



agence d'évaluation de la recherche  
et de l'enseignement supérieur

Department for the evaluation of  
research units

AERES report on unit:

Unit of Neuroscience Information Complexity

UNIC

Under the supervision of the following  
institutions and research bodies:

Université Paris-Sud

Centre National de la Recherche Scientifique - CNRS



January 2014



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*On behalf of AERES, pursuant to the Decree  
of 3 november 2006<sup>1</sup>,*

- Mr. Didier HOUSSIN, president
- Mr. Pierre GLAUDES, head of the  
evaluation of research units department

*On behalf of the expert committee,*

- Mr. Gilles LAURENT, chair of the  
committee

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<sup>1</sup> The AERES President "signs [...], the evaluation reports, [...] countersigned for each department by the director concerned" (Article 9, paragraph 3 of the Decree n ° 2006-1334 of 3 November 2006, as amended).



## Evaluation report

This report is the result of the evaluation by the experts committee, the composition of which is specified below.

The assessments contained herein are the expression of independent and collegial deliberation of the committee.

Unit name:	Unité de Neurosciences, Information et Complexité
Unit acronym:	UNIC
Label requested:	UPR CNRS
Present no.:	UPR 3293
Name of director (2013-2014):	Mr Yves FREGNAC
Name of Project Leader (2015-2019):	Mr Yves FREGNAC (director) and Mr Daniel SHULZ (co-director)

## Expert committee members

Chair:	Mr Gilles LAURENT, Max Planck Institute for Brain Research, Germany
Experts:	Mr Boris BARBOUR, École des Neurosciences Paris Île-de-France, (representative of CoCNRS)
	Mr Serge CHARPAK, Laboratoire de Neurophysiologie et Nouvelles Microcopies, Paris
	Mr Gustavo DECO, Universita Pompeu Fabra, Spain
	Mr Rémi GERVAIS, Université Claude Bernard Lyon 1 (representative of CoCNRS)
	Mr Gwendal LE MASSON, Neurocentre Magendie, Bordeaux
	Mr Luis Miguel MARTINEZ, Laboratory of Visual Neuroscience, Spain
	Mr Jean-Philippe RANJEVA, École de Médecine de Marseille (representative of CNU)
	Ms Alexa RIEHLE, Institut de Neurosciences de la Timone, Marseille

### Scientific delegate representing the AERES:

Mr Yves TROTTER

### Representatives of the unit's supervising institutions and bodies:

Mr Etienne AUGE, Université Paris-sud

Mr Bernard POULAIN, INSB-CNRS

Mr Eric SIMONI, Université Paris-sud

Mr Alain TREMBLEAU (representative of Doctoral School 3C)



## 1 • Introduction

### History and geographical location of the unit

UNIC is a multidisciplinary research unit at the interface between Physics and Neuroscience, located on the CNRS Campus in Gif-sur-Yvette. Historically, this research unit is the follow-up of the “unité de Neurosciences Intégratives et Computationnelles” (UPR (unité Propre de Recherche) CNRS 2191), which was created in 2000 by the Life Science department of the CNRS. It was re-created in 2009 as a new unité Propre du CNRS, the “unité de Neurosciences, Information et Complexité” (UPR CNRS 3293) with the same acronym “UNIC”. The research combines concepts from information theory, statistical physics, dynamic systems and complexity to guide experimental exploration of sensory processing and perception in thalamic and cortical networks. The present application aims for the renewal of status (unité Propre du CNRS), with the same scientific focus and director.

The techniques carried out at UNIC are based on interdisciplinary approaches: electrophysiological recordings (intracellular sharp and patch recordings, dynamic-clamp in vivo and in vitro, multiple simultaneous single unit recordings and local field-potentials), network functional imaging (two photon and voltage-sensitive dye imaging, combined with optogenetic techniques) and psychophysical measurements, databases of correlates between structure and function, theoretical neuroscience and computational modeling, as well as statistical physics and large scale simulations.

### Management team

UNIC is presently comprised of 35-45 researchers, technicians and students. The personnel is grouped in 6 scientific teams and 1 administrative/technical team. The next 5-year term will see the retirement of one team (not to be examined by the AERES experts committee) replaced by a new team on a related theme (NEW team 3), and the inclusion of a new ATIP team (NEW team 7), which has been created at UNIC in July 2013.

The renewed research unit will act as an individualized UPR as long as it remains on the CNRS Life Science Campus at Gif-sur-Yvette (most likely until 2018). Once the construction of a new building on the Plateau of Saclay (regrouping the Neurosciences labs of the Gif and Orsay region) will be completed and the associated facilities (animal house, networking) will be functional, UNIC will join the new UMR (Neuro-PSI) with the aim to constitute an individualized scientific department (UNIC) in the new consortium NeuroSaclay (Neuro-PSI and Neuro-SPIN). At the present time, the detailed governance of the new UMR is still under discussion and the exact date of the move to Saclay is not yet guaranteed.

For the period on the CNRS Gif Campus (most likely, most of the mandate), UNIC will be directed by Mr Yves FREGNAC (director) and Mr Daniel SHULZ (co-director, who will become director at Mr Yves FREGNAC’s retirement (after 2 years mandate)). This proposal has been made with the agreement of the director of INSB (Ms Catherine JESSUS) and the President of University Paris-Sud (Mr Jacques BITTOUN).



## AERES nomenclature:

SVE1-LS5

## Unit workforce

Unit workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions	2	2
<b>N2:</b> Permanent researchers from Institutions and similar positions	12	14
<b>N3:</b> Other permanent staff (without research duties)	6	7
<b>N4:</b> Other professors (Emeritus Professor, on-contract Professor, etc.)		
<b>N5:</b> Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)	11	19
<b>N6:</b> Other contractual staff (without research duties)	3	3
<b>TOTAL N1 to N6</b>	<b>34</b>	<b>45</b>

Unit workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	11	
Theses defended	13	
Postdoctoral students having spent at least 12 months in the unit*	5	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions		

## 2 • Assessment of the unit

### Strengths and opportunities related to the context

The reviewing committee is unanimously enthusiastic in its evaluation of UNIC's past research and of its plans for the future. Words that come to mind when analysing research at UNIC are: originality, rare synergy, complementarity, breadth, depth, technical excellence. UNIC forms a unique assemblage with enormous added value, a finely tuned research machine with enormous further potential in its future setting at NeuroPSI (i.e., even beyond the forthcoming 5-year funding period). UNIC further amplifies the excellent quality of its teams by the many creative interactions between them. Given the relatively small size of this unit, the return on the investment is huge.

UNIC's scientific output is excellent, of often outstanding quality and originality, intrinsically interdisciplinary in a way rarely seen anywhere in the world.



The range of approaches used by UNIC is very broad. It includes, among others, single cell physiology, synaptic physiology, population recordings, macro and microscopic voltage-sensitive-dye imaging, intrinsic imaging, fluorescent 2-Photon imaging, theory/numerical simulations. The nature and scale of the datasets studied and anticipated are also pushing them towards creating tools for the handling and analysis of large neurobiological datasets. All such tools are being developed as open-source code, and will thus benefit the scientific community at large. This is a huge service. UNIC is also heavily involved, mostly through its computational side, in the recently launched Human Brain Project initiative, indicating the trust placed in it by the European scientific community, and ensuring financial support for some of its activities over the coming years.

