

EVALUATION REPORT OF THE UNIT

GRAMFC - Groupe de Recherches sur l'Analyse Multimodale de la Fonction Cérébrale

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Université de Picardie Jules Verne

Institut national de la santé et de la recherche
médicale - Inserm

EVALUATION CAMPAIGN 2024-2025 GROUP E

Report published on February, 18 2025

High Council for evaluation of research and higher education



In the name of the expert committee :

Frédérique Liegeois, chairwoman of the committee

For the Hcéres :

Stéphane Le Bouler, acting president

In accordance with articles R. 114-15 and R. 114-10 of the Research Code, the evaluation reports drawn up by the expert committees are signed by the chairmen of these committees and countersigned by the president of Hcéres.

To make the document easier to read, the names used in this report to designate functions, professions or responsibilities (expert, researcher, teacher-researcher, professor, lecturer, engineer, technician, director, doctoral student, etc.) are used in a generic sense and have a neutral value.

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:	Ms Frédérique Liegeois, University College London, United Kingdom
Experts:	Mr Pierre Burbaud, CHU de Bordeaux (representative of CNU) Ms Chantal Delon Martin, Inserm, La Tronche (representative of the CSS Inserm) Mr Clément François, CNRS, Aix-en-Provence Mr Etienne Guillaud, CNRS, Bordeaux (supporting personnel)

HCÉRES REPRESENTATIVE

Mr Giovanni Stevanin, Inserm, Bordeaux

REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr Denis Postel, Université de Picardie
Ms Marie-Josèphe Leroy-Zamia, Inserm
Ms Benedicte Samyn, Inserm

CHARACTERISATION OF THE UNIT

- Name: Groupe de Recherches sur l'Analyse Multimodale de la Fonction Cérébrale
- Acronym: GRAMFC
- Label and number: Inserm UMR 1105
- Composition of the executive team: Mr Fabrice Wallois

SCIENTIFIC PANELS OF THE UNIT

SVE Sciences du vivant et environnement
SVE5 Neurosciences et troubles du système nerveux

THEMES OF THE UNIT

Research at the Groupe de Recherches sur l'Analyse Multimodale de la Fonction Cérébrale (GRAMFC) focuses on the multimodal analysis of brain function and dysfunction during early neurodevelopment. The team develops tools for simultaneous monitoring of electric & hemodynamic activity, and subtle magnetic fields in newborns and infants, both under normal and pathological conditions. Their goal is to better understand early brain maturation and the effects of pathological conditions on neurodevelopmental outcomes. There are three main lines of research ("axes"), namely i) Technological development (Axis 1), ii) Early neurodevelopment (Axis 2) and iii) Neurodevelopmental pathologies and outcomes (Axis 3).

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The GRAMFC unit was established in 2004 as a multidisciplinary group and has since developed a team of neurophysiologists, neonatologists, neuroscientists, and engineers. It was officially recognized as a research unit (Equipe d'Accueil 4293) by the French Ministry of Research in 2008. In 2010, the group expanded to include the paediatric neurology team of the local hospital (CHU Amiens-Picardie), the centre for learning and language disabilities, the child psychiatry department, and the Autism centre. In 2016, the university hospital's gynaecologists-obstetricians also joined the group. GRAMFC was further recognized by Inserm in both 2012 and 2018 (as UMR 1105). The unit holds a unique position, being located in both i) the Centre Universitaire de Recherche en Santé (CURS) (which houses the main health research units of Université Picardie Jules Verne) where they occupy the ground floor, and ii) the paediatric part of the Exploration Fonctionnelle du Système Nerveux department (EFSN) of the Centre Hospitalier Universitaire (CHU). The CURS building is located adjacent to the CHU facilitating interactions.

