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Table of Contents

1. Executive Summary

2. Introduction

2.1 The European Institute for Theoretical Neuroscience

From the DoA "The aim of the EITN is to serve as an incubator of ideas and foster the exchange of ideas between theoreticians and experimentalists, inside and outside the HBP. The institute is located in Paris and is open to researchers from the field, from all over Europe and the rest of the World, whether they are HBP Partners or not. Besides organising inter-SP internal workshops, the Institute will also organise international workshops open to everyone promote interactions between neuroscience and other disciplines. To help with this, the EITN will work with analyses of estimates of the different communities involved in the workshops to improve the reaching out accordingly."

2.2 The Aim of this Document

This Deliverable describes the activities of the EITN between Month 1 - 12 of the SGA1 Phase.

3. EITN Activities

3.1 Work Conducted by the EITN's Resident Post-Docs

3.1.1 Introduction

Several resident postdocs have worked at the EITN. The delay in the signature of the agreement of this funding period made it more difficult to hire the 4 EITN postdocs initially present in the submitted proposal. Nevertheless, this gave us the opportunity to develop the concept of HBP-connect and we were able to hire full-time post docs at the EITN – most of them starting second period of this SGA1.

Nevertheless, some SP4 partners managed to allocate full-time post docs at the EITN (*see table below*) participating actively to the animation of the EITN.

Name	Institution	Date of start	End date
Romain Caze	CNRS (Destexhe)	April 2016	July 2016
Alberto Romagnoni	CNRS (Destexhe)	January 2016	April 2016
Ulisse Ferrari	UPMC (Marre)	April 2016	October 2016

The work of the different postdocs is detailed in Deliverable D4.7.1 of SGA1, and is summarized as follows.

3.1.2 The post docs in detail

3.1.2.1 Romain Caze (CNRS)

Romain Caze has worked on defining computational operations performed by neuronal dendrites. This work has been inspired from results in HBP on active dendrites (Matthew Larkum, SP3), and he has interacted with the other members of HBP modelling dendrites (Destexhe, Segev), as well as to the design of mean-field models (Faugeras). A preprint is now in preparation.

3.1.2.2 Alberto Romagnoni (CNRS)

Alberto Romagnoni has been working on a mean-field model of neurons with adaptation. This model is now continued by a postdoc in SP4 (di Volo) and was also intensely discussed with other SP4 partners involved in mean-field models (Faugeras, Deco, Jirsa, DeKamps). As a consequence of these discussions, we decided to launch a HBP-wide comparison of mean-field models in SGA2. The model developed by Romagnoni, diVolo & Destexhe is now extended to model voltage-sensitive dye imaging signals and should be published soon.

3.1.2.3 Ulisse Ferrari (UPMC)

Ulisse Ferrari worked on an Ising-based method to characterize multi-electrode recordings, which is useful for both the retina or cerebral cortex recordings. It can also be applied to data from spiking network models, and therefore has a high potential in HBP. He has been supervised by Olivier Marre (UPMC) and has worked intensely with researchers from the groups of Alain Destexhe (CNRS) and the other postdocs present at the EITN. He also actively participated to the workshops on the visual system organized at the EITN. A publication of this work is in preparation.

3.2 The EITN Visiting Scientists Programme

In the current phase, we had two long-term visitors invited by the EITN, as well as several short-term visitors

Name	Institution	Date of start	End date
Yashar Ahmadian Tehrani	University of Oregon, USA	15/12/2016	04/01/2017
Nuria Tort-Colet	University of Barcelona, Spain	10/01/2016	11/01/2017
Marco Ferreira-Brigham	Brigham Associates BVBA, Belgium	12/02/2017	18/02/2017

Several collaborations emerged from the hosting of these visitors.

Morgan Taylor came in early 2016 (Ramp-Up Phase) as an EITN visitor, and she subsequently obtained a Chateaubriand Fellowship to join Alain Destexhe's team for a 6-month period. She is developing a model of V1 responses based on multi-electrode experiments.