Remarkable in UNIC is the synergy between its labs: labs merge theory, numerical simulations, experiments seamlessly; students and postdocs love this fluidity and benefit greatly from this mode of operation. It works well because of several key features: a collective philosophy (concerning scientific questions and approaches) shared by the team leaders; mutual respect and trust; physical proximity of the labs; a deliberate sharing of resources (over half of the unit's funds are placed in a common pool) and techniques; a forceful (in the positive sense), efficient and charismatic leadership; good short, medium and long-term planning; excellent funding with numerous and large European grants; an appropriate size (i.e., neither too small nor too large). This combination of attributes is not easy to achieve and is not the result of chance. UNIC has created a set of conditions to be in a state of creative equilibrium, and it needs to be kept in this state.

UNIC addresses important scientific questions, central to the study of complexity in neuroscience: few labs/research entities in the world are so focused and ready to tackle such questions. These themes also mesh extremely well with the goals enunciated by CNRS's Mr Pierre TAMBOURIN in his June 2010 report to Mr François FILLON, concerning the scientific planning of Saclay ("Neupolis") (e.g., p8: "Dans le chapitre Biologie Systémique, Sciences de la Complexité, est évoqué l'un des enjeux clés pour le future Campus de Saclay, susceptible de faire un site unique au monde en sciences du vivant. Cette ambition vise à une "theorisation du vivant" (objectif 2030). Elle nécessite une démarche aussi profondément interdisciplinaire, qui associera aux sciences de la complexité, mathématiciens de la logique, physiciens, informaticiens, chimistes et biologistes soucieux de produire des données fiables et quantifiées (omiques en particulier)). This leads to many opportunities for the future, to be revisited below.

This experts committee sees wonderful opportunities for new synergistic interactions with other labs in Neuro-PSI and Neuro-SPIN; the scientific bridge between UNIC and NeuroSPIN can already be defined within the existing teams of UNIC (multimodal processing, active vision for example), but could (and should) be reinforced. An example of such opportunities is via the growth of the primate electrophysiology-imaging-human psychophysics axis. The opportunity offered by the CEA facilities is unique and should be exploited.

The unit contains a good distribution of ages and experience: there are two highly promising starting groups, one young computational group with a central role in UNIC, and four senior groups at different stages of their careers; one PI will be retiring at the end of 2014, and a second (the unit's director) in two years; UNIC's current leader will, the experts committee trusts, remain active as emeritus beyond this time. The transition of UNIC's leadership is already organized and supported by all; the passing of the baton in such conditions seems ideal. Finally, one of the new team leaders is a woman; this is, the experts committee believes, a very positive attribute, especially because systems/computational neuroscience is a field where women are very rare. She will act as an important role model.

The experts committee notes that the two newly added teams bring with them new expertise of great value to UNIC: Multi-photon microscopy and optogenetics, for example, are useful immediately and will rapidly benefit the entire unit; the full benefits of new expertise in primate electrophysiology may have to wait till UNIC has moved to Saclay but it will enable the careful development of exploratory experiments in other animal species and psychophysical studies in humans, possible immediately and over the duration of the upcoming funding period.

Though the review committee was asked not to review ATIP team 7, which has just joined UNIC, the experts committee wishes to express here its enthusiastic support of this new addition, and emphasizes the added value it brings to UNIC. The proposed research is exciting, perfectly integrated within the philosophy and themes of UNIC and is certain to benefit both the team and the unit as a whole in very short order.

In conclusion, UNIC appears to us as a humming, well-oiled, high-power engine, with unique scientific and collegial attributes, with already great scientific achievements, but also obvious promise to continue to contribute enormously to neuroscience on the world stage, but also to the future success of the interdisciplinary Saclay plateau project. It is clear to us that such finely tuned, obviously happy, successful and well functioning research unit should be protected and helped. Given the upcoming reorganization of research in Gif and Orsay in preparation for the move in 3+ years, the experts committee strongly recommends that what works in UNIC not be broken, that all the appropriate support be given to this unit during the transition period, and that UNIC's modus operandi be used, wherever appropriate, as a potential source of inspiration for NeuroSACLAY.



## Weaknesses and threats related to the context

While UNIC has enormous strengths, the experts committee believes that it could be made even stronger by a few developments such as, for instance (and only as a suggestion), the use of genetics and molecular biology in well targeted areas. UNIC is aware of this, but the opportunities have apparently not arisen yet or been created. We hope that the coming years will bring, via interactions with other existing labs in Gif and Orsay, or via new scientific recruitments, such new hybrid approaches to UNIC. The experts committee believes that addressing questions of central interest to UNIC with techniques typical of UNIC's approaches in animal model systems more familiar to other labs in the future NeuroPSI (such as classical vertebrate genetic organisms) could serve as a conduit for powerful new interactions, and create links with great scientific impact and social consequences. Placing seed money in one or two such projects might be sufficient incentive to get such collaborations going.

More immediately serious are issues related to the upcoming reorganization, move and retirements at Gif and Saclay. These changes are perceived as potential threats to the well-being and good function of UNIC, and such unease was perceived at all levels of the unit (with the unit's leaders, the PIs, scientists, engineers, postdocs, graduate students, technical staff and administrative assistants).

The major unresolved issue with a negative impact on UNIC is that of the future governing structure of NeuroPSI, and thus that of the operational independence of UNIC in the coming years. UNIC feels threatened by models of NeuroPSI governance that could lead to a loss of UNIC's scientific, financial, administrative and personnel-related independence and efficiency (see below). All these issues depend critically on whether NeuroPSI will operate on a collegial or pyramidal scheme. The experts committee notes that the discussions between the involved parties (the four future departmental units of NeuroPSI, including UNIC, and the project leader) aiming at defining this scheme are at a critical juncture. It appears to us that dialog between some of the parties has become extremely difficult, and trust has been lost. The experts committee considers imperative that these issues be resolved quickly. The experts committee suggests that the CNRS involves itself in these negotiations, for example through the participation of a senior, experienced, and neutral wise person in all the critical negotiations concerning future governance, and by employing international standards of procedure (e.g., rules of order, minute-taking and approval by participants, adherence to agreed-upon decisions). Without implying any bad faith on the part of any of the participants, organising a successful merger and move on this scale with the willing commitment of those involved requires a great deal of painstaking planning, negotiation and attention to detail; all those involved in the transformation of science in the south of Paris are encouraged to focus on these requirements. The experts committee sees no fundamental reason why an agreement satisfactory to all should not be reached. While UNIC's present modus operandi may not be the only one in which its members could continue to be successful, imposing something that is explicitly not wanted risks destroying their present equilibrium and would therefore be counterproductive. Once this issue has been resolved satisfactorily, the experts committee trusts that all other important decisions about the future organization in Saclay will be greatly facilitated.

