Research evaluation

EVALUATION REPORT OF THE UNIT

INS – Institut de neurosciences des systèmes

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Aix-Marseille Université

Inserm

EVALUATION CAMPAIGN 2022-2023

GROUP C

Rapport publié le 17/05/2024

High Council for evaluation of research and highter education

In the name of the expert committee[1] :

Denis Jabaudon, Chairman of the committee

For the Hcéres[2] :

Stéphane Le Bouler, acting president

Pursuant to Articles R. 114-15 and R. 114-10 of the French Research Code, evaluation reports drawn up by expert committees are signed by the chairmen of these committees and countersigned by the Chairman of Hcéres.

This report is the result of the unit's evaluation by the expert committee, the composition of which is specified below. The appreciations it contains are the expression of the independent and collegial deliberation of this committee. The numbers in this report are the certified exact data extracted from the deposited files by the supervising body on behalf of the unit.

MEMBERS OF THE EXPERT COMMITTEE

Chairperson:	Mr Denis Jabaudon Université de Genève Suisse
Experts:	Ms Elise Bannier Centre hospitalier universitaire de Rennes - CHU Rennes Ms Sophie Denève Mr Bogdan Draganski Centre hospitalier universitaire vaudois Suisse Mr Denis Jabaudon Université de Genève Suisse Ms Marianne Renner Sorbonne université Mr Simon Thorpe Université Toulouse 3 - Paul Sabatier - UPS

HCÉRES REPRESENTATIVE

Ms Céline Souchay

CHARACTERISATION OF THE UNIT

- Name: Institut de Neurosciences des Systèmes
- Acronym: INS
- Label and number: UMR 1106
- Number of teams: 4
- Composition of the executive team: M. Viktor Jirsa

SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement

SVE5 Neurosciences et troubles du système nerveux

THEMES OF THE UNIT

***The themes of the unit are experimental neuroscience**, **neurotheory**, **neurotechnology**, **neurocognition** and **clinical translation** in epilepsy and neurodegenerative diseases. By performing imaging during cognitive, behavioural and psychophysical paradigms, the unit studies cognitive processes, memory and language, and their disorders such as epilepsy, neurodegenerative diseases and healthy ageing.*
The development of neuroinformatics tools specific to their integrated approach is a priority, through modelling using The Virtual Brain (Team TNG and PhysioNet), data analyses using AnyWave (Team DynaMap) and network signal analysis methods (all teams), and involvement in the European digital neuroscience platform EBRAINS.
There is a large effort towards translation to the clinics (e.g. MEG in presurgical evaluation at Dynamap, VEP in TNG).

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The Institut de Neuroscience des Systèmes (INS) was founded in 2012 as a transdisciplinary centre dedicated to the study of the dynamics of brain function and dysfunction. It is a mixed Inserm-University research unit located on the Timone medical campus of Aix-Marseille University.
INS office and laboratory space is located at two nearby locations within 200 m of each other:
1. The Medical Faculty building (approx. 1500m2) houses a high-performance computing cluster dedicated to neural modelling (The Virtual Brain (TVB)), two EEG-TMS platforms including robot navigation.
2. The second location is in the Timone Hospital (approx. 200m2) housing the MEG platform and the clinical epileptic patient unit with stereotactic EEG (sEEG). The MEG platform is ran by a MEG research engineer with high expertise who will retire in a few years and replacement needs to be secured Anatomical and functional MRI data are collected at the Center for Magnetic Resonance in Biology and Medicine (CRMBM-CEMEREM) or at the Centre IRMf at CERIMED.

RESEARCH ENVIRONMENT OF THE UNIT

The institute comprises 149 members working in four teams emphasising theory (TNG), brain mapping (DynaMap), physiology (PhysioNet) and cognition (DCP). Clinical researchers are embedded in the research teams. They are coming from five clinical services: Epilepsy, Functional Neurosurgery, ENT Pediatry, Neurology & Neuropsychology, Pharmacology.
This represents 37 permanent faculty (16 full-time researchers, 3 University and 18 Hospital researchers) in the fields of fundamental, computational, cognitive and clinical neuroscience. Sixty percent of INS members originate from outside of France.
The team also runs four platforms, two physical platforms: MEG, TMS-EEG and two digital platforms: HPC, TVB
INS is a lead partner in two FHUs (EPINEXT renamed EPINOV with RHU funding and DHUNE).
Several INS members are founding members of the VBTech start-up created out of the EPINOV and Human Brain Project projects. Three ERC grants currently fund members of the unit. INS is involved in fifteen international consortia, of which INS assures leadership in the Human Brain Project (Coordinator of WP1 Multiscale Brain Connectome) and EBRAINS, the European consortium Virtual Brain Cloud, the Institute of Language, Brain and Communication (ILBC), which constitutes a major French collaborative initiative in Cognitive Science and CENTURI (Turing Center for Complexity in the Living), a major federative hub for the general system's biology.
Also INS is part of the neuroscience PhD program (NeuroSchool) which increases its attractiveness.

UNIT WORKFORCE: in physical persons at 31/12/2021

Permanent personnel in active employment	
Professors and associate professors	27
Lecturer and associate lecturer	12
Senior scientist (Directeur de recherche, DR) and associate	12
Scientist (Chargé de recherche, CR) and associate	9
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	16
Subtotal permanent personnel in active employment	**76**
Non-permanent teacher researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	20
Post-docs	42
PhD Students	39
Subtotal non-permanent personnel	102
Total	**178**

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: NON-TUTORSHIP EMPLOYERS ARE GROUPED UNDER THE HEADING 'OTHERS'.