Nuria Tort-Colet will be hired as a SP4 postdoc to work on network dynamics, she is planned to start working on June 2017.

3.3 EITN attendance

The EITN has now reached a "cruising" phase, which was perturbed by the interruption of funding in the beginning of SGA1 (the CNRS limited the advance of funds for the EITN, to prioritize continuation of the postdoc contracts). As a consequence, the postdoc program is now "exploding", as we had to hire a number of postdocs to fill the person-months committed to in SGA1.

The presence of post docs and long-term visitors was not reached as expected, this is why we are now extending this program to young researchers, who could greatly benefit of being EITN visitors and interact with the researchers present. Also note that having scientists for long stays requires planning their stay a long time in advance, which was not possible in SGA1 because of the delayed payment.

To foster interaction between EITN and the rest of the consortium, the HBP-connect concept was set-up, and we must say that HBP members seemed thrilled about it. We are finalizing several co–supervising post-doc positions while recruiting at the same time.

3.4 Workshops Organised by the EITN

During M1-M12 of the SGA1, EITN continued running with about 20 events held and a total of more than 300 participants.

Learning from experience and wanting to focus on quality rather than on quantity, we tend to adopt a brainstorming session format where we limit the number of participants at an event

to around 40. This allows us to hold in-depth discussions where unforeseen collaboration may come out more easily.

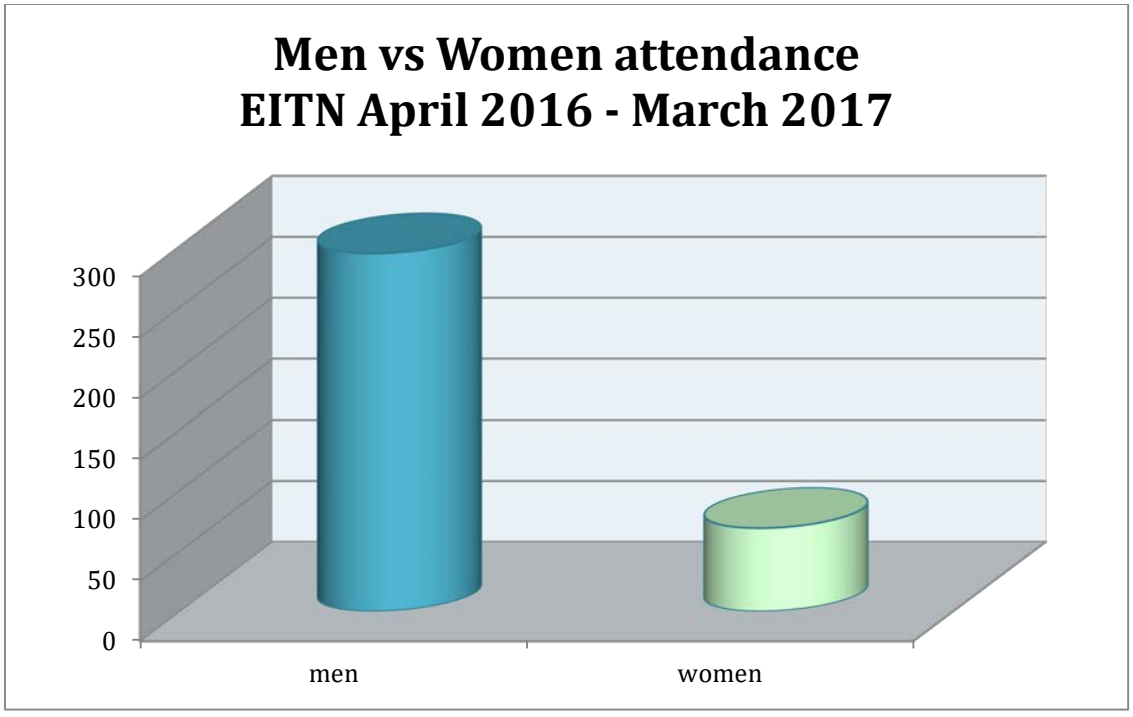
Events calendar can be found in the Annex A.

