about the anatomy and function provide insight into the default network’s contribution to cognition and its importance to neurologic and psychiatric illness.

18:00 – 19:15
ORAL SESSIONS
Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

18:00
O-T4: Emotion and Motivation 1: Reward, Decision Making, and Learning
Chair: Todd Hare, California Institute of Technology, Pasadena, CA, USA

18:00
515 WTh-AM: Episodic Future Thought Reduces Delay Discounting through Prefrontal-Mediotemporal Interactions
Jan Peters, NeuroimageNord, Department of Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

18:15
638 MT-PM: Characterization of Prediction Error Signals in the Ventral Tegmental Area under Variable Timings
Miriam Klein, Sobell Department of Motor Neuroscience and Movement Disorders, University College London, London, UK

18:30
288 WTh-PM: Ventral Striatal Response to Incentive Stimuli Anticipation in Children of Alcoholics
Wai-Ying Wendy Yau, University of Michigan, Ann Arbor, MI, USA

18:45
21 WTh-AM: Disrupting the Prefrontal Cortex Diminishes Emotional Biases in Moral Judgment
Sebastien Tassy, CNRS, Marseille, France

19:00
666 MT-PM: Exacerbated Responses Specific to Monetary Rewards in Pathological Gamblers
Guillaume Sescousse, ‘Reward and decision making’ group, Cognitive Neuroscience Centre, CNRS, Lyon, France

H1 & H2 (Level -1)
O-T5: Cognition and Attention: Brain Plasticity and Aging
Chair: Cheryl Grady, Rotman Research Institute, Toronto, Canada

18:00
202 WTh-PM: Developmental Differences in Brain Activation Can Be Reduced After Practice
Dietsje D. Jolles, Leiden University, Leiden, The Netherlands

18:15
26 WTh-PM: Changes in Cortical Plasticity Across the Lifespan
Alvaro Pascual-Leone, Harvard Medical School, Boston, MA, USA

18:30
158 WTh-PM: Age-Related Neural Changes in Remembering and Imagining
Donna Rose Addis, Dept of Psychology, The University of Auckland, Auckland, New Zealand

18:45
153 WTh-AM: Microstructural Changes and Atrophy in Brain White Matter Tracts With Aging
Federica Agosta, Scientific Institute and University Ospedale San Raffaele, Milan, Italy

19:00
1097 MT-AM: Brain Networks for Aβ Deposition, Glucose Metabolism, and Gray Matter Density in Normal Aging
Hwamee Oh, University of California, Berkeley, Berkeley, CA, USA
ORAL SESSIONS, continued

18:00  
1172 MT-PM: A Specific-to-Nonspecific Transition of Resting Brain Network from Light to Deep Anesthesia  
Xiao Liu, CMRR, University of Minnesota, Minneapolis, MN, USA

18:15  
925 WTh-AM: Differences Between DfMRI and BOLD fMRI Responses in Parietal Cortex Using a Working Memory Task  
Toshihiko Aso, Human Brain Research Center, Kyoto University Graduate School of Medicine, Kyoto, Japan

18:30  
717 WTh-AM: Neurovascular Coupling in Human Visual Cortex is Modulated by Cyclooxygenase-1 (COX-1) Gene Variant  
Sebastian Heinzel, University of Wuerzburg, Department of Psychiatry, Psychosomatics and Psychotherapy, Wuerzburg, Germany

18:45  
918 WTh-PM: Three Dimensional Echo-Planar Imaging at 7 Tesla  
Benedikt Poser, Erwin L Hahn Institute for Magnetic Resonance Imaging, Essen, Germany

19:00  
920 WTh-PM: White Matter fMRI Activation in the Internal Capsule: Co-Localization With DTI Tractography  
Erin Mazerolle, National Research Council, Halifax, NS, Canada

19:30 – 20:30  
POSTER RECEPTION  
Exhibit Hall (Level 0)

Multifunction Area (Level -1)  
#1-589 MT-AM and MT-PM (Monday and Tuesday presenters)  
Disorders of the Nervous System: Epilepsy, Mood and Anxiety Disorders, Parkinson’s Disease and other Basal Ganglia, Schizophrenia

Multifunction Area (Level -1)  
#590-1593 MT-AM and MT-PM (Monday and Tuesday presenters)  
Disorders of the Nervous System: Stroke and Recovery of Function

Emotion and Motivation: Reward, Sexual Behavior, Social Behavior

Imaging Techniques and Contrast Mechanism: Multi-Modal Integration, Optical Imaging/NIRS/MRS, Perfusion MRI, PET, TMS

Language: Production, Reading/Writing

Memory and Learning: Plasticity (Normal and Following Pathology), Working Memory


Motor Behavior: Cerebellum, Hand Movements, Locomotion, Motor-Premotor Cortex / Motor Cortical Functions

Neuroanatomy: DTI Studies, Application

Physiology, Metabolism and Neurotransmission

Sensory Systems: Pain and Autonomic Function, Tactile/Somatosensory, Vision
Neural activity organizes into distributed networks that exhibit system-level synchronization as a key mechanism for the dynamic integration of information across different processing units. In recent years, resting-FMRI has been used to characterize the distributed nature of such patterns of functional co-activation in BOLD recordings in the form of Resting-State Networks, and DTI has provided important information about structural organization and correspondences. Other types of recordings (such as electrophysiological measurements) as well as neuro-informatics databases (such as BrainMap) can be used to further detail a picture of the distributed nature of brain’s functional architecture. In this symposium we will focus on the ability to robustly characterize, using functional imaging data, functional parcellation, functional architecture and functional ontologies of the human brain.

