Research evaluation

EVALUATION REPORT OF THE UNIT

IPHC – Institut Pluridisciplinaire Hubert Curien

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Université de Strasbourg

Centre national de la recherche scientifique — CNRS

EVALUATION CAMPAIGN 2022–2023

GROUP C

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In the name of the expert committee[1]:

Nicolas ALAMANOS, Chairman of the committee

For the Hcéres [2]:

Thierry Coulhon, President

Under the decree n° 2021-1536 of 29th November 2021:
[1] The evaluation reports 'are signed by the chairperson of the expert committee'. (Article 11, paragraph 2);
[2] The president of the Hcéres 'countersigns the evaluation reports established by the expert committee and signed by their chairperson.' (Article 8, paragraph 5).

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

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Experts :	Mr. Tiziano CAMPORESI, CERN, Genève, Suisse Ms. Isabelle FOURNIER, Université de Lille Ms. Florence ARDELLIER, APC Paris (research support personnel representative) Mr. Fernando FERRONI, Gran Sasso Science Institute, l'Aquila, Italie Mr. Denis DAUVERGNE, CNRS Grenoble (CoNRS representative) Mr. Jean-François MATHIOT, CNRS Aubière (CNU representative) Ms. Pascale DELANGLE, CEA Grenoble Ms. Christel LEFRANCOIS, La Rochelle université Mr. Jean-François LE GALLIARD, CNRS Paris Ms. Catherine PERRIN, Université de Montpellier

HCÉRES REPRESENTATIVE

Mr. Guy CHANFRAY

CHARACTERISATION OF THE UNIT

- Name: Institut Pluridisciplinaire Hubert Curien
- Acronym: IPHC
- Label and number: UMR 7178
- Number of teams: 21
- Composition of the executive team: Ms Sandrine COURTIN

SCIENTIFIC PANELS OF THE UNIT

ST Sciences and technologies
ST2 Physics

THEMES OF THE UNIT

The activities of the IPHC are organised around four departments, 1) Ecology, Physiology and Ethology (DEPE), 2) Subatomic Research (DRS), 3) Analytical Sciences (DSA), and 4) Radiobiology, Hadrontherapy and Molecular Imaging (DRHIM). They are subdivided in 21 research teams and 7 technical platforms, namely C4Pi, Cyrcé, PAI, ProFI, PSGE, RAMSES and Scigne. Shared administrative and technical services complete the structure of the institute (mechanics, electronics, IT, radiation protection).

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The 'Institut Pluridisciplinaire Hubert Curien' (IPHC) is a mixed research unit UMR 7178 CNRS – University of Strasbourg (Unistra). It was created on January 1, 2006, after the merging of three laboratories and it is currently composed of approximately 400 agents, including nineteen professors and associate professors (*professeurs d'Université*), 36 lecturers and associate lecturers (maîtres de conferences), 25 Senior scientists (*Directeurs de recherche, DR et associés*), 29 Scientists (*Chargés de recherche, CR et associés*) and 138 Research supporting personnel (PAR), who pursue activities in subatomic physics, chemistry and biology, and manage the structure.

Today the IPHC site includes seventeen buildings over an area of more than 24 000 square metres. It is located mainly at the Cronenbourg Campus (Strasbourg; 21 812 m^2 are under CNRS management, and 2 047 m^2 under the management of the European School of Chemistry, Polymers and Materials) and on the premises of the Faculty of Pharmacy in Illkirch (251 m^2) for research in chemistry related to the pharmaceutical domain.

RESEARCH ENVIRONMENT OF THE UNIT

The research activities of the unit's teams are associated with scientific domains covered by four CNRS institutes, IN2P3 (National Institute of Particle Physics and Nuclear Physics), Inee (National Ecology and Environment Institute), INC (National Institute of Chemistry) and, since 2012, INSB (National Institute of Biological Sciences). The IPHC staff members are evaluated by different sections of the '*Comité national de la recherche scientifique*' (CoNRS, sections 01, 13, 14, 16, 24, 26, 28, 29, 30 and CID52), and the '*Conseil national des universités*' CNU sections 29, 31, 32, 62, 63, 67, and 85. The IPHC professors and associate professors, lecturers and associate lecturers are linked to six University departments (Physics and Engineering, Life Sciences, Chemistry and Pharmacy Faculties, as well as the Louis Pasteur IUT and the European School of Chemistry, Polymers and Materials). The skills of engineers and technicians cover a wide area and are associated with all '*branche d'activité professionnelle*' (BAP A, B, C, E, F, G and J).

IPHC is a mixed research unit with strong links with the Unistra in terms of research (ITI, IdEx programmes, regional projects) and education. The IPHC PhD students are enrolled in one of the three Doctoral Schools: Physics and Chemical Physics (ED182), Chemical Sciences (ED222) and Life and Health Sciences (ED414). In addition, the Institute plays an active role in several structures created by the PIA (Plan for Investment) namely (1) the Unistra IDEX, (2) the national Profi proteomic infrastructure (Strasbourg/Grenoble/Toulouse), (3) the LABEX IRONs (Innovative Radiopharmaceuticals in Oncology and Neurology), NIE (Nanostructures in interaction with their environment, Strasbourg) and Medalis (development of innovative medicines in the cancer treatment field), the EUR QMAT (Unistra) and (4) the Equipex S3 (coordination by Ganil in Caen).

The unit participates in four Unistra Interdisciplinary Thematic Institutes (ITI): QMat (which includes 3 IPHC PIs), HiFunMat (including 1 IPHC PI), TRANSPLANTEX NG and IMS (including 2 IPHC PIs). The ITIs are major structures in redesigning the research and education at Unistra. They follow the creation of 'graduate schools' and particularly that of the EUR (*École Universitaire de Recherche*) QMat (Quantum Science and Nanomaterials), financed as part of the PIA3, in which the unit is highly involved. In this context, the IPHC also participates in the ILC (Institute of Language and Communication) and ISY (Institute for Sustainability) research federations. The IPHC is part of two regional clusters. The CPER Alsacalcul is led by a common scientific council and includes the IPHC Scigne platform. The second, entitled Bigest, brings together local bioinformatics players and is co-financed by the PIA3 'MUDIS4LS'. The IPHC participates in the Satt Conectus through maturation and pre-maturation projects such as the implementation of the Fibermetrix Start-up, the current QMF project, the

MERCURE project (which led to the creation of the Smartium Start-up in 2020) and in a set of projects linked to domains such as for instance research on Lyme disease.

IPHC collaborates with the Comprehensive Cancer Centre ICANS (*Centre Européen de lutte contre le cancer de Strasbourg*) and the proton therapy centre in Nice (*Centre Antoine Lacassagne*) for studying the production of secondary particles and the associated mechanisms of water and biomolecule radiolysis. The IPHC is also collaborating with the '*Centre Hospitalier de Mulhouse'* in the framework of European projects (Eurados). Radiochemistry research oriented towards environmental contamination by radionuclides is performed in the frame of the Fessenheim *Observatoire Hommes Milieux* and the ZATU (*Zone Ateliers Territoires Uranifères*).

Most of the IPHC teams benefit from a qualified technical support which contributes to the development of excellent research tools.

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

Permanent personnel in active employment	
Professors and associate professors	19
Lecturer and associate lecturer	36
Senior scientist (Directeur de recherche, DR) and associate	25
Scientist (Chargé de recherche, CR) and associate	29
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	138
Subtotal permanent personnel in active employment	**247**
Non-permanent teacher-researchers, researchers and associates	19
Non-permanent research supporting personnel (PAR)	24
Post-docs	11
PhD Students	103
Subtotal non-permanent personnel	**157**
Total	**404**

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

Employer	**EC**	**C**	**PAR**
CNRS	0	53	129
Université de Strasbourg	50	0	8
Université de Haute-Alsace	5	0	0
Inserm	0	1	1
Total	**55**	**54**	**138**

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	10 626
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP idex, I-site, CPER, territorial authorities, etc.)	7 003
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	20 437
Own resources obtained from international calls for projects (total over 6 years of sums obtained)	4 009
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.).	9 066
Total in euros (k €)	**51 141**

GLOBAL ASSESSMENT

IPHC is a multidisciplinary unit (hereafter often named the Institute), the originality of which consists in the wide range of disciplines covered, with each field at the highest national or even international level. All the disciplines, structured within departments, contribute to the scientific activity of the laboratory and all of them, in their respective disciplinary fields, participate in its influence. The scientific production is of an excellent level, even exceptional in certain areas where the IPHC is considered as one of the leading French laboratories in the field.

IPHC as a whole benefits from a very good reputation and attractiveness, which is reflected by its involvement in national projects as well as in research projects at internationally recognised facilities. It relies on technical platforms, some of which are exceptional on a national and even international scale, managed by staff with original skills, of very high technical levels.

In addition, IPHC has been able to forge close links with the socio-economic and cultural world, resulting in excellent interactions with industry, particularly in the fields of chemistry and physics (patents, Cifre PhD grants, maturation projects and the creation of two start-ups).

Furthermore, IPHC is strongly involved in education and training through research at the Master's level and at the level of the doctoral schools to which it belongs. 121 theses and nineteen HDRs were defended during the period under evaluation, which underlines the dynamism of the laboratory in doctoral training. Currently, 100 PhD students and eleven post-doctorates are working at the Institute.

A short assessment for each department is given below.

The scientific production of the Ecology, Physiology and Ethology Department (DEPE), composed of teams 1 to 4 is excellent. The research activities of the department's teams are in line with the thematic priorities established by CNRS 2019–2023 'Contract of Objectives and Performance for different aspects of ecosystem health and human health'. The Department teams have clear priorities for the future and plans for collaboration with some of the Institute's other departments. Involvement at National and European projects is also of a very good level and should ensure continuity of the Department team's research activities.

The Subatomic Research Department (DRS) is composed of teams 5–15. The scientific production and research activities of the Department teams, conducted for most of the teams within the framework of major international collaborations, are of the highest international level and in line with the recommendations of the corresponding European Agencies' roadmaps (ECFA – Nupecc, APPEC) and IN2P3 scientific strategy. A particular attention should be given concerning the replacement of retiring senior physicists.

The research activities of the Analytical Science Department (DSA), composed of teams 16–19, are of excellent quality. They are oriented towards the (multi- and inter-) disciplinary structuring of research, the establishment of high-performance platforms and the reception of foreign researchers. During the period under review, two analytical chemistry teams have seen an impressive leap in their human resources. The evolution of these teams, located at the Cronenbourg campus, may be slowed down by prosaic problems of space.

The Radiobiology, Hadrontherapy, Molecular Imaging Department (DRHIM) is composed of teams 20, 21, one of which, team 21, has only one permanent member. The research activities of team 20 and in particular its application to industrial networks is excellent. However, given the current situation where the department is reduced to almost one team, one can question about its existence as a department.

In line with the recommendations of the previous Hcéres evaluation, the structuring of the unit has evolved in a positive way. By taking a series of concrete measures, IPHC management has succeeded in strengthening internal communication, facilitating the circulation of information and homogenising management practices and scientific publications with the aim of strengthening the unit's identity and affirming its status as a multidisciplinary institute in the regional, national and international landscape.

Further efforts are needed in order to clarify the role of the department heads in the IPHC governance and decision-making processes, in order, among other things, to establish their legitimacy with the various authorities and the recognition of their key role in the governance of the IPHC. Efforts are also needed in order to develop a scientific policy of interdisciplinary collaboration, to respond to the specific needs of certain teams, in particular in terms of human resources, and to improve communication within the unit.

The organisation of the unit in terms of four departments (DEPE, DSA, DRS and DRHIM) covers all the facets of the scientific activities of the unit. However, in view of the limited number of human resources in a few teams, in particular in the DRS and DRHIM departments, the direction of the unit should consider whether the actual repartition is still the most adequate.

DETAILED EVALUATION OF THE UNIT

A – CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The previous committee provided the unit's management with a set of challenging recommendations aimed at strengthening internal communication, facilitating the circulation of information and standardising administrative practices in order to reinforce its identity as a multidisciplinary laboratory: IPHC management has responded to these recommendations by implementing a set of actions that are particularly, but not exclusively, relevant to the internal life of the unit.

After two years of the coronavirus crisis, the management is setting up regular meetings in order to strengthen the laboratory identity and improve synergies. In particular the management team has increased the number of general assemblies (GAs) where research and technical projects are presented to all staff. This action was followed by the organisation of interdepartmental seminars open to all the staff and the organisation of festive events to reinforce a community feeling.

A new website was also created which seems to satisfy the majority of the Institute's staff and where a lot of practical information is made available to the entire Institute's staff.

In order to standardise common practices, the Institute has also implemented different tools to improve the 'quality' process at the level of support services, documentation management, workflow management, and scientific production. The Institute's platforms are increasingly involved in these processes, which has enabled them to obtain certification from the Unistra under the Cortecs network label (Cyrcé, PAI, ProFI/PSGE and Scigne) as well as from IN2P3 (C4PI, Cyrcé, Scigne). All newcomers (permanents, non-permanents and trainees) are made aware of the quality approach via training sessions on quality.

The IPHC also takes particular care in its communication with local, regional, and national partners, which are regularly invited to important events in the life of the Institute (commemoration of the 10th anniversary of the Cyrcé project or the 50th anniversary of IN2P3, etc.).

The organisation of the management team is classical. All departments and services are represented at weekly meetings where information on the life of the Institute is exchanged and decisions on its functioning are taken.

HDRs and PhDs have been strongly encouraged among engineers. For example, two engineers have defended their HDRs and two obtained their PhD. In consultation with the management, the activities of the concerned teams have been adapted to enable applicants to prepare their HDRs and PhDs under good conditions.

Obtaining a strong identity in a multidisciplinary laboratory with world-class teams in each discipline is a difficult but exciting task. We can see that the management team has taken significant steps to respond to the recommendations of the previous Hcéres committee and has not skimped on initiatives to achieve this objective.

Significant efforts have been made in order to improve the IPHC governance. These efforts should be continued further to improve and clarify the governance structure of the unit by better specifying the role of the Head of Department in the management of the institute through their participation in the Management Committee. A greater role should also be given to the Laboratory Council, which could contribute to discussions and decisions concerning internal functioning, budget and human resources.

B – EVALUATION AREAS

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

Assessment on the unit's resources

As far as human resources are concerned, these seem to be adequate to carry out most of the research activities. However, the situation is very different from one department to another and from one team to another. It seems to be strained for certain teams that do not have enough human resources to carry out some of their scientific activities. The problem of human resources is certainly one of the central points that should preoccupy the unit's management in the years to come, especially since a significant number of the Institute's staff are due to retire in the next decade. Maintaining adequate human resources and balancing the needs between different departments and teams will probably be one of the major challenges of the institute's strategy for the years to come.

The unit's funding (excluding salaries) is largely provided from external resources obtained from grants and service contracts obtained following calls for projects and contracts through the technological platforms. It enables the Institute to accomplish its missions. However, this situation may be somewhat fragile for certain teams, which may no longer dispose of the necessary funding to carry out their long-range activities.

Assessment on the Scientific Objectives of the Unit

The unit's activities cover several scientific fields. On the whole, these are activities of very high scientific level carried out in the framework of significant partnerships, national and international collaborations. These research activities often rely on the use of high-level platforms and the hosting of renowned foreign researchers. Some departments also contribute to the development of innovative experimental devices for both fundamental and applied research.

The strategy of the unit is in line with the recommendations of the corresponding European Agencies' roadmaps and the four CNRS Institutes (IN2P3, INEE, INC and INSB) thematic priorities.

The Institute is also attentive to the economic and societal impact of its research. In this context, it participates in research on Covid-19 and Lyme disease and is currently setting up a transversal action to help with the dismantling of nuclear installations. In addition, during the reporting period, two start-ups were created.

The IPHC has a Scientific Council, which play an important role in setting the new scientific projects of the Institute.

It has to be noted that there are factors of uncertainty regarding some projects that depend on decisions taken by external authorities.

Assessment on the functioning of the unit

The functioning of IPHC is strictly in line with the administrative procedures in force at CNRS and Unistra. For instance, the recruitment procedures are those applied by the supervisory authorities and in compliance with the European Human Resources Strategy for researchers (HRS4R). To implement this policy, the unit disposes of an organisational chart setting out the various rules and procedures in force. It has created an equality/parity advisory team for identifying complaints or conflict situations involving IPHC staff, the new arrival procedure and a local committee examining health and safety and working conditions (CLHSCT).

IPHC also applies all the necessary provisions for the protection of its scientific assets and computer systems. Finally, the Institute has drawn up a Continuous Activity Plan (CAP), which has been validated by the CNRS. The coronavirus crisis provided an opportunity to test in real conditions the effectiveness of this plan, which guaranteed the continuity of the Institute's activities during the lockdown.

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

Strengths and possibilities linked to the context

The human resources, with some exceptions, are in line with its various research programmes and the needs of the technical platforms.

The financial support provided by the supervisory authorities namely CNRS and Unistra, and the active involvement of its agents in the search for additional funds enables the Institute to accomplish its missions.

Additional financial resources are obtained from regional, national and European funding agencies such as ANR (Agence Nationale de la Recherche), CPER (Contrat de plan Etat-Région), CNRS-IN2P3, INCa (Institute National du Cancer), Europe and through collaborations with the socio-economic world (collaborations with industry, service providers and associations). For the development of projects, the unit is regularly supported by the CNRS Innovation programme (pre-maturation, even pre-pre-maturation from CNRS institutes) and the Satt Conectus programme (valorisation and technology transfer) for pre-maturation and maturation. Further support is also obtained by the CNRS MITI programme (Mission pour les initiatives transverses et interdisciplinaires).

To promote actions of collective interest, the unit has set up a levy system (5 % of all eligible resources) providing a financial buffer that is redistributed. Examples of levy redistribution are the funding of videoconference rooms (2019/2020), of equipment for the amphitheatre (2021), and for promoting new programmes at the interface of the Institute's scientific fields, strengthening in this way the collaboration between the different IPHC teams.

With the exception of the analytical chemistry teams, which are cramped in the premises of the chemistry school (teams 16, 18 and 19), or the pharmacy school at Illkirch (Team 17), the 24 000 m^2 of the IPHC accommodate the 400 IPHC agents in rather satisfactory conditions. Current buildings offer 7 143 m^2 (CNRS) and 800 m^2 (Unistra) of technical space dedicated to technical platforms and services. The storage space housing computer and documentary resources are also sufficient for present needs. Recently, many premises have been renovated. In particular building 60, which houses the DEPE, has been renovated according to the latest environmental standards.

Weaknesses and risks linked to the context

IPHC seems to have adequate resources to carry out most of its experimental programmes, although some concerns may be expressed in the team-by-team analysis.

A very large part of the budget originates from external resources obtained through calls for projects. This type of resource is by nature uncertain over time and does not allow for a long-term scientific policy. This is probably one of the major constraints regarding the Institute's programmes and may weaken some of them in the future.

Another topic of concern is the housing conditions of the analytical chemistry teams in the premises of the chemistry School.

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

Strengths and possibilities linked to the context

The scientific activities of the unit cover several scientific areas depending on different supervisory authorities.

The IPHC is endowed with a Scientific Council, which has the responsibility of advising the management on the new scientific projects. The scientific orientations of the institute are also presented and discussed at the Laboratory Council level allowing all the Institute's staff to be informed on the unit's scientific orientations.