RESEARCH ENVIRONMENT OF THE UNIT

The unit is recognized as an Unité Mixte de Recherche (UMR), affiliated to the University Picardie Jules Verne (UPJV) and Inserm. The unit is attached to the Neuroscience research field, defined jointly by CHU Amiens-Picardie and UPJV. The themes of the unit fit within the research topics of the various services of the pole Femme, Couple, Enfant (FCE) of the pediatric department (held by the outgoing director of GRAMFC, and further by the future vice-director of GRAMFC) of the CHU and, more particularly, with the 'Exploration Fonctionnelle du système nerveux pédiatrique' (EFSN) service. These overlaps highlight the link between GRAMFC and the local clinical setting. The unit is mainly located within two contiguous buildings: in the university health research center (CURS) and in the CHU Amiens-Picardie. In the CURS, it benefits for a total space of 800 m² with all the offices of the research staff on the ground floor. In the CHU Amiens-Picardie, it has a research space of 25 m² and research offices of 25 m², to which must be added a closed space for MEG of 25 m² and a recently equipped BabyLab of 25 m². Those 2 buildings are less than 10 years old. The Inserm unit hosts a range of investigating systems located in the CURS. These comprise one diffuse correlation spectroscopy system, one fNIRS device, two high resolution EEG (64 channels) systems, one 3D printing system, one electrophysiology room (MUA, ECoG, LFP) and one experimental MEG-OPM device (5 sensors and a non-magnetic tunnel). In addition, the Inserm unit has a platform in the pediatric EFSN department of the CHU with access to one MEG 25-channel OPM, two high resolution EEG devices (128 channels), one high resolution EEG (64 channels), one frequency resolved high density NIRS system, one high resolution continuous-wave NIRS EEG system, two low resolution NIRS systems, one babylab with video eye-tracking and two tDCS devices. The unit is member of a FHU on children at risk with CHU Le Havre, and has been involved in the GIS Autism since 2019.

UNIT WORKFORCE: in physical persons at 31/12/2023

Catégories de personnel	Effectifs
Professeurs et assimilés	4
Maitres de conférences et assimilés	2
Directeurs de recherche et assimilés	0
Chargés de recherche et assimilés	0
Personnels d'appui à la recherche	7
Sous-total personnels permanents en activité	13
Enseignants-chercheurs et chercheurs non permanents et assimilés	2
Personnels d'appui non permanents	3
Post-doctorants	1
Doctorants	9
Sous-total personnels non permanents en activité	15
Total personnels	28

DISTRIBUTION OF THE UNIT'S PERMANENTS BY EMPLOYER: in physical persons at 31/12/2023. Non-tutorship employers are grouped under the heading "others".

Nom de l'employeur	EC	C	PAR
Université de Picardie Jules Verne	5	0	2
Inserm	0	0	0
Autres	1	0	5
Total personnels	6	0	7

GLOBAL ASSESSMENT

The overall profile of the unit is excellent. The GRAMFC is a medium sized unit (~10 ETP), supported by the university (UPJV) and Inserm, that jointly support three research axes in the neuroscience field. The UPJV created a Chair for a junior professor and gives recurrent doctoral grants to the unit. Notable strengths include unique experimental platforms, outstanding facilities (several paediatric/foetal high-resolution electroencephalography -EEG systems, near infrared spectroscopy -NIRS systems, magnetoencephalography -MEG...) and an excellent scientific position that is internationally competitive in the field. GRAMFC is one of the very few research units in France and worldwide that investigates early brain maturation in the foetus, premature babies and neonates, examining both typical development and atypical (pathological) conditions. To achieve this position, the unit is continuously developing new investigation methods that examine brain activity (electrical, vascular and metabolic) in close coordination with medical doctors. Among their main achievements, the unit revealed the brain's capacity to code auditory rhythmicity as early as the third trimester in neonates born preterm, and identified the relationship between neuronal and haemodynamic activities during epileptic seizures in newborns. Technologically, the development of MEG-OPM for premature neonates, fetuses, and infants stands out as a key achievement. In the last period, scientific production has been excellent (>50 publications) and interactions with the industry very strong (highlights include four patents and a spin-off company). Scientific collaborations have been developed with national and international laboratories in the same field. The unit also obtained significant research funding at national and European level (over 5M euros) including through competitive calls such as H2020, as partner, and ANR (roughly half as PI).