Employer	**EC**	**C**	**PAR**
Aix-Marseille Université	20	0	7
CHU Marseille	18	0	2
Inserm	0	12	6
CNRS	0	5	1
IEP Aix	1	0	0
Others	0	4	0
Total	**39**	**21**	**16**

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	**1941**
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, i-site, CPER, territorial authorities, etc.)	216
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	17,180
Own resources obtained from international call for projects (total over 6 years of sums obtained)	13,649
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.)	0
Total in euros (k €)	**32,986**

GLOBAL ASSESSMENT

The scientific interests of the INS are clearly defined and correspond to those set-up at the foundation of the unit. Strengths lie in modelling and data collection, as well as access to patients. There is a strong focus on understanding network function, particularly in the context of epilepsy, but other disorders are also being tackled, including neurodegenerative disorders. In the context of understanding brain function, aspects related to cognition are somewhat lacking, but this would represent a thematic diversification that the group in its current state may not be able to afford. The imaging facilities are currently provided by the hospital's Center for Magnetic Resonance in Biology and Medicine (CRMBM-CEMEREM) and collaboration with the hospital are perceived as excellent. Based on these elements, the overall evaluation of the unit is deemed as excellent to outstanding.
The potential for translational science is excellent and technology transfer is present, including through the foundation of a start-up for a data analysis software (VBTech). The science itself is largely focused on human data and cross-correlation of data.
The INS thus has an outstanding expertise and visibility in its field, despite weak administrative resources and relatively little support from Aix Marseille University. Sanitary conditions for workers on site are pitiful, with, in particular, shameful condition of the lavatories. The directorate needs to keep an eye on their equity, diversity and inclusion (EDI) culture as failing to do so may in the long term affect the well-being of some co-workers. The workforce as a whole is remarkably international and English is established as the shared scientific language. The extent to which clinicians are integrated within the main workforce is unclear, as very few of them were present during the day to visit. Altogether this is an excellent to outstanding units with clear strengths in terms of scientific performances despite somewhat challenging administrative support conditions.

DETAILED EVALUATION OF THE UNIT

A – CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

In the previous report, there were some concerns about the quality and quantity of scientific advances. Advice was given to put in place a clear publication and dissemination strategy that encompasses all INS outputs. A mixture of rapid publication in open source journals to increase visibility with a small, but selected, number of very high-profile journal papers for major advances to increase international impact was proposed. Based on the current excellent output, it seems like this advice has beared fruits. Emphasis needs to be put on the quality of the scientific results themselves rather than in the journals in which these results were published; a strictly quantitative account of the publication record does not pay justice to the unit's outstanding contribution since research output has not increased proportionally to the workforce itself.
The insufficiency of the administrative support remains a significant concern that has not been addressed and affects researcher and support staff time.
Based on these elements, the effort put into following the recommendations is deemed here excellent.

B – EVALUATION AREAS

EVALUATION AREA 1: PROFILE, RESOURCES AND ORGANISATION OF THE UNIT

Assessment on the unit's resources

Strengths and possibilities linked to the context: Grant research is active and fruitful, including through prestigious national and international calls. Access to patient data at the Timone hospital is a clear strength. High quality platforms: MEG, EEG and robotised TMS and an intracranial EEG laboratory, and one *ex vivo* and one *in vivo* platform.
Weaknesses and risks linked to the context: The administrative support is insufficient. The MEG centre is threatened by the small number of permanent staff. The extent to which clinical teams participate in the unit is unclear.

Assessment on the scientific objectives of the unit

Strengths and possibilities linked to the context: The scientific vision is clear, and the unit participates actively to local and national initiatives (*EPINEXT/EPINOV, DHUNE, CENTURI, NEUROMARSEILLE)*. The presence of a SAB is a plus. *Weaknesses and risks linked to the context:* None identified.

Assessment on the functioning of the unit

Strengths and possibilities linked to the context: The unit consists of an international team of culturally diverse researchers. The safety culture is maintained through regular training and documentation.
Weaknesses and risks linked to the context: There is an important infrastructure/administrative workload for clinical and animal experimentations without dedicated support from the University, which comes at the cost of scientific progress. The storage and protection of sensitive data should be described and improved. Gender balance disappears when going up the management ladder.

1/ The unit has resources that are suited to its activity profile and research environment.

Strengths and possibilities linked to the context

The Unit constitutes a rich research environment; it is interdisciplinary in gathering researchers in experimental neuroscience, electrophysiology, neurocognition, neurotheory and computer science. The unit has access to

and manages MEG, EEG and TMS equipment at the core of their experimental expertise. The unit has developed successfully digital platforms that are open to the scientific community at the international level. INS researchers are actively involved in obtaining external grant funding, which represents the major source of INS funding. INS is using some of this funding to hire personnel for administrative support to help to deal with the insufficient infrastructure support. Based on these observations, the ability to take advantage of the research environment and support activities is deemed as outstanding.

Weaknesses and risks linked to the context

Some of the platforms run on temporary contracts, which threatens skill sustainability. For instance, the MEG centre is threatened by the small number of permanent staff (only 1 engineer) who will retire in five years from now. With the increase in the number of team members, offices need to be shared. Additional space, also for meeting rooms and a renovation of public spaces (among which bathrooms) would greatly improve working conditions and give visitors a better impression. There is a limited inter-team collaboration in place and this could be improved. Altogether, the ability of the unit to take advantage of its research environment and mobilise resources is deemed as outstanding.

2/ The unit has set itself scientific objectives, including the forward-looking aspect of its policy.

Strengths and possibilities linked to the context

The team strongly leads research in the field of virtual human brain aiming at serving research in neuroscience, open science and clinical research. Inter-team collaborations could be improved and the participation of the clinicians to the overall effort is at times unclear (they did not seem to be present during the evaluation). As detailed in the reports of the individual teams, the quality of the research is considered outstanding.

Weaknesses and risks linked to the context

None identified

3/ The functioning of the unit complies with the regulations on human resources management, safety, the environment and the protection of scientific assets.

Strengths and possibilities linked to the context

The unit consists of an international team of culturally diverse researchers; there is a culture of exchange and also regular assessments. The rapid growth of the unit with many team members with interdisciplinary and international backgrounds create a dynamic and lively atmosphere. The unit largely practices open science, and some team members are also involved in developing sustainable research considering climate change. The team is accompanied by protisvalor, Inserm and the SATT for valorisation and intellectual property issues.
In terms of gender parity and more globally equality, diversity and inclusion, there is still quite some effort to be done; the four team leaders are male and most of the technical personnel are females. Although not explicit, this creates an implicit gender hierarchy that would benefit from being addressed.
The safety culture is maintained through regular training and documentation.
Regarding the sustainable development, culture, INS is leading a project aiming at coordinating actions to reduce the carbon footprint across all Neuroscience Laboratories in Marseille and this topic is discussed during societal events.
This particular point is deemed good.