Our panel includes leading experts in the analysis of resting fMRI data and data-driven characterization of co-activations (S. Smith), the bottom-up modeling of brain connectivity and the relationships to recordings from different neuroimaging modalities (C. Honey), the investigation of co-activation patterns by means of meta-analytic approaches using neuro-informatics databases (P. Fox) as well as the generation of cognitive ontologies in relation to neuroimaging data (R. Poldrack). The first talk (Smith) will focus on hierarchies in the characterization of the functional architecture as well as on the optimality and interpretability of imaging-derived measures of functional connectivity in comparison to more abstract measures. The second talk (Honey) will review the evidence for a robust relationship between large-scale anatomical and functional architectures of the human brain and discuss computational models which can make predictions of this relationship as seen in different mesoscopic and microscopic neurophysiological recordings based on e.g. fMRI, MEG, and iEEG. The third talk (Fox) will describe the degree to which such macroscopic patterns of co-activations can be derived by means of meta-analysis of a large neuro-informatics database of imaging findings (BrainMap). The final talk (Poldrack) will detail ways in which such classification analysis of neuroinformatics databases along with meta-analyses of fMRI data can help determine the selectivity of activation, i.e. assess how much more are a region’s activity is specific to a particular cognitive process and thus provide insights into which aspects of the current cognitive ontology are correct and which may require revision.

**Learning Objectives**

Having completed this workshop, participants will be able to:

1. Describe different techniques for the characterization of functional networks from imaging data;
2. Understand different approaches for investigating such patterns by means of bottom-up modeling and structure-function relationships and by means of meta-analysis of large data bases of imaging findings;
3. Describe the degree to which such functional parcellations provide functional ontologies for the description of imaging findings; and
4. Understand the inferences that cognitive neuroscientists can draw from imaging data.
9:00 – 10:15  
H1 & 2 (Level -1)  
MORNING WORKSHOP

Multi-Subject Surface-Based Analysis of fMRI Data: Challenges, Solutions and Limitations  
Chair: Bertrand Thirion, INRIA Saclay-Île-de-France, Gif sur Yvette, France

Being able to detect reliably functional activity in a population of subjects is crucial in human brain mapping, both for the understanding of cognitive functions in normal subjects and the analysis of patient data. The usual group analysis approach proceeds by normalizing brain volumes to a common volume-based (3D) template, and then to apply voxel-based statistical methodology. However, a large part of the data acquired in functional MRI (fMRI) experiments aims at localizing cortical activity, and methods working on the cortical surface may provide better inter-subject registration than the standard procedures that process the data in 3D. In particular, surface-based (2D) analysis has proved to be very useful for the study of activity in the primary visual cortex. Surface-based analysis is made available to the community through several dedicated software’s (among others, FreeSurfer, Caret, Suma, Brainvoyager, Brainvisa). Nevertheless, few assessments of the performance of 2D versus 3D procedures have been shown so far, mostly because inter-subject cortical surface maps are not easily obtained. More precisely, surface-based analysis requires additional complex algorithmic procedures (projection of the volume-based data onto the surface, data processing on irregular mesh grids, check of the quality of the data sampled on meshes) and dedicated software tools (e.g. manipulation of meshes and mesh-related information) with respect to traditional 3D analysis.

Learning Objectives
This workshop will review the current state of the art and discuss open questions or limitations of 2D analysis procedures:

1. In the current state of the art, how accurate is surface-based registration when comparing similar regions across subjects?
2. In the particular context of multi-subject fMRI data analysis, which evidence do we have that surface-based approaches may be better suited than volume-based approaches?
3. Is there any difference in the statistical assessment of the presence of activation between volume and surface-based data?
4. What are the most prominent difficulties or shortcomings of multi-subject surface-based fMRI data analysis?

The Cortical Surface: Its Organization and the Influence on Surface-Based Data Processing  
Olivier Coulon, Laboratoire LSIS, UMR CNRS 6168, Marseille, France

Predicting Anatomical and Functional Boundaries from Surface-Based Inter-Subject Alignment  
Douglas Greve, Mass General Hospital, Charlestown, MA, USA

Beyond Blind Alignment of Macro-Anatomy for Analysis of Brain Functions and Brodmann Areas  
B.T. Thomas Yeo, Massachusetts Institute of Technology, Cambridge, MA, USA

Surface-Based Analysis of fMRI Data: Strengths and Limitations  
Bertrand Thirion, INRIA Saclay-Île-de-France, Gif sur Yvette, France

9:00 – 10:15  
J & H3 (Level -1)  
MORNING WORKSHOP

Gene Function Meets Brain Function  
Chair: Mallar Chakravarty, Rotman Research Institute, Baycrest Hospital and the Mouse Imaging Center, Hospital for Sick Children, Toronto, Ontario, Canada

Imaging genomics is a rapidly expanding field and has increased understanding of the genetic underpinnings of brain morphology and function in both normal individuals and those suffering from complex disorders of the central nervous system. There is mounting evidence that phenotypes elucidated through brain imaging experiments may be more sensitive for prediction and diagnosis of neurological disorders in comparison to subjective intake and diagnostic interviews and scores. Analyses of single nucleotide polymorphisms associated with these phenotypes have identified candidate genes responsible for the pathological evolution of specific diseases. Integration of large-scale spatially localized analyses of gene expression could be used in brain image analysis to help better understand functional networks at the systems neuroscience level. In this symposium we will bridge the disciplines of genetics, gene expression analysis, and imaging from microscopic to population analyses. The speaker panel includes leaders in: methodological and experimental findings in large-scale imaging genetics studies in...
schizophrenia (Dr. Peter Kirsch, Germany) and Alzheimer’s Disease (Dr. Michael Greicius, USA), the generation of spatially localized maps of the three-dimensional gene expression (Dr. Ed Lein, USA), and population-level imaging genetics studies on heritable components of brain morphology and function (Dr. Tomas Paus, Canada). Drs. Kirsch and Greicius will demonstrate how imaging genetics can be used as a tool to advance translational research and the methods required to analyze candidate genes within a neuroimaging context. Dr. Lein will discuss the Allen Institute Human Brain Atlas and how it will be a crucial tool for linking neuroimaging tools with spatially localized, genome-wide, gene expression patterns. Finally, Dr. Paus will demonstrate how imaging genetics can be used as a phenotyping tool to analyze brain development and function.