Events organized at the EITN can be of different formats. We held small group discussions as well as big conference style events within the limit of the space we have.

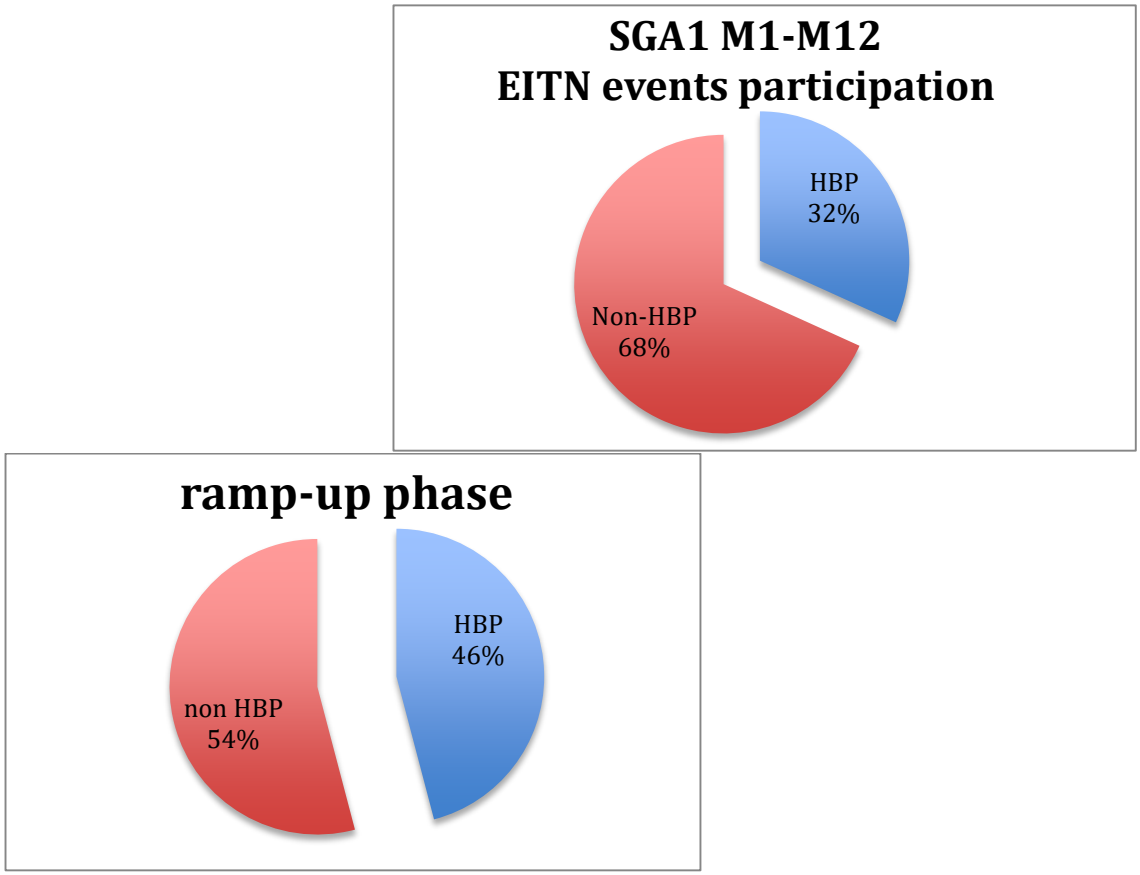
As planned, induced serials, such as the “dendrites” workshop organized by Idan Segev (HUJI, SP4) that already took place twice in the ramp-up phase, have been organized end of 2016.