DETAILED EVALUATION OF THE UNIT

A - CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

One suggestion of the previous evaluation was to strengthen the size of the team. Following this recommendation, GRAMFC increased the number of researchers holding the "habilitation in research" (HDR; n=8 versus n=4) necessary in France to supervise students. This increase allowed the recruitment of three PhD students per year during the present evaluated contract, with eight PhD defences and ten still ongoing PhDs. The unit also reinforced their engineering expertise (n=2 versus n=1).

As recommended, the team also began to develop several cohorts of patients in their field of research. In addition, they used preclinical models, as suggested, to investigate the mechanisms contributing to the emergence of epileptic spikes. For this purpose, they developed an invasive and sophisticated multimodal approach combining simultaneous multi-unit activity measurements (MUA), local field potential, electrocorticography (ECoG), NIRS, direct current stimulation (DCS), and coherence analysis.

The only weakness reported in the previous evaluation was the impact factor of publications. Although in comparison with the previous contract, the team produced more (n=54 versus 34 articles) and higher quality scientific publications (significant increase towards more renown journals such as Human Brain Mapping, Cerebral Cortex, Scientific reports, Journal of Neuroscience et Neuroimage), this point still requires further joint efforts targeting journals with larger readership.

B - EVALUATION AREAS

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

Assessment on the scientific objectives of the unit

Objectives of the unit are excellent and cutting-edge. The scientific objectives of the unit focus on early neurodevelopment, both typical (axis 2) and pathological (axis 3). Developing these axes relies on the development of new technological tools (axis 1). This integrated strategy leads to a remarkable quality of work which significantly increases our knowledge of early neurodevelopment at multiple scales, and has high potential translational impact.

Assessment on the unit's resources

The unit's resources, in particular technical ones, are excellent and well suited to the research activities. Human resources are all focused on the scientific objectives. They combine a multidisciplinary workforce that includes engineer and technical staff, neuroscientists and clinical staff from the local hospital. The total ETP of the unit is 10.3 with a very good balance of technical / managing staff close to one. The members of the team have a strong capacity to supervise PhD students (8 staff member with the required HDR diploma). This allowed the recruitment of three PhD students/year during the present contract, with 8 PhD defenses and 10 still ongoing PhD. Over the last period, funding was obtained to support 23 projects (over 5M euros), which has ensured sufficient financial resources for every new project. Technical resources are constantly being updated since they are the key of success for the delivery of study objectives. The previous period relied on a combination of EEG with NIRS. The new one adds a unique combination of EEG with MEG (using the newly developed optically pumped magnetometers – OPM - sensors). Prospective for the future involves ultrasound systems. Finally, clinical resources are provided thanks to the medical doctors of the team that have access to patients, facilitating the recruitment.

Assessment on the functioning of the unit

The panel of experts thought that the functioning of the unit is excellent in terms of ethical rules for clinical studies, gender balance, tracability and backup of data, follow-up of students, training opportunities as well as publication in open access. In addition, the emergence of new themes is encouraged in a bottom-up way.

1/ The unit has set itself relevant scientific objectives.

Strengths and possibilities linked to the context

The scientific strategy is highly relevant to the scientific and clinical setting, in line with the former strategy, with an ongoing search for innovative tools specific for neonates, such as the unique combined EEG/MEG_OPM tool. The main strength of the unit is to base its research on new technological developments and create conditions for their application and dissemination. Close connections between the technological development team and clinical teams (paediatric FENS, neuro-pediatrics, child psychiatry, neonatology intensive Care unit (NICU), gynaecology obstetric and child psychiatry) allow new developments that directly impact neuro-developmental investigations. The platforms developed present cutting-edge technologies that put the team as a leader internationally. New low field magnetic resonance imaging (MRI) systems that can be at patients' bed (and especially in neonatology) might constitute a new opportunity for the unit (<https://multiwave.ch/>).

Weaknesses and risks linked to the context

The capacity to host and supervise PhD students will be lowered by the retirement of several PU-PH, which may impair the capacity of the unit to develop novel approaches and remain competitive in the field. However a strategy has been developed to maintain the number of HDR (seven planned in the next contract).