Weaknesses and risks linked to the context

Skill sustainability is threatened in particular in terms of technical expertise and platform management if some specific long-term positions are not secured. This is the case for example for the MEG platform, where the device needs to be replaced and where the senior technician will retire in five years. Administrative workload is supported by insufficient administrative staff and is taken over by researchers and technical support staff. This creates tensions within the teams and is not favourable to scientific progress. The storage and protection of sensitive data should be described (Data Management Plan) and improved via Privacy Impact Assessment. Gender balance disappears when going up the management ladder. The younger generation should be encouraged to develop leadership initiatives over the coming years and further favour inclusivity.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The attractiveness of the unit is deemed as excellent to outstanding. Members of the unit are invited to present their work in academic institutions or at international and European congresses and have received nine national and international awards over the evaluation period. The unit organises an annual retreat as well as regular focused scientific events, and the members of the unit participate in editorial boards for recognised journals and as experts in grant panels or scientific reference boards. No specific weakness has been identified here.

1/ The unit has an attractive scientific reputation and contributes to the construction of the European research area.

Strengths and possibilities linked to the context

The visibility and scientific reputation of the unit are rated as outstanding. Its integration into the European research area is also outstanding, particularly through its participation to multiple consortia, as detailed in the sections devoted to the individual teams.
INS members have been distinguished for their scientific excellence and have received nine national and international awards. They have been involved in leading roles within more than seven scientific societies and have been invited to present their work at more than 2000 international and European events during the last five years.
Almost all of the senior INS members are sitting on editorial boards. Particularly, Christophe Bernard is the founding editor and editor-in-chief of eNeuro.

Weaknesses and risks linked to the context

The unit has grown considerably since the last evaluation period and the extent to which this growth can be sustained is unclear.

2/ The unit is attractive for the quality of its staff hosting policy.

Strengths and possibilities linked to the context

Attractiveness is reflected by the large number of international collaborators and the quality of these collaborators in terms of their scientific contribution. Staff hosting policy is good, although the state of the overall office space and sanitary conditions is relatively low. Interaction between different groups has been difficult to assess formally and clinicians were overall not clearly present on site. Three international renowned guest researchers were hosted at INS during the last five years, one of this collaboration led to a publication in Science. The overall evaluation here is deemed good.

Weaknesses and risks linked to the context

The overall working culture is good although a strong top-down management seems to be present, and some dismissive or naïve comments hinted at insufficiencies in the Equity-Diversity-Inclusion (EDI) culture, which should probably be formalised.

3/ The unit is attractive because of the recognition gained through its success in competitive calls for projects.

Strengths and possibilities linked to the context

The INS was successful in responding to European and international competitive calls for the project, including two NIH grants and three ERC grants. INS received ANR funding for ten projects as leader of the project. There are absolutely no concerns regarding the funding.
The overall evaluation here is outstanding.

Weaknesses and risks linked to the context

None identified

4/ The unit is attractive for the quality of its major equipment and technological skills.

Strengths and possibilities linked to the context

Technology is state of the art and attractiveness in these terms is rated excellent. The MEG machine arrives towards the end of its life cycle but application to funding for its replacement is in progress. One concern is the presence of a single MEG technician that will be retiring within the next five years and for whom no replacement is in place as of now.

Weaknesses and risks linked to the context

The MEG machine arrives towards the end of its life cycle but application to funding for its replacement is in progress. One concern is the presence of a single MEG technician that will be retiring within the next five years and for whom no replacement is in place as of now.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

It is difficult to evaluate the overall production of the lab because the list of publications was provided in the form of a twenty-page pdf file containing many duplications because papers involving more than one team are included twice. That said, using Scopus and the affiliation identifier ('Institut de Neurosciences des Systèmes' 60,107,144) produces a total of 599 publications for the period 2016–2021 with 11,314 citations – around 19.9 citations per publication. 63.6% of the publications are in the best journals of the disciplines, including Epilepsia (34) and NeuroImage (18).

1/ The scientific production of the team meets quality criteria.

Strengths and possibilities linked to the context

Given the small number of teams (4) for such a large laboratory, it is difficult to rely on the portfolio which can only highlight a few outputs. Nevertheless, it is clear that the lab's production is of high quality. Using Scopus, it is possible to use the Affiliation ID for 'Institut de Neuroscience des Systèmes' 60,107,144 to obtain a list of 599 publications for the period 2016–2021. It is gratifying to see that the number of publications increased considerably in 2020 and 2021 with 146 publications in 2021 alone, compared with around 80 per year from 2016-18, and around 70 per year in the previous period. It would appear that the lab has responded to the previous HCERES evaluation which noted that the number of publications was relatively modest for a lab of its size.
Together, the 599 papers have been cited over 11,312 times. The lab is well above the global average in terms of citation of its publications in the scientific literature. Most papers (63.7%) are published in the best disciplinary journals in the scientific field.
The lab has produced an impressive number of papers in journals that are among the best specialised journals, given the topics. These include 34 pages in Epilepsia, eighteen in Epilepsia and Behaviour, eighteen in NeuroImage and fifteen in Scientific Reports. Other high-profile journals include PLoS Computational Biology (11), Brain (7), Nature Communications (7), PNAS (7), PloS One (6).
Some of the lab's most highly cited publications are multicenter publications involving large numbers of institutions, indicating that the lab is integrated into the international research community.
It is good to see that around 75% of the articles were published in Open Source.
Among the highlights are a critical review in Epilepsia by Bartolomei et al. in 2017 entitled 'Defining epileptogenic networks: Contribution of SEEG and signal analysis', which looked at the state of the art of SEEG signal analysis and highlighted the tools developed by the Dynamap team. There is also an important review paper on 'The Safety of Ingested Caffeine: A comprehensive review'. Both review papers have been cited well over 200 times.
Another key publication is a paper by Pizzo et al., published in Nature Communications (2019) that demonstrated for the first time that 'deep brain activities can be detected by magnetoencephalography' using a unique set-up of simultaneous MEG-SEEG that has been developed at the INS.

