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Welcome to the 2018 Champalimaud Research Symposium on Quantitative Approaches to Behaviour and Neural Systems! We have an exciting four days ahead of us to exchange visions, viewpoints, experiences and ideas.

At this moment, our field is in a state of rapid development and exploration. New experimental techniques and analysis methodologies allow unprecedented resolution and scope in our interrogation of animal behaviour and the structure and function of the nervous system.

As usual in science, such progress brings opportunities to evaluate and question the conceptual frameworks that we use to interpret these results and to push our investigations in new directions. This effort is particularly important in biology and neuroscience which have greatly benefited from theories adapted from other disciplines, such as physics, statistics, computer science and engineering.

Our goal has been to gather experts from all of these fields in order to showcase some of these exciting new approaches and to promote a discussion of how to identify the essential problems that we are facing, and the critical elements that theories of neural systems and behaviour should address. We are truly grateful and honoured by the fact that all of you have decided to join us in this project.

We encourage you to take this opportunity to enjoy the vibrant spirit and warm hospitality of the Champalimaud Research community, and the city of Lisbon as a whole. Ask questions, speak your mind and explore, and we hope that we can all come to the end as slightly different scientists than we were at the beginning, excited to explore new scientific directions with new friends.
Champalimaud Research currently comprises 19 main research groups, counting more than 300 scientists who work in two different areas of investigation, within two sub-programmes.

Created in 2007, the Champalimaud Neuroscience Programme aims to unravel the neural basis of behaviour, attempting to forge new links between the nervous system function and the behavioural output.

The Biology of Systems and Metastasis Programme, established in 2014, aims to understand and prevent cancer, understanding changes in communication between cells, tissues and organs, and changes in metabolism that permit cells to metastasise and tumours to grow.
Invited Speakers

Keynote speaker

Haim Sompolinsky
Hebrew Univ.
Israel
23 Tue
19:00

Surya Ganguli
Stanford Univ.
USA
24 Wed
15:00

Anne Churchland
CSHL
USA
25 Thu
12:00

Megan Carey
Champalimaud Portugal
26 Fri
11:00

Tim Behrens
Univ. Oxford
UK
24 Wed
09:30

Barbara Webb
Univ. of Edinburg
UK
24 Wed
17:00

Albert-László Barabasi
Northeastern Univ.
USA
26 Fri
12:00

Mark Transtrum
Brigham Young Univ.
USA
26 Fri
12:00

Christian Machens
Champalimaud
Portugal
24 Wed
11:00

Matthew Botvinick
DeepMind & UCL
UK
25 Thu
09:30

Rainer Friedrich
FMI
Switzerland
25 Thu
17:00

Florian Engel
Harvard Univ.
USA
26 Fri
13:30

Mark Humphries
Univ. Nottingham
UK
24 Wed
12:00

Maria Neimark Geffen
Univ. Pennsylvania
USA
25 Thu
11:00

Josh McDermott
MIT
USA
26 Fri
09:30

Stuart Geman
Brown Univ.
USA
26 Fri
15:15
tuesday

15:00 - 17:00 Auditorium hall

REGISTRATION

17:00 Welcome reception Amphitheatre

18:30 Auditorium

Opening remarks
Champalimaud Foundation board and chairs of the 2018 Champalimaud Research Symposium

19:00 Auditorium

KEYNOTE LECTURE

Haim Sompolinsky
Hebrew University, Israel

Transformation of sensory representations in deep neural architectures
**Wednesday**

**RegISTRATION**

09:00 - 09h30

**Talk Session**

09:30

**Auditorium hall**

- **Invited Speaker**
  - **Tim Behrens**
    - University of Oxford, UK
    - Inference in replay through factorised representations

- **Selected Speaker**
  - **Stephen Lisberger**
    - Duke University, USA
    - Quantitative analysis of behavior and neural responses explicates a sensory-motor system

Coffee break

- **Invited Speaker**
  - **Christian Machens**
    - Champalimaud Centre for the Unknown, Portugal
    - Robust coding with spiking neural networks

- **Selected Speaker**
  - **Julie Lee**
    - University College London, UK
    - Probing task selectivity in mouse parietal cortex