DEPE: The four current teams in the Ecology, Physiology and Ethology Department (DEPE) (teams 1 to 4) are all addressing mechanisms that enable animal species and humans to cope with the constraints of their environment, and use behavioural ecology and ecophysiology approaches whether functional or evolutionary. This strongly facilitates collaborations between members and teams of DEPE and is a major strength of the Department. These research areas are also in line with the thematic priorities established by CNRS 2019–2023 'Contract of Objectives and Performance for different aspects of ecosystem health and human health' with clear priorities for the future as well as plans for collaboration with other research teams at IPHC especially DSA and DRHIM. Furthermore, the DEPE teams have established partnerships with academic and non-academic actors and leading groups in space research and physiology, clinical research on obesity and sedentarity, aging research, ecology of Antarctica species and conservation biology. This will provide strong support for the future projects of the department. Examples of long-term research projects have been provided during the visit and seem to be clearly identified by team leaders and the head of the department.

DRS and DRHIM: The DRS and DRHIM departments are composed of teams 5–15 and 20–21 respectively. The experiments carried out by these teams either address fundamental research questions (teams 5, 6, 7, 8, 9, 10, 11, 12) or applied research questions (teams 13, 14, 15, 20, 21). Given that DRHIM has only two teams, one of which has only one permanent member and given the scientific proximity of the themes of the two departments, their scientific activities are evaluated in the same sub-chapter of the present report.

The theory team (team 5) provides guidance on the different research topics invested by other teams. It makes contributions, which are essential in today's theoretical and experimental environments.

Teams 5–13 collaborate with key international actors in their respective field, such as CERN (France, Switzerland), KEK (Japan), AIEA (Austria), and worldwide facilities for nuclear Physics (such as RIKEN and RCNP – Japan, ANL – USA, LNL – Italy, ALTO – France).

The scientific programmes carried out by these teams address fundamental questions in the fields of particle physics, astroparticle physics, cosmology and subatomic physics. In this sense these teams, which conduct their experimental programmes within the framework of major international collaborations, are addressing research fields that are part of the core mission of IN2P3 scientific policy.

Special mention must be made of the Picsel team (team 11). Thanks to its long-standing expertise in CMOS pixel sensors and a very important support of the C4PI platform, it plays a leading role in the development of monolithic CMOS technologies, where the possible applications go well beyond Higgs factories like ILC, FCCee or Alice ITS3, Belle 2 including future possible upgrades of the detectors and dosimetry.

Teams 13–15 and 20–21 are strongly involved in societal applications dedicated to nuclear power, environment and health, radiobiology, Hadrontherapy, molecular imaging with skills that are issued from nuclear physics and nuclear chemistry, and detector developments. Team 13 provides important information on cross sections for nuclear power plants. Team 14 is involved in radiochemistry for environment and nuclear fuel cycling, and, together with team 15, they provide radiochemical and nuclear data for biochemistry issues. Their expertise is used to develop sensors for dosimetry and radiological surveillance. Teams 14 and 15 have recognised expertise in the environmental and health impact of radiation. Teams 20 and 21 carry out research in molecular imaging, Hadrontherapy and radiobiology in order to understand radiation-related problems at the level of pre-clinics, with possible forward application to the clinical practice.

Furthermore, the Institute with major input from teams 20 and 21, has developed the Cyrcé platform, comprising a cyclotron accelerator with proton irradiation lines, a radiochemistry lab, a small animal imaging and the associated animal housing facility. This represents a complete infrastructure for radioisotope production, new radiotracer synthesis, and the small animal irradiation and imaging. This research effort is part of the national context in which the Institute is and will be involved via the RDA's MI2B or the RESPLANDIR network.

The unit is attentive to the economic and societal impact of its research. To this end, the Institute is planning to set up a new activity within teams 14 and 15 to participate in the decommissioning of nuclear power plants and in particular, to start with, the Fessenheim nuclear power plant. For this reason, it has recruited a junior professor to work on the dismantling of nuclear power plants. This should eventually lead to the creation of a strong expertise in the dismantling and clean-up of nuclear facilities with significant societal and economic impact. Furthermore, the unit is participating in research on Covid-19 (identification of severity markers in young patients) and Lyme disease.

Members of these departments represent IN2P3 at ECFA and NuPECC and have participated in ten of the thirteen IN2P3 foresight exercise workshops and two INEE (Institut écologie et environnement du CNRS) forward study workshops contributing to the establishment of the scientific vision for the next ten years of the supervisory authorities.

The strategy of the unit in the domains of subatomic and Astroparticle physics is in line with the recommendations of the corresponding European Agencies' roadmaps (ECFA – Nupecc, APPEC) and the IN2P3 scientific strategy.

DSA: The department of analytical sciences is involved in the field of chemistry and health (teams 16, 17, 18, 19). The search for non-genetic information, particularly proteins, confronts the Institute's researchers with societal issues in terms of environmental issues, personalised medicine and public health, with numerous socio-economic impacts.

Similarly, the rapid development of tools for the analysis, modelling, design and synthesis of living molecules or their assemblies is in line with an emerging and resolutely integrative and interdisciplinary approach to chemical analysis. Research at the Department of Analytical Sciences is oriented towards the (multi- and inter-) disciplinary structuring of research, the establishment of high-performance platforms and the reception of foreign researchers.

It should be noted that during the period under review, two analytical chemistry teams have seen a leap in their human resources. Team 16 increased its permanent IT staff (BIATSS) by three and the number of its PhD students from ten to thirteen. Team 19 increased its permanent and fixed-term contracts from three to seven and doubled the number of doctoral students.

Various interdisciplinary actions are developed between these departments. Although, their level of progress and maturation is variable (e.g. grouping around the dismantling of Fessenheim; EVOCANCER project,) they are considered by the committee as extremely positives.

Weaknesses and Risks Linked to the Context

The DRHIM department failed to integrate a new radiobiology team issued from the University Hospital (team 22 which left the Institute in 2021). Although new external scientists joined the Molecular Imaging team (one University hospital professor, one INSERM researcher), several scientists left the department that is now composed of one important research team (Team 20) and a single-permanent team (team 21). Moreover, there is significant overlap between the thematic of the DRHIM department and the health-oriented research performed in teams 14 and 15 from DRS. The Hcéres committee questions about the scientific interplay of some teams in the DRS department with teams in the DRHIM department and recommends a new organisation, respecting the underlying human relation issues.

Concerning the DSA, in spite of the positive character of the various interdisciplinary actions developed between its departments, they are only slightly highlighted, either in the self-evaluation report or in the presentations made during the visit. It is therefore difficult to understand their specific objectives, their feasibility and implementation. IPHC strategy concerning these types of actions must be clearly stated, and their visibility improved.

Concerning human resources, the last Hcéres committee noted that for some experimental activities, notably in the DRS department, the number of permanent physicists was insufficient. Four years later, we realise that the number of permanent physicists has not been adequately increased to support the experimental activities of these teams. To give just a few examples, the exploitation of the technical deliverables of the Ogma (Observations with gravitational waves & Multi-messenger Astronomy) team may be affected by the very small number of researchers actually involved in the project. Another of the many examples we can cite are the activities around the Agata collaboration. They are led by a CNRS physicist who will retire in five years and a university professor.

In order to meet the growing needs in terms of human resources, a pooling of technical staff would be welcomed. Even if such an initiative cannot meet all the requirements of the different teams, which often require specific technical skills, it could help meet certain needs, such as for instance data management which seems to be a problem for several DEPE and DSA teams.

The situation in the domain of human resources seems better for the analytical science department (DSA), although there is a risk of isolation of the teams working mainly on the pharmacy campus. At least two teams, 16 and 19, are facing a rapid increase of their resources. The evolution of these teams, located at the Cronenbourg campus, may be slowed down by prosaic problems of space. If the School of Chemistry (ECPM) cannot cope with this situation, it is up to the unit's management to deal with the problem and to find solutions in order to accommodate these teams in good conditions.

Changes in the international geopolitical context may have a lasting effect on the attractiveness of certain experiments and certain teams, such as the 'superheavy elements' experiment conducted by members of the DNE team, where travel to JINR Dubna in Russia is no longer envisaged, or the 'neutrino' team, which participates in the Juno experiment, located in China, given the difficulties of travelling to that country.

Finally, the many retirements foreseen over the next ten years and the need to recruit new personnel to maintain the excellence of the Institute's activities is another matter of concern.

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 approach of the IPHC to these matters is strictly in line with the procedures in force at the CNRS and Unistra. Recruitment procedures are those applied by the supervisory authorities and in compliance with the European Human Resources Strategy for researchers (HRS4R) aiming to improve the practice of research organisations and institutions concerning recruitment and working conditions.

Equality and parity advisor teams were also set up at the end of 2020. These female-male teams are jointly responsible for identifying complaints or conflict situations of IPHC staff members, regardless of their status. Under the supervision of the unit's management, they are solving (trying to solve) these situations. The 'new arrival' procedure also includes discussions with the equality and parity advisors.

Furthermore, the institute disposes of an organisational chart setting out the various rules and procedures in force and sets up, each year, a unit Training Plan (UTP) which is discussed in a contradictory way by the Unit Council and ultimately approved by CNRS.
Internal promotions are also organised in a transparent way. Concerning CNRS technical staff, the procedure includes a meeting with team leader and IPHC's management in order to establish a proposal priority list. This priority list will be possibly modified after discussion with the local joint committee (CPL - composed of elected

staff representatives) before proposal to the IPHC's director. The final choice and validation for priority list remains to IPHC director.

The management of the Institute is also attentive to the working conditions of its staff. The local committee for health and safety and working conditions (CLHSCT), chaired by the unit director, and in which two management members are permanent participants, is currently examining working conditions.

Furthermore, a group of four Prevention Assistants (AP) and the Laboratory Council also participate in the examination of general situations concerning working conditions and carry out an awareness and prevention policy.

The IPHC management or the equality and parity advisors are in charge of examining individual or special situations. The thesis monitoring committee examines conflicting situations concerning PhD students.

The unit applies all the necessary provisions for the protection of its scientific assets and computer systems.

In addition, the unit implements the recommendations on the prevention of environmental risks and the pursuit of sustainable development objectives. As an example of this proactive policy, the management encourages teleworking and the implementation of interdepartmental programmes facilitating the sharing of equipment between teams. Another example is the initiatives taken by the management concerning healthy food consumption by staff with the creation of vegetable gardens open to all members of the Institute. Many other examples can be found in the corresponding document.

The unit has drawn up a Continuous Activity Plan (CAP) which has been validated by the CNRS. The Covid crisis provided an opportunity to test in real conditions the effectiveness of this plan, which guaranteed the continuity of the Institute's activities during the lockdown.

Weaknesses and Risks Linked to the Context

It is particularly difficult to identify major weaknesses in this area; otherwise they would have already been corrected. However, it is clear that daily vigilance on the part of the unit's management, as well as all staff, is essential to ensure that the Institute's operations comply with regulations on human resources management, safety, environment and protection of scientific heritage.

During the Committee's exchanges with the unit's staff, the Committee was informed that the unit as a whole has only one quality engineer. This naturally calls for action to sustain this need. Furthermore, it seems important to better integrate postdoctoral students, who are relatively few in number and possibly isolated, by associating them, for example, with the doctoral students' group. It would also be useful, and this is a need expressed during the visit by doctoral students and postdoctoral fellows, to reinforce training on psychosocial risks and harassment at work.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The unit has a national and international reputation of excellence in many domains. The resources of its technical sector allow the various teams to play key roles in the various projects they engage in and makes them very attractive partners in any ongoing or new project.

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 international reputation of the unit is remarkable. In particular, its members participate in the organisation of numerous international congresses and assume editorial responsibilities in major scientific journals. Furthermore, they participate in a large number of important scientific councils contributing to the shaping of the National and International research priorities. They are also members of academies, scientific institutions and learned societies. Members of the unit are also recipients of various national, European and International scientific awards.

Members of IPHC are frequently invited to present their scientific work at academic assemblies or international conferences. On average, they made eleven presentations per researcher or lecturer during the reporting period. Some of these presentations were made at major international conferences, including plenary talks.

Furthermore, the institute organises major international and European scientific conferences. During the period under evaluation, the unit organised sixteen international symposiums. Of these, eleven received funding from

IN2P3 and the Unistra. The Grand-Est Region also provides occasional assistance in the organisation of these events. The Unistra's congress team provides logistical support in some cases. Members of IPHC are members of the scientific committees for such events.

Members of the unit also hold editorial responsibilities in high impact scientific journals and collections. Almost all IPHC members assume editorial or referee responsibilities for the major journals in their field. In particular, IPHC members are editors of nine journals in the fields of biology, physics and health.

Members of IPHC contribute to the development of National and International research priorities by taking part in many steering, advisory or scientific committees of different laboratories. They have also been experts for the ANR (French National Research Agency) on four occasions, including two positions as committee chairs. Members of the unit regularly provide expertise for European Commission projects and are involved in five types of expertise for the ESA (European Space Agency). Two are French representatives on the strategic committees for Subatomic Physics in Europe, namely ECFA (European Committee for Future Accelerators, Particle Physics) and Nupecc (Nuclear Physics European Collaboration Committee, Nuclear Physics). Finally, ten IPHC members are active members of five CNRS GDRs scientific councils.

The unit hosts members of academies, scientific institutions and learned societies. Among them, one is a member of the '*Académie des Sciences*', another of the International Academy of Astronautics, and five are members of scientific councils or offices of the French Physical, Chemical and Biological Societies. Several are active in nuclear-related societies, such as the Nuclear Track Society, chaired during the reporting period by an IPHC member.

Members of IPHC have received various International, European and National scientific prizes and awards. The last few years have been particularly rich in prizes and distinctions (more than 50). For example, of the five CNRS medals and crystals that the unit has received since its creation in 2006, four were awarded during the period of the present evaluation. Two members of the Institute have been appointed honorary professors by foreign universities (University of the Witwatersrand, South Africa, and York University, UK). One member of the Institute was appointed Commander of the National Order of Merit in 2021. Members of the unit have received numerous other awards for their scientific and technical expertise presented in the Institute's Self-Assessment document. The talent of the Institute's students was also recognised. Fourteen students won scientific prizes for their doctoral work during the reporting period, including a L'Oréal-Unesco Jeunes Talents France prize for women in science.

Weaknesses and risks linked to the context

No major risk identified.

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

Strengths and possibilities linked to the context

The unit has an attractive staff hosting policy and regularly hosts renowned guest researchers. Concerning research integrity and open science, it implements the operational strategy of its supervisory authorities.

IPHC currently hosts 100 PhD students and eleven post-doctorates. A midterm assessment allows the students and their collaborators to evaluate their thesis work and discuss possible difficulties or points to be improved. In the case of difficulties, the students are assisted by the thesis monitoring committee.

The eleven post-doctorates currently at the IPHC are working either on projects carried out within a contractual framework (industry or ANR) or on fundamental research projects (mainly IN2P3). The unit offers all post-doctorate-optimal conditions, not only in terms of space and equipment (office, PC made available), but also in terms of intellectual environment. All these conditions allow post-doctorates to be known and appreciated by the whole scientific community and eventually to apply for permanent positions.

During the period under evaluation, the unit hosted fifteen renowned guest researchers (>2 months). One quarter of them are professors of international reputation. For instance, one of them, an evolutionary biologist with a broad understanding of ecology and genetics at the population level, is a recipient of the Fulbright Fellowship and was awarded the title of Chevalier of the Order of Academic Palms. During his stay, he was awarded an USIAS Fellowship and was nominated as Chair of the 'Cercle Gutenberg'. Inevitably, the Covid-19 crisis has decreased the number of guest researchers and their number has dropped over the last two years from five to one.

Weaknesses and Risks Linked to the Context

Today, the unit hosts very few renowned researchers from outside institutions. It is obvious that an effort should be made to increase the future attractiveness of the Institute and increase their number. Their contribution can be important both in defining the Institute's scientific strategy and in training young students and in developing the network of collaborations for young researcher such as postdocs.

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 Unit participates in international, European (ERC, etc.) and national (PIA, ANR, projects led by the supervisory authorities, etc.) calls for projects. All these projects enable it to collect ~10 M€/year (external resources). A percentage (5 %) of these resources is levied by the Institute allowing it to finance collective equipment but in no case to finance CDDs or post-doctorates.

During the evaluation period, the Institute participated in H2020 European calls and obtained nineteen new contracts in addition to renewals of existing ones. These contracts represent a total budget of 3 026 k€. Furthermore, an ERC grant and a dozen other international contracts were obtained.

The PIA has enabled the IPHC to finance the development of emerging projects such as the Cyrcé platform and the Fessenheim OHM. It has also consolidated the development of the PRoFI platform, which has received 2 M€ of PIA funding. The Scigne platform is contributing to the activities of the '*Institut Français de Bioinformatique*', recipient of the PIA MUDIS4LS, and the Data Terra Research infrastructure, recipient of the PIA GAIA Data. It also received PIA funding. In addition, over the reference period, 39 ANR funds were obtained for a total of 5 930 k€. On average, 42 projects were submitted each year, with a success rate of 15 % similar to average success rates across all disciplines nationwide. It should be noted that the national success rates were 16.2 % in 2019, 17.1 % in 2020 and 23.7 % in 2021.

Over the reference period, the unit also responded to other calls for projects launched by supervisory bodies, local authorities, associations, etc., including one INCA (National Cancer Institute) and two CPERs (state-region long-range plan). The financial support from fourteen associations supplements the resources collected by IPHC.

Weaknesses and risks linked to the context

There are difficulties in finding the necessary budget to finance postdoctoral contracts.

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

Strengths and possibilities linked to the context

Most of the teams benefit from the Institute's technical support, the highly technical level of which undeniably contributes to the successful construction and operation of seven platforms and much other experimental equipment. The IPHC's platforms are supported by highly qualified personnel who master the technological processes from the earliest stages of their construction to their final characterisation and proper functioning.

The fact that the technical staff of the unit is relatively large makes it possible, among other things, to ensure the quality management of each platform. Indeed, several platforms of the Institute have been awarded the quality label either by IN2P3 (C4PI, Cyrcé and Scigne) or Unistra (Cyrcé, PAI, PSGE and Scigne). The PSGE and Cyrcé platforms are also IBiSA accredited. All of the Institute's platforms have a steering committee (COPIL) that ensures their proper management and advises on their development strategies.

Furthermore, the Institute's management supports industrial access to the platforms, which partly ensures their funding. When necessary and possible, the unit participates in the renovation of equipment via its own funds and support or by applying for funding from partners.

Weaknesses and Risks Linked to the Context

The operation of some of the unit's technical platforms requires highly qualified engineers and technicians ensuring continuity of service. In the event of transfers or retirement, it may be difficult to recruit highly qualified staff on fixed-term contracts (CDD) or via research contracts.

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

Articles published by members of the Institute meet the highest standards of publication integrity and academic honesty. Due to the multidisciplinary nature of the Institute, the number of publications varies from department to department and within a department from team to team. Policies are in place regarding data storage.

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

Strengths and possibilities linked to the context

The scientific production of the unit is excellent in terms of publications (2 412 articles in total, 28 articles/publishing FTE), even exceptional in certain fields where the IPHC is considered as one of the leading French laboratories.