The Physionet team's output was marked by the publication in Science of a research summary on 'Convergence of adenosine and GABA signalling for synapse stabilisation during development' which summarised work done in several leading labs across the world. The Physionet team also published papers in several high-profile journals including multiple papers in PNAS, Nat Rev Neurol, Science Advances and J NeuroSci, as well as a general theory to explain the rhythmicity of seizures as part of a special issue of the journal Epilepsia.
The TNG group's output includes 'A taxonomy of seizure dynamics' published in eLife, but also numerous other important papers in high-profile journals including NeuroImage, Nature Communications, Nature Neuroscience and Neuron.

Weaknesses and risks linked to the context

The documents provided by the lab provide only limited information about presentations at colloquia and conferences;

2/ Scientific production is proportionate to the research potential of the unit and shared out between its personnel.

Strengths and possibilities linked to the context

The scientific production of the four teams is reasonably well balanced and consistent with the number of personnel belonging to each team. Thus, of 599 publications visible in Scopus that have at least one author with an affiliation at the INS, 218 involve the Dynamap team, 177 involve the DCP team, 103 involve the Physionet team, and 196 TNG. Given the numbers of members in each team, this suggests that Dynamp and DCP have been producing slightly more per person per year (just over one) than Physionet and TNG. However, this difference probably reflects the high proportion of clinicians in the first two teams, whereas Physionet and TNG are involved in research which tends to be more fundamental in nature.
Around 80 of the papers involved members from more than one team, and this is a positive sign.

Weaknesses and risks linked to the context

The volume of production also needs to be considered in relation to the amount of funding. The INS is a very well-funded laboratory, with around €35 million of funding for the period 2016–2021 and salary charges for permanent staff of over €2.8 million per year, resulting in total funding of over €50 million. Indeed, the university ranks the lab very highly in terms of its ability to obtain outside funding. The question is whether the scientific output of the whole lab represents good value for money.
This was a point that was already noted in the previous HCERES report where the president, Richard Frakowiak, noted 'The publication rate of approximately seventeen papers per team per year, given the number of staff, is not high' and that 'there is a suspicion that literature output may not have been ambitious enough given a five-year budget of €26.6 M or so and 74 personnel of which around 50 are scientific staff'.

3/ The scientific production of the unit complies with the principles of research integrity, ethics and open science.

Strengths and possibilities linked to the context

Roughly three quarters of INS's scientific output (440 out of 599 publications) has appeared in open source journals, and versions of all papers are submitted to the HAL archive. All teams seem to have the same strategy of allowing PhD students and postdocs to sign as the first author, with the senior research signing in the last position. They have a policy of avoiding 'predatory' conferences and journals.

Weaknesses and risks linked to the context

Strong emphasis is being put on the notoriety of the journals in which the research is published while more attention could be given to the intrinsic quality of the science being submitted.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

Assessment on the inclusion of the unit's research in society

The unit has excellent interactions with the economic and social environment.
Overall, the unit is strongly involved in sharing knowledge and science dissemination. It contributes to the dissemination of knowledge to the public. It regularly interacts with several patient associations and maintain relationships with industrial partners.

1/ The unit stands out by the quality of its non-academic interactions.

Strengths and possibilities linked to the context

Non-academic interactions are not particularly evident. Nevertheless, the unit is engaged in research projects involving industrial partners. A start-up has been created based on the development of software within the unit but the extent to which this is a bidirectional interaction feeding back onto the unit is unclear.

Weaknesses and risks linked to the context

The extent to which the interactions between the start-up and the unit are bidirectional and are feeding back onto the unit is unclear.

2/ The unit develops products for the socio-economic world.

Strengths and possibilities linked to the context

Yes, the unit develops products for the socio-economic world. The unit has produced several patents and has launched a start-up company (VBTech) aiming at commercialising software developed in the unit. This point is deemed good.

Weaknesses and risks linked to the context

None identified

3/ The unit shares its knowledge with the general public and takes part in debates in society.

Strengths and possibilities linked to the context

The DCP team has an outstanding activity in communicating and sharing knowledge with the general public, showing a clear commitment towards the translation of their expertise towards the society. The unit have made several interventions in the media and have regular activities related to patient associations.

Weaknesses and risks linked to the context

There is no strong evidence of how the unit shares its knowledge with the general public and takes part in debates in society. An increased participation in events for the general public should be considered.

C – RECOMMENDATIONS TO THE UNIT

Recommendations regarding the Evaluation Area 1: Profile, Resources and Organisation of the Unit

The organisation of the unit is excellent, as are resources. Administrative support is clearly insufficient and at least one full-time equivalent should be provided.

Recommendations Regarding the Evaluation Area 2: Attractiveness

The attractiveness of the Unit is excellent. A large variety of international collaborators is present. EDI culture should be formalised.

Recommendations Regarding Evaluation Area 3: Scientific Production

No specific recommendation. The research output is excellent.

Recommendations regarding Evaluation Area 4: Contribution of Research Activities to Society

No specific recommendations here.