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

Strengths and possibilities linked to the context

The unit is leading a paediatric platform for neuroscience research. Technological resources to develop multidisciplinary investigation tools are clearly the main strength of the unit. The unit has a policy of obtaining funding for each new project and secured over 5 M euros in the evaluated period. This has ensured sufficient funding resources to support the units' activities. Specifically, the unit obtained funding for 23 projects, including seven ANR grants (3 as PI), four PHRC support (one as PI), three regional projects (as PI), two European projects (as co-investigator), one FHU grant (as Partner), two international foundation grants, one international funding with Iran. This is clearly excellent. This is a medium sized unit (10.3 ETP for publishing + 5 ETP for support) with 13 permanent staff members, corresponding to seven ETP and 15 non-permanent staff members (4 ETP : 2 researchers, 2 post-docs, 9 PhD and 3 supporting staff). These ETP are equally distributed between scientific (5.3 ETP) and clinical positions (5 ETP). The ratio of technical to managing staff is excellent and close to one.

Weaknesses and risks linked to the context

Two unit members who hold HDR (among 8) will soon retire during the next contract. Failure to recruit new permanent staff and to maintain the number of HDR holders in the unit are potential risks to consider for the next contract.

3/ *The unit's practices comply with the rules and directives laid down by its supervisory bodies in terms of human resources management, safety, environment, ethical protocols and protection of data and scientific heritage.*

Strengths and possibilities linked to the context

The unit has built an active recruitment policy to have more permanent people working in the unit. They are recruited according to the rules defined by institutional authorities. The gender ratio is perfectly balanced (15F/15M). The unit has set up a 12-points pipeline to foster the emergence of new themes in a bottom-up way that include identification of needs, generation of preliminary data on own funding and solicitation of agencies. Regarding data management, the unit has set up methods such as daily backups on the DSN server of the CHU Amiens-Picardie to achieve traceability of the experiments. The data archiving and data exchange complies with European legislation. They have built a unique EEG paediatric database allowing reuse of data. Ethical agreements are obtained from the dedicated authorities. PhD students follow ethical courses and publications are published in open access (55/56 during the past period).

Weaknesses and risks linked to the context

HAL has not been used to deposit publications due to lack of administrative support. It will become mandatory to gain better visibility and for evaluation purposes, that will soon rely on HAL.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

Overall, the unit's attractiveness is excellent to outstanding. The unit is clearly a world-leading research group with strong expertise and international reputation in multimodal functional neuroimaging of healthy full-term and preterm neonates and infants. The group is one of the few in the world to develop the MEG-OPM neuroimaging method, ensuring high reputation and attractiveness. During the last period they have obtained national and international funding to support their scientific projects, collaborated nationally and internationally, and attracted junior researchers from within and outside Europe.

1/ *The unit has an attractive scientific reputation and is part of the European research area.*

2/ *The unit is attractive because for the quality of its staff support policy.*

3/ *The unit is attractive through its success in competitive calls for projects.*

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

Strengths and possibilities linked to the context for the four references above

1/ **The unit has an attractive scientific reputation and is part of the European research area.**

Since its creation, the unit has built a highly attractive scientific reputation. It has been successful in fostering international collaborations being currently co-PI of one European network on epilepsy (Epicare network) and two European Horizon2020 projects on epilepsy and early neurodevelopment (PerEpi, TinyBrains). They have also developed collaborations outside of Europe (Canada, USA) for some projects. The scientific reputation of the unit is also reflected in the multiple invitations to conferences (5 international and 16 national), the organization of 2 symposiums during international conferences (the European Conference on Clinical Neuroimaging - ECCN - 2023 and The International Congress of Infant Studies - ICIS – 2024), and the editorial responsibilities that some members have (e.g., Frontiers in Psychiatry, Frontiers in Pediatrics). Finally, the new unit director was awarded the 2023 prize of the 5 senses for kids foundations showing the excellence of the unit.