Here are some examples of important publications in leading large impact journals across all departments:

Nature
Developmental mechanisms of stripe patterns in rodents, R. Mallarino et al., Nature 539 (2016) https://www.nature.com/articles/nature20109.
Climate-driven range shifts of the king penguin in a fragmented ecosystem, R. Cristofari et al., Nature Climate change 8 (2018), https://www.nature.com/articles/s41558-018-0084-2 (2 collaborative articles on Ecology, Physiology, Ethology).
Angular momentum generation in nuclear fission, https://www.nature.com/articles/s41586-021- 03304-w (major step forward on the nuclear fission process).
Unveiling the strong interaction among hadrons at the LHC, a major result of the Alice experiment, https://www.nature.com/articles/s41586-020-3001-6.

Science
Daily energy expenditure through the human life course, H. Pontzer et al., Science 373 (2021) https://www.science.org/doi/10.1126/science.abe5017 (collaborative article Ecology, Physiology, Ethology).

High impact studies on Covid (different aspects, multidepartment)

Identification of driver genes for critical forms of Covid-19 in a deeply phenotyped young patient cohort, R. Carapito, R. Li, J. Helms, C. Carapito et al., Sci Transl Med 2021, eabj7521.– http://dx.doi.org/10.1126/scitranslmed.abj7521.
Corona, Climate Change, and Evolved Human Behavior', C. Schradin, Cell, Trends in Ecology and Evolution 36, 7, https://doi.org/10.1016/j.tree.2021.03.010 (monograph on the impact of Covid crisis on human behavior).

Upconversion of light with molecular and supramolecular lanthanide complexes, A. Nonat, L. Charbonnière https://doi.org/10.1016/j.ccr.2020.213192, (review on up-conversion for 'Coordination Chemistry Reviews, collaboration between departments)

The articles published by the Institute's members, often in the context of very important international collaborations, meet the highest standards of publication integrity and academic honesty.

Weaknesses and risks linked to the context

No major risk is identified.

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

Due to the multidisciplinary nature of the Institute, the number of publications varies from department to department and within a department from team to team. Teams associated with large international

collaborations in subatomic physics publish far more papers than teams working on topics associated with a small number of authors.
On the other hand, teams working on applied sciences have more patents, licences and nondisclosure agreements than other teams.

Weaknesses and risks linked to the context

It seems worthwhile to make a clear distinction between the unit's own scientific production and that of collaborators attached to or hosted by it for a relatively short period.

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

Concerning the implementation of the supervisory authorities' strategy on research integrity, academic honesty and open science, the IPHC strictly applies the recommendations of the CNRS and Unistra. Thus, the National Charter of Ethics for Research Professions and a copy of the document 'Charter for the Promotion of Honest and Responsible Research' are given to each newcomer, who is invited to sign it. The Charter of the IPHC's internal rules and regulations, and more particularly the chapter on 'Confidentiality, publications and communication, intellectual property', reinforces this policy.

IPHC has participated in the development of the open science policy, one of the elements of which is the development of the Scigne platform. Good practices related to open science are encouraged in laboratory seminars (e.g. presentation and correct use of open archives). One of the IPHC members is responsible for the project 'Services and infrastructure for research data and open science' of Unistra.

IPHC members have been involved in the implementation of the European Open Science Cloud (EOSC) since 2019, notably through their contribution to the 'Architecture' and 'Technical Interoperability of Data and Services' working groups (2019–2020 and since 2021, respectively).

Indeed, IPHC promotes the principles of open science as described in the French Plan for Open Science. As far as scientific publications are concerned, researchers are invited to register a copy of their articles in the UnivOAK open archive. A clear advantage of the high-energy field is the possibility to publish articles in open access via the Sponsoring Consortium for Open Access Publishing in Particle Physics (SCOAP3).

As far as research data are concerned, the use of reference archives for each scientific field is emphasised. For data that do not have such archives, the laboratory has acquired significant storage resources backed by IN2P3 computing centre. As soon as the 'Recherche Data Gouv' platform is online, the data will be recorded on it.

The Scigne platform will participate in the curation of these data, as part of its involvement in the 'Atelier des données' project led by the Unistra. All this information is included in the data management plans that accompany the projects.

Weaknesses and risks linked to the context

No major risk identified.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

The unit is very well integrated into societal issues through its collaborations with the industrial and socio-economic world and its participation in events or presentations aimed at the general public. The IPHC has established contractual partnerships with non-academic actors and is currently developing collaborative research projects with the industry. Furthermore, in terms of economic impact, beyond research collaborations with industry, it makes its expertise available through services provided to industrial actors. The two start-ups recently created illustrate the IPHC's innovative contribution to societal issues.
Finally, the IPHC's staff participates in an impressive number of public presentations, which give the Institute great visibility both at the regional level (scientific festivals, etc.) and the national level (national media).

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

Strengths and possibilities linked to the context

In terms of non-academic interactions, the IPHC has established contractual partnerships with non-academic actors and is currently developing collaborative research projects with the industry. Most of the contracts with industrial partners concern teams whose activities are more industry-oriented. In addition, when regulatory conditions and mutual agreements allow, the unit welcomes personnel from the companies with which it is collaborating (on average, 2 or 3 people/year). These non-academic collaborations are also financing PhD students out of 225 PhDs, 64 were financed or co-financed by industrial partners.

Furthermore, in terms of economic impact, beyond the research collaborations with industry, the unit makes its know-how available through the services provided to industrial actors such as the development of C4PI electronic circuits, but also to the civil society (e.g. the RAMSES platform) provides environmental measurements, and the inorganic analytical platform offers research on metal contamination).

The average annual level of IPHC service is of the order of 600 k€/year, reaching 862 k€ in 2021.
In their respective fields, the two recently created start-ups also illustrate IPHC's innovative contribution to societal issues.

Weaknesses and risks linked to the context

No weaknesses or risks identified.

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

Strengths and possibilities linked to the context

The unit is attentive to the potential that its research and expertise bring to the socio-economic world. For example, in 2020, IPHC participated in research concerning the identification of Covid-19 severity markers in young patients and on Lyme disease (development of a new diagnostic method for Lyme borreliosis, a disease that is the subject of a national priority plan) that also seems to be well spread locally.

During the reference period two start-ups have been created. One in chemistry, PolyDTech, and the other in radioprotection, SmartiumInto. In both cases, the PhD students, with the support of their thesis directors, have carried out the business creation project.

Furthermore, IPHC is involved in discussions with other actors such as the Eurométropole of Strasbourg, the regional health agency and the city of Nancy concerning the creation of a clinical centre for proton therapy in the Grand Est region.

Many teams are involved in informal networks disseminating their results to the socio-economic world.

Weaknesses and risks linked to the context

No weaknesses 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 unit's personnel participates in an impressive number of public presentations, which gives the Institute a high visibility both at the regional level (science festivals…) and national level (national media).

During the period covered by the present evaluation, they have participated in 65 scientific mediation products and in 119 radio, television and print media broadcasts as well as at 9 'science and society' debates.

The unit is also involved in citizen participatory science activities, mainly on environmental and ecological topics. For example, the 'Solenville' project aims to describe the soil fauna of the city, according to different management strategies for green spaces. Citizens and students (2nd year and Master students) collect soil fauna samples.

The IPHC is also organising awareness-raising activities for young people (pupils, middle and high school students) either in their schools or on the IPHC premises.

Weaknesses and risks linked to the context

No weaknesses identified.

C – RECOMMENDATIONS TO THE UNIT

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

Many steps in the restructuring of the Institute have been taken with real success, of which the management of the unit should be proud.

However, in the near future new efforts should be made to transform a successful structure that hosts high-level scientific teams into an even better organised multidisciplinary unit. In this context, it seems important to clarify the role of the Heads of Departments in the Management Committee of which they appear to be official members, the decision-making processes at the Institute level and in particular the mechanisms for allocating human resources to departments, teams and projects. The committee recommends the utmost vigilance by the unit's management in order to prepare properly calls for projects and react when the result is not satisfactory and possibly find alternative solutions, in particular for certain teams, which may no longer dispose of the necessary funding to carry out their long-range activities.

A greater role should also be given to the Laboratory Council, which could better contribute to discussions and decisions concerning internal functioning, budget and human resources. Such a role would imply a larger number of meetings, or additional meetings of the internal 'bureau'.

It also seems important to clarify the processes put in place for promoting interactions between the different departments and the scientific life within the departments.

In view of the limited number of human resources in a few teams, the direction of the unit should consider whether the actual structure of the Institute is still the most adequate.

Recommendations regarding the Evaluation Area 2: Attractiveness

The attractiveness of the Institute is very good. However, efforts could be made regarding the number of high-level visiting scientists and the management and visibility of platforms.

Currently, the Institute hosts very few renowned researchers from outside institutions. It is obvious that an effort must be made in order to increase their number. Their contribution can be important both in terms of elaborating the Institute's scientific strategy and the training of young students.

All IPHC platforms have national and international collaborations. This could be improved by making them known to the entire national and international scientific community. This is a future challenge for the unit's management.

Recommendations regarding Evaluation Area 3: Scientific Production

The scientific production of the unit is globally very good, sometimes excellent in disciplines where the laboratory is recognised as one of the leaders on the national and international level.

However, it is illusory to compare the scientific production of one discipline to another since it depends on the importance of the community working in the domain and the importance of the collaborations. Any such comparison would be meaningless.

While it is important to publish in open access journals, management should continue to strongly encourage researchers to publish in the highest impact journals. However, the committee encourages the researchers to make available the articles on open access platform such as HAL as soon as possible.

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

The Institute's contribution to societal issues, even if it is not part of the missions of many of its teams, is impressive. Of course, we could propose to do better, that is the role of each committee, but it is already impressive.

TEAM-BY-TEAM ASSESSMENT

Team 1: Evolutive Physiology and Ethology (EPE)

Name of the supervisor: Mr. Vincent VIBLANC

THEMES OF THE TEAM

Team 1 is dedicated to research about animal physiology and behaviour including relationships between social organisation and ecophysiological strategies, the understanding of social networks, sexual selection and mating systems, the analysis and understanding of life-history trade-offs and aging processes, studies of telomere biology as well as a critical appraisal of ethical issues in animal welfare. The team explores these topics using a diversity of model systems in particular long-term studies of marked populations including primates and novel laboratory studies of ants. Approaches mastered by the team include field ecology, social networks, methods of telomere biology and comparative analyses.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Team 1 includes four permanent personnel formerly included in former Team 2 'Ecophysiologie Evolutive EPE' and former Team 3 'Ethologie Evolutive EtE' as well as a new CNRS recruit (2022). It was designed to respond to some recommendations of the previous report regarding current Team 2 Pagras and the need to clarify the focus of future teams around common themes, common methods and shared model systems. The previous report was extremely positive about the scientific production of the team and its track record of publications as well as the common achievements of the staff with few major recommendations. Despite the important restructuring of the team, Team 1 has maintained a high level of scientific excellence, has produced a major contribution to some of the most important debates in animal ecophysiology and ethology, and contributed a lot to teaching and outreach activities.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	1
Senior scientist (Directeur de recherche, DR) and associate	2
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)	0
Subtotal permanent personnel in active employment	**4**
Non-permanent teacher-researchers, researchers and associates	4
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	11
Subtotal non-permanent personnel	**16**
Total	**20**

EVALUATION

Overall assessment of the team

Team EPE dedicated to evolutionary ecophysiology and ethology is a strong research team with five high-quality permanent researchers involved in developing knowledge of animal-social behaviour, life-history strategies including aging processes, and mating strategies. The team has an excellent track record of publications, contributes to major advances in the field of animal ecophysiology and behaviour and participates importantly to teaching and outreach activities at Unistra, in the laboratory as well as with its partners.

Strengths and Possibilities Linked to the Context

The major strengths of Team EPE are (1) the excellence and complementarity of the permanent researchers of the team with an average track record of 9 publications per year per person, (2) its major contributions to novel topics in evolutionary ecophysiology and ethology including social networks, telomere biology or animal welfare, (3) exceptional collaboration networks in France and abroad, (4) high numbers of PhD students (most often in collaboration with other labs) and post-doctorates per PI and a major contribution to master programmes at Unistra, and (5) complementary study systems including wild animals (mammals and birds) and laboratory systems (ants). The team members have published a lot together as well as with other members of the DEPE. Opportunities identified in the report include novel techniques of telomere length measurements in different non-model wild species, the capacity to better exploit data from long-term field studies, and the possibility to attract junior researchers with a different background (for example quantitative ecology or theoretical ecophysiology). International collaborations are truly exceptional and well illustrated by the authorship network of the publication list. The team is also attractive as shown by a recent recruitment of a junior CNRS researcher. It has developed research collaborations with other teams of DEPE as well as with other IPHC departments, notably DSA.

Weaknesses and Risks Linked to the Context

The major weaknesses identified in the report produced by Team EPE include (1) relatively small and inconsistent support from funding agencies except for the very successful year 2021, (2) the absence of technical staff dedicated to some of the activities of the team or shared with other teams of the DEPE, and (3) the reliance of the team to permanent access to long-term study sites abroad and collaboration with foreign researchers (especially two field sites in the USA and South Africa). Associated risks include (1) the loss of long-term funding to perform field research abroad (or loss of local collaborators), and (2) little valorisation of methodological developments performed by the team due to little manpower of the technical staff. Such difficulties should be addressed altogether with Team 3 and Team 4 who share similar threats.

RECOMMENDATIONS TO THE TEAM

Common recommendation to the DEPE teams: The main recommendation is to interact with other teams of DEPE to discuss a strategy to recruit permanent technical staff with skills relevant for the research activities of the members of the different teams (e.g. database development and curation). In the same line of thought, it appears obvious that many points are common to the research themes addressed by ADAGE, AVEC and also EPE. It is thus essential to highlight the specificity of each team (thus justifying the existence of each one) or to develop the discussions of scientific strategic plan concerning the possibilities of a reorganisation or interactions to be developed between the members of the various teams.

The committee recommends further strengthening of scientific interactions between team members to develop new collaborative research programmes that would even better exploit the techniques and data available in the team. There are also obvious connexions and overlaps with the research done by other permanent staff in different teams including especially members of ADAGE research team. A strategic planning is needed to either better delineate topics and challenges of EPE, ADAGE and AVEC, possibly with a different organisation of the scientific and technical staff. Communication to potential students and the general public should be improved by providing more information on team members and research outcomes in the website of the team. Protocols and techniques could be even better exploited and valued by recruiting a technical staff in charge of implementing current laboratory methods and developing new ones, possibly in collaboration with other teams in DEPE. Plans should be adopted to implement a strategy that accounts for the potential risks of losing access to long-term study sites due to reduction of funds, departure of foreign collaborators or changes in legal conditions to access sites abroad.

Team 2: Physiological Adaptations to Gravity & Health (Pagras)

Name of the supervisor: Ms. Audrey BERGOUIGNAN

THEMES OF THE TEAM

Team Pagras is a small research team highly specialised with two permanent researchers focusing on whole-organism energetics to understand body weight regulation and metabolic processes associated with adaptations to novel environments, especially but not only in humans, including low gravity environments. Body weight regulation is investigated with different techniques, especially stable isotopes techniques and different *in vivo* approaches in collaboration with clinical research, space agencies, and field ecologists. The team manages a mass spectrometry platform and is involved in international research programmes related to space exploration, human metabolism and OneHealth.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Team Pagras has two permanent researchers (originally 3) from former team EPE led by Carsten Schradin and was created to take into account recommendations of the previous report to (1) focus the research activities of the team on metabolism and chronic pathologies, (2) improve the number of high-impact publications in cellular and molecular biology and (3) develop collaborations with a newly created department dedicated to 'Radiology, Hadrontherapy and molecular imaging'. This restructuring has brought clarity to the scientific themes and projects of teams 1 and 2 of the DEPE department, but it is not clear to what extent collaborations with the DRIHM department have progressed or not since then. Even though the new structure is sound and the organisation of the team is logical, this has also led to a rather unequal workforce between the two new teams, especially given the responsibility and management duties of one of the permanent staff (S. Blanc) of team Pagras.

WORKFORCE OF THE TEAM

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

EVALUATION

Overall assessment of the team

Pagras team is well identified with a research agenda focusing on human weight regulation and energetics, with associated programmes in non-human models. This research has important implications for human health and space exploration with an excellent track record of publications and international collaborations. The team should be commended for its achievements given the strong commitment of its members in management duties. Pagras will, however, need to adopt a clear strategic plan to face probable difficulties given its current size and involvement of one member as director of INEE at CNRS.

Strengths and Possibilities Linked to the Context

Team Pagras holds two prestigious senior researchers well integrated in national and international research networks. The team produces high-quality research outputs about body weight and body composition regulation in humans, adipose tissues and hibernation strategies in mammals, whole-organism and tissue metabolism effects to understand animal energetics and effects of novel environmental conditions on these. The research programme of the team has important implications for human health, space exploration strategies and animal conservation. The team has an excellent track record of publications given its small size (2 permanent staff and one technical staff) and is extremely well identified in the research landscape with its focus on whole-organism energetics and applications to understanding of low-gravity adaptations. The team has long-standing collaborations with international research programs such as CNES studies dedicated to space exploration (e.g. bedrest experiments) or clinical programs related to fasting. One staff member holds a position at the University of Colorado, Anschutz Medical Campus, where she focuses on the impact of sedentarity on human health. The other staff member is also strongly involved in the development and management of international research programs in ecology and health and plays a major role at CNRS (current director of CNRS Inee, an institute in charge of hundreds of laboratories and thousands of researchers across France, the annual budget of ca. 30 M€). The strong international collaborations open up opportunities for new research in non-model systems, especially wild animals, and access to data sets and facilities. The team manages a platform of isotope ratio mass spectrometry with one dedicated technical staff.

Weaknesses and Risks Linked to the Context

One of the obvious weaknesses of the team is its small size (one permanent staff has retired) making it extremely fragile despite the good focus and current scientific activity and continuous financial support from research grants (ca. 100 k€ per year). This is particularly relevant given that one staff member has very important duties at CNRS, making it extremely unlikely that he can contribute to the life and achievements of the team in the coming years. Risks associated with this are loss and discontinuation of science programmes, arrest of international collaborations, loss of attraction for students and young researchers, and reduction of scientific output. In addition, the team lacks a clear strategy of collaboration with other research teams from the DEPE and it is not obvious how the technical platform of the team will be used in the future. Some internal research collaborations, for example, on model systems of the laboratory such as birds or wild mammals, would strengthen the research programme of the team and make it more resilient given its very small size. It is not clear how scientific and technical collaborations with the DRHIM department have progressed or not since the creation of the team.

RECOMMENDATIONS TO THE TEAM

Common recommendation to the DEPE teams: The main recommendation is to interact with other teams of DEPE to discuss a strategy to recruit permanent technical staff with skills relevant for the research activities of the members of the different teams (e.g. database development and curation). In the same line of thought, it appears obvious that many points are common to the research themes addressed by ADAGE, AVEC and also EPE. It is thus essential to highlight the specificity of each team (thus justifying the existence of each one) or to develop the discussions of scientific strategic plan concerning the possibilities of a reorganisation or interactions to be developed between the members of the various teams.