TEAM-BY-TEAM ASSESSMENT

Team 1: Dynamical Brain Mapping

Name of the supervisor: Christian Benar

THEMES OF THE TEAM

The main research themes of Dynamical Brain Mapping (DynaMap) team concern the brain mechanisms underlying epilepsy using a range of approaches, including both methodological developments and clinical research. They use both invasive and non-invasive electrophysiological methods coupled with advanced signal processing methods, and is responsible for managing the magneto-encephalography (MEG) platform at the INS.
The team is particularly interested in developing biomarkers for epilepsy, including the presence of high-frequency oscillations (> 250 Hz), and characterising epileptogenic networks.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The self-evaluation document does not specifically mention the recommendations made in the previous evaluation of the Dynamap team. However, the previous HCERES report made the following recommendations *'to improve the level of the publication by selecting journals with higher impact.'* This seems to have been followed in that around 44% of the publications are now in top 10% journals (based on Citescore percentile).
'DynaMap's platform and methodological roles must be carefully balanced to avoid jeopardising its own scientific projects.' It would appear that this point has been taken into account.
'Attractiveness (postdocs, international visibility) needs to improve and will likely do so with the integration of new collaborators, both of which have a strong publication record.' This does appear to have been confirmed since the team has indeed expanded.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	8
Lecturer and associate lecturer	4
Senior scientist (Directeur de recherche, DR) and associate	2
Scientist (Chargé de recherche, CR) and associate	2
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	4
Subtotal permanent personnel in active employment	**20**
Non-permanent teacher researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	3
Post-docs	8
PhD Students	0
Subtotal non-permanent personnel	11
Total	**31**

EVALUATION

Overall assessment of the team

Globally, the Dynamp Team was considered to be excellent and in many ways outstanding. It has published an impressive number of high quality publications relevant to a number of key areas, including the use of high-frequency oscillations, the use of Stereotactic EEG (SEEG) for diagnosis, brain connectivity methods, as well as recommendations for epilepsy treatment;
The output corresponds to an average of six publications a year for each of the permanent researchers which is excellent.

Strengths and possibilities linked to the context

The Dynamap team is composed of several very active clinical researchers, accompanied by two INSERM DR2 researchers, one of whom only joined the team part-time in September 2019, before fully joining the team in January 2021.
Using Scopus as a source of information shows that 52 of the team's 218 publications are reference publications for the scientific communities which are concerned. Although it should be mentioned that this area of research is relatively highly cited. Nevertheless, this is a relatively impressive achievement. Five publications (including 3 reviews) have captured a large readership as judged by their impressive number of citations in the scientific literature.
One hundred and forty-one of the publications were published in the best journals of their disciplines, which is already very satisfactory, but it is striking that 94 of the team's papers are published in the most prestigious of them. This suggests that the team is successful at targeting high-profile journals. Examples include Annals of Neurology (7), Brain (3), Epilepsia (24), PLos Computational Biology (5). One paper appeared in a new journal 'Advanced Science' that immediately developed a high notoriety within the community.

The Dynamap team has good interactions with the other three teams in the lab, as demonstrated by 73 publications with the DCP team and 26 with TNG. In contrast, there are only eight publications with members of the PhysioNet team, but this is relatively easy to understand given the divergence in approaches.

Ninety-four of the team's publications involve partners outside of France, including the United States (27), United Kingdom (18), Italy (18), Germany (15), China (10), demonstrating that the team has a rich set of international collaborations.

The overwhelming majority of the team's production is in the form of research articles (169), but they also published 27 Review papers. Some of the reviews have been very influential, with over four reviews cited over 100 times each.
In contrast, chapters and conference proceedings are relatively rare, but this probably is typical for the area of research.

Weaknesses and risks linked to the context

It might be thought that the absence of publications in the very highest-profile journals (such as Nature, Science…) could be considered a weakness. However, given the very high level of the journals used and the fact that they tend to be among the best journals for the discipline, this may simply reflect a sensible publication strategy.

There are still quite a lot of papers published in journals that are not open access (65), and this is something that could be improved in the future.

RECOMMENDATIONS TO THE TEAM

Given the ability of the team to publish in the very best journals of the discipline, and a generally large number of publications, it may be that occasionally attempting to publish in the very highest-profile journals might be justified. However, the current publication strategy is clearly very good.

Team 2: Dynamics of Cognitive Processes

Name of the supervisor: Danière Schon

THEMES OF THE TEAM

The major research topics are the temporal processes during music and speech perception and the spatio-temporal dynamics of memory in normal and pathological states.

Specific topics for research include attention mechanisms, entrainment, auditory cortex asymmetry, music rhythm stimulation in children with hearing loss and cognitive dysfunction in neurodegenerative diseases.

The methodological approaches are basically brain imaging (sEEG, MEG, EEG, TMS, fMRI) combined with cognitive and psychophysical paradigms, cognitive models for understanding speech processing attention mechanisms and predictive behaviours, as well as applications to speech rehabilitation, mostly via music rhythmic training.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous report stressed the high quality of the work of the team, which is a leading team in speech and music perception at the national and international level. The committee advised to stay focused on the domains in which the DCP team has an international recognition. They expressed some concerns about the capacity of the team, considering its workforce, to find funding given the extreme competitiveness that exists in the field of human memory, in both normal and pathological states. The committee recommended increasing the interaction between PIs, creating links between research topics to optimise chances to be published in high impact journals. The reinforcement of the relationship with clinicians was also advised.

The publication record was also considered as excellent both in terms of numbers of published articles.

The committee underlined the good organisation of the team and the excellent spirit between team members. The overall strategy for training through research was described as very successful.

One weakness that was reported was the lack of international grants. The recommendation was to try to build more international collaborations that will help in obtaining large international grants.

Despite the very good interaction of the team with the social, economic and cultural environment, it was remarked that the numerous clinicians present in the team may have difficulties to find time for interactions with the social, economic and cultural environment.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	9
Lecturer and associate lecturer	2
Senior scientist (Directeur de recherche, DR) and associate	5
Scientist (Chargé de recherche, CR) and associate	1
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	3
Subtotal permanent personnel in active employment	**20**
Non-permanent teacher researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	3
PhD Students	0
Subtotal non-permanent personnel	3
Total	**23**

EVALUATION

Overall assessment of the team

The team made significant and original contributions, focusing not only on mainstream questions about the spatiotemporal dynamics of the brain, but also on innovative approaches such as the study of language and music. The methodological approaches were interdisciplinary comprising cognitive science, linguistics, speech therapy, psychophysics, modelling and imaging.

A notable effort has been made in translating research to patient care, in particular with the use of music in the rehabilitative process of children with a cochlear implant.

Strengths and possibilities linked to the context

The team develops innovative approaches on basic research of brain dynamics on normal and pathological states. They generated of a body of relevant knowledge over time on several theoretical frameworks of cognitive neuroscience and the team has a sound scientific reputation.