Computational and theoretical neuroscience is a field largely dominated by men, and we are doing what is possible to have a better gender balance in our activities, but it must be clear that a perfect balance will not be achievable. We plan to be more insistent on having female speakers at each workshop, and are making it clear that workshops with only male speakers will not be accepted anymore. We will also encourage female postdocs to present wherever possible. Finally, we will organize an annual workshop on "Women in Neuroscience", where the great majority of speakers will be women.

As we feel this topic is of importance, we also have started discussions with the HBP members in charge of the HBP gender issue, among others, and hope to find other means to address this matter.



We are able to analyse from our data that a larger number of non-HBP members participated to our events. This allows us to think that our activity is on the right track for reaching out to a larger community.



Examples of events outcomes can be found in Annexe B.

3.5 Dissemination of EITN activities

During this last period, we also have worked on dissemination.

We started communicating the publications of our partners on our Twitter account with hopes to enlarge our audience, in particular among our main target: neuroscientists.

A researchgate account, a mendeley account and an HBP collaboratory page were created for the EITN. These accounts already showed great benefits for our scientific work dissemination. We hope interest will grow among our followers and consequently enlarge our network.

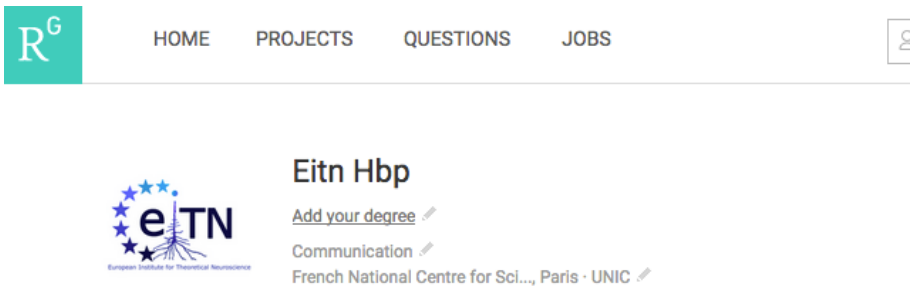


Figure 1: "Eitn Hbp" Researchgate account

The website has been visited at an average rate of 15 visits per day which is considerably more than the amount reached during the RUP.

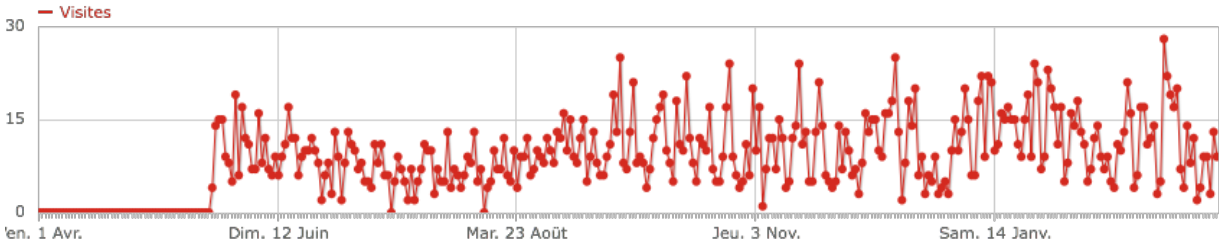


Figure 2: Daily visits accountings of our webpage.

The v2 of the website has been launched before last summer. Also, hiring a communication assistant has reinforced our team. We are now fully developing tools to reach out more efficiently towards the outside Theoretical Neuroscience communities but also towards the rest of the HBP consortium with which we really want to consolidate our exchanges.

We also have set up a private server where we upload the PDFs of the presentations (as well as other material such as movies or PDFs of publications) – this serves to disseminate the information about our workshop among the participants.

3.6 Continuing the EITN work in the Operational Phase

During the second part of SGA1, and during SGA2, we will continue the EITN operations. The budget is much larger in the second year because of the delayed payment in the first year of SGA1. Consequently, there will be a number of postdoc position (8 one-year positions) which we are now recruiting. There will also be an increase of the budget available for organizing workshops and for the visitor program. We will continue to advertise the HBP-connect workshops and encourage HBP partners to organize workshops at the EITN. Also note that, as mentioned above, the visitor program will be extended to young researchers.