A second set of problems (clearly related to the first) concerns operational decisions for future operations in Saclay. While seemingly important only over the long term, they actually impact UNIC's viability already today. They do so at two levels: at a psychological one by placing everyone in an unnecessary state of anxiety and uncertainty; at an operational one, by delaying critical decisions concerning human resource allocations. Among those, the issues of key Information Technology and Administrative personnel are paramount. For example, UNIC's head IT engineer, winner of the CNRS Crystal Medal and a highly valued member of UNIC, will retire in two years. Given the heavily computational nature of research at UNIC, this expertise is obviously critical. It is also very important that the expertise of someone about to retire be transmitted to his/her replacement, and hence, that a replacement be hired very quickly (allowing temporal overlap) and the corresponding position attributed to UNIC.

The experts committee also noted that UNIC, as a research unit of the CNRS, has a rather unstable if not precarious administrative infrastructure headed by two AIs on temporary contracts. One of them is on soft money from grant overheads, and the second on a non-permanent contract about to end by law (Sauvadet) in less than 2 years. If this person's position is not stabilized in short order, her knowledge will be lost and UNIC will need to train a new person yet. This, again, seems unnecessary and counterproductive. The experts committee therefore recommends that the administrative support of UNIC be brought up to the standards that a unit of this size and quality deserves.

A third issue of note is that of the upcoming transition of leadership. The present director of UNIC has very rare leadership qualities, a unique personality and drive, a central intellectual position in UNIC, and critical involvement in European funding for computational neuroscience. He will be hard if not impossible to replace as a leader and everyone realizes this, including his future successor. This review committee, however, wants to express its full support of, and confidence in, the director-nominee. It is particularly pleasing to note that UNIC's PIs and personnel are also enthusiastic about this choice. The facts that the present and future directors have already worked together



for many years, that the future director is already co-director, and that the present director will remain as emeritus for some years, also make for an optimal transition. The graph of internal collaborations within UNIC may evolve over the coming years as a result of this turn-over, and this is not to be feared. UNIC must be a dynamic entity, generating new internal and external links as it evolves. The future looks bright.

### Recommendations

The main recommendations to UNIC are simple:

- keep going with the science: your interdisciplinary approach is unique, precious, powerful and should continue;

- think about the future (move to saclay, reorganization) in a positive way. there is great potential for new and very exciting science, and even if scientific interactions with your future neighbors are rare at present, this move provides new opportunities. they should be exploited, and thought about now;

- apply for ERC grants, at all levels (junior to senior). You are in an excellent position to garner such funding. This is important also because much of the present and future funding (e.g., from HBP) may not support experimental projects as generously as computational ones;

- build stronger ties with the Université d'Orsay. This would be to everybody's advantage and is likely to become a necessity in the future. In particular, NeuroSaclay offers new possibilities for novel Masters and PhD programs, e.g., at the interfaces of neuroscience, biology, the science of complexity, taking advantage of immense strengths in the area.

The main recommendations at the institutional level are:

- support of an outstanding research unit that works so well should be continued (and increased as much as is possible). UNIC is a rare construction, that works not only because of the quality of its members, but also thanks to powerful synergies, producing considerable added value. Such an equilibrium (I) is not easy to achieve, (II) was not arrived at by chance, and (III) is relatively fragile;

- UNIC should be helped to resolve all key issues concerning the upcoming move and reorganization into NeuroPSI in Orsay. Once a clear and agreed-upon governance scheme for NeuroPSI has been arrived at, many operational details will likely resolve themselves by consent;

- speedy solutions should be provided to the few, but key, human-resource problems (IT and administration, see above) at UNIC.





### 3 • Detailed assessments

Note: this assessment will not summarize or repeat the individual assessments addressed in part 4 below (team by team analysis). Rather, it will focus solely on those aspects that concern the unit as a whole, ie on the added value provided by the particular synergistic nature of UNIC.

#### Assessment of scientific quality and outputs

The quality of UNIC's published output is very high. The science produced is highly quantitative, original and creative, forms a coherent whole and appears in many top journals of high impact and visibility. Productivity is good, especially for work that is often of great technical or intellectual novelty, thus requiring constant time investment. The unit produced many influential reviews and books.

A high fraction of the papers produced by UNIC labs are the results of collaborative efforts, reflecting the very high internal interactivity of this unit. What is notable is that this work would not exist, were these labs not working together on a common set of problems. That is, the expertise needed to generate this work is spread over all participating parties and the results emerge from these collaborations.

Research is original, and often the results of risky technical or intellectual ventures. The whisker "Matrix" stimulator for example, is a very original technical achievement, made possible by an excellent mechanical workshop infrastructure, and this investment has not only already paid off, but has led to new collaborations between UNIC and other labs in the Paris area. The merging of the dynamic clamp technique with real-time numerical simulations is also very creative and important. These examples are only selected as illustrations; many other could be given. In short, new science emerges from all the potential pairings within UNIC.

#### Assessment of the unit's academic reputation and appeal

UNIC has an outstanding reputation on the European and world stage. This is particularly notable in the central position and leading roles of UNIC labs in many collaborative European efforts (e.g., FET (Future and Emerging Technologies) projects, HBP (Human Brain Project)), and the excellent level of funding that results from these efforts. The recent recruitments made at UNIC will only reinforce this visibility and reputation (and are the proof of UNIC's great attractiveness as a place to do research).

The appeal of UNIC on the world stage is also apparent in its ability to recruit top graduate students (e.g., from top schools in France) from France and abroad. UNIC is very selective in its admission process, and it shows. This is how it should be. Those students go on to postdocs in top places in the world and successful academic careers.

UNIC will also likely increasingly play an important role in creating computational platforms and software for the handling and analysis of large datasets. All this is being done in open-source formats and is thus of great value to the field.

Finally, the visibility of UNIC can be seen in the high citation rate of many of its top publications.

#### Assessment of the unit's interaction with the social, economic and cultural environment

UNIC makes key contributions at a number of levels. First, it provides a model for successful collaborative science. This contribution should not be overlooked. Second, UNIC and several of its members play key roles in international scientific projects with great visibility and potential impact on the non scientific public (e.g., HBP projects, neuromorphic approaches to computing). Third, many UNIC PIs play an important role in making neuroscience and computational neuroscience accessible to and understandable by the public via talks and popularizing publications. Finally, while it is still too early to say, the potential impact of neuromorphic computing approaches (the development and maturation of which UNIC contributes significantly to) could be immense. The future will tell, but this investment in off-the-beaten-track interdisciplinary science is astute.



## Assessment of the unit's organisation and life

This aspect is certainly one of the central and key attributes of UNIC. UNIC is a lab of labs, and it is sometimes difficult to say where one team starts and where the other begins. Students and postdocs move seamlessly between teams, work together in close quarters; theorists and modelers get to see experiments, experimenters get to run simulations or play key roles in their design. All this cross-fertilization works, because people get along, share the same philosophy, and strive to make it work together. This approach is also apparent in the commitment of the administrative support personnel. The hierarchical structure is globally transparent and everyone values the reigning "esprit de famille". As emphasized in section 2, one does not arrive at this happy state of affairs just by chance. It is the result of an active search process, and the positive state of this unit should be fostered.