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

Over the last five years, the unit has recruited ten international students (from Iran, Italy, Mexico) among 21, thus representing almost half of the group's Ph.D. workforce. The GRAMFC also hosted nine university professors (Iran, Germany, Canada, Italy, and Spain) and two post-doctoral researchers. The unit provides support to facilitate the scientific, social, and cultural integration of international students through different local and internal initiatives (French classes, social events, cultural university services etc.).

3/ The unit is attractive through its success in competitive calls for projects.

The unit is PI for two international projects involving European and Canadian partners (i) the fMEG OPM project in collaboration with Grenoble and Tübingen (Germany) funded by ANR-DFG, and (ii) the Babymusic project in collaboration with Hamilton (Canada) funded by the Fondation pour l'Audition. Both demonstrate evidence of its international reputation. The unit is coordinating a Franco-Iranian network (NEUROBIOM project) involving 4 Iranian universities. This network has benefited from support from the French ministry of Foreign affairs, the Iranian ministry of research, and the Iranian Cognitive Science Council. In this context, three Excellence Eiffel scholarships were obtained for co-supervised Iranian Ph.D. students.

Overall, the unit has obtained funding for 23 projects between 2016 and 2023 (over 5M euros) and five industrial collaborations to create a startup (Seenel Imaging). During the period, funding included seven ANR research grants (three as PI), two charity grants (Fondation de France, Fondation pour l'Audition) and two H2020 grants as co-investigator.

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

A major strength of the unit is its platforms that support the investigation of early neurodevelopment. The unit has created a unique experimental platform with high quality cutting-edge equipment allowing the exploration of behavioural, electrical and metabolic cerebral activity in paediatric populations. Specifically, the platform is equipped with various HD (high density)-EEG, NIRS, and NIRS-EEG systems, one eye-tracking, one 25-channels MEG OPM, and two TDCs (transcranial direct current stimulation) devices. The development of the MEG-OPM is a clear strength as very few devices are currently available in France and Europe. These systems are primarily used for fundamental research purpose and require the constant involvement of engineers and technicians for maintenance. In addition, the unit has also access to another platform at the University Health Research Centre where various equipment and facilities are available. The unit has patented four new technologies. The combination of high-resolution electroencephalography (HR EEG) with high-density near-infrared spectroscopy (HD NIRS) allows the simultaneous measurement of electrical and hemodynamic brain activity. GRAMFC has also implemented advanced tools for signal modelling, processing, and complex data analysis.

Weaknesses and risks linked to the context for the four references above

The retirement of the previous director may represent a risk for the future of the unit as it could translate into a lower attractiveness both in terms of international collaborations and success in competitive calls. The previous director was the investigator linked to on all four European grants, all three Eiffel bursaries, and half of national grants obtained. The number of invited lectures (5 international over 5 years) is modest relative to the size of the unit. More particularly, international oral presentations (n=16) have decreased compared to the previous evaluation period (n=24), although partially explained by the COVID pandemic.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

The scientific production of the unit is excellent and has increased compared to the previous evaluated contract. During the last contract (2018 -2023), the team produced a total of 54 publications and obtained four patents. Publications were in highly regarded international journals in the field, such as Human Brain Mapping (4), Cerebral cortex (3), PLOS One (3), Neuroimage (2), Scientific Reports (2), J. Neuroscience (1), JAMA Network Open (1) and Eur. J. Neurosci (1). Outside the main axes, the team participated in 37 publications in medicine.

- 1/ The scientific production of the unit meets quality criteria.*
- 2/ The unit's scientific production is proportionate to its research potential and properly shared out between its personnel.*
- 3/ The scientific production of the unit complies with the principles of research integrity, ethics and open science. It complies with the directives applicable in this field.*

Strengths and possibilities linked to the context for the three references above

The publications of the unit appear in peer-reviewed international journals that are relevant to the discipline and highly regarded. The unit's field of research is highly innovative, investigating high-risk topics regarding the population in focus, namely brain function and dysfunction during early neurodevelopment. The production must be considered in view of the fact that this is a medium-sized team (~1-2 publications per year / PI). It is noteworthy that doctoral and post-doctoral students are encouraged to participate in the scientific production activity. Considering differences between the three axes (methodology for Axis 1, Research for Axis 2 and 3), the production appears relatively homogeneous. The unit's policies ensure data traceability and archiving, and research activities follow ethical guidelines. Almost all publications are on open access.