- **Invited Speaker**
  - **Mark Humphries**
    - University of Nottingham, UK
    - Decision and memory representations in the prefrontal cortex independently contribute to learning

**Poster Session I**

11:30 - 13:00

**Exhibition hall**

- **Surya Ganguli**
  - Stanford University, USA
  - Emergent elasticity in the neural code for space

- **Discussion**
  - Alex Cayco Gajic
  - Barbara Webb

Coffee break

- **Alex Cayco Gajic**
  - University College London, UK
  - Population activity of cerebellar granule cells in awake mice

- **Barbara Webb**
  - University of Edinburgh, UK
  - Closing the loop: modelling the neural basis of path integration in the insect brain

13:00

**Exhibition hall**

Lunch

15:00

**Auditorium**

- **Invited Speaker**
  - **Surya Ganguli**
    - Stanford University, USA
    - Emergent elasticity in the neural code for space

- **Discussion**
  - Alex Cayco Gajic
  - Barbara Webb

Coffee break

- **Alex Cayco Gajic**
  - University College London, UK
  - Population activity of cerebellar granule cells in awake mice

- **Barbara Webb**
  - University of Edinburgh, UK
  - Closing the loop: modelling the neural basis of path integration in the insect brain

18:00

**Exhibition hall**

Lisbon tour

CCU Entrance
25 thursday

09:00 - 09:30 Auditorium hall

REGISTRATION

09:30 Auditorium

TALK SESSION

1 Invited speaker

Matthew Botvinick
DeepMind & University College London, UK
Neural correlates of distributional reinforcement learning

António Miguel Fernandes
Max Planck Institute of Neurobiology, Germany
Neuronal circuitry for stimulus competition in the visual system

Coffee break

Maria Neimark Geffen
University of Pennsylvania, USA
Excitatory-inhibitory neuronal circuits for dynamic auditory perception

Tomoki Fukai
RIKEN Center for Brain Science, Japan
Unsupervised learning of information streams in networks of dendritic neurons

Anne Churchland
Cold Spring Harbor Laboratory, USA
Movement-related activity dominates cortex during sensory-guided decision making

12:30 - 13:00 Exhibition hall

Lunch

13:00 Exhibition hall

POSTER SESSION II

15:00 Auditorium

TALK SESSION

Albert-László Barabási
Northeastern University, USA
Controlling networks: fundamentals and applications to brain science

Discussion

Coffee break

Mafalda Valente
Champalimaud Centre for the Unknown, Portugal
Reaction time reveals the mechanistic basis of Weber's law

Rainer Friedrich
Friedrich Miescher Institute for Biomedical Research, Switzerland
Connectivity determines computation in the olfactory bulb
Friday

09:00 - 09:30
Auditorium hall

REGISTRATION

09:30
Auditorium

TALK SESSION

Josh McDermott
Massachusetts Institute of Technology, USA
Next-generation auditory observer models via deep learning

Caroline Haimerl
New York University, USA
New York University, USA
Shared stochastic modulation can facilitate biologically plausible decoding

Coffee break

Megan Carey
Champalimaud Centre for the Unknown, Portugal
Spatial and temporal locomotor learning in mouse cerebellum

Adam Calhoun
Princeton University, USA
Estimating behavioral state for sensorimotor transformations

Mark Transtrum
Brigham Young University, USA
Model reduction and effective theories in physics, biology, and neuroscience

12:30 - 13:30
Lunch
Exhibition hall

13:30
Auditorium

TALK SESSION

Florian Engert
Harvard University, USA
Neuronal mechanisms of evidence accumulation and perceptual decision making in the larval zebrafish

Discussion

14:00

Luke Coddington
HHMI Janelia Research Campus, USA
Are dopamine prediction errors a cause or a consequence of learning?

Stuart Geman
Brown University, USA
How do biological and artificial neural networks represent relationships?