The experts committee notes also that this synergistic organisation has practical advantages of economy: the interactive nature of the science and the culture of collaboration produces more "bang for the buck", thus resulting in a strong impact for what is in the end, a relatively small-sized CNRS unit. This efficiency is another excellent attribute.

UNIC has 7 researchers with permanent CNRS or University MCU/prof positions, and 1 special case (IR position, co-leader of team 1). The positions are: 2 CR1 (CNRS), 1 CR2 (CNRS), 1 MCU, 1 assistant professor and 2 "chercheurs" in CDI; due to the Sauvadet Law, these latter two scientists were granted a permanent position after 6 years of postdoc. One of them may be interested in applying for a more official research position, such as CR.

Leadership of team 1 after the team leader retirement in two years has already been arranged: the designated team leader is presently an IR in that team and can officially become its leader. However, a conventional researcher's position (e.g., CR, DR, University assistant professor or full Professor) might, in the long run, be more desirable for him and his team. One solution would be for the designate to obtain his HDR, improve his publication record, and apply for this change of title/position. He is aware of this issue.

The global atmosphere within the unit is quite good; the researchers feel free to develop their own scientific themes and are free to publish within their team and outside, through collaboration. Some of them have more ambitious objectives, such as becoming team leaders, within UNIC or elsewhere sometime in the future.

They all welcome the co-director taking over from the current director after his retirement. This decision is consensual, and has already been discussed with all members of the unit.

They all seem very concerned by the upcoming move to Saclay. The uncertainty concerning the governance and future reorganisation of the lab and the lack of clarity in the process leading to these changes, together cause general anxiety. They fear the creation of a hierarchical structure, which they do not desire, and a lack of technical support from the CNRS.

On the brighter side, they see the future Neuro-Saclay campus as an opportunity to broaden the scope of their research: new scientific interactions, move towards new experimental model systems such as non-human primates and human.

They are aware of the need to take responsibility in student training, of the need to obtain their "HDR", and to get their own grants (e.g., from ANR).

The discussion with the experts committee was open and free. Our feeling is that the researchers and teaching assistant professor are quite happy with the on-going running and organization of the lab, and well aware of the challenges they will face in the near future.

## Assessment of the unit's involvement in training through research

The global assessment is outstanding. Students are of outstanding quality, their work creative and deep, and their ability to secure postdoc positions at top places excellent in the world (Europe and USA) noteworthy. This emphasizes the quality of their work, and indicates the reputation of UNIC and of its PIs.

Due to a number of causes peculiar to research in the Paris area (geographical location of Gif, nature of research at Orsay, high density of the neuroscience community in central Paris), many of the graduate students are presently enrolled at Paris 6 rather than Paris 11 as one might have assumed. How things will evolve when UNIC moves to Saclay needs to be clarified in the coming years.



The reviewing committee was informed by letter from the director of the École Doctorale ED3C of a relatively high proportion of long PhDs (over the normally assigned 3-4 years). This problem seems to belong to the past: none of the presently enrolled PhD students are in or seem likely to find themselves in this situation (see paragraph below). Finally, the committee notes that some of the experimental projects in which students can be engaged require considerable technical skills, often difficult to acquire in much less than 1-2 years. In addition, some projects are carried out with precious animals that may have undergone long behavioral training. If something unfortunate happens to one of these animals, a project can be significantly delayed. There are thus, every once in a while, legitimate reasons for the extension of a PhD beyond the required norm. As indicated above and below, however, worries are not warranted at this point.

The entire experts committee met the doctoral and post-doctoral students for about 1 hour. Six PhD students and 10 post-doctoral students attended. Among the 6 students, 2 are in their 1<sup>st</sup> year, 2 in their 2<sup>nd</sup> year and 2 in their 4<sup>th</sup> year and planning to defend. This is a well-balanced distribution with reasonable maximal thesis duration.

The students expressed the fact that they are very pleased and excited to belong to this laboratory. They particularly appreciate the large network of international collaborations developed by the laboratory, allowing them to meet international scientists regularly. These are good opportunities for them to establish their own network for their future career. They also appreciate the fact that their own research involves collaborations among them, in the spirit of inter-disciplinary research that characterizes the laboratory. It was mentioned that the retirement in 2 years of the IT engineer in charge of software development could be a problem.

In conclusion, the experts committee underlines the excellence of training and expresses no particular concern for graduate students and postdocs, with the single recommendation that vigilance be maintained regarding thesis and postdoc durations.

### Assessment of the strategy and the five-year plan

The proposed plan for the forthcoming funding period is outstanding. It builds on past and present successes and extends in many exciting new directions, some of them appropriately risky (e.g. active vision, magnetron project, multimodal integration). Lastly, it invests in the future by the recent recruitment of new PIs, and lays the groundwork for future strategic hires of great significance for the success of Neuro-Saclay (e.g. primate physiology and imaging/human perception). The visibility of the computational core of UNIC will be enhanced by its development of open source data handling platforms and by the new institute for Theoretical Neuroscience funded by HBP (to be situated temporarily in Paris and then moved to Saclay). The important leadership succession issues have been worked out and the changes will be progressive. The proactive organisation of UNIC for the future is very impressive.

As indicated in section 2, there are significant, but highly resolvable threats to the integrity and success of UNIC, linked to the scientific reorganization at Gif, Orsay and Saclay. The experts committee thus strongly recommends that supervisory institutions take an active role in helping UNIC and its partners resolve them so as to guarantee the local and global success of Neuro-Saclay. Even if relatively small, UNIC has a big and critical role to play in Saclay; it is ready, able and eager to play it.



## 4 • Team-by-team analysis

**Team 1:** Visual Cognisciences: functional integration and synaptic plasticity in the mammalian visual cortex

Name of team leader: Mr Yves FREGNAC

### Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions	(0.25)	(0.25)
<b>N2:</b> Permanent EPST or EPIC researchers and similar positions	1	1
<b>N3:</b> Other permanent staff (without research duties)	1	1
<b>N4:</b> Other professors (PREM, ECC, etc.)	2	2
<b>N5:</b> Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	2	2
<b>N6:</b> Other contractual staff (without research duties)		
<b>TOTAL N1 to N6</b>	<b>6 (6,25)</b>	<b>6 (6,25)</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students 1 co-supervision with Team 6, 3 Co-supervision with G. Peyré (ERC))	6	
Theses defended	9	
Postdoctoral students having spent at least 12 months in the unit	2	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	1	2

### • Detailed assessments

#### Assessment of scientific quality and outputs

Excellent science and output (publications).

There is a level of integration across disciplines which is rarely found even within the most high-ranking international research institutions and a very good level of interaction between the different labs.



The team leader is a world leader in the field of primary sensory research (experiments at different spatio-temporal scales and theory).

Beyond the many important and consistent scientific contributions of the director, his Lab is generally notable for its technological innovation in the service of world-class science, for example, introducing the new method of functional synaptic imaging, or the statistics manipulations of the context to explore the role of lateral connexions.