**Learning Objectives**

Having completed this workshop, participants will be able to:

1. Describe the different aspects of genetics in neuroscience: from the molecular biological underpinnings of brain function to the genotypes associated with specific phenotypes in normal and pathological cases;
2. Examine different analysis approaches of brain imaging data with respect to specific genes or the entire genome; and
3. Conceptualize issues and limitations involved in the quantity of data required to perform genome-wide imaging studies.

**In-Vivo Imaging Genetics: A Scaffold for Translational Science**

Peter Kirsch, Central Institute of Mental Health, Mannheim, Germany

**ApoE and Brain Imaging: A Cautionary Tale and a Guide to Future Studies**

Michael D. Greicius, Stanford University, Stanford, CA, USA

**The Allen Human Brain Atlas: Mapping Genes in Action**

Ed Lein, Allen Institute for Brain Science, Seattle, WA, USA

**Populations Neuroscience: A New Merging of Disciplines**

Tomas Paus, Rotman Research Institute, Baycrest Hospital, Toronto, Ontario, Canada

**10:30 - 11:45**

**ORAL SESSIONS**

Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

**Auditorium (Level 0)**

**O-W1: Cognition and Attention: Perception, Attention & Imagery 1**

Chair: Andreas Kleinschmidt, INSERM/CEA, Gif sur Yvette, France

**10:30**

1497 MT-AM: Retinotopic Organization of Object-Selective Areas

Anne Schobert, University of Trento, Rovereto, Italy

**10:45**

152 MT-PM: A Category-Specific Response to Animals in the Right Human Amygdala

Florian Mormann, University of Bonn, Bonn, Germany

**11:00**

1563 WTh-AM: Bifurcation in Neural Dynamics between Valid and Invalid Sensory Inferences

Luc Arnal, Inserm U960 - Ecole Normale Supérieure, Paris, France

**11:15**

1585 WTh-AM: Processing Spatial and Pitch Attributes of Sounds in the Absence of Visual Experience: an fMRI Study

Olivier Collignon, Université de Montréal, Montreal, Canada

**11:30**

130 WTh-PM: Neural Mechanisms of Face Selection in the Context of (dis)similar Faces Identified by EEG and fMRI

Francesco Gentile, Faculty of Psychology and Neuroscience, Maastricht University, The Netherlands, Maastricht, Netherlands
ORAL SESSIONS, continued

H1 & 2 (Level -1)
O-W2: Disorders of the Nervous System: Neurology
Chair: James Rowe, Cambridge University Neurology Unit, Cambridge, UK

10:30
598 MT-PM: Degeneration of Corpus Callosum and Corticospinal Tract Relates to Recovery of Function After Stroke
Ling Wang, Cognitive Neurology (INM-3), Institute of Neuroscience and Medicine, Research Centre Juelich, Juelich, Germany

10:45
599 MT-AM: Structural Plasticity in Stroke Inferred by Probabilistic Fiber Tracking and MEG
Monica Bucci, University of California-San Francisco, San Francisco, CA, USA

11:00
453 WTh-AM: Structural and Functional Connectivity Predicts Cognitive Function after Traumatic Brain Injury
David Sharp, Imperial College London, London, UK

11:15
82 WTh-PM: Bilateral White Matter Disconnections in Balint’s Syndrome and Simultanagnosia
Magdalena Chechlacz, Behavioural Brain Sciences Centre, School of Psychology, University of Birmingham, Birmingham, UK

11:30
454 MT-PM: Investigating Parkinson’s Disease Using Rotating Frame MRI
Shalom Michaeli, University of Minnesota, Minneapolis, MN, USA

J & H3 (Level -1)
O-W4: Imaging Techniques: Multimodal Approaches
Chair: Hidenao Fukuyama, Kyoto University, Kyoto, Japan

10:30
13 MT-AM: Localized Modulation of Brain Function using Pulsed Low-Intensity Focused Ultrasound
Alvaro Pascual-Leone, Harvard Medical School, Boston, MA, USA

10:45
777 MT-AM: Concurrent tDCS and fMRI Reveals Modulatory Effects on Brain Activation During a Simple Motor Task
Peter Dechent, MR-Research in Neurology and Psychiatry, University Medical Center Göttingen, Göttingen, Germany

11:00
805 MT-AM: Feasibility of Simultaneous Intracranial EEG-fMRI in Humans: First Results
David Carmichael, UCL Institute of Neurology, London, UK

11:15
840 MT-PM: Tract-Based Magnetic Resonance Spectroscopy of the Cingulum Bundle at 7 Tesla
René Mandl, University Medical Center Utrecht, Utrecht, Netherlands
11:30
1270 MT-PM: GABAergic Tone and its Responsiveness to Modulation Reflect Individual Performance of Motor Tasks
Velicia Bachtiar, Oxford Centre for Functional Magnetic Resonance Imaging of the Brain (FMRIB), University of Oxford, Oxford, UK

12:00 – 12:30
Auditorium (Level 0)
KEYNOTE LECTURE
Using fMRI to Detect Conscious Awareness
Adrian Owen, MRC Cognition and Brain Sciences Unit, Cambridge, UK

In the absence of any overt behavioral response, how can we ever know, unequivocally, that another person is aware? With reference to various altered states of consciousness, including anesthesia and vegetative state, I will contrast those circumstances in which fMRI can be used to infer awareness with those circumstances in which it cannot.

