Research evaluation

EVALUATION REPORT OF THE UNIT

CPT – Centre de physique théorique

UNDER THE SUPERVISION OF THE FOLLOWING ESTABLISHMENTS AND ORGANISMS:

Aix-Marseille université — Amu

Centre national de la recherche scientifique — CNRS

Université de Toulon

EVALUATION CAMPAIGN 2022–2023

GROUP C

Rapport publié le 12/06/2023

In the name of the expert committee[1]:

Barend VAN TIGGELEN, Chairman of the committee

For the Hcéres [2]:

Thierry Coulhon, President

Under the decree n° 2021-1536 of 29 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

Chairperson:	Mr. Barend VAN TIGGELEN, CNRS Grenoble
Experts:	Ms Bérengère DUBRULLE, CNRS Gif-sur-Yvette Mr. Mathieu LEWIN, CNRS Paris Ms Isabelle OLLITRAULT, CNRS Nantes Mr. Guillaume ROUX, CNRS Paris Ms Mairi SAKELLARIADOU, King's College London, Royaume-Uni Mr. Ingo SCHIENBEIN, Université Grenoble Alpes - UGA Ms. Aleksandra WALCZAK, CNRS Paris

HCÉRES REPRESENTATIVE

Mr. Guy CHANFRAY

CHARACTERISATION OF THE UNIT

- Name: Centre de Physique Théorique
- Acronym: CPT
- Label and number: UMR 7332
- Number of teams: 8
- Composition of the executive team: Mr. Thierry MARTIN

SCIENTIFIC PANELS OF THE UNIT

ST Sciences and technologies

ST2 Physics

THEMES OF THE UNIT

The CPT is one of the largest research units in France on theoretical physics. Its three authorities are the national centre for scientific research (CNRS), the Aix-Marseille University (Amu) and the University of Toulon UTLN. The CPT captures very many items, including its interdisciplinary interfaces with biology, epidemiology, applied mathematics, turbulence and astrophysics. It is divided into eight teams characterised by either its own methodology or research subject. Team E1 studies phenomenological particle physics and QCD (Quantum ChromoDynamics), team E2 performs mathematical approaches towards physical laws, team E3 studies cosmological issues such as the large-scale structure of the Universe, its standard model and its dark energy, team E4 applies the loop approach to quantum gravity and seeks to come to phenomenological consequences such as the value of the cosmological constant, team E5 performs statistical physics and develops all kinds of network models to systems well beyond physics, such as epidemiology and social sciences, team E6 on nanophysics focusses on many items in contemporary condensed matter physics such as (fractional) quantum Hall effect, electron quantum optics and Andreev reflection. Team E7 is a very multidisciplinary group working on nonlinear or dynamic aspects in biophysics, plasma, finance and Hamiltonian systems. Finally, team E8 works on the analytic and spectral properties of quantum-mechanical models.

HISTORIC AND GEOGRAPHICAL LOCATION OF THE UNIT

The CPT was founded in the early sixties mainly on subjects around mathematical physics. After the recent fusion of the universities in Marseille it has currently three authorities, Amu, UTLN and CNRS. It has premises both at Luminy campus (la Grande Barre, shared by Amu and CNRS as hosting authorities) and at Toulon University campus. During the last contract La Grande Barre closed for asbestos works, and still will be until 2023. The CPT members at Luminy currently reside in the offices of the former University library and elsewhere on the Luminy campus. With the Covid-19 pandemic, many have been working at home for more than a year. Also, the Toulon antenna of CPT was subject to renovation works and its members were geographically spread.

RESEARCH ENVIRONMENT OF THE UNIT

With the attribution of the IDEX Aix Marseille (run by the foundation A*MIDEX), and the subsequent fusion of three universities to Amu, the research environment in Marseille has changed a lot recently. Several Labex structures (and in particular OCEVU on particles and high energy physics, and Archimede on mathematics and computer science, both involving CPT), finished their action in 2019. Some were reconducted as Amu Institutes others were created from scratch. CPT teams are actively involved, including in their steering committees, in 5 of them: IphU that replaces OCEVU, Archimède, ISFIN covering plasma physics, Amutech on nanosciences, and Origin on planet formation & emergence of life. CPT is a partner in more than 10 national research groups (GDR) of CNRS. The proximity of Iter is supported by a collaborative agreement with CEA Cadarache. CPT is also involved in the new "Convergence Institute" CenTuri on complexity and living systems. CPT is a founding member of the Fédération de Recherche des Unités de Mathématiques de Marseille (Frumam). The research environment in Toulon is the interdisciplinary pole MEDD (Mer, Environnement et Développement Durable) of UTLN.