The scientific production of the team is outstanding for the two subgroups that compose the team (researchers and MDs) and they fulfil the standards for basic and clinical research, publishing pure research articles, reviews, clinical and translational studies, metanalyses as well as procedures and recommendations for MDs. In total (source Scopus), they published 177 articles since 2016 (plus 14 if we consider the publications of A. Bidet-Caulet who joined the team in 2021). The rate and level of publication are excellent, highlighting their strong participation in national and European clinical networks as well as internal and external research collaborations. Team members organised and chaired eleven national and international conferences.

Full researchers have on average ~12 publications per person, mostly on specialised and multidisciplinary respected, or even prestigious journals (Science, Neuron, Nature Communications, PNAS, Cerebral Cortex, etc.). MDs have in average ~30 publications per person. Quite a number of the articles published by MDs correspond to publications of consortia and large-scale clinical studies. Nevertheless, most MDs have publications as first,

last or co-last author. Two clinical essays were started or conducted during the period, under the supervision of M. Ceccaldi. M. Didic established three patient cohorts (two are undergoing).

The team is also involved in promoting good scientific practices (two articles about good practices in MEG and iEEG research). A. Bidet-Caulet co-authored a paper on gender bias published in Neuron in 2021.

The team has an outstanding activity in communicating and sharing knowledge with the general public, showing a clear commitment towards the translation of their expertise towards the society. They established tight links with school teachers, speech therapy and patient communities (AD, epilepsy and hearing impairment) as well as with artistic communities (Festivals and Conservatories).

Weaknesses and risks linked to the context

It seems difficult to establish a synergy between the different scientific topics.

Considering the large number of MDs in the team, translation from basic to clinical science is less than expected.

During the mandate, the team succeeded two recruitment of scientists with permanent positions and one research engineer. Two members of the team obtained their HDR. However, the lack of recruitment of young MD(s) could compromise the transfer of expertise and continuity of some projects, given the average age and the proportion of senior MD.

The attractiveness of the team to recruit PhD students and postdoctoral researchers is not clear. The team does not seem to be successful in obtaining PhD fellowships. Since 2016, fourteen PhD students were recruited in the team. Nine were or are supervised by researchers and five by MDs. Two students abandoned, seven graduated and six are currently in the lab. Among the last, two do not have funding and the other three have doctoral contracts that include (1) or not (2) teaching.

There are no non-MD professors (PU or MCU) that could enhance links with the university.

RECOMMENDATIONS TO THE TEAM

The team should aim to establish a recruitment strategy to assure the transfer of expertise among MDs and to improve the synergy between the different scientific topics.

Team 3: Physiology and Physiopathology of Brain Networks

Name of the supervisor: Christophe Bernard

THEMES OF THE TEAM

The team focuses on the mechanisms of epilepsy and its comorbidities, recently extended to investigating more general rules of network dynamics in the 'healthy' brain.

The originality of this team is to span multiple levels of analysis while being firmly grounded in fundamental biological mechanisms at the microscopic (synapses and microcircuits) and macroscopic (metabolism, circadian rhythms, rhythms) scales. There is also an important neuro-engineering dimension with the development of new state-of-the-art biotechnology to measure and control neuron/network activity.

It is a highly multidisciplinary approach combining a wide range of techniques, from genomics, proteomics, in vivo and in vitro neurophysiology, to theoretical neuroscience.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team largely addressed the concerns of the previous report. Previous evaluation noted a lesser scientific impact of the 'clinicians' as part of the team (that has left since), and the team's limited clinical or industrial valorisation. In this current period, the team produced two patents and its fundamental scientific results led to two clinical trials ('Epinov' and BDNF as predictive factors for depression).

Recruiting young researchers were advised to compensate for departures. Two CRCN, Adam Williamson and Pascale Quilichini, were recruited since, which is very impressive.

The team also developed more collaboration with other teams in INS, getting involved with their efforts at large scale modelling of brain circuits. Collaborative work with TNG has led to the development of a 'virtual mouse brain' and a new mathematical framework for the rigorous classification of epileptic seizures.

As noted in the previous report, research topics pursued in the team lack cohesion, with co-signed publications concerning only three of the PIs. However, this is to be expected given the large span of methods and levels of analysis addressed by PIs who are all fully independent researchers.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	2
Senior scientist (Directeur de recherche, DR) and associate	4
Scientist (Chargé de recherche, CR) and associate	4
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	2
Subtotal permanent personnel in active employment	**12**
Non-permanent teacher researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	5
Post-docs	11
PhD Students	0
Subtotal non-permanent personnel	16
Total	**28**

EVALUATION

Overall assessment of the team

This team is excellent to outstanding scientifically. They were the first to propose a framework for multidian cycles in epilepsy, demonstrate deleterious in utero effects of caffeine and identify the mechanism for stabilisation of GABAergic synapses, all highly impactful results. The neuro-engineering part of the project is a state of the art with very high potential, conducted with the best experts in the field. The panel appreciated the strong engagement of the team leader in scientific ethics, and his position as chief editor of eNeuro, a journal created by academics for academics.

Strengths and possibilities linked to the context

Regarding scientific production, all the PIs in the team have contributed significantly, with at least two highly cited papers each. The output is relatively low in terms of absolute number of papers, with a total of 103 publications (0.66/researcher/year). However, many of the publications are high quality, as witnessed by the number of citations: four publications with>100 citations, twelve with>50 citations, and 30 cited>30 times. These include prestigious journals such as Science, Science Advance, Nat Rev Neurol, Mol Psy, PNAS, Annals of Neurol, Elife. The most important scientific results attracted interest outside of academia, as witnessed by four Inserm publications later reported on in the mainstream media. Two patents were produced. Fundamental scientific results may lead to important clinical applications, such as non-invasive deep-brain stimulation.

- The team supervised twelve postdocs, twelve students, among which seven defended their PhD, with three ongoing. All PhD students who completed their PhD had first author publications.

The team is attractive, since it recruited two new PIs (CRCN in 2016, 2019). Moreover, students and postdocs come from all over the world, with 80% non-French. Collaborations are ongoing with the best experts in their fields.