Weaknesses and risks linked to the context for the three references above

Despite the high quality of the research work and innovative approaches, the unit has not published in highly impactful journals in the field, or in journals that would ensure greater international visibility (e.g. of wider readership). Given the niche area of research (very early neurodevelopment), publication may be more challenging.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

Overall, the unit's contribution to society is very good to excellent. The creation of a startup company and the obtention of several patents (4 obtained, 2 under review) represent remarkable achievements. Besides, since the last contract, the unit has made substantial contributions to society through the three axes, via public engagement and educational activities. Its interactions with the clinical setting within the CHU also constitute a major strength.

- 1/ The unit stands out for the quality and the amount of its interactions with the non-academic world.*
- 2/ The unit develops products for the cultural, economic and social world.*
- 3/ The unit shares its knowledge with the general public and takes part in debates in society.*

Strengths and possibilities linked to the context for the three references above

1/ The unit stands out for the quality and the amount of its interactions with the non-academic world.

The unit has built solid interactions with the economic world through collaborations with two national (Malterre in Amiens, Mag4Health in Grenoble) and two international companies (Hemophotonics, Spain ; EGI, USA). The unit interacts with a national company to design EEG-MEG headsets for newborns and support for foetal MEG sensors. Thanks to the strong collaborations with the hospital, the unit has been able to implement HD-EEG recordings in clinical routine (NICU and epilepsy unit) which is another strong achievement.

2/ The unit develops products for the cultural, economic and social world.

The unit has strong interactions with industrial partners. A remarkable achievement of the unit is the creation of the Seenel spin-off in 2017. Since then, the unit continues the partnership with the Seenel company through efficient fund raising and collaborations in international projects. The unit has obtained three industrial European patents co-licensed with Seenel, while another one is currently being reviewed. Concerning the cultural world, the unit has organized a science and music conference for the general audience in Amiens where talks from two internationals and one national invited speaker were followed by a music concert.

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

Compared to the previous evaluation, the unit put some efforts in participating to outreaching activities. This was done through the organization of various events (Pint of science, Annual brain week in Amiens, science and music conference in Amiens, MAGIC event in Amiens). The new lab director has been invited to give a public conference at IRCAM (Paris) during the « journées de la perception sonore ». Some of the results generated by the unit have been promoted in regional and national TVs and radios. Finally, the director participated in the writing of a collective book on neonatal brain imaging edited by the CNRS in 2022.

Weaknesses and risks linked to the context for the three references above

The impact and visibility of the unit in the society could be higher considering the clinical relevance and translational potential of the methods developed and the findings. However, one must take the domain of research into consideration (early pathological neurodevelopment) since therapeutic tools in this field are limited. Further extensive research is necessary before the basic science findings can be applied to clinical practice in order to treat brain damage linked to acute ischaemia or other very early conditions.

ANALYSIS OF THE UNIT'S TRAJECTORY

The unit plans to maintain the current structure, with its three main research axes. It has set itself ambitious objectives, that however appear deliverable overall given ongoing funding into the next period (10 grants beyond 2024), staff availability/expected recruitment, and collaboration with their spin-off company. The unit has also set out plans to apply for further funding. The present director of the unit will be succeeded in the upcoming contract by a new director (PhD-HDR, currently chaire de Professeur Junior, to be named Professor in 2025), who will benefit from a teaching discharge to focus on the research activities in the unit. She will be joined by a deputy director (MD-PhD, MCU-PH, to be named Professor (PU-PH) in 2024). Jointly, they have the expertise and complementary competence to carry forward the ambitions of the technological and clinical axes. They have already demonstrated excellent potential (via successful grants and publications in the previous contract) to deliver the next project.