4. Conclusion

The EITN is more than ever an instrument of communication within HBP, as well as between HBP and the various external communities. The workshop programme has been organizing successful meetings with prestigious speakers outside the HBP. The EITN postdocs are now starting to work on subjects co-supervised by different HBP partners, and we hope to be able to report next year the first concrete results of this collaboration. We believe it will create essential links and collaborations between HBP partners. So, despite the difficulties due to the delayed payment in the first year of SGA1, the EITN managed to continue its operation at a low pace, which is now echoed in the second year of SGA1 by an increased pace of the different EITN activities and their impact on the project.

5. Annex A: EITN events agenda

2017:

March 28

Neuromathematics seminar : Boris Gutkin from ENS Paris presents "Dynamics of dopamine neuron firing in normal and drug-modulated conditions".

March 9-10

Workshop "Consciousness in humans, animals & robots I: concepts, theories, and neural mechanisms"

Organized by Kathinka Evers (Uppsala University), Cyriel Pennartz (University of Amsterdam), Johan F. Storm (University of Oslo) & Alain Destexhe (UNIC EITN CNRS**)**

March 7

Neuromathematics seminar : Catherine Tallon-Baudry from ENS Paris presents "Visceral inputs, brain dynamics & subjectivity".

February 24

Theoretical Neuroscience Seminar: Morgan Taylor presents “Inhibition and visual receptive field structure"

January 11-12

SP4 annual internal Meeting

HBP internal event

January 10

Theoretical Neuroscience Seminar: Núria Tort-Colet from Systems Neuroscience group (IDIBAPS)

January 03

Theoretical Neuroscience Seminar: Yashar Ahmadian from University of Oregon presents “Loosely balanced cortical dynamics : from contextual modulations to variability suppression”.

2016 :

November 28-29

Workshop "Biophysics and genetics of human cortical slice neurons"

Organizers : **Idan Segev** (The Hebrew University of Jerusalem, SP4), Huib Mansvelder (Vrije Universiteit Amsterdam), Christof Koch (Allen Institute), Alain Destexhe (UNIC EITN, CNRS)

November 8

Neuromathematics seminar : Romain Brette from Institut De la Vision presents :

"Neural geometry and excitability"

October 6-7

Workshop Slow Waves: Models and Experiments

HBP Partnering Project internal event

Organizers : Maria-Victoria Sanchez Vives (SP3) & Alain Destexhe (CNRS UNIC EITN, SP4)

September 26

Workshop "Dendritic models on Neuromorphic Hardware"

Organizers : Karlheinz Meier (UHEI, SP9) & Alain Destexhe (CNRS UNIC EITN, SP4)

June 13-14

Modeling,Visuo-Motor Integration - CDP4 kickoff meeting

Organizers : Rainer Goebel and **Sonja Grün (SP4)**

May 19-20

Workshop "Modelling of the early visual system"-part 2

Organizers : Yves Frégnac, **Olivier Marre (SP4)**, Cyril Monier, Alain Destexhe, and Antoine Chaillet

May 12-13

SP4-SP9 workshop on Multiple scales, Plasticity and Learning in Neuromorphic System (CDP5 "Functional plasticity for learning in large-scale systems" kick-off meeting)

Organizers : **Walter Senn (SP4)**, Wolfgang Maass, Karlheinz Meier, Alain Destexhe, David Lester (SP9)

May 3

Theoretical Neuroscience seminar : Florent Meyniel (Neurospin, CEA) presents "A normative account of the sense of confidence during probabilistic learning".

April 5

Neuromathematics seminar : Bertrand Thirion (INRIA Saclay-Ile-de-France, SP2) presents: "Seeing it all: Convolutional network layers map the function of the human visual system".