The team leader is highly visible: Scientific comity of SFN, Editor eNeuro, editorial board of Science Advance. He is strongly involved in the dissemination and vulgarisation of science, with four Inserm publications and many presentations to mainstream media, in particular on Nicotine in Utero and Circadian and multidian cycles in epilepsy. The team leader is also highly involved in the epistemology of science, and fights against two of the worst problems plaguing our field: fallacies/dishonest presentation of results, and the excessive power of commercially motivated, American-owned scientific journals.

The visibility of junior PIs (organisation of conferences, invited talks, dissemination, editorial activities) should be encouraged more, especially female members. For example, they could be the PIs on future collaborative grants, become team leader themselves, or be more involved in dissemination activities or organisation of international meetings.

Weaknesses and risks linked to the context

The self-evaluation mentions that some of the PIs have received better funding than others. However, the team is globally well funded (4M euros in 5 years).

The self-evaluation also mentions a lack of expertise in theoretical neuroscience/dynamical systems within the team. They must rely on the expertise in TNG, particularly Victor Jirsa, to develop this dimension of their projects. However, this limitation can also be seen as a strength since this contributes to improving between-team collaboration in INS. The difficulty may lie more in the capacity to attract candidates with a strong theory background, especially younger PIs with the required expertise (applied mathematics or dynamical system theory) with only an INSERM-AMU affiliation. An additional affiliation to CNRS could help in hiring this profile of researchers and thus complement the team(s) with a strong theoretical expertise.

The research topics span multiple levels of analysis (inter-areal communication, sleep and memory, effects of nicotine during development, dynamics of epilepsy, organic pumps, photopharmacology and optosensorics) but could be better integrated. It might be interesting to separate the 'neuroengineering' dimension, by

creating a new team in INS for example, while identifying a few general questions spanning multiple levels and touching several research topics, thus generating more collaborations between the PIs of the team.

Finally, a certain lack of institutional support was mentioned, especially by AMU. Particularly, the team lost its experimental rooms when the animal facilities were regrouped and moved to another floor, but unfortunately did not get all of them back, creating strong pressures on the available spots and slowing down experimental studies. Engineers and technicians with absolutely necessary expertise do not have any perspectives for obtaining permanent positions, and may have to leave because of the Sauvadet law, taking their expertise with them. It is extremely difficult (particularly for non-permanent Inserm researchers) to obtain a slot in a necessary formation/training course (e.g. in surgical techniques). Most grants are administered by AMU, but their system is opaque with lack of administrative support, delays are extremely long and procedures are complex, and it is not always clear who to contact to solve a specific problem. Finally, there is a severe need for complete renovation of the team spaces and facilities, with toilets that defy description and traumatise external visitors to the extent that they still speak about them years later.

RECOMMENDATIONS TO THE TEAM

Regarding the lack of expertise in theoretical neuroscience, the hiring of co-supervised and co-funded, quantitatively trained students between TNG and Physionet would be advisable.

To improve and reinforce cohesion between PIs with the team, frequent team meetings (with aspects that make them entertaining: Chalk talk? Pizzas?) as well as an annual retreat (organised by students) could greatly contribute.

Pursuing industrial collaboration for the Neuro-engineering projects could improve the funding for the team.

Junior PIs should be encouraged to take the lead role in collaborative grants and prepared to take over leadership of the team in the future.

The mathematical models of epilepsy and virtual mouse brain could be made more easily available by advertising it outside the E-brain/HBP community.

Team 4: Theoretical Neuroscience Group

Name of the supervisor: Victor Jirsa

THEMES OF THE TEAM

The main topics of Team No. 4 – i. Large-scale brain network theory and tools; ii. Epilepsy and iii. Neurodegenerative diseases and healthy ageing are based on the theoretical grounds of brain activity that organises itself in dynamic networks, which are captured at different scales in brain imaging signals – EEG, MEG, sEEG and fMRI.

The team has a long-standing track record in theoretical and empirical work on the mechanisms of spatiotemporal organisation of large-scale brain networks covering the wide span between development of neuro-informatics tools for dedicated investigations at various levels of observation and applications to answer neuroscientific questions in the healthy and diseased brain.

Over time, the increasing sophistication of the theoretical approaches and expanding field of potential applications necessitated access to empirical data, which was largely accomplished with the integration of APHM academics in the field of pharmacology that contributed unique data sets to the TNG.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The mismatch between the T4's size and the overall output was partially addressed with explanations about bottlenecks in the redactorial process and the time-consuming leadership role of TNG in the HBP and EBRAINS. These are valid points given the seismic changes in the landscape of scientific publishing and the current focus of the community on code and data sharing that give more visibility, which enhance the probability of collaborations. Nevertheless, this point should not be left without an appropriate action plan. In the same context, the recommendation to formalise a publication strategy for PhD students was not fully addressed.

The recommendation to increase TNGs involvement in clinical consortia was addressed in two ways – first, by integrating clinical scientists that are potentially closer to large-scale clinical trials and second, by advancing the versatility of The Virtual Brain (TVB) framework towards clinical applications as an attractive option for inclusion in consortia. Given the timescale of true integration, the Quantitative Systems Pharmacology direction has led to new better models of drug effects. However there is no clear sign of added value in terms of involvement in clinical consortia beyond the already existing. Similarly, the relatively 'new' topic of healthy ageing and neurodegeneration has resulted in few publications. However no breakthrough in the circle of consortia focusing on early diagnosis and novel treatment. Probably, this will change after first successful reports from the EPINOV trial, which the community eagerly waits for and the quick start of the Virtual Brain Cloud Horizon 2020 project. The leadership in networks dedicated to unmet medical needs: DHUNE and ORPHANDev should be honoured.

Following the previous evaluation's recommendation, the TNG team maintained TVB as an open platform and developed viable technology transfer strategies, including the creation of the start-up Virtual Brain Technologies (VBTech) in August 2021.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	10
Lecturer and associate lecturer	4
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	1
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	3
Subtotal permanent personnel in active employment	**19**
Non-permanent teacher researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	11
Post-docs	20
PhD Students	0
Subtotal non-permanent personnel	32
Total	**51**

EVALUATION

Overall assessment of the team

The TNG team has clearly fulfilled the predicted outstanding role in computational neuroscience worldwide. The already established leadership in significant EU (TVB, EBRAINS, the Virtual Cloud – TVC) and national projects (RHU Epinov) has delivered an impressive amount of funding and has attracted leaders in the field for collaborations.