One top priority of this research team is to increase in size by attracting junior or senior researchers to increase the permanent research staff and make it possible to pursue its ambitious research programmes and current international collaborations. This could also be done by hosting foreign researchers on temporary contracts thanks to help from Chair programmes or maybe IDEX Unistra. Otherwise, there is a clear identified risk that the team becomes too small and unmanageable and a new organisation with other teams of DEPE will be needed. Another recommendation would be to develop long-standing internal collaborations, for example, with DEPE and DRHIM members. This might help increase the number of PhD students and also attract young researchers searching for a permanent position. The team should also better communicate about the specificity and sharing of its technical platform. Currently, this platform is managed by one permanent staff but it does not have a dedicated website, a publicly available access strategy for users and utilisation statistics so it remains unclear if this is a team instrumentation or a 'true' laboratory platform accessible to internal or external users.

Team 3: Animal adaptation and Environmental management (ADAGE)

Name of the supervisor: Ms. Sylvie MASSEMIN-CHALLET

THEMES OF THE TEAM

The ADAGE team shares its research activities between fundamental and operational approaches with the main objective of improving the understanding of the functioning of socio-ecosystems. The researchers of this team carry out their activities on a wide variety of species, focusing on their ecophysiological adaptations to changing environmental conditions. They develop approaches at different levels of biological organisation, notably to elucidate the mechanisms underlying maintenance, survival and reproduction functions. Coupled with the assessment of environmental conditions and stresses in relation to human activities, ADAGE's research contributes to the improvement of environmental practices by providing decision support to managers and politicians.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous report the team ADAGE did not exist, but was foreseen in the project of restructuration of the department DEPE. The only remark made by the experts was that the sustainability of this project strongly depends on a wave of recruitment and the ability of the team to contract technical staff.
At the time of planning this team, it consisted of one lecturer and associate lecturer, three scientists or senior scientists (CR ou DR) and one research support staff. Today, one additional CNRS researcher and one additional assistant professor arrived in 2019 and 2016, respectively. On the other hand, the permanent research supporting personnel has been replaced by a non-permanent position.

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	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)	0
Subtotal permanent personnel in active employment	**6**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	1
Post-docs	0
PhD Students	8
Subtotal non-permanent personnel	**9**
Total	**15**

EVALUATION

Overall assessment of the team

Through its excellent scientific activities on different biological and socio-ecosystem models (e.g. urban, open-field plains, marine), the internationally recognised team ADAGE presents an original and relevant research, closely linked to conservation biology and physiology. The scientific production is of a very good level with 79 articles (equivalent to 3 articles/researcher-professor/year). A significant participation of the young non-tenured members is noted with 51 % of the articles co-signed by PhD students. The team is engaged in citizen participatory science activities and part of its activity consists in disseminating its results among actors in the socio-economic world, through technical reports and restitutions, which give it a transdisciplinary colour.

Strengths and Possibilities Linked to the Context

Strength of ADAGE lies on the use of applied ecophysiology coupled with a habitat-centred approach. The skills developed by the tenured members of ADAGE allows the team to lead or participate in local, national, or international (even if less present) projects. The team has co-published 34 articles with different universities, institutes and biological reserves in twenty different countries around the world (Europe, North America, Australia, North Africa and Japan), which illustrates the recognition of ADAGE in the international community. ADAGE is also involved in transdisciplinary projects based on participatory science activities where they closely interact with citizens (e.g. *SOlenville – Zone Atelier Environnementale Urbaine*). Due to the nature of its research on socio-ecosystems, collaborations with local partners have been established, as well as dissemination of results among actors in the socio-economic world, through technical reports and restitutions.

In addition to its research of very good level, its national and international collaborative network, and its close links with the socio-economic world, ADAGE has a high number of PhD students which illustrates its contribution to the training of young researchers, but also its attractiveness. This latter is also illustrated by the recent recruitment of a junior researcher (CR at CNRS).

Weaknesses and Risks Linked to the Context

The socio-ecosystem approach is one of the specificities of ADAGE and it seems that each socio-ecosystem considered is closely dependent on each of the tenured researchers. The associated risk is that this may contribute to limiting the collaborative work between the different team members if the level of co-construction or interactions within ADAGE is not sufficiently developed by the team and department leaders. It is therefore necessary for a sustained scientific animation to contribute to a collaborative scientific project.

ADAGE emphasises its interactions with citizens, stakeholders and non-academic partners, but without participating in continuing education to these non-academic actors. This could, however, be a relevant action to contribute significantly to their awareness of environmental issues.

The team members are partners in various local and national research projects. However, it should be noted that projects at local level (e.g. Région Grand Est, DREAL…) are mainly carried out by two researchers of the team without whom this type of funding (and therefore the relations with local actors) could be weakened. The associated risks are the irregularity of the scientific programmes, the consequent difficulty of long-term projections and the weakening of local collaborations.

An additional weakness is the absence of tenured technical staff dedicated to the specific activities of the team. A risk may be that some of the scientific activities of the team's researchers will be reduced, because of an increasing time spending on technical tasks.

The absence of post-doctorates whose activity in a research team allows them to strongly contribute to its research dynamics is also a weak point of this team.

RECOMMENDATIONS TO THE TEAM

Common recommendation to the DEPE teams: The main recommendation is to interact with other teams of DEPE to discuss a strategy to recruit permanent technical staff with skills relevant for the research activities of the members of the different teams (e.g. database development and curation). In the same line of thought, it appears obvious that many points are common to the research themes addressed by ADAGE, AVEC and also EPE. It is thus essential to highlight the specificity of each team (thus justifying the existence of each one) or to develop the discussions of scientific strategic plan concerning the possibilities of a reorganisation or interactions to be developed between the members of the various teams.

It is also specifically recommended that ADAGE promotes interaction and common scientific programmes between its members. It is essential to improve communication as well as visibility by setting up the individual webpage of each member of the team; they are currently non-existent. The Committee also recommends improving the environmental awareness of nonacademic actors by participating in continuing education activities specifically dedicated to this audience. A particular effort is expected concerning the reflection on a funding strategy in order to be able to recruit postdoctoral researchers in the years to come.

Team 4: Adaptation of Marine Vertebrates to Environmental Change (AVEC)

Name of the supervisor: Ms. Céline LE BOHEC

THEMES OF THE TEAM

Through its scientific activities, the AVEC team explores the impacts of environmental changes on the ecological and evolutionary processes of animal species. Based on an integrative approach at different levels of biological organisation (from genome/epigenome to the dynamics of populations and ecosystems), AVEC members aim to understand the mechanisms involved in these impacts and to identify the tipping points. They focus their research on marine vertebrates in particular challenging ecosystems (e.g. polar, tropical…). The team develops tools to long-term monitoring of sentinel marine vertebrates and thereby contributes to sustainable conservation and management strategies for biodiversity.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous report the team AVEC did not exist, but was foreseen in the project of restructuration of the department DEPE. Recommendations previously made were based on three main points:

1. Too wide a range of objectives (and model species) could reduce the team's visibility and thematic coherence
2. The team would benefit from developing projects using methods mastered by the IPHC, in particular functional proteomics; it is worth noticing that the new orientation towards genetics and epigenetics is conditional on the reinforcement of skills in this field through recruitment
3. The often high costs associated with instrumentation and travel to polar or tropical regions. A significant effort to find funding must therefore be made by each permanent staff member to the detriment of research time.

The committee concluded with the fact that the excellent and very promising project of the AVEC team would benefit from focusing on a few models, including more regional species.

No new recruitment of researchers or permanent technical staff is highlighted in the present self-assessment document (point 2), nor the development of research actions on local species.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	0
Subtotal permanent personnel in active employment	**4**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	2
Post-docs	0
PhD Students	6
Subtotal non-permanent personnel	**9**
Total	**13**

EVALUATION

Overall assessment of the team

Thanks to its specific skills coupled with state-of-the-art technological tools, AVEC develops high-quality research and contributes to knowledge on iconic animal species (i.e. penguins, marine turtles…). This contributes to a national and international recognition of this team and its attractiveness for students (from Bachelor to PhD level). Between 2016 and 2021, the AVEC team produced 98 publications (an average of 4 publications/researcher/year). Additionally, members of AVEC are engaged in general public awareness and promotion of science, as well as numerous committees, which provide advice and formulate recommendations to policy-makers and skate holders.

Strengths and Possibilities Linked to the Context

The team's strength lies in its expertise in the research of emblematic species in exotic and extreme ecosystems. The development of innovative tools (via the MIBE platform) for monitoring physiological and environmental data of wild animals (e.g. mini biologger, robots deployed in situ for wildlife observation, etc.) is an undeniable asset. AVEC contributes significantly to the knowledge needed for the management and protection of emblematic animal species. Through its strong involvement in international policy-making bodies, the team indeed contributes to defining conservation strategies.

The influence of the team is also proven by academic and non-academic recognition (e.g. the 'L'Oréal-Unesco for women in science – France 2020' programme obtained by a PhD student). AVEC team is strongly involved in the dissemination of science to the public through actions organised at the national level (e.g. heritage days, science festivals…) and also more specifically (e.g. animal documentaries: Arte, BBC…). CNRS-Inee recently initiated a pilot project to label the long-term time series acquired in the polar zone in collaboration with the Antarctic and Southern Territories Workshop Zone (ZATA) and the French Polar Institute (IPEV). It is worth noticing that two members of AVEC obtained their HDR over the considered period. (i.e. 2017 and 2020).

Weaknesses and risks linked to the context

The departure of a research engineer weakens the team's activities, calling into question research on a particular species (marine turtle) and ecosystem (French Guiana).

The other related risk is a rupture of the associated funding that appeared regular at least over the considered period of evaluation.

The remoteness of the field sites where the team's activities take place leads to strong logistical and cost constraints. Coupled with the difficulty of obtaining permanent financing, the potential risk could be an increasing difficulty in implementing these activities, which could even endanger their existence.

The lack of permanent technical staff is a main weakness. The identified associated risk is an increasing difficulty of maintaining the long-term observatories in which the team is involved (e.g. polar regions, French Guiana, West Indies), as well as a difficulty in managing/processing the voluminous data from the monitoring tools used.

It should also be noted that the team itself has underlined the constant increase in workload related to activities ancillary to its research activity as such.

RECOMMENDATIONS TO THE TEAM

Common recommendation to the DEPE teams: The main recommendation is to interact with other teams of DEPE to discuss a strategy to recruit permanent technical staff with skills relevant for the research activities of the members of the different teams (e.g. database development and curation). In the same line of thought, it appears obvious that many points are common to the research themes addressed by ADAGE, AVEC and also EPE. It is thus essential to highlight the specificity of each team (thus justifying the existence of each one) or to develop the discussions of scientific strategic plan concerning the possibilities of a reorganisation or interactions to be developed between the members of the various teams.

In accordance with the recommendations made in the previous evaluation, the AVEC team would benefit from focusing on a few models, including for example more regional species. In this report, it is indeed possible to see that the team's activities are still very much focused on remote sites (and species). The team members are very successful and are recognised for their research. However, it is strongly recommended that they consider developing a strategic plan for alternatives in the face of increasing difficulties in working at these sites (e.g. irregularity of financial resources, suppression of vessel rotation, pandemic events …). Thinking must also be carried out concerning the human resources of the team which are in decline. Prioritising the search for postdoctoral funding could help attract young researchers, potential candidates for the CNRS. It is also recommended that the team mobilises to give the Life Observatories more visibility. Regarding visibility, it is also essential for the website to be updated and that the individual webpage of each member of the team be set up; they are currently non-existent.

Team 5: Theory (THEO)

Name of the supervisor: Ms Kamila SIEJA

THEMES OF THE TEAM

The scientific activities of the Theory team are divided very unequally between two main themes: I) low-energy nuclear physics with, on the one hand, the study of few-body systems and, on the other hand, the study of heavy nuclei within the framework of configuration interaction models or mean field models, in direct connexion with experimental programmes in France and abroad, ii) high-energy particle physics with, on the one hand, studies of physics beyond the standard model, and, on the other hand, studies on quantum field theory and quantum systems.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The recommendations of the previous report were organised into six criteria:

—The quality and scientific production of the team is always extremely good. The demand for a better focus on few research themes will be partially fulfilled by retirements in recent years and in those to come.

—The scientific influence and attractiveness of the team could be much stronger, through participation in ANR funding for instance, in order to welcome doctoral or postdoctoral students. However, this is not always possible given the very limited number of human resources in some themes.

—interaction with the economic, social, cultural and health environment has increased significantly in outreach events, which are easier to consider in a theoretical physics team.

—there are no well-identified actions in order to have a better organisation and life of the team. Note, however, that a sharing of skills can only be done if the research themes have a minimum of overlap, with sufficient human resources. First attempts in this direction have been made between few-body and many-body studies for low-energy nuclear physics.

—The implication in training through research is always very strong at all levels of the academic cursus. However, there is still one thesis whose duration largely exceeds three years.

—The perspectives and scientific strategy have not changed significantly.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	2
Lecturer and associate lecturer	2
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	0
Subtotal permanent personnel in active employment	**8**
Non-permanent teacher-researchers, researchers and associates	4
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	2
Subtotal non-permanent personnel	**6**
Total	**14**

EVALUATION

Overall assessment of the team

The research themes covered in the team correspond to a very wide area of interest, from formal studies in high energy physics and quantum systems to few- and many-body nuclear structure studies. The natural demographic evolution of the team will, however, induce its scientific activities to focus on low-energy nuclear structure studies, with a unique expertise.
These studies are of very high scientific quality and extremely well recognised in the international community, in close connexion to experimental programs in France. The low energy scientific domain evolves, however, very rapidly, with the advent of ab initio methods, and the expertise of the team should be strengthened by a future recruitment in this domain in order to maintain its originality.

Strengths and Possibilities Linked to the Context

The nuclear structure studies carried out by the members of the theory team are based on skills acquired, in France and in Strasbourg, over many years. Their expertise in both many-body and few-body studies are widely recognised, and lead to numerous publications in the best scientific reviews in the field. This expertise is, moreover, in full adequacy with the experimental programmes in France and abroad. These studies are carried out by a restricted, but not negligible, number of permanent members (6 persons). Their high international visibility is a major asset for being able to project themselves into the future with a limited number of well-targeted ambitious projects.

Weaknesses and Risks Linked to the Context

High-energy particle physics studies are carried out by two permanent members of the team, one of whom will retire next year. They are much more formal and therefore also more confidential, with very little connexions with the community of French theoretical as well as experimental physicists. Although these studies have an interest from a pure theoretical point of view, it will be very difficult in the near future to have a positive dynamic in this domain within the theory team.

RECOMMENDATIONS TO THE TEAM

The Theory team must take advantage of every opportunity, in its local but also national environment, to promote its unique position with regard to nuclear structure studies. This begins with a clear display of its scientific priorities for the years to come. This must then take the form of an active search for doctoral and post-doctoral students in this field, both at the national and international level, a greater visibility at the local level in the domain of scientific communication. This also involves an active policy of inviting researchers. All these actions are clearly motivated by the need for recruitment in this scientific domain in the near future.

Team 6 : Alice

Name of the supervisor: Mr. Christian KUHN

THEMES OF THE TEAM

The team activities have been shared between an intense detector development programme and a continuation of the study of the Quark Gluon Plasma characteristics. For the ITS upgrade project, the team has participated to the design and construction of the detector, besides leading the activities in the simulation of the detector. On the research side, the team concentrates on some study of the characteristics of heavy ion collisions involving strange and charmed particles.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The main recommendations of the previous report were focusing on recommending getting an enhanced participation into the Hardware development for the Alice upgrade of the Inner Tracker, possibly by engaging the Picsel team, as the group involvement was concentrating on the simulation. These recommendations have been followed and a major responsibility for the construction and deployment of the ITS was given to the Picsel and μTech/C4PI teams which were involved in the design of the detector. Regarding the recommendation linked to the time that it was taking PhD students to get their degree, there is no evidence of any delay in discussing the thesis for the students engaged into the present evaluation period.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	3
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)	1
Subtotal permanent personnel in active employment	7
Non-permanent teacher-researchers, researchers and associates	2
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	4
Subtotal non-permanent personnel	6
Total	**13**

EVALUATION

Overall assessment of the team

The team has made major contributions to the ITS and is carrying significant responsibilities at the national and international level. They participated (with the Picsel team) to the design of the detector. With the μ-tech/C4PI teams, they were responsible for 25 % of the ITS module production and coordinated the module production of the five production sites. The group manages the team of 50 Alice people developing the simulation and the data reconstruction of the ITS. The team contributed to some aspects of the study of the QGP collective phenomena with collisions containing strange or charmed quarks.

Strengths and Possibilities Linked to the Context

The group, despite a relatively small size, makes important contributions to a leading international project using in optimal way the competences and know-how of the laboratory. Its engagement in state-of-the-art technologies (both hardware and software) makes it attractive for students. The group is visible beyond the inner Alice ring: they are collaborating actively with the Heavy ion community on both experimental and theoretical aspects (for example the role being played in the comparison of the new TOF technologies used in the various experiments, the collaboration with the theoretical phenomenology community and the participation in the FCPPL).

Weaknesses and Risks Linked to the Context

The diversity of the team contributions to Alice (detector installation and maintenance, simulation responsibility, active analysis activities) spreads thin the contribution and reduces its impact. It is noticeable, from the '*Données de production*' of the lab, that the Alice team has not produced much in terms of conferences, papers, recognition (with the exception of the award of the CNRS silver medal).

RECOMMENDATIONS TO THE TEAM

The committee recommends increasing the sharing of the technical load with other teams of the lab which share similar competences: e.g. activities related to the ITS operation and maintenance where a possible contribution could be sought from the Picsel and μTech/C4PI teams, similarly to what happened for the design and construction effort.

Team 7: Belle 2

Name of the supervisor: Ms Isabelle RIPP-BAUDOT

THEMES OF THE TEAM

The Belle experiment exploits the collisions of electron positrons at the energy of Upsilon 4S allowing the study of the pair produced beauty hadrons and pairs of tau leptons. The team joined the experiment (which started in 2019) in its earlier phases: the contributions have been on the hardware side of the deployment of a silicon tracker demonstrator which was used to test some aspects of the collider performance and is now working on searches for new physics in anomalous decay of quark b to quark s. In parallel they are working on the definition/design of the silicon tracker of the proposed upgrade.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team did not exist at the time of previous evaluation

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
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)	0
Subtotal permanent personnel in active employment	**4**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	3
Subtotal non-permanent personnel	**4**
Total	**8**

EVALUATION

Overall assessment of the team

The team has good visibility within the Belle collaboration, having been the one who started the Belle 2 French collaboration and having contributed a tracker prototype which has allowed key studies of the collider. The interesting physics, the exploitation of the skills of the group and of the laboratory for silicon detector make the team attractive both internally and externally, favouring a good network with other major labs participating in Belle II. The senior members of the team carry several responsibilities.

Strengths and possibilities linked to the context

The strength of the team comes from the competences acquired in the domain of silicon detector which places them in a visible position within the Belle 2 collaboration, where members of the team are in responsibility position either in the technical or software coordination.
The team is also promoting the development of innovative analysis avenues based on deep learning algorithms which are engaging new generations of master and doctoral students.

Weaknesses and risks linked to the context

While the activities of the team are attractive, the supervisory capabilities risk to be limited by the multiple responsibility commitments for teaching and managerial positions in IPHC and at the national and international level of the senior people of the team.