12:30 – 13:30
POSTER SESSION
Exhibit Hall (Level 0)
#1-589 WTh-AM (Odd numbered posters present)
Brain Stimulation: TMS
Cognition and Attention: Attention (Auditory, Tactile, Motor), Attention (Visual), Cognitive Aging, Cognitive Development
Disorders of the Nervous System: Addiction, Alzheimer and Dementia, Autism, Brain and Spinal Cord Trauma, Developmental Disorders,
Emotion and Motivation: Decision Making, Emotional Learning

#591-1587 WTh-AM (Odd numbered posters present)
Emotion and Motivation: Emotional Perception
Genetics
Imaging Techniques and Contrast Mechanism: Anatomical MRI, Diffusion MRI, EEG, Functional MRI, MEG
Language: Comprehension, Language Acquisition
Memory and Learning: Learning (Explicit and Implicit), Long-term Memory (Episodic, Semantic, Autobiographical)
Modeling and Analysis: Bayesian Modeling, Bold fMRI, Classification and Predictive Modeling, Exploratory Methods, Artifact Removal, Flattening, Segmentation

13:30 – 14:45
LUNCH

14:45 – 15:45
POSTER SESSION
Exhibit Hall (Level 0)
#2-588 WTh-PM (Even numbered posters present)
Brain Stimulation: TMS
Cognition and Attention: Attention (Auditory, Tactile, Motor), Attention (Visual), Cognitive Aging, Cognitive Development
Disorders of the Nervous System: Addiction, Alzheimer and Dementia, Autism, Brain and Spinal Cord Trauma, Developmental Disorders,
Emotion and Motivation: Decision Making, Emotional Learning

#590-1588 WTh-PM (Even numbered posters present)
Emotion and Motivation: Emotional Perception
Genetics
Imaging Techniques and Contrast Mechanism: Anatomical MRI, Diffusion MRI, EEG, Functional MRI, MEG
Language: Comprehension, Language Acquisition
Memory and Learning: Learning (Explicit and Implicit), Long-term Memory (Episodic, Semantic, Autobiographical)
Modeling and Analysis: Bayesian Modeling, Bold fMRI, Classification and Predictive Modeling, Exploratory Methods, Artifact Removal, Flattening, Segmentation
Neuroanatomy: Anatomical Studies
Pharmacology
Sensory Systems: Auditory/ Vestibular, Chemical Senses: Olfaction, Taste, Multisensory and Crossmodal
The brain does not passively represent the external environment in a purely stimulus-driven manner. Top-down modulation mechanisms, which involve both enhancing and suppressing influences from “higher” cortical areas on neural activity in “lower” cortical and subcortical regions, can dramatically influence how information is represented and stored. This symposium will present theoretical models and supporting empirical data on the role of top-down modulation in visual processing. Evidence is emerging that alterations in top-down modulation underlie a wide range of cognitive deficits associated with normal aging and neurological disease, such as Alzheimer’s disease, PTSD, ADHD and autism. It is anticipated that therapeutic interventions (both pharmacological and cognitive training) that address these underlying mechanisms will have a broad impact on such conditions. Top-down modulation has critical implications for our understanding of the flow of information in the brain, and elucidating the underlying mechanisms establishes a foundation for characterizing all higher cognitive operations.

**Learning Objectives**

Having completed this symposium, participants will be able to:

1. Describe recent theoretical models and empirical evidence of top-down modulation;
2. Describe the presence of converging mechanisms operating at multiple levels of the visual system and its impact on diverse cognitive domains; and
3. Develop future research projects that will empirically address predictions emerging from these concepts and theories

**Attentional Selection from Natural Scenes**
Sabine Kastner, *Princeton University, Princeton, NJ, USA*

**Neural Synchrony and Selective Attention**
Robert Desimone, *Massachusetts Institute of Technology, Cambridge, MA, USA*

**Top-Down Predictions in Visual Cognition**
Moshe Bar, *Harvard Medical School, Charlestown, MA, USA*

**Top-Down Enhancement and Suppression in Visual Association Cortex**
Adam Gazzaley, *University of California-San Francisco, San Francisco, CA, USA*

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17:15 – 17:45

**Auditorium (Level 0)**

**TOWN HALL MEETING**

All OHBM meeting attendees are encouraged to participate in this open forum; where you will have an opportunity to ask questions and give the OHBM leadership feedback. Updates on future meeting sites and council elections will be presented.
17:45 – 18:15
Auditorium (Level 0)
**KEYNOTE LECTURE**
Electrophysiological Imaging of the Attention Network
Pascal Fries, Ernst Strüngmann Institute, Frankfurt, Germany

Selective attention requires the flexible communication among several brain areas. We have recorded large parts of the visual attention network, including areas V1, V2, V4, parietal, premotor and prefrontal areas simultaneously with a 252-channel subdural grid electrode in monkeys. Attention strongly modulated the precision of brain-wide synchronization in several networks with distinct spatio-spectral signature.