As such, they seamlessly combine sophisticated experimental techniques covering different scales (optical imaging, single and multiple cell recordings, LFP, etc) and computational models, computer vision, and other novel technologies with behavioral psychophysics to present a world-class research program.

The Mr Yves FREGNAC lab has a high reputation as an international leader in the field of systems neuroscience. The lab has remarkable facilities and produced technical achievements that enable experiments that are simply not possible elsewhere in the world. During the past three years, the scientific momentum of the department has continued unabated, and perhaps even increased, ensuring continued international leadership in integrative neuroscience.

### Assessment of the unit's academic reputation and appeal

The Lab's members are producing outstanding research that is appearing in the top journals and conferences (Nature Neuroscience reviews, Journal of Neuroscience, Nature Neuroscience, Physical review letters, Plos computational Biology, Frontiers in synaptic Neuroscience, etc) that reinforces the already gained reputation world wide. The Lab is considered one of the leading labs in primary sensor research world wide.

### Assessment of the unit's interaction with the social, economic and cultural environment

Many activities in science outreach and translational research (e.g. integrated projects for establishing a solid neuromorphic transfer, collaborations with computer vision, etc).

The lab has a superb track record with respect to obtaining outside funding.

### Assessment of the unit's organisation and life

Cross-talk between different labs, scientists, disciplines. Lean organisation. "Good" mix of experimentalist and theoreticians.

### Assessment of the unit's involvement in training through research

The lab remains a world leader in training new scientists interested in computational and experimental neurophysiological approaches to perception, as well as in developing new, highly-creative tools for studying these problems in increasingly more ecological contexts.

students and post-docs were very productive and were successfully developing their own independent research programs.

The lab also continues to be one of the most prestigious destinations for those studying sensory processing, experimentally or theoretically.

### Assessment of the strategy and the five-year plan

Consistent, realistic and concrete continuation of the line of research around the main three subjects of the lab.



## Conclusion

### Outstanding lab

- **Strengths and opportunities:**

Integration of different techniques and theory in two very focused, relevant problems:

- I) sensory processing given a statistical context and local lateral interactions;
- II) in vivo plasticity.

This lab can radically alter the dominant view (feed-forward) of sensory processing in cerebral cortex.

HBP support will be a great help.

- **Weaknesses and threats:**

Possible threats in the long term, linked to uncertainty of organization of NeuroSaclay.

- **Recommendations:**

Follow research plans as defined.

Work to preserve the organization of the lab and the social/scientific geography of UNIC.



**Team 2:** SomatoSensory Processing, Neuromodulation & Plasticity

Name of team leader: Mr Daniel SHULZ

### Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	3	3
N3: Other permanent staff (without research duties)		
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		1
N6: Other contractual staff (without research duties)		
<b>TOTAL N1 to N6</b>	<b>3</b>	<b>4</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	2	
Theses defended	5	
Postdoctoral students having spent at least 12 months in the unit	1	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	1	3

- Detailed assessments

#### Assessment of scientific quality and outputs

The research in the group of Mr Daniel SHULZ is focused on the representation of sensory information in the cortex, specifically of the rodent whisker system in the barrel cortex. As part of an ambitious and detailed program, the group has developed techniques to investigate all stages of sensory processing in this modality. In this review period, the highlights among these developments are the characterization of whisker mechanical properties (Boubenec et al., 2012), the construction of a multi-whisker stimulator (Jacob et al., 2010) and installation of voltage-sensitive dye measurements. The multi-whisker stimulator has already borne fruit in the form of significant papers demonstrating multi-whisker receptive fields at cortical and thalamic levels (Jacob et al., 2008; Estebanez et al., 2013). The research of the group is quite interdisciplinary, at both technical and interpretational levels, and this



makes a strong contribution to the overall output of the group, which is of very high quality (Neuron, Nature Neuroscience, J. Neuroscience, Frontiers in Synaptic Neuroscience..).

### Assessment of the unit's academic reputation and appeal

The group leader is very active in organizing conferences, both in France and abroad. In the review period, he organized 6 international and 4 national meetings. He has in turn been invited to 20 international conferences. He is also coordinator of a Franco-Latin American research network (Argentina, Brazil, Chili, Uruguay). The research of the group is well funded (ANR, EU grants), including by grants coordinated by the team leader.

### Assessment of the unit's interaction with the social, economic and cultural environment

In the review period, the group leader has given 2 public lectures, obtained a prize from the science popularisation journal "La Recherche". A patent has also been obtained on the multi-whisker stimulator.

### Assessment of the unit's organisation and life

The group leader will be co-director then director of the unit. There is ample evidence of active leadership of his group, notably in the funding raised, the students and post-docs trained and the publication record.

### Assessment of the unit's involvement in training through research

The group has a significant teaching activity, contributing some 50 hours/year at several parisian institutes and universities. The team has trained 6 PhD and 8 masters students in the review period.

### Assessment of the strategy and the five-year plan

The ambitious project builds on and extends the technical development that has already begun to produce innovative and significant new results, which offers a high degree of confidence that the group will be successful in advancing our knowledge of sensory coding in cerebral cortex.

### Conclusion

- Strengths and opportunities:

A team with an ambitious and attractive research programme with a deserved international reputation. High risk interdisciplinary developments have already proved productive.

- Weaknesses and threats:

None detected.

- Recommendations:

No change required.





**NEW Team 3:** From action planning to sensory processing and perception

Name of team leader: Ms Xoana G. TRONCOSO

### Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions		
<b>N2:</b> Permanent EPST or EPIC researchers and similar positions		3
<b>N3:</b> Other permanent staff (without research duties)		
<b>N4:</b> Other professors (PREM, ECC, etc.)		
<b>N5:</b> Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		1
<b>N6:</b> Other contractual staff (without research duties)		
<b>TOTAL N1 to N6</b>		<b>4</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended		
Postdoctoral students having spent at least 12 months in the unit		
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions		1

### • Detailed assessments

#### Assessment of scientific quality and outputs

This project team could emerge provided that Dr Xoana TRONCOSO obtains a permanent researcher position. Consequently, the team cannot be fully evaluated yet. However, the training and publications of the group leader indicate a very promising future.

#### Assessment of the unit's academic reputation and appeal

Because this is a new team in the process of establishing itself, there are no data to comment on this point.



### Assessment of the unit's interaction with the social, economic and cultural environment

Because this is a new team in the process of establishing itself, there are no data to comment on this point.

### Assessment of the unit's organisation and life

Because this is a new team in the process of establishing itself, there are no data to comment on this point.

### Assessment of the unit's involvement in training through research

Because this is a new team in the process of establishing itself, there are no data to comment on this point.

### Assessment of the strategy and the five-year plan

The project proposed by this new team is a missing link of the unit's working plan: connecting perception with saccadic and fixational eye movement behavior. It is very promising and has a clear and logical working plan, which is in part dictated by the existing experimental environment. It thus starts with an anesthetized cat preparation to study sub-threshold synaptic integration during natural vision, in collaboration with Team 1, by adding human visual psychophysics and imaging (fMRI). The group leader is very familiar with every one of these experimental approaches. The group's studies will be logically extended after the move to Saclay to electrophysiological studies in the awake behaving monkey. This needs a well-established infrastructure and the know-how in animal care and animal training. This will be provided by the primate facility at NeuroSPIN. This project thus dovetails naturally with the new "Plateau de Saclay" neuroscience infrastructure planned to open in 2018.