RECOMMENDATIONS TO THE TEAM

The team should be careful in prioritising future activities given the level of existing commitments within the Belle 2 collaboration and those at the local and national level. In particular any future engagement on hardware development and construction responsibilities have to be carefully evaluated at the laboratory and national level to make sure that adequate managerial and technical resources are available to grant successful delivery.

Team 8 : CMS

Name of the supervisor: Ms. Anne-Catherine LE BIHAN

THEMES OF THE TEAM

The team has been part of the international collaboration CMS operating at the LHC collider at CERN since its beginning. It has established itself on the research side as a key actor for the studies of top quarks and continues to be an active member of the Higgs Physics analysis group, maintaining a tradition of precise exploration of the Standard Model. On the detector side, it has continued to play a key role in the Silicon Tracker project with involvement in the conception of the real-time track triggering scheme foreseen for the High Lumi LHC and the responsibility for the design and development of part of the mechanical support and silicon module placement of the Barrel tracker.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The recommendation made in the previous evaluation have been globally satisfied: the team maintains a high level of commitment on the analysis side and has made crucial contributions to the Phase II upgrade programme and is holding responsibility positions in that respect.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	2
Lecturer and associate lecturer	3
Senior scientist (Directeur de recherche, DR) and associate	3
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	0
Subtotal permanent personnel in active employment	**11**
Non-permanent teacher-researchers, researchers and associates	2
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	5
Subtotal non-permanent personnel	**7**
Total	**18**

EVALUATION

Overall assessment of the team

The group is involved in key analysis which are exploiting the knowledge of the tracking system, specifically in searches and measurements with final states with long-lived particles, like b-quarks. At the same time, the group has played a crucial role in the design and development of the tracker upgrade in view of the High LUMI LHC programme: their work on the design of the usage of the tracking at first level trigger is the most visible example of this.

Strengths and Possibilities Linked to the Context

The strength of the group relies on their competences in both hardware and software/analysis linked to the role that the group has played since ever in the design, construction and operation of the silicon tracker. Their involvement in the tracking trigger is one which will give CMS an edge in the physics searches of the Phase II of LHC. The visible role that the group plays in the experiment makes the team attractive for students and favours networking with other institutes.

Weaknesses and Risks Linked to the Context

The engagement of the group members at many levels, analysis effort, design and construction of the detector, commitment to operation demand an adequate level of resources. In particular the need of doctoral students and supervisory capabilities have to be kept at an adequate level. The risk is to spread the existing resources too thin to operate successfully.

RECOMMENDATIONS TO THE TEAM

The team must maintain the engagement on the detector construction front in view of the future installation of the Tracker upgrade: having formal responsibility on aspects of the actual construction of the Outer tracker will enhance the importance of the group and globally of the contributions of IN2P3 to this critical project. In parallel the group should continue to play a leading role on the analysis side and on the development of future analysis strategies aiming to improve the study of final states containing heavy quarks.

Team 9: Neutrino

Name of the supervisor: Mr. Marcos DRACOS

THEMES OF THE TEAM

The neutrino team participates in two main, large, international projects, ESSnuSB and Juno. Both concern neutrino oscillation physics and seek to address the most important open questions in this field.
ESSnuSB is a H2020 EU Design Study evaluating the possibility of using the high-power European Spallation Source (ESS) linac in Sweden to produce a very intense neutrino beam to eventually discover CP violation in the leptonic sector.
The Juno experiment deals with another neutrino oscillation-related question, i.e. neutrino mass ordering. Juno, thanks to its huge volume will also be able to very precisely measure most of the neutrino oscillation parameters and will offer a chance to a rich astroparticle physics programme. There is also a connexion of the programme looking for the neutrino mass hierarchy in China with the efforts made in the Orca detector of the KM3Net programme.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The group has shifted its activity from Opera/DoubleChooz to Juno and the studies on the possible use of ESS as a neutrino source. These projects are in preparation/study phase. There is not much to retain from the recommendations of the previous report.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	1
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)	1
Subtotal permanent personnel in active employment	**4**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	1
Post-docs	0
PhD Students	3
Subtotal non-permanent personnel	**5**
Total	**9**

EVALUATION

Overall assessment of the team

This team comes from a successful story dedicated to the measurement of the neutrino mixing matrix parameters obtained by studying the oscillations. Opera and Double Chooz are the experiment where this group has greatly contributed. This team now is following two different projects that are at very different stage of preparation.
The participation in Juno in China is justified by its enormous potentialities, namely measuring with precision most of the PMNS parameters and aiming to determine the neutrino mass ordering. The contribution has been relevant in the construction; now the challenge is how to become visible in the commissioning and data analysis. The human resources of the group are marginally sufficient to justify this ambition.
While the action in Juno is happening right now, the other project dealing with exploring the possibility of using ESS for providing an intense neutrino beam is a design study with a target far away in time. However, the group has been very active and very visible in the project.

Strengths and Possibilities Linked to the Context

The team is focused on a crystal clear physics case: measure the neutrino parameters by using the oscillations. Among them determination of mass ordering is of paramount importance. It is a perfectly reasonable choice coming from the experience of Opera and Double Chooz. The two projects joined by the neutrino team are Juno and the study of the possibility of exploiting ESS as a source of an intense neutrino beam. Juno is in the preparation phase and the other is a design study. It is therefore normal that the number of publications is not comparable to the one of the experiments taking data. This is very well compensated by the large number of presentations to, often very visible, conferences. One relevant publication is the one on the projection of the combined sensitivity of Juno and Orca on the determination of the neutrino mass hierarchy. This is also another post of strength of the team, having the possibility of interacting efficiently with the Orca team inside KM3Net. The group, in the frame of Juno collaboration, has developed an interesting industrial collaboration that ended up with a commercial electronics module. Although limited by restrictions due to pandemics, there has been also some outreach activity thanks to the European financed ESSnuSB project.

Weaknesses and risks linked to the context

Although the scientific case chosen by the team is of extreme relevance, there are risks associated with the nature of the projects.

Juno is a very important, high gain experiment not lacking an important risk component. It will be important for the team to appear very visible in the collaboration. The hardware contribution has been relevant but the physical distance of the experiment poses challenges to the participation in the commissioning and data analysis. And the time to be able to give relevant contribution is now, also with the difficulty of dealing with pandemic restrictions. The evolution of relations with China and even the difficulty of going to the experimental site are to be taken in serious account. This can have an impact on the attractiveness of the group. On the other end the idea of having an intense neutrino beam in Europe is appealing. However its possible realisation and exploitation looks very far in time. So that the Human Resources should be properly assigned in order not to lose opportunities offered by Juno. The issue concerning HDR has to be solved soon otherwise it will have a dramatic impact on the recruitment of PhD students since the leader is the only one possessing an HDR and is going to retire shortly.

RECOMMENDATIONS TO THE TEAM

The team should carefully evaluate the most incisive actions to become a component of Juno with a high degree of visibility.

Although the case for a neutrino beam in Europe has a reason to be explored, the participation in the studies on the possibility offered by ESS should carefully optimised in a way not to spoil the Juno return. Juno will be commissioning and data analysis which requires a very strong effort in an experiment physically very far away. A great attention should be put to implement a real collaboration with the KM3Net/Orca collaboration for an eventual common frame for the determination of the mass ordering. The IPHC group is the perfect link for going in this direction. One component of the team has to obtain the HDR for keeping the chances to have PhD students on board.

Team 10: Observations with Gravitational waves & Multimessenger Astronomy (Ogma)

Name of the supervisor: Mr. Thierry PRADIER

THEMES OF THE TEAM

The team activity develops along three lines. The participation in Virgo with a contribution to the detector calibration, in the preparation of the analysis of multi messenger events combining gravitational waves and neutrinos in KM3Net and in the construction of a part of the domes for the Orca side of KM3Net.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team did not exist at the time of previous evaluation.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	3
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	0
Subtotal permanent personnel in active employment	**4**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	2
Subtotal non-permanent personnel	**2**
Total	**6**

EVALUATION

Overall assessment of the team

The team is following a very challenging route by preparing for studying multi-messenger processes with the goal of a better understanding of our Universe. It has accumulated experience in ANTARES and Virgo and now looks to exploit data from new/upgraded experiments as KM3Net and Virgo in O4 data period. The group shows a large number of publications as part of large international collaborations. Scientists in the team are also committed to dissemination and outreach with a visible impact and success.
There is criticality, though. The team is extremely limited in manpower and its approach towards the two big commitment is not clearly sketched in terms of priorities and task sharing. The team has been recently formed and it is difficult to make a judgement on the progress made.

Strengths and possibilities linked to the context

The experience accumulated in the past participation to ANTARES data taking and analysis and the equivalent role in Virgo is a strong asset to spend in KM3Net and the new phase of Virgo.
The publications are mainly collaboration papers, reflecting the international frame of the research conducted by this team. Almost all the publications are in high quality journals and a few of them exemplify the main achievement of them, the contribution to the development of the Digital Optical Module for the KM3Net, the progress on the Newtonian Calibrator for Virgo and the work on the classification of the Gravitational Wave sources.
The team is fully aware of the importance of dissemination. Through several initiatives, often of single members, is part of a rich and important programmes. It is relevant to mention the '*Physique pour tous !*' evening classes for a general audience and the fact that one member of the group is the referent for '*Maison pour la Science en Alsace*'.

Weaknesses and Risks Linked to the Context

The commitment of the team in terms of FTEs is very small with respect to the tasks that it declares to be able to pursue in the future. Although the physics underlying these researches is the same, there is a vast difference in the technologies, detector studies and data analysis between an underwater observatory and a gravitational wave interferometer.
Having to cope both with the data that will come from Orca/Arca and Virgo/Ligo a clear definition of the share of the efforts is not given. What is understood is that the large part of the effort goes to GW activity.
In short, the plan presented cannot be executed with such a group structure.

RECOMMENDATIONS TO THE TEAM

The team has three important commitments. They share the physics motivation but are far apart in their experimental nature. As the group is thin, perhaps some prioritisation should be made, a structure implemented and a strategy made clear. The dome production shall not be affected by any restructuration of the group as it is important, visible and going well.

Team 11: Physics with Integrated Cmos Sensors and Electron machines (Picsel)

Name of the supervisor: Mr. Auguste BESSON

THEMES OF THE TEAM

Picsel team works in the framework of the Standard Model of Particle Physics and semi-conductor physics. It develops innovative technology based on semi-conductor CMOS Pixel Sensor for subatomic physics detectors and other application domains. The scientific goal of the team is to pursue the R&D of the technology based on CMOS Pixel sensors to improve readout speed and capability in severe radiation environment tolerance to permit the use of the inner tracking system of detectors in the future $e^+ - e^-$ colliders. It is mostly supported by microelectronic C4PI platform.

Picsel is developing CMOS technologies, where the possible applications go well beyond Higgs factories (ILC, FCCee): Alice ITS3, Alice 3, Belle 2 (future possible upgrades of the detectors) and dosimetry.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous evaluation made five main recommendations linked to the implication on data analyses and exploitation of identified subatomic experiences, the use of the local, national and international networks to invite physicists and co-supervise theses and submit high-level applications, the diversification of communication activities, the strengthen of the team by the internal or external contribution of new researchers and finally to do not count on the realisation of the MISTRAL and ILC project but on the Belle 2 plan in the next five years.
Picsel team follows the recommendations since the last five years, two researchers and two professors are involved in the scientific production of the team and they sign all the scientific publications.
Picsel team is now strongly involved in a network involving Detector projects (ILD & IDT at ILC, Alice ITS3, Strong, M. V. D. at CBM-MVD…) and international R&D programmes (Aïda Innova, Cremlin+) and bilateral networks (FCPPL, FJPPL, IRL-DMLAB). Picsel obtained more than 1M€ of external funding thanks to international projects or national agency calls for bids. Five PhDs are in progress. No new HDR has been obtained.
Picsel team has been fully involved in the scientific and local organisation committees of several international conferences which also included industrial sessions. The team has also provided general public conferences or lectures.
Picsel team, supported by the C4PI platform, contributes actively to the technical design of Alice ITS3 and Belle 2 upgrades.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	1
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	0
Subtotal permanent personnel in active employment	**3**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	2
Post-docs	2
PhD Students	5
Subtotal non-permanent personnel	**9**
Total	**12**

EVALUATION

Overall assessment of the team

Picsel team has an international visibility in the field of CMOS pixel sensors totally compliant with the priorities beyond LHC established by the European Strategy Update and ECFA. Highly supported by C4PI platform team, the team is very dynamic with several high-level publications and attractive with nine non-permanents (5 PhD, 2 Post-doctorates and 2 IT). The critical size of permanent researchers (3) could be considered as a weakness to conduct in parallel large contributions to emblematic experiences like upgrades of Belle 2, Alice and future ILC detectors.

Strengths and Possibilities Linked to the Context

Picsel team played a pioneer role in establishing the innovative technology of CMOS pixel sensors giving a high reputation at the international level. Today, with close interactions with microelectronics platform C4PI, it gives to the Laboratory a top-level position for this technology. The five past years were highlighted with contributions based on CMOS pixel technology for an ultralight a detection module double-sided detection PLUME for Belle 2.

The expertise developed in Picsel is also solicited for the design phase like the update of Alice-ITS3 and of Belle 2.

Picsel team contributes in different areas and their members are regularly invited to present their results in the conference and welcome PhD and post-doctorates who all sign of all the scientific publications.

During the evaluation period, the team was composed of three tenure researchers, five PhD, two post-doctorates and two fixed terms engineers. The leader of Picsel team changed during the last five years even if the number of permanent staff does not change. The close link with the high-level microelectronics technology C4PI platform is a key of the success of Picsel team for the ambitious programme of projects contributions. No tenure engineer are (is?) member of Picsel team.

During the evaluation period, Picsel appeared as an attractive team with six PhD defences passed and five new PhD are preparing their thesis. Moreover two post-doctorates and two fix term engineers are completing the team.

During the period, the team has produced nine publications (e.g. NIM-A), three proceedings and around fifteen presentations in recognised international conferences of the domain (LCWS, Vertex, TWEPP).

The nowadays context displays opportunities of contributions for several high-level international experiments and a nice positioning to IPHC well beyond Higgs factories ((ILC, FCCee): Alice ITS3, Alice 3, Belle 2 (future possible upgrades of the detectors) and dosimetry.

Weaknesses and risks linked to the context

The success of the CMOS Pixels Sensors technology developed at IPHC by Picsel team is offering a large panel of opportunities in the subatomic domain (Alice, Bell, future Higgs Factory, ILC…) and dosimetry.

This induces the following risk: even if the team is very attractive and dynamic, at the top technological level, three tenure researchers are certainly not adapted to several engagements in parallel and the follow-up of five PhD and two post-doctorates.

The link with the microelectronics platform C4PI has to be mandatory kept to continue to keep a leader role in the CMOS Pixel Sensors domain and their engagement guaranteed.

RECOMMENDATIONS TO THE TEAM

Thanks to the great opportunities of next years, even if the decision is not in the hand of the IPHC, the committee recommends establishing an anticipated roadmap according to the decisions of international experiments on the choice of CMOS Pixel sensors.

Team 12: Nuclei to Stars (DNE)

Name of the supervisor: Mr. Olivier DORVAUX

THEMES OF THE TEAM

The scientific research activities of the DNE team are conducted along four experimental axes: Clusters and NucleoSynthesis (CNS), Exotic structures in nuclei (SEN), Synthesis and structure of very heavy and super-heavy nuclei (SHE) and reaction dynamics and neutron emission (Dren).

Clusters and NucleoSynthesis (CNS): The team conducts $^{12}C+^{12}C$ deep sub-barrier fusion cross section measurements. Among the reactions that are critical for astrophysical processes, the $^{12}C+^{12}C$ fusion reaction plays a critical role in the evolution of massive stars and strongly influences various explosive astrophysical scenarios. The sensitivity of the technique used by the team is not affected by ambiguities that taint current measurements made by the indirect Trojan horse method (THM). The team has obtained a new IdEx grant to upgrade its setup and is a partner in this context of the H2020 Chetec-Infra project (5 M€/5 years, 2021).

Exotic structures in nuclei (SEN). The team participates in the experimental programme conducted with the Agata γ-ray detector. Agata coupled with ancillary detectors allows the measurement of nuclear observables which are essential to our understanding of nuclear structure, namely excitation energies, lifetimes and spins. In parallel to the experimental activities and within the Agata collaboration, the associated detector laboratory has received accreditation for the validation of capsules and for the assembly and maintenance of triple cryostats containing three capsules each. Agata has been recognised as a research infrastructure since the end of 2021.

Synthesis and structure of very heavy and super-heavy nuclei (SHE). The team participates in experiments aiming to study the spectroscopy of superheavy elements. In the framework of the Gabriela project, the team has a long-standing collaboration with the JINR at DUBNA. The most recent campaigns have provided a wealth of new data allowing our knowledge of the properties of nuclear states in the N=148-154 region and of the fission properties of high-K isomers to be extended. The team has also participated in the development of new intense beams, in particular of 50Ti and 54Ce, using the so-called MIVOC (Metal Ions from VOlative Compounds) method.

Reaction dynamics and neutron emission (Dren). The team investigates the neutron and proton content of the fragments produced in fission reactions in the sub-lead region using the magnetic spectrometer VAMOS at Ganil and a new detection arm close to the target. These studies may shed some light on the role played by the 'proton number' in the fission process. The programme advisory committee (PAC) of Ganil has accepted the new experimental proposals of the team.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has increased its amount of external funding as recommended in the previous report. Nowadays, the search for external funding via European projects or partnerships with industry has become a necessity for the implementation of new detectors or for conducting experimental activities, e.g. funding of post-doctorates by European projects, for several teams.

Furthermore, in the previous report, the committee had asked for ' … mobilisation of the group as a whole and a perpetuation of national and international collaborations in order to maintain the smooth running of the experiments, knowing that the number of physicists per theme is sometimes a little under-critical internally…'. Today the group is evolving within the framework of strong international collaborations but the problem of the low number of physicists for certain themes remains.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	3
Lecturer and associate lecturer	1
Senior scientist (Directeur de recherche, DR) and associate	3
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)	0
Subtotal permanent personnel in active employment	**8**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	4
Subtotal non-permanent personnel	**5**
Total	**13**

EVALUATION

Overall assessment of the team

The team conducts experimental programmes along four axes: Clusters and NucleoSynthesis (CNS), Exotic structures in nuclei (SEN), Synthesis and structure of very heavy and super-heavy nuclei (SHE) and reaction dynamics and neutron emission (Dren).
In the context of these activities, the team participates in a broad number of international collaborations in France or abroad (Finland: JYFL; Russia: JINR; Italy: LNL) and in R&D for the future Spiral2 detectors (S3, Paris, Agata, Neutromania).
Collaboration with the theoretical team is very active and should be maintained at the highest level. Team members are also involved in technical developments associated with the experimental programmes.
The team is also very active in the search for external funding, which is nowadays, and regrettably, indispensable for conducting its experimental programmes.
Finally, the group faces a major problem in terms of human resources.

Strengths and possibilities linked to the context

All permanent staff members contribute significantly to the research effort of the team in the laboratory and in international collaborations. One of the team's strengths is its very good cohesion and the judicious choice of high scientific level experiments. Thanks to this, the members of the team can plan efficiently the team's scientific activities and their involvement in major international projects such as Spiral2, Agata, Stella, etc. that take place in several laboratories worldwide. This collection of scientific activities gives the team very high visibility and enables it to attract PhD students. Furthermore, the DNE team has long-standing collaborations with detector manufactures like the Ge manufacturer MIRION or the scintillator manufacturer Saint-Gobain.