18:30 – 19:45
**ORAL SESSIONS**
Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

J & H3 (Level -1)
O-W5: Emotion and Motivation 2: Pharmacology and Neurotransmitters
Chair: Jean-Claude Dreher, Center for Cognitive Neuroscience, Bron, France

18:30
616 WTh-PM: Dynamically Changing Corticosteroid Effects on the Human Amygdala
Marloes Henckens, Radboud University Nijmegen, Donders Institute for Brain, Cognition and Behaviour, Nijmegen, Netherlands

19:00
584 WTh-PM: Dopamine and Serotonin Influence the Neural Computation of Appetitive and Aversive Prediction Errors
Catherine Hindi Attar, NeuroimageNord, Department of Systems Neuroscience, University Medical Center Hamburg-Eppendorf, Hamburg, Germany

19:15
567 WTh-AM: Fear Conditioning Mechanisms Associated With Trait Vulnerability to Anxiety
Sonia Bishop, University of California-Berkeley, Berkeley, CA, USA

19:30
633 MT-AM: Dopamine D3 Receptor Availability Explains Orbitofrontal Connectivity With Cognitive Networks
David Cole, Imperial College, London, UK

H1 & 2 (Level -1)
O-W6: Modeling and Analysis: Brain Networks II
Chair: Pedro Valdés-Sosa, Cuban Neuroscience Center, Havana, Cuba

18:30
828 MT-PM: Functional Connectivity Analysis is Reliable in Whole-Head Near-Infrared Spectroscopy
Jan Mehnert, Berlin NeuroImaging Center, Berlin, Germany

19:00
972 MT-PM: Dynamic Granger Causality With Embedded Hemodynamic Model
Martin Havlicek, Brno University of Technology, Brno, Czech Republic

19:15
994 MT-PM: Laminar-Specific Functional Connectivity: Distinguishing Directionality in Cortical Networks
Jonathan Polimeni, Massachusetts General Hospital, Charlestown, MA, USA

19:30
503 MT-AM: Dysmodularity in Schizophrenia: Unsupervised Learning and Graph Theory Approaches
Aaron Alexander-Bloch, NIH/University of Cambridge, Cambridge, UK
ORAL SESSIONS, continued

Auditorium (Level 0)
O-W7: Cognition and Attention: Perception, Attention and Imagery II
Chair: Anna Christina Nobre, Oxford University, Oxford, UK

18:30
165 MT-AM: Separating the Sensory, Perceptual and Motor Components of Visual Decision Making
Jose Rebola, IBILI, Faculty of Medicine, University of Coimbra, Coimbra, Portugal

18:45
1471 MT-AM: Manipulating Visual Perception with Real-Time fMRI-based Neurofeedback Training
Frank Scharnowski, Wellcome Trust Centre for Neuroimaging, UCL, London, UK

19:00
136 MT-PM: The Power of Imagination – How Anticipatory Mental Imagery Alters Perception of Fearful Faces
Esther Diekhof, Centre for Translational Research in Systems Neuroscience, Dep. Psychiatry, Georg August University, Göttingen, Germany

19:15
951 MT-AM: Direct Evidence for Top-Down Prefrontal Control of Visual Working Memory Targets During Distraction
Eva Feredoes, University College London, London, UK

19:30
157 MT-AM: Separating Conscious Access from Spatial Attention During Masking: An MEG Study
Valentin Wyart, University of Oxford, Oxford, UK

21:00 – 1:00
CLUB NIGHT: RAZZMATAZZ NIGHTCLUB
Almogàvers 122
Barcelona, Spain 08018

Spend an evening at Razzmatazz, Barcelona’s famous discotheque. Entertainment features live music by Mother Groove and a DJ. The party is complimentary to registrants, but a ticket must be requested. Additional guest tickets are 50.00€.

Razzmatazz is one of the most important concert venues in Barcelona; in size, facilities and features. It is located in the Poble Nou district, just ten minutes from Plaça Catalunya, the heart of the city. Razzmatazz occupies a 3,700 m2 area divided into five different self-contained spaces that can also be used together. The illuminated facade is by the Catalon designer Sergio Ibáñez.

Directions: From the Congress Center, take the subway from the Zona Universitaria station to the Espanya station. Transfer to the Red Line and take subway to the Marina station. Walk along Almogavers Street 3 minutes to the Club.
9:00 – 10:15
H1 & 2 (Level -1)
MORNING WORKSHOP
Measuring Consciousness in Disorders of Connectivity
Chair: Quentin Noirhomme, University of Liège, Liège, Belgium

During the last decade, functional neuroimaging of disorders of consciousness (i.e., coma, vegetative state and minimally conscious state) has evolved from measuring resting cerebral blood flow or electrical activity to studying functional response to somatosensory stimuli and to active paradigm asking patients to concentrate on doing a task like playing tennis. While these methods have improved the care of the patients, highlighting their capability to hear or to feel pain, or detecting early recovery of consciousness in paralyzed patients, they also show how difficult it is to distinguish different states of consciousness. Somatosensory studies show that minimally conscious patients could have functional activation similar to control while, if vegetative patients mainly show islands of activation, some also show activation similar to controls. Furthermore, they did not provide any prognostic markers leaving patient, family and caregivers in the smog. In parallel, theories of consciousness have evolved and highlighted the importance of global activation as mandatory for awareness. These new developments combined with the results of the somatosensory studies have reframed disorders of consciousness as a disconnection syndrome. Brain connectivity can now be measured with a large range of methods. However, brain connectivity measures have seldom been used in disorders of consciousness. This workshop will examine some of the first results of connectivity studies in disorders of consciousness. The speakers will cover a range of functional and effective connectivity approaches based on fMRI, EEG, TMS and intracranial recordings. Results obtained in other unconscious states (i.e., anesthesia and deep sleep) will be reviewed. The workshop will offer the opportunity to discuss the role of brain connectivity as a potential new marker for diagnosis and prognosis.

Learning Objectives
Having completed this workshop, participants will be able to:
1. Discuss the potential role of connectivity in disorders of consciousness;
2. Describe various methods for measuring connectivity and explain how they apply to disorders of consciousness; and
3. Understand some of the current issues regarding brain functional and effective connectivity.