The next period's objectives are a natural continuation and expansion of the current projects, for example the optimization of EEG-NIRS for infants and newborns, a high risk/high reward project to detect early biomarkers of hypoxia/ischemia (this will require funding application), recording of endogenous activity and functional connectivity, foetal/neonatal MEG, auditory rhythm processing, musical therapy, and application to fund a multicentre project (EEG).

A strength of the unit in the future will rely on the use of a combination of EEG with MEG-OPM, a cutting-edge tool that should provide very unique clinical results for the team. This approach adds sensitivity of tangential sources to the sensitivity of radial sources in the brain. In addition, MEG-OPM technology is particularly easier to use than SQUID for MEG in the infant population.

The unit current and future directors have already identified funding bodies to target for future applications, plan to lead several projects, and have already listed priorities to increase their contribution to society and scientific visibility.

Another very interesting orientation is the research on therapeutic strategies with combination of tDCS with EEG and the development of well-being strategies based on music therapy. Research on the efficacy of very early interventions is highly needed. Results may have a wide clinical impact and are likely to also increase our understanding of early neuroplasticity.

RECOMMENDATIONS TO THE UNIT

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

A new permanent researcher would strengthen the workforce in such a medium sized unit and ensure the delivery of scientific objectives. This could be a new recruitment at Inserm or welcoming a researcher from elsewhere. The unit planned to have more staff members with HDR. This will be crucial for the future. Given the wealth of the data acquired up to now, the conditions for reuse of these data in open source (with potential access to external researchers) would be very useful for the scientific community. Collaboration with data scientists might be helpful in the future for the unit to achieve this aim. Carbon footprint will soon be requested by Inserm to build future de-carbonation strategies. Its assessment needs to be evaluated.

Recommendations regarding the Evaluation Area 2: Attractiveness

The members of the unit should continue applying to international grants as done in the last years. Given their cutting-edge methods and established European collaborations, PIs could for instance apply to ERC funding to lead major projects. This would contribute to securing and maintaining the leading status of the unit in the field of neuroimaging in paediatric populations, and allow the recruitment of postdoctoral researchers. In the previous evaluation, the committee emphasized that valorization and promotion of the toolboxes should be considered. This recommendation still holds for the next period. The international visibility of the unit would benefit from a standardized and easy-to-read web-page and a more user-friendly design. The two institutions (UPJV and Inserm) provide ready-to-use kits as well as technical support. Regarding visibility, organizing more international conference symposia (e.g. Human Brain Mapping, European Academy of Paediatrics) would be needed. The unit members should also consider editorial roles in specialized international peer-reviewed journals outside predator journals to increase their visibility and reputation in their fields.

Recommendations regarding Evaluation Area 3: Scientific Production

It seems relevant to think about improving the strategy of publication considering for example journals such as Brain, Neuron, Science in Translational Medicine, and journals of the Nature group (Nature Medicine, Neuroscience, Nature Communication).

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

The field of research of the unit is innovative and particularly interesting since they investigate the plasticity of brain function during early neurodevelopment and its dysfunction in pathological conditions such as ischemia during neonatal period or epilepsy in new-borns. With such topics of significant impact in terms of Public Health, there is potential to attract interest from the general public and media. The webpage could be formatted using institutional turnkey kits to increase visibility. The unit could consider other ways to increase the visibility of their research to clinicians and the wider public (e.g. short videos on YouTube, lectures at summer school or CPD accredited schools, short courses). This would be a great opportunity for junior researcher to develop new communication skills.