### Conclusion

- **Strengths and opportunities:**

The group leader has been hired to expand UNIC's reach towards human and non-human primate neuroscience (visual psychophysics, imaging and electrophysiology). The group leader brings expertise in these domains that does not exist now in UNIC and as such, is great added value for the unit. One can imagine also that the group will be an asset (indeed probably even a necessity), when building the scientific bridges between Neuro-PSI and the CEA's Neuro-SPIN in Saclay. Another important point is that the group leader combines research with promoting transfer of knowledge to the public, both nationally and European wide. The appointment of the group leader thus seems to carry strategic weight for the future.

- **Weaknesses and threats:**

The leader of team 3 does not yet have a permanent position or an HDR, and will need to establish a network of local and (inter)national collaborations and to prove her independence and excellence. Two of the three team-leaders with whom the group interacts will retire in the near future. One of the main approaches that the group leader used previously—single-neuron recording and intra-cortical microstimulation in the awake behaving monkey—is not available at UNIC at present. The experts committee is fully confident, however, that these hurdles will be met with success in the coming few years and once the unit moves to Saclay, enabling primate physiology. UNIC appears fully committed to providing the infrastructure and means necessary for this team before and after the move.

- **Recommendations:**

Given that this proposed team is just getting established, an evaluation of the team's accomplished research cannot yet be provided. It is clear, however, that the candidate has an excellent scientific multidisciplinary background. Her expertise fits the unit's overarching goals perfectly. It can be hoped and trusted that Dr Xoana TRONCOSO will be successful in obtaining a permanent CNRS position shortly, but it could legitimately be asked whether it might be more efficient for her to start establishing her projects in a pre-existing team before building her own independent group. Given the highly supportive and interactive nature of UNIC, this formal and local issue is of relatively minor importance.



**Team 4:** Neurocybernetics of thalamic and cortical networks

Name of team leader: Mr Thierry BAL

**Workforce**

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions		
<b>N2:</b> Permanent EPST or EPIC researchers and similar positions	2	2
<b>N3:</b> Other permanent staff (without research duties)		
<b>N4:</b> Other professors (PREM, ECC, etc.)		
<b>N5:</b> Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	2
<b>N6:</b> Other contractual staff (without research duties)		
<b>TOTAL N1 to N6</b>	<b>3</b>	<b>4</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students (co-supervision with Team 5)	1	
Theses defended	1	
Postdoctoral students having spent at least 12 months in the unit	1	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	1	1

- Detailed assessments**

**Assessment of scientific quality and outputs**

This team has a strong experimental core on thalamo-cortical interactions, and their role in cortical activity in awake and attentive states, continuing the work started as a postdoc with Mr David Mc CORMICK at Yale university. The continued close interaction with that lab has very positive consequences (transfer of technical know-how among them).

The approaches and technical designs are of great originality with very strong emphasis on technique development, for many years centered on dynamic clamp, with recent addition of Active Electrode Compensation (developed with team 5), now adding High Resolution VSD imaging, magnetropes, local LFP measurements.



There are new forays into homeostatic synaptic plasticity at neuromuscular junction (NMJ), with precise experimental predictions to be tested in future funding period.

The future plans address local integrative issues (cellular and subcellular); others are more distributed issues (via Voltage-Sensitive dyes (VSDI) or low field potentials (lfps) and Magnetic Fields (Mfs).

The team has published 11 research publications in the last 5 year period, 9 of which collaborative within UNIC, 2 where PI is senior author. The total number of publications is up from what it was in previous funding period. Good journals (J. Neuroscience, Plos Comput Biol, J. Physiol (London), Neuron? etc). Co-edited one important book on Dynamic Clamp. One manuscript is submitted on homosynaptic regulation of activity at the nmj.

The team is small, by design, but its interests are diversified; this modus operandi works well in the highly interactive context of UNIC, and with many other external collaborative projects.

### Assessment of the unit's academic reputation and appeal

This is a small group known for the high quality of its work, and its synergistic value. It is well appreciated outside of UNIC, and internationally, for its technical know-how and appreciation of detail.

### Assessment of the unit's interaction with the social, economic and cultural environment

The team leader co-edited a technical book on dynamic clamp, of great value for the field.

The team's focus on research could be to the detriment of meeting and external activities. This is probably wise given the size of the group.

Some teaching: Supelec, Université Pierre et Marie Curie, Université Bordeaux 2.

### Assessment of the unit's organisation and life

This is a small but highly interactive team, as confirmed in collaborative publications within and outside UNIC. The lab could benefit from growing a bit to reach critical mass. The efficiency of the group appears highly sensitive to small fluctuations of personnel.

### Assessment of the unit's involvement in training through research

Again, this team is small, with few postdocs or PhDs. Team 4 produced one PhD in the last funding period, and is advising one at present. The PI also participated in 2 PhD review committees.

### Assessment of the strategy and the five-year plan

The biological questions addressed are interesting ones: local dendritic release in nRT interneurons, subcellular organization of nonlinear properties in cortical interneurons, role of T-type  $Ca^{++}$  channels in regulating thalamic neuron transfer functions, diversity of transfer functions, mechanisms of homeostasis at nmj. The questions have the right mix of description and experimental manipulation, and have the potential to illuminate the more general issues of Thalamo-Cortical transfer in new ways. The range of questions may appear a bit large for a lab this size but it is hoped the group can grow.

The technical focus continues in collaboration with other labs (in particular with Team 5), continuing a very fruitful approach (theory, simulation, experiment). It will address issues related to the generation of local field potentials, of magnetic fields, and will combine AEC (Active Electrode Compensation) with voltage clamp. This would be a very useful tool for in vivo voltage clamp. Local magnetic field recordings are also a very interesting new foray.

While the scope seems to exceed the physical potential of the lab in its present state, it is not necessarily a bad idea to have a number of projects in mind. Those which are collaborative and closer to technical development, will probably receive man-power from the collaborating lab(s). The team is encouraged to grow some, and to increase the fraction of its publications as senior author.



## Conclusion

An excellent and very original lab, small by design, with unique approaches, rare in the world, and great local and national value.

- **Strengths and opportunities:**

Very collaborative, solid and reliable scientific and technical linkage to Mr David Mc CORMICK lab at Yale, clever experimental designs, very valuable presence in UNIC.

- **Weaknesses and threats:**

Small lab, exposed to small variations in personnel. Plan is ambitious, but should probably prioritize and continue as progress ensues.

- **Recommendations:**

Approve funding and research plan.

Suggest focus and moderate growth (maybe in coordination with other PIs within UNIC): Examine how this might be feasible.

Try and publish more senior author papers, even if collaborative: i.e., wear PI hat more often, increase leadership role.