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

Permanent personnel in active employment	
Professors and associate professors	19
Lecturer and associate lecturer	14
Senior scientist (Directeur de recherche, DR) and associate	5
Scientist (Chargé de recherche, CR) and associate	10
Other scientists (Chercheurs des Epic et autres organismes, fondations ou entreprises privées)	0
Research supporting personnel (PAR)	2
Subtotal permanent personnel in active employment	**50**
Non-permanent teacher-researchers, researchers and associates	10
Non-permanent research supporting personnel (PAR)	4
Post-docs	7
PhD Students	34
Subtotal non-permanent personnel	**55**
Total	**105**

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

Employer	**EC**	**C**	**PAR**
Aix-Marseille Université	24	0	0
CNRS	0	16	2
Université de Toulon	10	0	0
Total	**34**	**16**	**2**

UNIT BUDGET

Recurrent budget excluding wage bill allocated by parent institutions (total over 6 years)	2 655
Own resources obtained from regional calls for projects (total over 6 years of sums obtained from AAP Idex, I-site, CPER, territorial authorities, etc.)	0
Own resources obtained from national calls for projects (total over 6 years of sums obtained on AAP ONR, PIA, ANR, FRM, INCa, etc.)	1 906
Own resources obtained from international call for projects (total over 6 years of sums obtained)	371
Own resources issued from the valorisation, transfer and industrial collaboration (total over 6 years of sums obtained through contracts, patents, service activities, services, etc.)	451
Total in euros (k €)	**5 383**

GLOBAL ASSESSMENT

The Committee highlights the excellent scientific production of the CPT – both in quality, quantity and diversity, over the last 5 years that has led to an equally excellent national and international visibility of the research unit, including its outreach to a broad audience. This major achievement has happened despite largely deteriorated circumstances, such as the Covid-19 epidemic, the asbestos works in the Grande Barre on the Luminy Campus, and the renovation works on the Toulon campus. This complicated spontaneous scientific collaborations, crucial in theoretical and mathematical physics, and enforced remote working. The unit maintains very good relations with its 3 authorities, including their administrative desks, and adapted rapidly to the changing research environment in Marseille. The main recommendation of the committee is to modernise the internal organisation of the unit, to remove obsolete structures and to make way to cope with future challenges. A second recommendation is to bring more scientific strategy in the decision tree. In particular, the committee reiterates the recommendation of the former Hcéres evaluation committee to reconsider the present structure in terms of 8 teams, and to put more weight on a few grand themes when making scientific decisions or when animating scientific activity. The new direction should carefully follow the thematic evolution, and formulate a clear proactive strategy to redirect certain activities that will disappear due to retirements in favour of new themes that can grow in the future.

The key elements of the evaluation of the eight teams and the IT team are summarised below.

Two CDD contracts of the administrative desk have still not been made permanent. It is essential for a correct functioning of the laboratory to attribute permanent contracts to both CDD hires. The absence of a network engineer is a genuine risk for a large unit such as CPT, with so many advanced numerical activities. The new CPT direction should consult with its authorities to find a rapid and sustainable solution to this problem.

Team 1 (particle physics) is an excellent team with great international visibility. It is important to stabilise the current situation by converting the Chaire position into a tenure position. A huge opportunity is to attract the partner of one team member who may otherwise leave.

Team 2 (GPS) has a very good reputation, both at the national and international level. It should formulate a more long-term strategy in order to survive, and try to benefit from clearly existing links with other teams inside CPT.

Team 3 (Cosmology) produces very good research in observational cosmology, with large outreach. It should try to create more research time for instance by applying for an ERC grant or by proposing candidates at CNRS.