Could Connectivity be a Measure of Graded Consciousness?
Anil K. Seth, University of Sussex, Brighton, UK

A Perturbational Approach to Measure Effective Connectivity and the Brain’s Capacity for Consciousness at the Patient’s Bedside.
Marcello Massimini, University of Milan, Milan, Italy

The Enigmatic Role of Spontaneous Activity in the Human Brain
Rafi Malach, Weizmann Institute of Science, Rehovot, Israel

Default Mode Network in Disorders of Consciousness
Mélanie Boly, University of Liège, Liège, Belgium

9:00 – 10:15
J & H3 (Level -1)
MORNING WORKSHOP
fMRI in Clinical Trials: Promise, Progress and Path Forward
Chair: Adam Schwarz, Eli Lilly and Company, Indianapolis, ID, USA

As the field of neuroimaging matures there is increasing interest in the application of fMRI in clinical trials, both to elucidate neuropsychiatric disease processes and as a probe of pharmacological effects on brain systems. In the latter context, fMRI holds considerable promise both as a CNS biomarker and as a means to more fully understand the action of novel therapeutics. However, performing fMRI studies in this context places increased demands over single-site research studies, including the possible involvement of multiple scanning sites, comparability of data, operating exigencies of the pharmaceutical industry, regulatory requirements and the issue of possible confounding effects of drugs or disease on physiology impacting the hemodynamic response. To maximize the success and impact of fMRI in the trial setting, an understanding and appreciation of these issues is essential. This symposium will provide a themed overview and stimulate discussion around several key aspects.
Learning Objectives
Having completed this workshop, participants will be able to:
1. Understand issues involved in multi-site fMRI studies and recommendations for how to address them;
2. Appreciate the operating exigencies of the pharmaceutical industry and relevant regulatory requirements; and
3. Have an awareness of possible confounding effects of drugs or disease on physiology impacting the hemodynamic response, and steps to minimize the risk of data misinterpretation.

fMRI in Drug Development: Its Role and Demands
Alexandre Coimbra, Merck and Co., West Point, Pennsylvania, USA

Physiological Confounds in Clinical fMRI Trials: Issues and Mitigation
Peter Jezzard, FMRIB Centre, Oxford, UK

Steps Towards Quantitative fMRI
N Jon Shah, Research Center Juelich, Juelich, Germany

A Cookbook for Multi-Site fMRI Studies
Douglas N Greve, Athinoula A Martinos Center for Biomedical Imaging, Charlestown, Massachusetts, USA

9:00 – 10:15
Auditorium (Level 0)

MORNING WORKSHOP
Prospects for Noninvasive Microstructural Parcellation of Human Cortex: The Challenge of an In Vivo Brodmann Atlas
Chair: Stefan Geyer, Max Planck Institute for Human Cognitive and Brain Sciences, Leipzig, Germany

It is a highly desirable goal, pointed out by Francis Crick in 1993, and later by Devlin in 2007, to bring our understanding of human cortical anatomy to a level which enables comparative analysis of microstructural and functional organization. Functional MRI has been steadily improved as a tool for neuroscience over the last 15 years, and can now claim submillimeter precision, at a field strength of 7 Tesla. However, anatomical MRI has generally been regarded as incapable of discriminating functionally distinct cortical areas, lacking both sufficient sensitivity and spatial resolution. At most, functional MRI activations have been correlated with probabilistic atlases of cortical anatomy derived from cytoarchitectonic and chemoarchitectonic studies of cadaver brain slices. These characterize the brain as a mosaic of Brodmann areas, with further subdivisions. In order to associate activations in an individual brain with identifiable cortical areas, the brain volumetric image must be normalized into standard MNI space. Unfortunately, due to significant inter-individual differences, areas of good structural overlap of cortical areas between cadaver brains in the probabilistic atlas are often small, which thus severely limits interpretation of functional images.

With the advent of high field MRI scanners for human use, progress has accelerated in recent years in the identification of specific cortical areas by their anatomical MRI signature alone. The major factor providing MRI contrast in cortical gray matter is the presence of myelin, which reduces water proton density, decreases longitudinal and transverse relaxation times, provides magnetization transfer contrast, causes water diffusion to become anisotropic, and generates phase contrast in susceptibility-weighted phase images. The heavily myelinated bands of Baillarger have been observed in MR images of primary visual cortex (since 1992) and the visual motion area V5/MT. The effect on image contrast of the densely myelinated radial axons traversing primary auditory and primary motor cortex has also been observed with MRI. However, while several other brain regions show layer structure in MR images, they have not yet been given specific Brodmann classification. The myeloarchitectonic maps elaborated by Vogt and Vogt in the early 20th century are little known, their important publications still await translation into English, and no full user-friendly concordance yet exists relating their areas with those of Brodmann.

Learning Objectives
Having completed this workshop, participants will be able to:
1. Understand the fundamental importance of microstructural information for correctly interpreting functional activations in the brain;
2. Learn about state-of-the-art structural mapping approaches in post-mortem brains and the problems of correlation with functional data on a probabilistic basis; and
3. Appreciate that the ultimate goal is structure-function correlation in the same subjects, which can only be achieved by in vivo microstructural MR mapping.
Histological Mapping of the Cerebral Cortex and Probabilistic Structure-Function Assignments
Simon Eickhoff, University Hospital Aachen, Aachen, Germany

Molecular Profiling Approaches to Brain Mapping
Andreas Jeromin, Banyan Biomarkers, Alachua, FL, USA

Identifying Anatomically Distinct Cortical Regions Using High Resolution In Vivo Structural MR Images: Development and Validation of 3D Methods
Gary Egan, University of Melbourne, Melbourne, Victoria, Australia

Using Structural, Functional, and Connectivity Information to Identify Architectonic Regions in the Human Cerebral Cortex
Bruce Fischl, Massachusetts General Hospital, Charlestown, MA, USA

10:30 – 11:45
ORAL SESSIONS
Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

Auditorium (Level 0)
O-Th1: Motor Behavior
Chair: Henning Boecker, University of Bonn, Bonn, Germany