The strengths of the team may be highlighted by examining its scientific production and its interactions with the non-academic world. During the evaluation period, the DNE team published 123 articles in high impact reviews. A few selected examples are: 'Advances in the Direct Study of Carbon Burning in Massive Stars', PRL 124, 192,701 (2020); measurements with the Stella experimental station allowed the extraction of excitation functions for the 12C+12C fusion reaction over eight orders of magnitude. These data may help to resolve the disagreement

between data obtained by direct measurements and data obtained by the indirect Trojan horse method. 'Experimental Evidence for Common Driving Effects in Low-Energy Fission from Sublead to Actinides', PRL 126, 132,502 (2021); the aim of this study is to bring to light, for the first time, the key role played by the 'proton number' in the fission process. Almost all members of the team co-authored this publication. The extension of these studies will be continued at Ganil using advanced gamma calorimeters. 'Gamma spectroscopy with Agata in its first phases: New insights in nuclear excitation along the nuclear chart', Progress in Particle and Nuclear Physics 121 (2021) 103,887; this review article published in Progress in Particle and Nuclear Physics, a review with a very high impact, was co-authored by one of the team's members.

Team members are authors or co-authors of all these articles. During the period the team hosted eight PhD students. Furthermore, there is a strong collaboration between theory and experiment as evidenced by joint publications.

In addition to their research activities, members of the team are involved in developing new instruments that will lead to the opening up of new experimental directions or new societal applications (new gamma-ray imagers, new neutron and particle detectors, etc.). As an example, in the framework of the Agata development, the DNE team has the already mentioned long-standing collaboration with the Ge manufacturer MIRION, in order to improve High purity Germanium (HPGe) detectors, with two co-financed theses in the last six years. One PhD student worked on gamma-ray tracking in the framework of the Agata international project jointly with the MIRION Company, who partially financed the PhD thesis. The Clover detector, one of the bestselling HPGes, was designed by members of the team and produced by the MIRION company. The DNE team has also established several partnerships with the already mentioned Saint-Gobain manufacturer of scintillators in the framework of the PARIS international collaboration and new neutron detector developments for NEUTROMANIA. The R&D activities concerning the NEUTROMANIA project have been broadened to fulfil the needs of industrial applications, in particular that of replacing 3He based detectors. DNE members and collaborators have demonstrated the ability to measure Boron deposits in the Fessenheim reactor pipeline circuit using the prototype of a newly developed neutron detector in collaboration with EDF and Carmelec, a company partner of the French nuclear protection industry.

Team members teach in schools and give presentations to the public. Following the Fukushima accident, one of the team members gave several lectures on this accident, at the CNRS, at Strasbourg University, at the 'Maison France Japon' and for associations…. The team members place their scientific expertise at the service of the organisation of events for the public (exhibitions, biennales, installations, concerts, shows, etc.).

Weaknesses and Risks Linked to the Context

As stated above the last Hcéres committee noted the lack of a reasonable number of permanent physicists for some experimental activities and requested '[…] *a mobilisation of the team as a whole and a perpetuation of national and international collaborations to maintain the good progress of the experiments, knowing that the number of physicists per theme is sometimes a little under critical internally'*. Four years later, it can be seen that the number of permanent physicists has not been increased in a satisfactory way in order to sustain these activities. The small number of permanent physicists, especially for the scientific activities along the experimental axes *Exotic structures in nuclei (SEN*) and *Synthesis and structure of very heavy and super-heavy nuclei (SHE)*, is a real weak point of the team. One CNRS physicist who will have to retire within five years and a university lecturer are conducting studies within the Agata collaboration and two professors and students carry out the super-heavy element studies (SHE). Therefore, the question facing the team is the following: *'In a national context of reduction of research staff in our fields, should we try to do everything, maintaining the two activities mentioned above with a maximum of two researchers per activity, or should we decide to discontinue one of these activities in order to sustain the other scientific activities?'* A very difficult choice, which is the responsibility of the team and the management of the unit. This is a very difficult choice, especially as the two activities mentioned above have for several years been among those which have contributed to the laboratory's high reputation on the national and international level. However, the ostrich policy is undeniably the worst one. In this context one has to keep in mind that the war in Ukraine and the exclusion of Russian physicists and laboratories from our collaborations has also profoundly modified the international context. It seems very likely that the collaboration of French laboratories with DUBNA around the Gabriela detector will end.

RECOMMENDATIONS TO THE TEAM

For several decades, the members of the DNE team have been at the forefront of the French expertise in the field of gamma-ray spectroscopy with germanium detectors. Since then, the team has diversified and embraced new research topics of undeniable intellectual interest. This has led to a lack of human resources for some of the team's experimental historical activities, such as the research on superheavy elements.

Although the eventual end of the collaboration with DUBNA may lead to a reorientation of some of the scientific activities of the team, the lack of human resources should lead the physicists of the team to a great solidarity as well as to a reflection on their possible future experimental commitments.

Team 13: Nuclear Data for Reactors (DNR)

Name of the supervisor: Ms Maëlle KERVENO

THEMES OF THE TEAM

The research activities of the DNR team are aiming to improve our knowledge of (n, xn) reaction cross sections for nuclei which are important for nuclear energy applications and nuclear power plant development. These measurements, featuring prominently in the high priority request list of the Nuclear Energy Agency, allow the inference of the total (n, n') cross-section, which is the sum of all the partial cross sections of γ rays feeding the ground state of the nucleus. To conduct its experimental programme, the team has developed the GRAPhEME array for (n, n'γ) cross section measurements and the Delco array for conversion electron measurements. In parallel, the team has assumed responsibilities in the construction of the Neutrons for Science (NFS) facility at Ganil. In particular, it has taken responsibility for the design, production, construction and assembly of the neutron beam line as well as for the second collimator and its shielding which will be important for its planned campaigns of (n,2n) and (n,3n) cross section measurements. In addition, the team has built a fast tape station, for decay studies of radioactive nuclei and ion source development. The team maintains scientific collaborations with theoreticians and nuclear data evaluators.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has followed the recommendations of the Hcéres by developing fundamental and applied skills. As such, it has diversified its experimental approaches by actively participating in the development of experimental facilities like the NFS facility at Ganil.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	0
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
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)	0
Subtotal permanent personnel in active employment	**3**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	2
Subtotal non-permanent personnel	**3**
Total	**6**

EVALUATION

Overall assessment of the team

For many years the team has demonstrated its excellence in the study of (n, xn) reactions, with unique skills in prompt gamma spectroscopy, recognised at the national and international level. In addition, it has participated in the construction of the NFS facility at Ganil where it plans to conduct a significant part of its research work.
In recent years, the perception of the present and future of nuclear energy has changed in the national and European context, which should be a plus for the scientific activities of the team.
The team should continue its strong collaborations with institutions concerned with this theme and with other teams working in this domain.
It is well integrated and visible in the national framework SCInee, gathering researchers in the field of experiments, modelling and evaluation of nuclear data for the future and innovative nuclear power plants.
It could also add new research domains to its activities by taking an interest in the dismantling of nuclear installations, an activity for which it already masters the tools.
Of course, adding new activities requires a strengthening of the team, which is relatively small with only three researchers to carry out even the current activities, among them one is close to retirement.

Strengths and possibilities linked to the context

The team has developed a state-of-the-art experimental methodology which, coupled with theoretical calculations, provides high quality evaluated data for nuclear applications. During this period the team consisted of three staff members, one post-doctorate and two PhD Students. It has participated in the publication of seven articles in high impact journals and has 35 contributions to conferences. Among these articles, one was written in collaboration with team 5 (theory). The number of publications may seem low compared to the 44 publications of the previous Hcéres review, but it is probably justified by the team's activities around the construction of the NFS facility, where the team is planning to follow up part of its experimental activities intended to support civil nuclear power. An example of the team's scientific production is: 'Measurement of ^{238}U (n, n'γ) cross section data and their impact on reaction models', Physical Review C 104, 044605 (2021). In this article, whose corresponding author is a member of the team, cross sections for 18 γ-ray transitions for ^{238}U (among them, 5 γ-ray transitions have never been measured before) were obtained and compared to existing evaluated data. The authors of the article state that '*Through comparison between experimental and calculated (n, n'γ) cross sections, we find inaccuracies in the description of specific reaction mechanisms and challenge recently implemented models. This helps improve the whole modelling of the (n, n') reaction*…'. Indeed, a precise knowledge of the ^{238}U (n, n') inelastic processes, which strongly contribute to the slowing down of the fast neutrons, is required for optimising new reactor designs. It is undeniable that the experimental work of the team contributes to a better knowledge of (n, xn) reaction cross sections, important for reaction modelling and energy applications. In particular, they are involved in the nuclear data evaluation. The team has a strong involvement in the '*Groupement de Recherche'* SciNEE (*Nuclear Energy and Environment Science*) gathering interdisciplinary CNRS research teams. This makes it at the forefront of strategic initiatives by CNRS in this domain.

The team is the leader of an integrated project Nacre of the multi-partner Needs programme (*Nucléaire, énergie, environnement, déchets, société*).
The team's activities have undergone a paradigm change in the last few years. As much as the activities around civil nuclear power could raise questions a few years ago, they now seem completely justified. Four years ago, the Hcéres committee questioned the sustainability of these activities: '*The sustainability of the team's research depends very strongly on the future of European programmes related to civil nuclear energy, as well as on the future investment of the CNRS-IN2P3 in nuclear energy programmes'*. Since then, there has been a shift in the appreciation of nuclear energy both at the European level, where it is considered as 'green energy', and at the national level, where there are plans strongly to support nuclear energy activities with the construction of a group of new nuclear power plants. The team is now working within a clearer framework, which should be beneficial to it.
The team benefits from an excellent technical support that helps for new developments and onsite installations.

Weaknesses and risks linked to the context

A weak point of the team is the limited number of members given the range of scientific activities they wish to carry out and the absence of a teacher researcher among them, which does not give direct access to students.

A particular aspect of their research resides in the multiplicity of funding sources, which induces a large number of redundant applications and reporting (IN2P3 programmes, Needs programme, European projects…). This may become a cause of discouragement.

RECOMMENDATIONS TO THE TEAM

The DNR team has a good international reputation and should, in the near future, benefit in its scientific activities from the political will to strengthen the development of nuclear energy, which could favour the links with other research institutions in the field. Its research activities should continue at NFS and other facilities in the field. Together, they could benefit from increased institutional funding for new equipment and for the funding of post-doctorates. The team could also diversify its activities by participating in the decommissioning of nuclear installations, which would be very useful from a societal and financial point of view. Finally, team members could participate in public debates on the French energy mix by providing expert advice.

Team 14: Radiochemistry

Name of the supervisor: Ms Mireille DEL NERO

THEMES OF THE TEAM

The Radiochemistry team has expertise on mechanisms of extraction/recovery and environmental speciation/mobility of trace metals and radionuclides, which both relate to socio-economic or societal challenges in the fields of environment or sustainability. The team has also developed expertise on radiation-matter interaction and in radiolysis of water and biomolecules.
The team is integrated in national programs linked to Environment and Health, and in the economic world with a start-up development.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Research activities related to health and the environment are well structured and integrated into the national research programme of IN2P3. The transverse environmental axis is a real opportunity. The societal impact of radionuclides in the environment has been addressed in a large audience article. This activity will grow with the nuclear plant dismantling problematic. The team succeeded in keeping an activity linked to 'nuclear' concerns by means of international collaborations. The 'ionic liquid' activity has been maintained and further developed with success. The research activity linked to fundamental aspects of biochemistry under irradiation has been developed, with strong links to the Cyrcé platform and the DeSIs team.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	2
Lecturer and associate lecturer	2
Senior scientist (Directeur de recherche, DR) and associate	0
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)	5
Subtotal permanent personnel in active employment	**11**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	6
Subtotal non-permanent personnel	**7**
Total	**18**

EVALUATION

Overall assessment of the team

The Radiochemistry group has a strong recognition thanks to its expertise in the various domains covering radiochemistry, metal extraction, radionuclide and trace-element speciation and mobility in the environment, particle matter interaction and radiolysis, and physico-chemistry for organic scintillations. The team benefits from an exceptional high-quality environment and technical skills, and from high attractiveness due to the societal applications of their fundamental work (environment and health), with the potential transfer into the economical world.

Strengths and Possibilities Linked to the Context

The Radiochemistry team has a recognised expertise on mechanisms of extraction and recovery, particularly using liquid membrane technology, ionic liquid or deep eutectic liquid solvents. This expertise is expressed through the participation of the team to the ERA MIN2 Limex project (lithium extraction), and an ANR project. The team collaborates internationally with Texas A&M, the National University of Science and Technology (Russia), and Chalmers Institute (Sweden) for radioelement extraction.
The team has a strong recognition for environmental speciation/mobility of trace metals and radionuclides. This expertise is related to socio-economic or societal challenges in the fields of environment or sustainability, with collaboration with biologists, and contribution to the ANDRA-EJP EURAD-FUTURE project and a project coordinated by the national interdisciplinary Needs programme.
The team also has a unique expertise on radiation-matter interaction and in water and biomolecules radiolysis. This opened to collaborations with team 15 (DeSIs), the local Cancer Institutel ICANS, the molecular biology institute IBMP, the ICube Laboratory, the Aerial centre for technological resources, and, internationally, with the NIRS in Japan. This expertise is also used for the modelling and the development of innovative dosimetric devices, with the Fibermetrix start-up and the Aerial LabCom.
Moreover the team takes advantage of the high-level skills/training of engineers and technicians to develop dedicated setups and use its advanced techniques (e.g. ESI-FTMS, ATR-FTIR spectroscopy, HPLC, etc.) and the technical facilities available at the IPHC (Cyrcé, Inorganic Analytical Platform) or via collaborations.

The implication of the members – not only the teachers – in teaching in the domain of radiochemistry and radiation effects is a good indication for the dynamism of the team.

The Fibermetrix start-up, dedicated to real-time dosimetry in X-ray imaging and radiotherapy by means of in-house and patented organic scintillators, is directly issued from the team, and keeps collaborative contacts with the team. Two former students are at the head of the holding company.

The scientific production is original and published in high-quality peer-reviewed journals and of high scientific impact, and is presented in international conferences. The publication rate is fairly good: 52 publications, 49 conference proceedings, for six permanent researchers.

In the period, the team was reinforced by one new researcher, and, very recently, it has been chosen with Team 15 to host a junior professor's chair for developing the Nuclear Power Plant dismantling research programme.
The team is also attractive to students: nine PhDs are currently ongoing (supervision or co-supervision) and seven defences during the period.

The team contributes strongly to the transdisciplinarity of the unit, with collaborations and common publications with teams 1, 3, 15, 17, 18, and 21 (all departments).
It is well integrated in the national research organisation via the CNRS-GDRs SciNEE (nuclear energy and environment) and MI2B (Health).

Weaknesses and risks linked to the context

The maintenance of the high-level techniques available onsite depends on subsequent financing, and on the stability of the dedicated technical staff within the team. There may be a risk in a context of decreasing human resources.
The publication rate, although fairly good in the average, is not uniformly distributed among the permanent researchers. In particular, one of the four doctors (PhD obtained in the period) does not have a publication as the first author.
The various activities of the team may appear without strong overlap. This may be a risk for the long-term support of high-level technical staff and common equipment if they are allocated to a small number of projects.

RECOMMENDATIONS TO THE TEAM

The committee encourages the team to pursue and develop their projects that are well in phase with the multidisciplinary objectives of the unit. The aging distribution is quite favourable, which makes it optimistic to keep their involvement for most of the scientific activities for which they have a strong expertise.

The scientific production of the team is encouraged, in particular for PhD students.

The contribution to the environmental application of nuclear plant dismantling will be reinforced with the recruitment of a junior-chair professor, jointly with team 15. This represents an additional opportunity for further developments of collaborations with other teams from IPHC, which have already been anticipated for a large part.

It is important to strengthen the cohesion between the various components of the team, in order to consolidate the common scientific objectives, and to ensure the sustainability of the high-quality of their technical resources.

Team 15: Dosimetry, Simulation, Instrumentation (DeSIs)

Name of the supervisor: Mr. Nicolas ARBOR

THEMES OF THE TEAM

The DeSIs (Dosimetry, Simulations, and Instrumentation) activities are represented in three main thematics: nuclear data and Monte Carlo models, dosimetry, environmental radioactivity. The team develops innovative systems for ionising radiation detection and Monte Carlo algorithms of radiation-matter interaction. It has an experience in the development of neutron and gamma measurement systems, in particular those using CMOS technology for which the IPHC has international expertise. These detectors are designed to adapt to the specific constraints of the different fields of application: medical, industrial, etc. New measurement systems are associated with original Monte Carlo simulation algorithms in order to optimise their operation and data analysis, and to specific data acquisition.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

In the previous report, the team project was focused on Health and Environment. The evaluation committee encouraged checking the adequation with the team's human resources, and to collaborate with other teams from the DRHIM Department. This was done above expectations, since DRHIM researchers joined the team to develop Hadrontherapy and radiobiology-related activities.
The publication level of the team reached an equilibrium between instrumentation journals that are specific to their technical developments, and larger audience reviews such as *Physics in medicine and biology*, *Frontiers in Physics*, *Journal of Applied Physics*.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	3
Senior scientist (Directeur de recherche, DR) and associate	0
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	3
Subtotal permanent personnel in active employment	**7**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	3
Subtotal non-permanent personnel	**3**
Total	**10**

EVALUATION

Overall assessment of the team

The team has a strong societal impact:

- Dosimetric instrumentation and simulation for radiotherapy and radioprotection (health and environment)
- Links with industry: four out of the nine PhD defended in the period were funded via industrial programmes. The start-up Smartium, dedicated to novel radio-surveillance techniques, has been founded by members of the team.

The expertise of the team in instrumentation, simulation and nuclear physics paves the way to the integration/coordination by the team in national and international scientific programmes, together with strong links with medical and industrial partners.

Strengths and possibilities linked to the context

The DeSIS team has an extensive experience in the development of neutron and gamma measurement systems, in particular those using the CMOS technology for neutron detection. These systems are integrated into various research projects (medical, industrial, environmental fields). Part of the objectives are dedicated to fundamental radiological science: increase the quantity and improve the quality of available data (nuclear-reaction cross-sections, secondary particles production, secondary doses, etc.) needed to model the radiological risk in radiation protection. This requires expertise in nuclear physics, with which the team is integrated in national and international programmes such as Eurados (dosimetry), Foot (Hadrontherapy with INFN and GSI), CLINM (cross sections for light ions and neutrons measurements), Gate and Geant4-DNA (international collaborations on Monte Carlo modelling).

The team is quite dynamic and attractive. It succeeded in establishing collaborations internally to IPHC (strong interaction with Team 14 on nuclear power plant dismantling and radiolysis studies, accelerator group), locally with hospital (ICANS Strasbourg, GHR Mulhouse, CAL Nice) and industrial (Aérial, IBA, GE) partners as well as at the national and international levels.

Although one researcher left the team (mobility associated to a promotion), two other researchers have joined it. In particular, the team was chosen with team 14 to host the new junior-chair professor to work on nuclear power plant dismantling.