15:45
Auditorium

Closing remarks
Chairs of the 2018 Champalimaud Research Symposium

16:00
Auditorium

Wine & cheese
Amphitheatre

17:30
Boat trip
CCU Entrance

19:30
Banquet & Party
Doc Cod, Doca de 5ª Amaro
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<td>Neural representations of the abstract causal structure of the environment</td>
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<td>Organisation of inhibitory Golgi cell population activity in the cerebellar cortex during spontaneous and evoked movements</td>
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<td>Investigating the potential bookmarking function of the proneural factor Ascl1/Mash1 in vertebrate neurogenesis</td>
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<td>Van Opstal, John</td>
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Practical Information

Venue - The Champalimaud Centre for the Unknown (CCU)

The CCU is located on the beautiful riverside area of Pedrouços, near the magnificent Tower of Belém. This area, where the river Tagus meets the Atlantic Ocean, is of great historical significance as the great Portuguese pioneers sailed from this location to discover the “unknown” in the XV and XVI centuries. The presence of the CCU leverages this historical heritage by creating an inspirational link between the discoveries of yesteryear and the epic adventure of scientific research.

Auditorium
(Talk Sessions)

Exhibition hall
(Poster Sessions and Lunch)

Amphitheatre
(Reception and Wine & Cheese)

Telephone
(+351) 210 480 000 (CCU)
(+351) 210 480 113 (Admin office)

Emergency
(+351) 210 480 258 (CCU)
(+351) 213 421 623 (Tourism police)
112 (National number)

Wifi

network: Eventos
password: Auditorio2018

JOIN THE CONVERSATION
#CRSymp2018

If you need a taxi please go to CCU main entrance (ground floor) and use the Taxi Application, located on the right side.

You will be given a taxi reservation number and you just need to take the taxi with the corresponding number. Feel free to ask for help at the CCU reception.

We kindly ask you not to give up after making a taxi reservation.

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Symposium Activities

If you want to join any of these activities, please ask at the Help Desk if there are still spots available and, if so, sign-up the corresponding forms. Spots will be granted on a first-come, first-served basis.

Walking tours in downtown Lisbon

On Wednesday (24th October) afternoon there will be walking tours in downtown Lisbon, guided by Champalimaud Research students and postdocs. A free bus will leave from the Champalimaud Centre for the Unknown at 18:00 to Cais do Sodré, where the tours start. The duration of each tour is approximately 45 min.

Tours to the Champalimaud Centre for the Unknown (CCU)

There will be guided tours to the CCU on Thursday (25th October), at 17:30 and during lunch on Friday (26th October), at 13:00. The duration of each tour is approximately 25 min.

Boat trip on the Tagus river

After the final session on Friday (26th October), take the chance to see the Champalimaud Centre for the Unknown (CCU) from a different perspective! We have arranged two Hippo trip tours (amphibious sightseeing), the first one leaving the CCU at 17:30 and the second one at 18:30. Both will arrive at the banquet location (Doca de Santo Amaro). The duration of the tour is 45 min. Please note that you may join this trip even if you did not sign-up for the banquet.

Banquet & Party

The banquet will be held on Friday (26th October) at Doc Cod, a riverside restaurant in Doca de Santo Amaro (Lisbon). At 19:30, a sunset cocktail will be served overlooking the river, followed by dinner at 20:00. Bring your dancing shoes for the party after dinner! The restaurant is a 45 minute walk from the Champalimaud Centre for the Unknown, and is also easily reachable by train (Alcântara-Mar station) or Taxi. The cost of the banquet & party is €50.

Special Issue of Cells Journal

“Quantitative Approaches to Behaviour and Neural Systems”

Selected Papers from 2018 Champalimaud Research

AN OPEN CALL FOR ALL SYMPOSIUM PARTICIPANTS

Participants in the 2018 Champalimaud Research Symposium are cordially invited to contribute original research papers or reviews to a Special Issue of Cells. All the papers will be peer-reviewed according to the standard procedure of Cells. One selected abstract will be awarded with a publication fully free of charge, and other papers will receive a 20% discount from the standard Article Processing Charge (APC).

The Issue will be Guest Edited by Dr. Alfonso Renart and Dr. Michael Orger from the Champalimaud Centre for the Unknown.

Deadline for manuscript submissions: 28 February 2019.

For more information see: www.mdpi.com/journal/cells/special_issues/CR_symposium
How to get to the Symposium Site