6. Annex B: Examples of Event Reports

6.1 Consciousness in humans, animals & robots I: concepts, theories, and neural mechanisms

EITN, 2017 March 9 & 10

Organized by Kathinka Evers (UU, SP12), Cyriel Pennartz (UvA, SP3), Johan F. Storm (UiO, SP3) & Alain Destexhe (UNIC EITN CNRS, SP4**)**

This was the first meeting on consciousness organized by HBP, and for this first conference, we voluntarily opened the workshop to represent different facets of the study of consciousness, such as experimental neuroscience, electrophysiology, neuro-imaging, theoretical simulations, up to neuro-philosophical consequences of understanding consciousness. The conference was extremely interesting to all the participants, and in particular, it appears that the study of consciousness is today materialized by precise experimental protocols and measurements. Similarly, models of consciousness or sensory awareness have tremendously progressed in the last decades, and have clear philophical consequences. The conference also touched the issue of consciousness in artificial systems, machines and robots, an area of research which also progressed tremendously. All of these areas are relevant to HBP, and it was decided to organize a series of workshops with more emphasis on specific aspects, such as the neural correlates of consciousness, the simulation of consciousness, cellular aspects, or neuro-philosophical aspects. It was also apparent that it is very productive to have all areas of research represented, and this combination is necessary to understand consciousness.

One can note that a larger consciousness meeting will be organized by HBP in 2018, with some of the organizers of this workshop.

6.2 Biophysics and genetics of human cortical slice neurons

EITN, 2016 November 28 & 29

Organized by Idan Segev (HUJI, SP4), Huib Mansvelder (VU, SP2), Christof Koch (Allen Institute), Alain Destexhe (CNRS UNIC EITN, SP4)

This event generated three key outcomes:

(i) Reinforced the collaboration between Allen Institute and the several HBP groups that participated in this meeting (SP1, SP2, SP4, SP6) and also with the Beijing Normal University, the University of Szeged and the Australian National University.

(ii) A new collaborative grant was submitted to the NIH with the participation of most of the participants in this meeting

(iii) A decision was taken that the event should be repeated next year and become annual.

(iv) A “standing paper” will be written collectively, calling for enhanced worldwide collaboration between neurobiologists and modellers and neurologists in hospitals, where fresh human tissue is available following brain operations, with the aim to study the genetics, cell types, biophysics, and circuit connectivity, using a variety of modelling approaches.

6.3 Dendritic models on Neuromorphic Hardware

EITN, 2016 September 26

Organized by Karlheinz Meier (UHEI, SP9) & Alain Destexhe (CNRS UNIC EITN, SP4)

The meeting started with a series of talks, successively from Alain Destexhe, Tomasz Gorski and Johannes Schemmel. AD and TG exposed the model of dendritic spike activity in cortical neurons, and the fact that this model can implement an inverse correlation dependence compared to point neuron models. JS described the Heidelberg circuits, plasticity processor and how to integrate multicompartment structures on neuromorphic chips. The model currently foreseen will be able to implement Na spikes, Ca spike and NMDA spikes in the dendrites.

The afternoon discussion that followed treated of diverse aspects such as the level of coarse graining needed to capture neural computations, molecule ? dendrite ? neuron ? Population ? The connection with plasticity was also discussed, as well as the role of dendrites, what is it that we cannot do without dendrites, what is the role of dendritic nonlinearities ? There was also a discussion of network level consequences of dendritic processing, and the need of tools to investigate such networks.

Karheinz Meier and Alain Destexhe concluded the discussion by drawing several directions for the future collaboration. It seems clear that the Heidelberg system will allow in a very near future the simulation of small neural circuits of neurons with dendrites. The implementation of dendritic neuron models is in principle possible with the SpiNNaker system, and if this is confirmed, it would be appropriate for large networks. It was agreed to investigate this in the spiNNaker system through a joint project, as well as to look for the implementation of balanced networks displaying self-sustained asynchronous states.

We decided to organize this type of brainstorm meeting on a regular basis, the next one being planned for February, 2018.