10:30
41 MT-AM: Functional and Anatomical Networks of Inhibition and Action Reprogramming
Rogier Mars, University of Oxford, Oxford, UK

10:45
34 WTh-PM: Development of a Baboon Model Using rTMS as Evidenced by Rate Dependent Regional Brain Activations
Felipe Salinas, University of Texas Health Science Center at San Antonio, San Antonio, TX, USA

11:00
512 WTh-PM: Structural Differences in Cortico-Basal Ganglia Networks Predict Individual Decision-Making Behavior
Birte Forstmann, University of Amsterdam, Amsterdam, Netherlands

11:15
1260 MT-PM: Parieto-Frontal Circuits Integrating Perceptual Information Into a Motor Plan – a TMS-EEG Study
Lennart Verhagen, Radboud University Nijmegen, Donders Institute, Nijmegen, Netherlands

11:30
148 WTh-PM: Age Differences in Callosal Contributions to Cognitive and Motor Performance
Brett Fling, University of Michigan, Ann Arbor, MI, USA

J & H3 (Level -1)
O-Th2: Brain Structure and Anatomy
Chair: Jean-François Mangin, CEA, NeuroSpin, Gif-Sur-Yvette, France

10:30
751 WTh-AM: Sensitivity of MRI Resonance Frequency to the Orientation of Brain Tissue Microstructure
Jongho Lee, NIH, Bethesda, USA

10:45
1326 MT-PM: Striato-Cortical Probabilistic Connectivity Atlases to infer Biomarkers of Huntington's Disease
Linda Marrakchi-Kacem, NeuroSpin, CEA, Gif-Sur-Yvette, France

11:00
1491 WTh-AM: Subpial Pathology as a Substrate for Cortical Thinning in Multiple Sclerosis: a 7T MRI study
Caterina Mainero, Massachusetts General Hospital, Charlestown, MA, USA

11:15
1104 MT-PM: Hippocampal and Ventricular Differences in 804 ADNI Subjects Mapped with Multivariate TBM
Yalin Wang, UCLA, Los Angeles, CA, USA

11:30
716 WTh-PM: Genetic Influences on Brain Architecture from Multivariate Diffusion Tensor Data
Agatha Lee, LONI-UCLA, Los Angeles, CA, USA
**ORAL SESSIONS, continued**

**H1 & 2 (Level -1)**  
**O-Th3: Disorders of the Nervous System: Development**  
Chair: Philip Shaw, National Institute of Mental Health, Bethesda, MD, USA

10:30  
**428 WTh-PM: Meta-Analysis of Whole-Brain Structural VBM Studies in Autism**  
Esther Via, Hospital Universitari de Bellvitge, Barcelona, Spain

10:45  
**426 WTh-PM: Striatal Functional Connectivity in Children with Autism: A Window into Brain Differentiation**  
Adriana Di Martino, Phyllis Green and Randolph Cowen Institute for Pediatric Neuroscience at the NYU Child Study Center, New York, USA

11:00  
**483 WTh-AM: Effect of DAT1 Genotype and ADHD Diagnosis on Task-Positive & Task-Negative Working Memory Networks**  
Ariel Brown, Massachusetts General Hospital, Boston, MA, USA

11:15  
**505 WTh-AM: Motivation and Methylphenidate Modulate Task-Related Default Mode Network Deactivation in ADHD**  
Elizabeth Liddle, University of Nottingham, Nottingham, UK

11:30  
**529 MT-AM: Morphometry of the Superior Frontal Cortex in Adolescent-Onset Psychosis**  
Joost Janssen, Unidad de Adolescentes de Psiquiatría. Hospital General Universitario Gregorio Marañón. CIBERSAM, Madrid, Spain

**12:00 – 12:30**  
**KEYNOTE LECTURE**  
**Auditorium (Level 0)**  
**Real Time Functional Connectivity Assessed Using Transcranial Magnetic Stimulation (TMS) Methods**  
John Rothwell, University College London, London, UK

In addition to creating “virtual lesions” that interfere with brain function, TMS also activates anatomical connections to distant areas. These produce their own EEG or BOLD signal changes, or modulate responses to a second TMS stimulus. The combination allows us to chart excitability changes in preparation for, and during, a task with millisecond precision.

**12:30 – 13:30**  
**POSTER SESSION**  
**Exhibit Hall (Level 0)**

### Odd numbered posters present

**#1-589 WTh-AM**  
**Brain Stimulation:** TMS  
**Cognition and Attention:** Attention (Auditory, Tactile, Motor), Attention (Visual), Cognitive Aging, Cognitive Development  
**Disorders of the Nervous System:** Addiction, Alzheimer and Dementia, Autism, Brain and Spinal Cord Trauma, Developmental Disorders,  
**Emotion and Motivation:** Decision Making, Emotional Learning  

### Even numbered posters present

**#591-1587 WTh-AM**  
**Emotion and Motivation:** Emotional Perception  
**Genetics**  
**Imaging Techniques and Contrast Mechanism:** Anatomical MRI, Diffusion MRI, EEG, Functional MRI, MEG  
**Language:** Comprehension, Language Acquisition  
**Memory and Learning:** Learning (Explicit and Implicit), Long-term Memory (Episodic, Semantic, autobiographical)  
**Modeling and Analysis:** Bayesian Modeling, Bold fMRI, Classification and Predictive Modeling, Exploratory Methods, Artifact Removal, Flattening, Segmentation  
**Motor Behavior:** Basal Ganglia/Brainstem/Spinal Cord, Brain-machine Interface, Eye Movements/Visuomotor Processing  
**Neuroanatomy:** Anatomical Studies  
**Pharmacology**  
**Sensory Systems:** Auditory/Vestibular, Chemical Senses: Olfaction, Taste, Multisensory and Crossmodal
13:30 - 14:45
LUNCH