The steadily expanding theoretical underpinning on network dynamics hones on elegant incorporation in a worldwide visible suit of neuroinformatics tools (TVB> 40K downloads) etc. that does not stop short from potential applications in the industry through the VBTech start-up.

The integration of more clinically related topics through academics in the fields of pharmacology and neurodegeneration has been a fruitful approach.

Strengths and possibilities linked to the context

Despite a mismatch between funding and output measured in peer-reviewed papers, TNG produced 196 publications including a substantial number in high-ranked journals (Elife, Nature Neuroscience, Nature Communications, Neuron and Brain) that brought in sixteen cases> 50 citations and in 35> 30 citations. The team got two patents, five are in the process of evaluation. The start-up VBTech was established and has made strong links with members of other INS teams. This signifies the high attractiveness of the team for potential collaborations in both academia and industry.

In the current evaluation period, TNG attracted three academic faculties from the field of pharmacology that opened new possibilities i. to introduce pharmacological modulation as perturber of network dynamics; ii. expand the network of clinical collaborators with the potential for inclusion in clinical consortia and iii. include neurodegeneration and corresponding data (IMIs project PharmaCog). Along these lines, the dFCwalk

framework provided an opportunity to Demian Battaglia to consolidate the integration phase with the inception of his responsibility of the topics neurodegeneration and ageing within TNG.

The coherency and innovation of the two topics – large-scale brain network theory and tools and epilepsy are beyond doubt. The gradual success of the TVB and VEP projects, particularly through the EBRAINS framework, is supportive for the steadily growing importance of this natural cohesion. The RHU EPINOV trial coordinated by the team will become the litmus for its expected huge success in the final phase of integration in clinical decision-making and therapy.

The new created links to OrphanDev National Network (FCRIN), the regional pharmacovigilance centre (CRPV) and regional pharmacodependance centre (CEIP) allowed for interactions with the French Drug Agency (ANSM) as well as the HTA agency (HAS). Similarly, the leadership in DHUNE, the University Hospital Federation dedicated to Neurodegenerative Disorders and Brain Ageing opened new possibilities for collaborations.

The TNG has accomplished an impressive amount of work on the promotion of science in the research community, but also in terms of scientific vulgarisation for the lay public.

Weaknesses and risks linked to the context

At the verge of turning the trend from the previous evaluation period, Team-4 remains at the lower end of scientific production given its funding volume. The turbulence in the publishing practices landscape should not deviate of this established scientific success criterion.

The team of sixteen senior researchers, helped by three permanent and eleven non-permanent support staff, supervised twenty postdocs and no PhD candidates. The fact there are no PhD candidates is a weak point not only in terms of the academic mandate for education, but much more as a failure to create a new generation of computational scientists that will take the lead in further developing, validating and expanding the scope of the established framework.

Expertise in cognition is thin in TNG, a fact that was mentioned for the whole INS in the previous evaluation. Strengthening this field of expertise will be crucial in the context of neurodegenerative disorders and ageing.

Given the high level of expectation from TVB, TVC and VEP in terms of clinical application and added value, there should be more proactive communication about achieved milestones. The HBP showcase should be seen as a motivation to provide early results on EPINOV.

RECOMMENDATIONS TO THE TEAM

TNG has all means at disposition to publish more in even higher-profile journals. The strong involvement of the faculty staff in large-scale national and EU project calls for a well-defined and formalised publication strategy for early-career researchers.

There should be a clear strategy for ensuring the continuity of academic success by covering the full scale of early career researchers' education. This could be in the form of a dedicated curriculum in computational neuroscience for PhD candidates that can spend the first year in all four INS teams to then continue their research project in one of the INS teams.

TNGs team should consider opportunities for acquisition of expertise in the broad field of cognition, given its pillar on neurodegeneration and ageing. This will strengthen the coherence between the theoretical approaches and their translation to human (clinical) neuroscience.

Current efforts to expand in the clinical fields of neurodegeneration, ageing, psychiatric disorders, brain tumours should be carefully planned. The strength of the established strategy in epilepsy engrained in the EPINOV trial and the VEP concept should be wisely translated in areas with objectively measurable diagnostic and therapeutic outcomes – see Deep Brain Stimulation for PD or OCD, etc.

The team should proactively support non-scientific communications and research publications pertinent to the ongoing EPINOV trial given its crucial importance for translating network dynamics to clinics via TVB and VEP frameworks.

CONDUCT OF THE INTERVIEWS

Date(s)

Start: 24 novembre 2022 à 8 h

End : 24 novembre 2022 à 18 h

Interview conducted: on-site

INTERVIEW SCHEDULE

PARTICULAR POINT TO BE MENTIONNED

GENERAL OBSERVATIONS OF THE SUPERVISORS

Le Président de l'université

au

Département d'Évaluation de la recherche - Hcéres

Objet : Observations de l'unité relatives au rapport d'évaluation des experts Hcéres
N/Réf. : VPR/LS/AMS/CM – 23-06

Dossier suivi par : Cécile Merle
Tél : 04 13 94 95 90
cecile.merle@univ-amu.fr

Vos réf : DER-PUR230023173 - INS - Institut de neurosciences des systèmes

Marseille, le lundi 21 août 2023

Madame, Monsieur,

Je fais suite à votre mail du 11/07/2023 dans lequel vous me communiquiez le rapport d'évaluation Hcéres de l'Unité de Recherche DER-PUR230023173 - INS - Institut de neurosciences des systèmes.

Comme demandé dans ledit mail, je vous indique que les tutelles de l'INS, Aix-Marseille Université et l'Inserm, n'ont pas d'observation à formuler.

Vous souhaitant bonne réception des présentes,

Je vous prie de croire, Madame, Monsieur, l'expression de mes respectueuses salutations.

Eric BERTON

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