The record of publications is quite good, both quantitatively and qualitatively: 42 publications during the period, 85 % of which were in journals highly recognised by the community.
The team is strongly involved in university activities (direction of the Faculty of Physics and Engineering, Licence responsibility) and the organisation/participation in national and international schools, which is an opportunity to attract students in their research field.

Last, the team also has a strong involvement with industry: industrial thesis and other contracts, a start-up has been founded by team members.

Weaknesses and risks linked to the context

As permanent researchers, the team is composed of four University teacher researcher, two of them being over 63 years old. In the past period, the team changed twice of leaders, among which one permanent CNRS researcher left for another team. In the same period, four persons joined the team. The team was renamed during the period. All the changes during this transition period reveal the dynamism and renewal of the objectives, but some stabilisation of the various projects is expected.

RECOMMENDATIONS TO THE TEAM

The team demonstrates dynamism and implication in various topics related to health, radioprotection and environment, with a clear visibility at the national and international levels. Moreover, the research activities are well connected to the local industrial world. The committee encourages the team to continue its scientific activities. However, it recognises that this may not be easy, given the foreseen retirement of some permanent researchers of the team and the strong teaching responsibilities of the younger team members.

This risk may be largely mitigated by the attractiveness of the team and by their success in research contracts. The link with other teams in the field of biophysics for health in the laboratory should be reinforced.

Team 16: Bio-Organic Mass Spectrometry (LSMBO)

Name of the supervisors: Ms. Sarah CIANFERANI / Ms. Christine CARAPITO

THEMES OF THE TEAM

The LSMBO research theme is dedicated to the development and applications of bioanalytical methodologies in Mass Spectrometry (MS) and hyphenated methods, and bioinformatics, for proteomics. The team has a strong focus on structural proteomics with various developments in the field of native MS, cross-linking MS and HDX-MS as well as monoclonal antibodies characterisation.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The Team has addressed most of the recommendations made during the previous evaluation. Indeed, the team has pursued its effort in maintaining a good equilibrium between research activities and their applications to collaborative projects while maintaining a routine platform activity. For example, the 2021 publication in Science Translational Medicine is a very good example of the application of the realised developments to Covid-19. Moreover, the team has maintained its strong relationship with industrial partners and keep pursing (pursuing?) its effort to valorise the research activities with one patent and one invention statement, 23 industrial research contracts (1 653 k€ total). Additionally, one team member has obtained the HDR. Finally, the methodological developments have been prioritised and, in particular, DIA approaches for quantitative proteomics have been developed and implemented.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	1
Senior scientist (Directeur de recherche, DR) and associate	1
Scientist (Chargé de recherche, CR) and associate	3
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	11
Subtotal permanent personnel in active employment	**17**
Non-permanent teacher-researchers, researchers and associates	3
Non-permanent research supporting personnel (PAR)	5
Post-docs	0
PhD Students	9
Subtotal non-permanent personnel	**17**
Total	**34**

EVALUATION

Overall assessment of the team

The team has been following a very positive evolution and addressing largely the recommendations of the previous evaluation. Indeed, the team has been reinforcing its expertise through various developments and has been active in the search of external funding schemes in order not to exclusively rely on the PIA funding. Still, the team has an important number of engineers compared to the researchers, and about 50 % of the team members are under contracts. The committee recommends that the team to continue its effort in trying to get more permanent personnel (researchers) and continue its active politics to get external funding. The committee strongly encourages the team to recruit more postdoctoral fellows, including through European projects.

Strengths and Possibilities Linked to the Context

The LSMBO team is focused on the development of methodological approaches for MS-based proteomics and has an international recognition especially in the field of structural proteomics. The team has a long-lasting expertise in MS but has also acquired over the years an extensive expertise in sample preparation, separative techniques (coupled to MS) and bioinformatics pipelines for data processing. Over the last contract, the team has promoted four main developments in sample preparation, quantitative proteomics, structural proteomics and bioinformatics methods. For sample preparation, the 'Tube Gels' as well as the automation of sample preparation for phosphoproteomics have been the main focused. Regarding quantitative proteomics, the team has implemented the PRM and the DIA. This was completed by the development of bioinformatics tools with emphasis on the creation of databases from NGS and transcriptomic data. The team has also pursued its efforts in structural proteomics developing novel coupling of separative techniques to MS to enable the analysis of proteins under non-denaturing condition (e.g. SEC-MS) or the implementation of IM-MS and Top-Down Ms A significative part of the applications is dedicated to the characterisation of therapeutic antibodies but not only. The Team is one of the few teams in France to have a strong expertise in structural proteomics covering a wide range of the different strategies.

The scientific production is very good (210) and corresponds to an average of 36 publications/year, and 2.05/FTE (17 FTE excluding the PAR). About 44 % of the publications (92 %) include a PhD student who has co-author which demonstrates the dynamics of the team. Regarding the development papers, these are in very good journals (e.g. 7 publications Analytical Chemistry). The Team has also 8 book chapters, developed three software and filled two patents.

The team is also hosting two platforms, the Strasbourg Proteomic Facility (PSGE) which is recognised at the national level by GIS IBiSA and the Profi Platform which is part of the National Infrastructure in Proteomics. These two platforms contribute to supporting the scientific community and represent an important source of funding for the team. The expertise of the team has thus made it possible to create strong links with companies, as shown by the 22 private research contracts over the period and the different publications with the industrial partners. In addition, the team has obtained 40 grants as coordinator or member of the national (2 PIA, 17 ANR, 1 Inserm 7 CNES, 6 charity foundations including 16 has coordinator), regional (5 including 2 has coordinator) and European level (1 has coordinator). The recognition is clear from the different awards obtained by the team members including the bronze medal from CNRS, the Strasbourg Idex Prize and three PhD prizes. The team is largely contributing to the valorisation of research and the scientific outreach as well with 31 communications in newspapers, on the radio or the TV (including one TV documentary) and the implication in learned societies (president of the FPS) or the organisation of conferences (e.g. SMAP 2019 >500 participants) and summer school. Finally, team members are experts for regional or national projects (13) and in the editorial board of journals (Proteomics since 2012).
Therefore, the team demonstrates a strong track record of realisations both in research and outreach and has an excellent evolution.

Weaknesses and risks linked to the context

The team has many engineers (PAR) but a limited number of researchers or teachers' researchers and while many PhD students are only a limited number of postdoctoral fellows. This limits the expansion of the team and of its recognition. Indeed, most of the realisation is supported by a limited number of the team members.

As mentioned by the team itself, one of the risks is associated with the important number (50 %) of non-permanent members. Despite positions have been requested in the management dialog and considering the limited number of academic positions currently available, there is a risk that a part of the non-permanent staff could not be maintained impacting the activity of the team and its platforms.

RECOMMENDATIONS TO THE TEAM

The team is following a very positive evolution and is very active, but the team activity is relying on a limited number of members and a large part of the being non-permanents. The committee recommends the team to pursue its efforts in trying to recruit permanent researchers. The committee also recommends pursuing the effort to get research funding to increase in parallel the number of postdoctoral fellows and make the team less relying on funding from the PIA. In particular, the application to Horizon Europe programmes would help the team. Finally, increasing the number of publications as FLC would also help the team in gaining even more international acknowledgement.

Team 17: Analytical Chemistry of Bioactive Molecules and Pharmacognosy (CAMBAP)

Names of the supervisors: Mr. Saïd ENNAHAR

THEMES OF THE TEAM

Team CAMBAP (10 permanent members) research activities aim at addressing challenging analytical developments contributing to the search for therapeutic (e.g. antidiabetic, anticancer active compounds) present at trace levels in complex matrices mainly from plant and food origins. The team has the appropriate infrastructure in terms of scientific instrumentation which is maintained with the highest quality standards. The team has very strong links with industry at the local and national levels. Thanks to its recognised expertise in analytical chemistry, the team has developed a remarkable worldwide collaboration network.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team took into account the remarks related to its visibility in the publications: the various members are present in 'useful rank' on many publications, in particular in papers published in journals focused on the analytical sciences discipline. Innovative analytical developments have been carried out within the team, attested by a patent and publications in leading journals.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	7
Senior scientist (Directeur de recherche, DR) and associate	0
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)	1
Subtotal permanent personnel in active employment	**10**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	4
Subtotal non-permanent personnel	**4**
Total	**14**

EVALUATION

Overall assessment of the team

The team has developed a widely recognised expertise in the field of analytical sciences applied to the search for bioactive molecules of natural origins, i.e. food strains, plants. This expertise has enabled several of its members to develop a large network of international collaborations which has enriched their work (publications mostly co-signed with international partners, reception of foreign PhDs, stays in foreign labs ….). The team also benefits from a very important industrial collaboration network at local and national level, which allows its work to be anchored in strong societal issues. The scientific production is excellent (108 publications over the period considered) and the team is present for many of them in a 'useful' (?) position, thus following the recommendations of the previous evaluation. The attractiveness of the laboratory to young researchers is very important (12 theses, many issued from international collaborations). Most team members are strongly involved in teaching, which allows students to benefit from teaching in line with current research developments.

Strengths and Possibilities Linked to the Context

The main strengths of the team lie in a widely nationally and internationally recognised expertise in health domains that are bromatology and pharmacognosy. The team's activities show great dynamism with studies carried out for the most part in collaboration with other international teams. Their work addresses broad issues of universal interest (valorisation of natural resources, research into new drugs, understanding of resistance mechanisms, etc.). The team's work is not limited to simple analytical support for projects with broader themes: the analytical developments are original as evidenced by, among other things, the filing of a patent and the great part of the team publications that find an audience in journals in the analytical sciences discipline. The team has a substantial analytical fleet for carrying out its work and does not hesitate to propose innovations in instrumentation either. The team recently opened its research work to new cutting-edge themes, i.e. lipidomics and metabolomics. Another strong point of the team lies in its very strong partnerships with the industrial world. These make it possible to promote applications of the developments initiated in the academic field and strengthen the recognition of the team with a wider audience.

Eventually, the team benefits from the complementary expertise of its members (analysis, microbiology, biology, pharmacognosy…) that enables them to address large health problematic.

Weaknesses and risks linked to the context

Despite a perfectly recognised expertise in the field of analytical sciences for the discovery of bioactive molecules in food-type matrices, the team should search for more funding from national or international AAPs (Appel à Projets). The actual situation does not allow it to have sufficiently large financial supports to carry out more fundamental research projects in analytical sciences. The team has all the workforce and skills for the deployment of such projects as demonstrated by the patent submitted by the team for the development of a very innovative screening test for cancer cells ('liquid pearls') or the newly developed axis in lipidomic/metabolomic. The team's projects appear to be closely linked to the very rich industrial network developed by the team. While these latter funds are very important in terms of valuation of the work carried out, the team would benefit from participating in more academic AAP projects in order to gain even more visibility with the scientific community. Even if it is currently complex to carry out projects of national or international scope in the sole field of analytical sciences, the team should be able to join forces with other teams from the institute (or outside) to propose projects in the field of food responding to health issues. The strong international network of collaboration developed by the team is a very strong asset to achieve this goal.

In addition, the team could be weakened in the future by the retirement of several staff members. As pointed out by the team itself, most members of CAMBAP are teacher-researchers with heavy teaching responsibilities, which already constitutes a difficulty in carrying out research activities. In this context it would be important for the team to benefit from a renewal/sustainability of statutory staff positions.

RECOMMENDATIONS TO THE TEAM

The team displays excellent dynamism in its research activities, in particular concerning the development of innovative analytical methodologies for the valorisation of bioactive molecules in health. The team must, however, be vigilant that a sufficient number of statutory staff is maintained in the future to maintain a research activity with equal qualitative and quantitative quality, as it currently knows. The team must also vary its sources of funding, in particular by applying for national/international academic AAPs, relying on the excellent network of collaborators at its disposal. Dissemination of work in international congresses should also be strengthened. Finally, a more homogeneous involvement in the research work of all teachers' researchers and researchers should be encouraged.

Team 18: Recognition and Molecular Separation Processes (RePSeM)

Name of the supervisor: Ms Barbara ERNST

THEMES OF THE TEAM

Team RePSeM for '*Reconnaissance et Procédés de Séparation Moléculaire'* is involved in research related to sustainable development in environment and health, with specific expertise in physical chemistry, analysis and process engineering. One axis of research is related to the recognition, complexation, analysis and separation of metals. Metals of interest are among technological or strategic ones for their recycling, toxic ones for depollution purposes and metals involved in some diseases such as iron. The second axis aims at valorising biomolecules like lignin through innovative bioprocesses such as membrane filtration coupled to continuous extraction. This second topic also contributes to bioprocesses for energy production, for instance in hydrogen extraction.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

It was recommended to define a clear scientific strategy that benefits from the strengths and to avoid dispersion of the activities. The two axes of research, around metals and bioprocesses presented in the report fully answer this recommendation. As a result the level of publication is very good and the impact of these publications increases regularly.

It was also advised to equilibrate between valorisation and basic research with high quality publications, and to develop international collaborations. The team demonstrates a good equilibrium between industrial contracts and valorisation and academic excellence and publications. For instance, the PhDs (14 over the period) publish well, working in research areas which are potentially highly applied. Partnerships with foreign countries have expended as shown by the number of shared publications with international partners.

An exploration of funding through PhD Cifre grants and through ANR JCJC was proposed. Two PhDs are currently funded through industrial partnerships and one ANR JCJC project was funded in 2022.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	3
Lecturer and associate lecturer	6
Senior scientist (Directeur de recherche, DR) and associate	0
Scientist (Chargé de recherche, CR) and associate	0
Other scientists (Chercheurs des EPIC et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	3
Subtotal permanent personnel in active employment	**12**
Non-permanent teacher-researchers, researchers and associates	0
Non-permanent research supporting personnel (PAR)	3
Post-docs	0
PhD Students	7
Subtotal non-permanent personnel	**10**
Total	**22**

EVALUATION

Overall assessment of the team

The team RePSeM benefits from a good level of recognition in the field of sustainable development in environment and health, for metal recognition, complexation and separation and for the development of original bioprocesses. These research areas are aiming at answering current societal challenges and their potential for valorisation is high as demonstrated by industrial collaborations. The number of trained PhD has significantly increased over the period, which should allow several lecturers to get their HDR in the forthcoming years.

Strengths and Possibilities Linked to the Context

The team is recognised in several research fields related to sustainable development in environment and health. These research areas are answering key current societal challenges and strong demands from society about metal reprocessing and biomolecules valorisation. The expertise in metal complexation, metal solution chemistry and extraction is a strong asset and valuable to develop some interesting collaborations with other laboratories in the field, including high-level international collaborations. Interactions with team 19 (SynPA) of the same department, which is developing among other things lanthanide complexes for health applications, show a nice complementarity. The expertise of the team in the development of processes for the valorisation of biomolecules is also well recognised. These two axes are highly complementary with a common expertise in supports/membranes development and understanding.

The quality of the publications of the team in these two axes of research is very good, with an impact which is growing over the years. Besides, seven theses have been defended during the reference period and seven are ongoing, which is a significant progress, with respect to the previous period and demonstrates the dynamics of the researchers of the team, who are all strongly involved in teaching at university, chemistry school, etc.
The valorisation potential of the research conducted in the two axes of the team is high and therefore financial resources obtained from industrial collaborations are significant. The Agency for ecological transition (ADEME) also funded the team. A European Eramin projects in the field of Raw materials for sustainable development and circular economy has also been granted in 2019.

Weaknesses and Risks Linked to the Context

The permanent research staff of the team are all full professors (3) or lecturers (5) with some important responsibilities at the ECPM school, at the IUT or related to the '*classes préparatoires intégrées Gay Lussac*'. The time they can dedicate to research is therefore limited with respect to full-time researchers in other teams. Furthermore, human resources have decreased during the reference period.

Financial resources did not include any project from the French National Agency (ANR), which allows the development of basic research at the highest level. However, in a promising way, one JCJC project was funded recently in 2022.

RECOMMENDATIONS TO THE TEAM

The strong dynamics along the two research axes of the team should continue. The strategy of gathering human forces, i.e. several researchers and support staff working together in the same direction, is important to strengthen the participation of the team to various consortia and to further increase the synergy and efficiency in applications, paper writing, etc. The equilibrium between industrial and academic funding is important and should be preserved. The funding of a JCJC ANR project is promising and submitting proposals to the ANR is strongly encouraged.

The lecturers who do not have the HDR should defend as soon as possible. This is a great opportunity for the team to increase its supervising forces, in particular for PhDs. It is also important for researchers to realise what they have achieved until now and what their midterm/long-term project is. This is also a key step in their career since being habilitated gives them the possibility to apply to full professorships.

The researchers in the team are all strongly involved in teaching and teaching-related duties. Therefore, the recruitment of a research support, technician or engineer, would benefit, both to the platform activities and the development of research. Finally, the team should propose a timetable for the renewal or upgrade of the equipment together with a finance plan to prepare future actions and funding requests, with the help of the IPHC institute.

Team 19: Synthesis for Analysis (SynPA)

Name of the supervisor: Mr. Loïc CHARBONNIERE

THEMES OF THE TEAM

The research of team 19 (SynPA, "*Synthèse pour l'analyse*") is oriented towards the design and synthesis of novel chemical objects, including molecules, nanoparticles (NP) or supramolecular compounds, and the evaluation of their properties. Among the objects designed are found cyclic ligands for metal complexation and nanoparticles involved in supramolecular assemblies.
The targeted applications are detection, analysis and medical imaging. The main research axes developed in the team are photon conversion and more precisely molecular up-conversion, detection and quantification of analytes by luminescence spectroscopy, metal complexes or NP for nuclear imaging (Positron Emission Tomography, PET) and Medical Resonance Imaging (MRI), with recent developments in therapy and clinical evaluation.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

It was advised to increase the research activity around bifunctional nuclear imaging agents along with the rise of the Cyrcé platform and the subsequent availability of ^{64}Cu, in collaboration with the team '*Imagerie moléculaire*'. The developments for PET imaging have been the subject of four publications of the team during the period. This work clearly benefits from the Cyrcé facility which is unique in France to get radioactive ^{64}Cu.
The participation of all the researchers to conferences was encouraged. Two researchers are still mainly representing the team in conferences. However newcomers have recently begun to present the team's work.
It was also proposed to increase the valorisation of the compounds. The creation of the start-up 'PolyDTech' in May 2019 perfectly answers this point.
The critical size of the team was mentioned as a risk for the visibility of the team, which was underlined as excellent. Since 2019, two researchers have joined the team: a lecturer (Maître de conference) from Strasbourg University and an affiliated PUPH also the head of the nanotranslational laboratory, at ICANS (Institut de cancérologie Strasbourg), who got an ERC starting grant in 2021. During the same period, a research engineer retired. The team is currently trying to get a novel CNRS position for an engineer with the help of the IPHC direction. The risk about the renewal of the spectroscopic apparatus is still an issue for the team although the funds obtained by the team over the period are substantial.

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	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)	2
Subtotal permanent personnel in active employment	**6**
Non-permanent teacher-researchers, researchers and associates	2
Non-permanent research supporting personnel (PAR)	1
Post-docs	1
PhD Students	9
Subtotal non-permanent personnel	**13**
Total	**19**

EVALUATION

Overall assessment of the team

The scientific excellence of the team is exemplified by the large number and high level of the publications, the numerous invitations to conferences, the prices and contracts obtained during the reference period and dynamic international and national collaborations. The team also demonstrated its ability to go towards valorisation with a start-up creation in 2019 and to promote young permanent researcher's development. Its attractiveness resulted in eight PhDs defended and nine currently ongoing. Considering the excellence of their research, the small size of the team appears as a main weakness in the future.