**Team 5 :** Computational Neuroscience : Dynamics of thalamic and cortical networks

**Name of team leader:** Mr Alain DESTEXHE

### Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions		
<b>N2:</b> Permanent EPST or EPIC researchers and similar positions	3	3
<b>N3:</b> Other permanent staff (without research duties)		
<b>N4:</b> Other professors (PREM, ECC, etc.)		
<b>N5:</b> Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	3	4
<b>N6:</b> Other contractual staff (without research duties)		2
<b>TOTAL N1 to N6</b>	<b>6</b>	<b>9</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students (1 co-supervision with Team 4)	3	
Theses defended	2	
Postdoctoral students having spent at least 12 months in the unit	4	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	1	1

## • Detailed assessments

### Assessment of scientific quality and outputs

The productivity of the group, measured in terms of scientific publications is outstanding. After a steady publication rate, the past year has seen a remarkable increase, many of them in high impact journals (PNAS, Physical Review letters, Current Opinion Neurobiology, Nature Neuroscience..).

In summary, the team continues to be outstanding in all aspects of scientific discovery, productivity and technical development. The lab's expanded interest in linking different time and spatial scales has already provided a new conceptual framework. Studies of the role of internal spontaneous state on task processing are beginning to yield important results, particularly concerning the role of noise and its regulation of global brain states and information processing. The scientific community will benefit from the work of this laboratory for many years to come.



### Assessment of the unit's academic reputation and appeal

The team has an excellent reputation world-wide due to their advances in linking different time and spatial scales (intracellular recordings, VSD, LFP, EEG, MEG), mean-field extensions, state-dependent computation, dynamic-clamp and thalamo-cortical interaction.

### Assessment of the unit's interaction with the social, economic and cultural environment

Active participation in popularization of neuroscience (theater, music, press).

Active acquisition of European funding with the consequent participation in relevant and visible integrative projects, e.g. the Flagship HBP, BrainScales, Magnetodes, etc.

### Assessment of the unit's organisation and life

The team seems to be structured and lead as a "research paradise", with many cross-cooperations between the members, between internal labs and with external recognized international labs.

### Assessment of the unit's involvement in training through research

They generated a young generation of excellent PhD/Post-docs with a solid integrative view of experimental and theoretical system neuroscience.

Active involvement in teaching and in particular in international school in neurosciences.

### Assessment of the strategy and the five-year plan

The plan is consistent but remains extremely innovative. The idea of linking new microscopic measurements of magnetic field with macroscopic models and MEG measurements is particularly liked.

### Conclusion

Excellent world-leading lab.

- **Strengths and opportunities:**

Integration of experiments and theory (dynamical clamp is a good example), innovative theoretical developments (second order mean-field, etc.).

Could become one of the most relevant and leading theoretical group in Europe.

- **Weaknesses and threats:**

Potential disruption of group dynamics and intra-UNIC interactions when PI also leads HBP's Institute for Theoretical neuroscience, while the latter is located in central Paris.

- **Recommendations:**

Research plan and team: solid and consistent.

Work hard towards keeping the team united in the phase during which the HBP funded Institute for theoretical neuroscience is in central Paris, and the lab in Gif. All will be regrouped once in Saclay.



**Team 6:** Neuroinformatics for data-driven modeling and Neuromorphic computing

Name of team leader: Mr Andrew DAVISON

### Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions		
<b>N2:</b> Permanent EPST or EPIC researchers and similar positions	1	1
<b>N3:</b> Other permanent staff (without research duties)	1	
<b>N4:</b> Other professors (PREM, ECC, etc.)		
<b>N5:</b> Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	2	3
<b>N6:</b> Other contractual staff (without research duties)		
<b>TOTAL N1 to N6</b>	<b>4</b>	<b>4</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students(co-supervision Team 1)	1	
Theses defended	1	
Postdoctoral researchers having spent at least 12 months in the unit (Co-supervision with Team 1)	1	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	1 (UK PhD)	1

## • Detailed assessments

### Assessment of scientific quality and outputs

This team addresses extremely important research topics yet largely underdeveloped in France. The field of Neuro-informatics aims to develop new frameworks and tools to organize, analyze and integrate the enormous amounts of data produced by experiments and computational models. In this field, the team has certainly achieved many important steps that are internationally recognized as major results.

The scientific production is of excellent quality, in specialized but highly rated journals (J. Neuroscience, Biological Cybernetics, Nature, Computing in Science and Engineering, Frontiers in Neuroinformatics, etc.). The techniques they have developed are of great importance for such an interdisciplinary unit because all the other teams will potentially benefit from them to extract and analyze their results efficiently. From the results obtained





and from the extension of these themes in the project, new techniques will arise (such as the use of neuromorphic hardware) and experimental results will be more extensively exploited and analyzed.

### Assessment of the unit's academic reputation and appeal

Many of the tools developed are already coming from large EU FET grants and Mr Andrew DAVISON is leading many of the essential work packages for software development in those efforts (FACETS or BrainScaleS). Those projects are recognized as leading EU project in the field of large-brain-network-modeling. The open-source strategy allows anyone to download, install and test the software tools developed. The success of the PyNN framework is a good example of an original and successful software package that is now downloaded by many labs around the world.

### Assessment of the unit's interaction with the social, economic and cultural environment

The field of neuro-informatics is new and fills a real need. The team has been successful at developing computer tools and environments to improve data processing under stable and reproducible conditions. Not many teams around the world work on such critical data processing and standardization issues, and this one is of the best. The collaborations developed within the major EU projects are essential. This team has or will have working collaborations with every single team of UNIC and therefore, it is an essential node in this unit, with a critical role to play in standardization of data formats and interplay between labs.

### Assessment of the unit's organization and life

This team was created in 2010, and is quite small (only one permanent researcher). One might think that, considering the importance of such technical development and code writing, this function could be fulfilled by a permanent engineer position (IE or IR) in a service platform. But the attribution of this function to a proper scientific team is entirely justified by the fact that the problems it strives to solve are intricately embedded in the neurobiology and its details. The team leader is not just a writer of elaborate code. His work is devoted, ultimately, to deciphering cortical function and to solving scientific problems. Most of the other team members have been hired through the EU grants and are devoted to specific tasks within the team's workplan. The team is already very well integrated within UNIC, but it is expected that collaborations with specific UNIC teams such as team number 6, on issues of visual cortex modeling and cortico-thalamic interactions will increase. Enhanced collaboration with experimentalists could lead to major results and publication (such as the Nature paper published in 2013, research carried outside of UNIC).

### Assessment of the unit's involvement in training through research

The team is regularly involved in Doctoral training with already one defended thesis and one enrolled graduate student. They also have postdoctoral researchers and researchers under contract.

### Assessment of the strategy and the five-year plan

The project presented for the next five years is an extension of present efforts, with an increased emphasis on large scale modeling of visual cortex. As the creation of this team is recent, it appears proper to focus and deepen research in this domain before diversifying. The team's strategy therefore appears good to us.

### Conclusion

This team is excellent, renowned and publishes well. The themes developed are a central part of the scientific direction of UNIC. It will likely strengthen its interactions with the other teams of the lab. It should work towards obtaining a permanent computer engineer to maintain his high level of (software) production.