14:45 – 15:45
POSTER SESSION
Exhibit Hall (Level 0)
#2-588 WTh-PM (Even numbered posters present)
Brain Stimulation: TMS
Cognition and Attention: Attention (Auditory, Tactile, Motor),
Attention (Visual), Cognitive Aging, Cognitive Development
Disorders of the Nervous System: Addiction, Alzheimer and Dementia, Autism, Brain and Spinal Cord Trauma,
Developmental Disorders,
Emotion and Motivation: Decision Making, Emotional Learning

Multifunction Area (Level -1)
#590-1588 WTh-PM (Even numbered posters present)
Emotion and Motivation: Emotional Perception
Genetics
Imaging Techniques and Contrast Mechanism: Anatomical MRI,
Diffusion MRI, EEG, Functional MRI, MEG
Language: Comprehension, Language Acquisition
Memory and Learning: Learning (Explicit and Implicit),
Long-term Memory (Episodic, Semantic, Autobiographical)
Modeling and Analysis: Bayesian Modeling, Bold fMRI,
Classification and Predictive Modeling, Exploratory Methods,
Artifact Removal, Flattening, Segmentation
Neuroanatomy: Anatomical Studies
Pharmacology
Sensory Systems: Auditory/ Vestibular, Chemical Senses:
Olfaction, Taste, Multisensory and Crossmodal

16:00 - 17:15
ORAL SESSIONS
Oral session presentations are chosen by the Program Committee from submitted abstracts using criteria of quality and timeliness; a wide spectrum of investigation is represented.

J & H3 (Level -1)
O-Th4: Brain Stimulation
Chair: Hartwig Siebner, Copenhagen University Hospital, Copenhagen, Denmark

16:00
728 WTh-PM: Brain Circuit Mapping with Optogenetic Functional Magnetic Resonance Imaging (offMRI)
Jin Hyung Lee, University of California, Los Angeles, Los Angeles, CA, USA

16:15
903 MT-AM: Non-invasive Plasticity Induction in a Cortical-Cortical Connection Pathway in Human Brain
Vanessa Johnen, Department of Experimental Psychology, University of Oxford, UK, Oxford, UK

16:30
456 MT-PM: Mapping Cortico-Subthalamic Coherence Using Simultaneous MEG and Intracranial Recordings
Vladimir Litvak, University College London, Institute of Neurology, London, UK

16:45
896 MT-PM: Transcranial Direct Current Stimulation (TDCS) Targeted Using Brain Imaging Accelerates Learning
Vincent Clark, University of New Mexico and Mind Research Network, Albuquerque, NM, USA

17:00
8 MT-PM: Abstinence Induced Craving Activity Influenced by tDCS: a pCASL Study
Thomas Fischer, TU Dresden, Dresden, Germany

Auditorium (Level 0)
O-Th5: Sensory Systems
Chair: Michael Beauchamp, University of Texas Medical School at Houston, Houston, TX, USA

16:00
1403 MT-AM: Open vs Hidden Opioid Administration: Belief Modulates Remifentanil Effects on Pain-Evoked Responses
Lauren Atlas, Columbia University, Brooklyn, NY, USA
16:15
1543 WTh-AM: Neural Processing of Odorant Stimuli by Early Blind Subjects
Mathilde Beaulieu Lefebvre, University of Montreal, Montreal, Canada

16:30
1562 WTh-PM: Bottom-Up or Top-Down: Connectivity Reflects Individual Differences in Grapheme-Color Synesthesia
Tessa van Leeuwen, Radboud University Nijmegen, Donders Institute (RU/DI-BCB), Nijmegen, Netherlands

16:45
1483 MT-AM: The Human MT/V5 Field Map Cluster
Hauke Kolster, Lab for Neuro- and Psychophysiology, KU Leuven, Leuven, Belgium

17:00
1072 WTh-PM: Gamma Band Representation of Amplitude and Frequency Modulation in Heschl’s Gyrus
Paul Wai-Fung Poon, National Cheng Kung University, Tainan, Taiwan, Republic of China

17:30 - 18:30
CLOSING COMMENTS AND MEETING HIGHLIGHTS
Auditorium (Level 0)
Mark D’Esposito, University of California-Berkeley, Berkeley, CA, USA

18:30 – 19:30
FAREWELL POSTER RECEPTION
Exhibit Hall (Level 0)
#1-589 WTh-AM and WTh-PM (Wednesday and Thursday presenters)
Brain Stimulation: TMS
Cognition and Attention: Attention (Auditory, Tactile, Motor), Attention (Visual), Cognitive Aging, Cognitive Development
Disorders of the Nervous System: Addiction, Alzheimer and Dementia, Autism, Brain and Spinal Cord Trauma, Developmental Disorders,
Emotion and Motivation: Decision Making, Emotional Learning

Multifunction Area (Level -1)
#590-1588 WTh-AM and WTh-PM (Wednesday and Thursday presenters)
Emotion and Motivation: Emotional Perception Genetics
Imaging Techniques and Contrast Mechanism: Anatomical MRI, Diffusion MRI, EEG, Functional MRI, MEG
Language: Comprehension, Language Acquisition
Memory and Learning: Learning (Explicit and Implicit), Long-term Memory (Episodic, Semantic, Autobiographical)
Modeling and Analysis: Bayesian Modeling, Bold fMRI, Classification and Predictive Modeling, Exploratory Methods, Artifact Removal, Flattening, Segmentation
Neuroanatomy: Anatomical Studies Pharmacology
Sensory Systems: Auditory/ Vestibular, Chemical Senses: Olfaction, Taste, Multisensory and Crossmodal
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