Strengths and Possibilities Linked to the Context

Team 19 (SynPA, for '*Synthèse pour l'Analyse'*) develops Research in chemistry at the interface with biology and medical applications, at the highest level. The expertise in lanthanide chemistry, either in molecular compounds or in nanoparticles, applied to the design and advanced analysis of the luminescence properties, has to be emphasised. Many indicators support this excellence and in particular their recognition by experts in the field, demonstrated by the large number of publications in specialised journal and also in high quality general chemistry journals and the number of invited conferences. The attractiveness of the team has significantly increased since the last evaluation as seen among others by the high number of PhD students hosted over the reference period.

The ability of the team to promote young permanent researchers is demonstrated by two HDR '*habilitations à diriger des recherches'* defended during the reference period. Also, one researcher was awarded the bronze medal of the CNRS, a prestigious French prize.

The will to go towards the valorisation of the compounds developed in the team led to the launch of the start-up 'PolyDTech' in May 2019, which is specialised in the R&D of fluorescent nanomolecules in the field of healthcare and life sciences. Many and various funding from local ones to European ones, with an ERC starting grant obtained in 2021 by a new affiliated academic staff guarantee a quality environment to conduct research. Besides, this recently funded starting ERC grant is, of course, a great scientific asset that will allow the team to go further towards clinical studies. There are also strong interactions with industrial partners.

Finally, the team is well positioned in the IPHC institute thanks to long-term collaborations with other teams, such as team 18, RePSeM, for metal complexation studies and the DRHIM department for PET imaging with radioactive complexes produced thanks to the Cyrcé platform.

Weaknesses and risks linked to the context

A main weakness is probably the still critical size of the team. Indeed, two new researchers, who are also professors, joined the team and one research engineer retired, which leads to a small number of people as permanent staff. Therefore, it appears highly important for the team, to go on with this high level of research, to get a novel CNRS position for an engineer with the help of the IPHC institute.

The risk about the renewal of the spectroscopic apparatus is another issue for the team although the funds obtained by the team are substantial.

RECOMMENDATIONS TO THE TEAM

The first recommendation would be to continue the research of excellence in the field of molecules/materials incorporating metals in various areas such as up conversion or medical applications and to preserve the dynamism that characterises the SynPA team.

The human resources of the team should be increased in the future through a research engineer position. Given the attractiveness of the team, high-level candidates could be identified for the CNRS competition. Such recruitment at the junior researcher engineer level would allow new themes in the field of metal/lanthanide complexes to be explored thanks to the strong background of the current team. The interactions and collaborations between the members of the team should be encouraged to maintain the efficiency in project funding and realisation.

Finally, a finance plan for the renewal of the spectroscopic apparatus should be established in the early phase to maintain the spectrometer park at the best level.

Team 20: Molecular Imaging

Name of the supervisor: Mr. Frederic BOISSON

THEMES OF THE TEAM

The research activities of the team are multidisciplinary, with the objective of improving techniques and methods for a better understanding of molecular processes during diagnostic and therapeutic investigations. Thus, the team is involved in the development of novel instrumentation for PET/SPECT imaging, the multiparametric study on the use of radiolabelled molecules for diagnostic and radiotherapy. The latter implies the development of new radiotracers, and the pre-clinical application of PET imaging, before and following the irradiation of tumours by proton beams. These studies are made possible thanks to the Cyrcé platform that includes small animal imaging, animal laboratory, and proton irradiation. The team has strong links with industrials.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Two main recommendations have been followed, and, to a large extent, with success:

- 'The team should be able to further improve its visibility at the national and international level, in particular through the development of collaborations': the team is involved in several funded projects, such as an ANR on the development of opaque scintillators for PET imaging, and the team is also newly involved in an international PRCI-ANR project 'Combination of proton radiations and oncolytic viruses to eradicate cancer' with NCT-Heidelberg.
- 'Collaborations with pharmaceutical and biological medical teams in the local and regional environment could be strengthened': the team has attracted researchers from University-Hospital and INSERM, but, in parallel, the promising integration in the department of two Paul-Strauss researchers was not successful. The collaboration with the CHU-team led to a publication on the role of an ^{18}F-based radiotracer in mice and humans.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	1
Lecturer and associate lecturer	0
Senior scientist (Directeur de recherche, DR) and associate	1
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)	8
Subtotal permanent personnel in active employment	**12**
Non-permanent teacher-researchers, researchers and associates	2
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	3
Subtotal non-permanent personnel	**6**
Total	**18**

EVALUATION

Overall assessment of the team

The scientific production and the thematic orientations of the team are very good. The team benefits from the exceptional environment of the Cyrcé platform. This has brought the team and the platform to a high level of excellence and recognition that are reflected through several projects with academic and industrial partners. However, the expected synergy with radiobiologists and nuclear physicists from the Hadrontherapy team was not successful within the DRHIM department.

Strengths and possibilities linked to the context

The team has an excellent expertise that is favoured by the exceptional environment of the Cyrcé platform, comprising the radionuclide production, the radiochemistry, the multimodal preclinical imaging and proton irradiation facility.
On the imaging instrumentation side, the team has developed dedicated and modular readout electronics in order to design preclinical PET imaging systems. The associated FPGA developments gave rise to a software patent with the Satt. This technological solution led the team to collaborate with the company Inviscan to develop next-generation PET modules. With this industrial partner, the team proposed a PET detector design project called digiPET, which has been labelled by the Biovalley cluster and financed by the Alsace region, the Eurometropolis and BPI.
On the preclinical applicative imaging side, the rpPET project, financed by INCa, consisted in a longitudinal study to demonstrate the interest of PET imaging in a macroscopic radiobiology context, following the irradiation of a tumour by a proton beam.
The team aimed to increase links with nuclear medicine. This rapprochement was initiated in 2016 by welcoming a PU-PH at Strasbourg-hospital. Also, the welcoming of an INSERM-researcher contributes to the scientific attractiveness of the team.
The team joined the Medalis Laboratory of Excellence (LabEx) on January 1, 2019, and a member of the team participates to the LabEx executive committee. The team participated actively in the prospective of the LabEx and its evolution towards the Interdisciplinary Thematic Institute (ITI) called the 'Institut du Médicament de Strasbourg (IMS)' in 2021.
The team established contracts and collaborative research projects with several non-academic partners: Laetoli Productions (sharing of knowledge), Inviscan SAS (development of DigiPET system), Posifit (production of 111-PBR radiotracer) and GlobalMorphoPharma (production of a synthesiser for 177-Lu purification).
The team proposed and developed DIRAC (Database of Imaging RAdiolabelled Compounds), an open-access database focusing on [18 F]-radiolabelled compounds.

The publications authored by affiliated members of IPHC are made in high rank journals. The recognised expertise of the clinician and of the specialists in imaging enabled them to write respectively nine book chapters, and two book chapters dedicated to PET and SPECT instrumentation, including multimodal imaging.

Weaknesses and Risks Linked to the Context

Within the DRHIM department, in which the team has a central position, the team was not successful in integrating the radiobiology team, although the operation was well anticipated with subsequent financial support to host an irradiator that would have enriched the Cyrcé platform. Also, two of the three nuclear physicists of the Hadrontherapy team did not succeed in collaborating with the team. They left the department and are continuing their activities in the same domain separately. This weakens the visibility of the Health-applicate research at IPHC.
There is a risk of isolation locally if the team does not succeed in gathering new interdisciplinary collaborators by means of an appropriate human management strategy.
The publication record given by the team in the period (85 publications, 9 book chapters) is quite overestimated, since many of them do not exhibit IPHC affiliations, and correspond to publications by former collaborators and other teams that have been attracted by the favourable scientific environment. Three of the four non-clinician permanent members (including one publishing radiochemist engineer) have more than two publications per year on average in the period. This relatively low publication rate is largely due to the long-time needed to valorise technical developments.
The interdependence of the team and the Cyrcé platform may become an issue. The platform, which is labelled IN2P3 and Unistra, is expected to work autonomously and host activities that are not related to the team and consequently limit the access of the team members to the platform (e.g. on the CMS beamline).

RECOMMENDATIONS TO THE TEAM

The scientific orientations of the team, and its implication in the industrial network, are excellent.
However, the strategy in the future should be more inclusive and federative, and the team should establish more collaborations locally.

In the present situation where the DRHIM department is reduced to almost one team – although of high scientific level – , and health-related research activities are performed in other departments, one may question about the existence of the DRHIM department itself.

Team 21: Hadrontherapy

Name of the supervisor: Mr. Marc ROUSSEAU

THEMES OF THE TEAM

The team investigates the various implications of IPHC in Hadrontherapy: a local activity consisting in the commissioning and dosimetry studies with the PRECy proton cyclotron at Cyrcé. The team contributes to the first studies combining proton irradiation and preclinical response by molecular imaging. Within national or international collaborations, the team is involved in programmes for nuclear physics process in carbon therapy, with expertise in secondary particle tracking and Monte Carlo simulations.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The scientific objectives of the team during the period have been partly achieved, with the setup of the radiobiological irradiation facility at Cyrcé. However, large-scale ambitions concerning the improvement of treatment plans in Hadrontherapy were reduced by i) the lack of funding for the proton radiography project, ii) the non-integration of the foreseen radiobiology group in the DRHIM department, and iii) the departure of several permanent researchers and a post-doctorate from the team, which is now reduced to one permanent person and one PhD student.

WORKFORCE OF THE TEAM

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

EVALUATION

Overall assessment of the team

The team has been strongly involved in the successful commissioning of the proton irradiation facility at Cyrcé, which is now operational. It is investigating further innovative developments with consequent funding.
Beyond the local facilities, the team has been involved in national and international collaborations dealing with nuclear fragmentation processes in carbon therapy, with a particular expertise in particle tracking and simulations.
The team has a relatively good publication record in high quality journals of its domain, considering that publications associated with technical developments require long delays. However, the team has been reduced to one permanent and one student only.

Strengths and Possibilities Linked to the Context

The Cyrcé platform, together with the complementary expertise of the various teams from several departments of the IPHC, represents a unique opportunity for research programmes of longitudinal studies combining radiobiology, molecular imaging, and associated technical developments. After the 1 M€ programme for setting up the biological irradiation platform (PRECy) allocated in 2016, the team succeeded in obtaining a new CPER project aiming at the production of helium beams.

In the period, the team has a scientific production in high quality standards in its domain (18 articles in international journals, but no conferences). Half of the publications correspond to nuclear physics-related works in national and international collaborations, dedicated to nuclear fragmentation, detection and tracking of charge particles with carbon ions. Three articles are directly linked to dosimetric studies at Cyrcé (instrumentation and simulations), and one recent article (with team 20) presents the first results of an 18 FPET-tracer imaging study of the response of proton irradiation in preclinical proton therapy.

Weaknesses and Risks Linked to the Context

The team has lost two of its three permanent members during the period. One post-doctorate left before the end of her contract. There is a loss in the expertise for proton and charge particle tracking, and Monte Carlo simulations. The activity related to nuclear physics in Hadrontherapy with carbon ions has now moved to the DeSIs team.

The size of the team is clearly subcritical, with only one student working on the high dose rate (flash) irradiation project, no post-doctorate and no non-permanent support. Moreover, the remaining scientist – teacher researcher at the university – is the scientific coordinator of the Cyrcé platform. Although he has been strongly involved in the development of the PRECy irradiation beamline, he raised a clear lack of recognition.

The question of attractiveness and human management needs to be addressed at the level of the DRHIM department.

RECOMMENDATIONS TO THE TEAM

The team should be integrated into another team. This could be either the Molecular Imaging team, or one team of the DRS.

The researcher could concentrate his activities in the developments of the Cyrcé platform, in particular with the funded project for helium ion acceleration and flash proton irradiation.
It is important to present the achievements and scientific outcomes of Cyrcé/PRECy in international conferences.

CONDUCT OF THE INTERVIEWS

Date(s)

Start: 16 octobre 2022 à 19 h 00

End: 20 octobre 2022 à 14 h 00

Interview conducted: onsite

INTERVIEW SCHEDULE

Dimanche 16 octobre

20 h 00	Dîner du Comité à huis clos

Lundi 17 octobre

8 h 30 - 9 h 00	Huis clos : réunion de préparation du comité d'experts
9 h 00 - 10 h 30	Session plénière - Présentation des membres du comité (5') - 50 + 35 : Présentation de la directrice
10 h 30 -10 h 45	Pause café
10 h 45 -12 h 45	DEPE 20 + 10: Ethology and Evolutive Physiology (EPE) 20 + 10: Physiological Adaptations to Gravity & Health (Pagras) 20 + 10: Animal adaptation and Environmental management (ADAGE) 20 + 10 : Adaptation of Marine Vertebrates to Environmental Change (AVEC) - Présence : membres des équipes
12 h 45 -13 h 45	Buffet ; Posters DEPE, DSA
13h45 - 15h50	DSA 30 + 15: Bio organic Mass spectrometry (LSMBO) 15 + 10: Analytical Chemistry of bioactive molecules & pharmacognosy (CAMBAP) 15 + 10: Recognition and Molecular Separation Processes (RePSeM) 20 + 10: Synthesis for Analysis (SYNPA) - Présence : membres des équipes
15 h 50 – 16 h 05	Pause café
16 h 05 – 18 h 10	DRS 20 + 10 : Alice 15 + 10 : Belle 2 30 + 15 : CMS 15 + 10 : Picsel - Présence : membres des équipes
18 h 10 – 19 h 10	Session fermée du comité d'experts
20 h	Diner du comité

Mardi 18 octobre

8 h 30 – 10 h 05	DRS 15 + 10: DNR 15 + 10: DESIS 30 + 15: Radiochemistry - Présence : membres des équipes
10 h 05 -10 h 20	Pause café
10 h 20 -12 h 25	DRS 30 + 15 : DNE 15 + 10 : Ogma 20 + 10: Theory 15 + 10 : Neutrino - Présence : membres des équipes
12 h 25 -13 h 30	Buffet ; Posters Plateformes, développements services techniques
13 h 30 – 14 h 40	DRHIM 30 + 15: Molecular imaging 15 + 10 : Hadrontherapy - Présence : membres des équipes
14 h 40 - 16 h 40	Présentation technique : Visites techniques IPHC 20 : Hall de montage KM3NET 50 : C4PI 50 : Cyrcé
16 h 40 - 16 h 55	Pause café
16 h 55 - 18 h 00	Présentation technique : Visites techniques IPHC 15 : PAI 50 : PSGE/ProFI
18 h 00 - 19 h 15	Session fermée du comité d'experts
20 h	Dîner du comité

Mercredi 19 octobre

8 h 30 – 9 h 30	Rencontre avec les IT et BIATSS
9 h 30 – 10 h 30	Rencontre avec les chercheurs et enseignants-chercheurs
10 h 30 –10 h 45	Pause café
10 h 45 – 11 h 30	Rencontre avec les doctorants
11 h 30 – 12 h 15	Rencontre avec les post-doctorants
12 h 30 -14 h	Buffet ; Posters DRS, DRHIM
14 h -15 h 30	Rencontre avec les tutelles
15 h 45 -17 h	Rencontre avec la directrice d'Unité
17 h - 18 h	Session fermée du comité d'experts
20 h	Dîner du comité

Jeudi 20 octobre

9h – 13 h	Travail du comité

PARTICULAR POINT TO BE MENTIONED

GENERAL OBSERVATIONS OF THE SUPERVISORS

Université de Strasbourg

Monsieur Éric Saint-Aman
Directeur du Département d'évaluation de la recherche
HCERES - Haut conseil de l'évaluation de la recherche et de l'enseignement supérieur
2 rue Albert Einstein
75013 PARIS

Strasbourg, le 18 avril 2023

Objet : Rapport d'évaluation DER-PUR230023178 - IPHC - Institut pluridisciplinaire Hubert Curien

Réf. : RB/FF/ 2023-304

Rémi Barillon
Vice-Président Recherche, Formation doctorale et Science ouverte

Cher Collègue,

L'université de Strasbourg vous remercie ainsi que tous les membres du comité HCERES pour le travail d'expertise réalisé sur l'unité de recherche « Institut pluridisciplinaire Hubert Curien» (IPHC – UMR 7178).

Nous n'avons aucune observation de portée générale à formuler suite au rapport d'évaluation transmis.

Je vous prie d'agréer, Cher Collègue, l'expression de mes cordiales salutations.

Rémi Barillon

Affaire suivie par :
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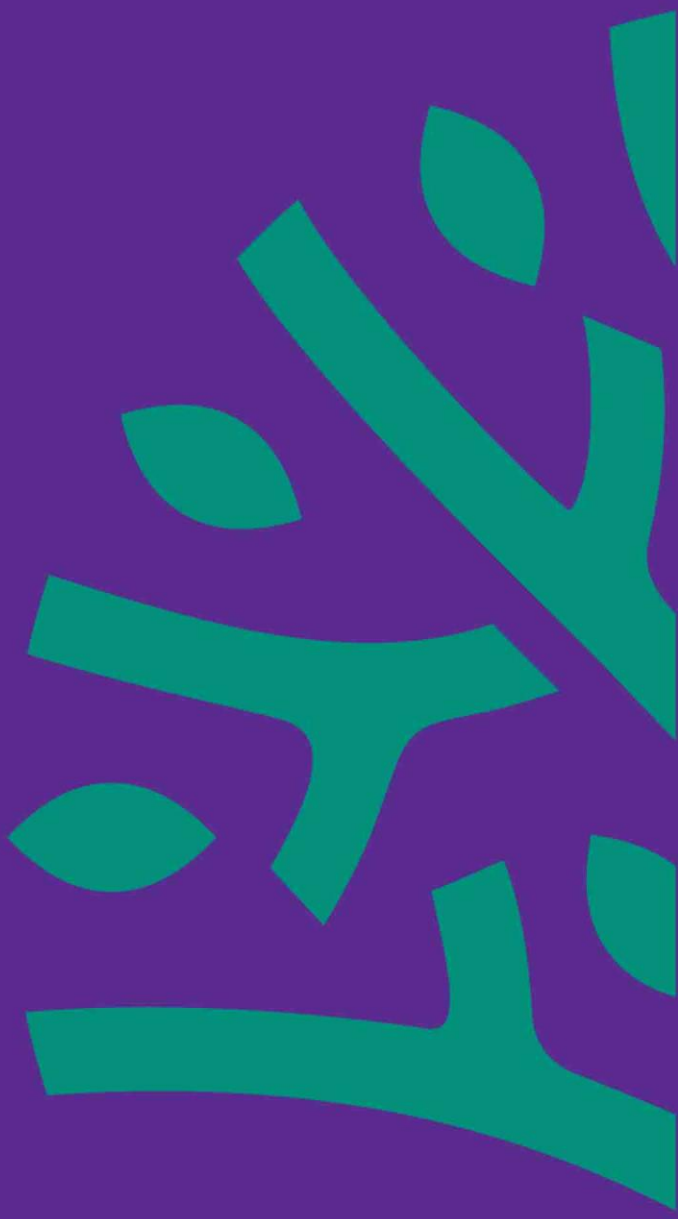

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