CONDUCT OF THE INTERVIEWS

Date

Start: 17 octobre 2024 à 09h00

End: 17 octobre 2024 à 14h00

Interview conducted: on-site

Start: 21 octobre 2024 à 08h30

End: 21 octobre 2024 à 17h30

Interview conducted: online

INTERVIEW SCHEDULE

Visit of the facilities: October 17 (Amiens)

Hcéres Scientific advisor: Mr Giovanni Stevanin

Subcommittee:

Ms Chantal Delon Martin, Grenoble (representative of Inserm CSS)

Mr Etienne Guillaud, Bordeaux (representative of technical staff - PAR)

Address: CURS - Centre Universitaire de Recherche en Santé de l'UPJV
30 Av. de la Croix Jourdain, 80000 Amiens

Planning:

- 9h Welcoming: service des EFSN pédiatriques Hall 2, 1er étage, CHU sud Amiens salle de la Direction Générale du CHU
- 9h10 Presentation of the unit and facilities by the unit director
- 10h Visit of the facilities (CHU and CURS/UPJV)
- 11h30 **Meetings with the various categories of staff - Session 1 (closed door)**
Meeting with the technical staff (permanent & non-permanent) (in French/ en français)
- 12h Lunch break
- 14h Departure from Amiens

Interview on line: October 21st

Hcéres Scientific advisor: Mr Giovanni Stevanin

Research committee:

Mr Pierre Burbaud, Bordeaux (representative of CNU)

Ms Chantal Delon Martin, Grenoble (representative of Inserm CSS)

Mr Clément François, Marseille

Mr Etienne Guillaud, Bordeaux (representative of technical staff - PAR)

Ms Frédérique Liegeois, Londres (**President**)

Observer: Mr Hervé Platel, Caen (representative of Inserm CSS)

8:30-8:50 **Welcome discussion online (only for the committee)**

8h50-15h00 Interview of the unit

8:50-9:00 Presentation of the evaluation process to the unit by the Hcéres advisor

9:00-10:00 Presentation of the unit scientific outputs and strategy by the present (Fabrice Wallois) and future (Sahar Moghimi) lab directors (30' presentation + 25'discussion)

10:00-10:15 *Coffee break*

10:15-12:00 Presentation of the scientific programs and research results by principal investigators (12mn past- 8mn future -15mn discussion)

Axis 1: Technological development - Fabrice Wallois
Axis 2: Early neurodevelopment - Sahar Moghimi
Axis 3: Neurodevelopmental pathologies and outcome - Emilie Bourel-Ponchel & Laura Routier

12:00-13:30	Lunch break
13:30-15:00	Meetings with the various categories of staff - Session 2 (closed door) 13:30 Discussion with PhD students and post-docs 14:15 Discussion with scientists (without unit directors)
15:00-15h30	<i>Coffee break</i>
15:30-16h00	Discussion with supervising bodies (closed-door)
16h00-16h15	Exchange with the CHU representatives (closed-door)
16:15-16:45	Discussion with the directors – future and present (closed-door)
16:45-17:30	Private meeting of the visiting committee (closed-door)
17:30	End of the interview

GENERAL OBSERVATIONS OF THE SUPERVISORS



Amiens, le 9 décembre 2024

Monsieur le Président

HCERES
2 Rue Albert Einstein
75013 PARIS

Direction de la Recherche
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Objet : Réponse officielle évaluation GRAMFC

Vos Réf : DER-PUR260025005 - GRAMFC - Groupe de recherches sur l'analyse multimodale de la Fonction cérébrale

Monsieur le Président,

Je tiens tout d'abord au nom de l'Université de Picardie Jules Verne et en particulier au nom du Directeur et des membres de l'unité de recherche GRAMFC - Groupe de recherches sur l'analyse multimodale de la Fonction cérébrale à vous remercier pour l'analyse approfondie effectuée, ainsi que pour les remarques constructives qui nous ouvrent des pistes de réflexion et d'amélioration.

Après discussion et concertation avec les membres de l'équipe, nous n'avons pas d'observations à formuler.

Je vous prie d'agréer, Monsieur le Président, l'expression de mes sincères salutations.

**Le Président de l'Université de
Picardie Jules Verne**



A handwritten signature in black ink, appearing to read 'Mohammed BENLAHSEN', written over a faint, large, stylized watermark of the name 'Jules Verne'.

Mohammed BENLAHSEN

The Hcéres' evaluation reports are available online:
www.hceres.fr

Evaluation of Universities and Schools
Evaluation of research units
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