- **Strengths and opportunities:**

Addresses fundamental topics essential for the technical and scientific coherence of UNIC.

High level of scientific production.

Excellent collaborative network; Mr Andrew DAVISON is the national coordinator of the INCF and the HBP Neuroinformatics Platform.



Coherent project for the next five years.

- **Weaknesses and threats:**

Small team, with only one permanent researcher.

Need to spread its own work (on simulator-independent models and reproducible research) within UNIC.

- **Recommendations:**

Recruitment of a permanent engineer.

Enhance collaborative work with experimentalist inside and outside UNIC.

Apply for ANR support.

PI should work towards obtaining HDR.



**Team 7 ( ATIP ):** Cortical dynamics and multisensory processing

**Name of team leader:** Mr Brice BATHÉLLIER

### Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
<b>N1:</b> Permanent professors and similar positions		
<b>N2:</b> Permanent EPST or EPIC researchers and similar positions	1	1
<b>N3:</b> Other permanent staff (without research duties)		
<b>N4:</b> Other professors (PREM, ECC, etc.)		
<b>N5:</b> Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	2	3
<b>N6:</b> Other contractual staff (without research duties)		
<b>TOTAL N1 to N6</b>	<b>3</b>	<b>4</b>

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended		
Postdoctoral students having spent at least 12 months in the unit		
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions		1

### • Detailed assessments

The instructions to the experts committee expressly indicated that team 7 should not be evaluated.

However, the experts committee takes the liberty to express a summary of its extremely favorable impressions (based on paragraph provided in section 2):

“Although we were asked not to review ATIP team 7, which has just joined UNIC, the review committee wishes to express here its enthusiastic support of this new addition, and emphasizes the added value it brings to UNIC. The proposed research is exciting, perfectly integrated within the philosophy and themes of UNIC and is certain to benefit both the team and the unit as a whole in very short order. Team 7 brings expertise in two-photon microscopy, and experiments on new sensory system, both of which will enrich UNIC’s technical and intellectual environments.”



## 5 • Conduct of the visit

### Visit dates:

Start: Monday January 13<sup>th</sup> 2014 at 12h30

End: Tuesday January 14<sup>th</sup> 2014 at 18h00

Visit site: UNIC

Institution: CNRS

Address: Building 32-33, Institute of Neurobiology Alfred Fessard (INAF)  
1 avenue de la terrasse, 91198 Gif sur Yvettes

### Conduct or programme of visit:

Agenda of the site visit  
13-14 January 2014

Unit: UNIC, UPR CNRS 3293 (Renewal)  
Present director: Mr Yves FREGNAC  
Proposed director: Mr Yves FREGNAC Co-director: Mr Daniel SHULZ

#### *Experts committee, composed by:*

##### AERES scientific delegate (DS):

Mr Yves TROTTER

##### AERES Scientific committee:

Chair: Mr Gilles LAURENT (Germany)

Members: Mr Luis Miguel MARTINEZ (Spain), Mr Gustavo DECO (Spain), Ms Alexa RIEHLE (France), Mr Serge CHARPAK (France), Mr Gwendal LE MASSON (France).

##### Scientific Experts, representatives of the Institutions:

Mr Rémi GERVAIS CNRS 26, Mr Boris BARBOUR CNRS 25; Mr Jean-Philippe RANJEVA CNU 69

Representative ITA: Ms Joelle SACQUET (CNRS 26)

### Day one - Date: Monday, January 13<sup>th</sup>, 2014

- |       |   |
|-------|---|
| 13:00 | Welcome of the experts committee by the UNIC director and the team leaders          |
| 13:20 | Experts committee organization and review task issues (closed door):                |
| 13:45 | Mr Yves TROTTER: the role and procedures of AERES                                   |
| 14:00 | Mr Yves FRÉGNAC:<br>Presentation of the past and future scientific strategy of UNIC |

#### Team presentations:

- |       |  |
|-------|--|
| 14:45 | Team 2<br>Somatosensory processing, neuromodulation and plasticity<br>Mr Daniel SHULZ    |
| 15:15 | Team 3<br>From action planning to sensory processing and perception<br>Ms Xoana TRONCOSO |



15:45	Coffee break
16:00	Team 4 Neurocybernetics of thalamic and cortical networks Mr Thierry BAL
16:30	Team 6 Neuroinformatics for Data driven modelling and neuromorphic computing Mr Andrew DAVISON
17:00	Debriefing on the team presentations (closed door) Internal meeting of the experts committee with the DS

<b>Day two - Date: Tuesday, January 14<sup>th</sup>, 2014</b>
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08:45	Welcome coffee
09:00	Team 1 Visual cognitive sciences Mr Yves FRÉGNAC
09:30	Team 5 Computational Neurosciences and thalamo cortical dynamics Mr Alain DESTEXHE
10:00	Team 7 (ATIP New Team) Multisensory integration and amodal perception Mr Brice BATHÉLLIER
10:30	Coffee break
10:45	Meeting with permanent and non-permanent staff: - Meeting with the technical staff <i>Audience: members of the experts committee, DS and ITA representatives of the Institutions.</i> - Meeting with PhD students and Post docs and/or fixed term contract researcher, engineers. <i>Audience: members of the experts committee and DS.</i> - Meeting with researchers, professors and assistant professors <i>Audience: members of the experts committee and DS.</i>
12:00	Meeting with the director of the "École Doctorale" <i>Audience: members of the experts committee and DS.</i>
12:15	Lunch
13:30	Discussion with the official representatives of the Institutions <i>Audience: members of the experts committee and DS.</i> Mr Bernard POULAIN (CNRS INSB DAS5D), Mr Etienne AUGE (vice-président Paris Sud) et Mr Éric SIMONI (vice doyen Paris sud)
14:15	Discussion with the heads of the unit (director and co-director) <i>Audience: members of the experts committee and DS.</i>
15:15	Coffee Break
15:30	Closed door synthesis meeting <i>Audience: members of the experts committee and DS.</i>
17:30	End of the visit



## 6 • Supervising bodies general comments

Le Président de l'Université Paris-Sud

à

Monsieur Pierre GLAUDES  
Directeur de la section des unités de recherche  
**AERES**  
20, rue Vivienne  
75002 Paris

Orsay, le 19 mars 2014

N/Réf. : 62/14/JB/LM/AL

Objet : Rapport d'évaluation d'unité de recherche  
N° S2PUR150008296

Monsieur le Directeur,

Vous m'avez transmis le 24 février dernier, le rapport d'évaluation de l'unité de recherche Unité de Neurosciences, Information et Complexité – UNIC - N° S2PUR150008296, et je vous en remercie.

L'université se réjouit de l'appréciation portée par le Comité sur cette unité. Bien qu'elle ne soit actuellement pas tutelle de l'unité, elle prend bonne note de la recommandation faite de développer les liens entre l'unité et l'université Paris Sud.

Je vous prie d'agréer, Monsieur le Directeur, l'expression de ma sincère considération.



Jacques BITTOUN  
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