Team 4 (Quantum Gravity) performs research with high quality, great originality and large outreach. Many subjects are risky, and on the cutting edge of physics. The recruitment of new members is vital for the survival. More internal collaboration could be possible and a more pronounced participation in the loop-twistor debate is a clear opportunity.

Team 5 (Complex Networks & Statistical Physics) is very dynamic and interdisciplinary. It that has grown a lot and gained visibility. It benefits enormously from interactions with the Centuri Institute of Convergence.

Team 6 (Nanophysics) presents remarkable scientific contributions also with experimentalists, is internationally renowned and has become a leading group in the French condensed matter theory community. It studies new innovative themes such as cold atoms, and is characterised by a healthy internal coherence.

Team 7 (Dynamical Systems) produces excellent interdisciplinary physics, large training by research and outreach. It is the remnant of a previous fusion that has apparently not yet been completed. Its future is jeopardised by imminent retirements and possible lack of funding.

Team 8 (Quantum Dynamics and Spectral Analysis), situated mainly on the Toulon campus, is a cohesive and enthusiastic team with a common strategy, long-term engagement, and a large training activity. It should be able to attract CNRS candidates on the interface of mathematical physics.

DETAILED EVALUATION OF THE UNIT

A – CONSIDERATION OF THE RECOMMENDATIONS IN THE PREVIOUS REPORT

The most significant recommendation in 2018 was to reconsider the team structure, some teams containing only a few staff members, some of them were about to retire, or were having heavy duties outside CPT. The committee recommended having fewer themes with broader topics and more permanent staff. Some related advice was to increase the transverse collaborations between teams and even inside teams. The second recommendation was to improve the dialogue between the CPT and the three authorities CNRS, Amu and UTLN in the new UMR contract, and to come up with a joint strategy about recruitment, PhD scholarships and funding. Related was the advice to come up with a genuine strategy for future recruitment. Finally, it was recommended to apply for more EC funding.

The team structure was hardly modified, only former teams E7 and E8 merged to become the new E7 team on "Theory and Applications of Dynamical Systems" inside which the former structure is still visible. A few collaborations between teams exist, but scientific activity at CPT is still mainly individual on topics spread among teams. The interaction with authorities has improved when it comes to recruitment and all three created jobs at CPT. Both Amu and UTLN provide scholarships to CPT but only to researchers affiliated to their own Doctoral Schools. With the creation of the Amu Institutes, the direct contact between the different teams and Amu has improved significantly. One EC contact (LINX) is running and one ERC is currently being mounted. During this evaluation, many teams are requesting new recruitment, and the question is how the CPT management will deal with these many requests.

B – EVALUATION AREAS

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

Assessment on the unit's resources

The budget of the CPT has steadily increased since 2016. This does not originate from an increased support of the authorities, which has been relatively constant, but rather from a strong increase in its own resources by a factor of four between 2016 and 2021 (from 241 k€ to 969 k€). These resources are mainly obtained via ANR funding and facilitate the recruitment of postdocs, the purchase of computer equipment and the support of significant resources have also been obtained in the particle physics team E1 within the framework of a chair of excellence, by OCEVU projects. Team E7 obtained funding via the Eurofusion program of the framework of FR-FCM and the call "Links" FET.

A 4% levy is made by the CPT on all resources obtained which makes it possible to make shared purchases or to finance Master 2 internships in teams with less funding. The CPT benefited from the Amu performance bonus, an amount between 8k€ and 9k€, for its good respect of the publication chart.

Assessment on the scientific objectives of the unit

Whereas most teams seem to have a clear strategy for the future, no general scientific policy at the level of the unit is visible, probably hampered by the diversity in team strategies.

Assessment on the functioning of the unit

The policy to act as a single unit with 8 team consists of a laboratory (unit) council (director, deputy director, head of administration as permanent members, some nominated and elected members, the team leaders are invited but not necessarily voting members) that meets on a regular basis, the organisation of seminars of general interest, implying in principle all teams, and one laboratory day each year. The direct involvement and representation of Ph. D students and postdocs in the unit council is not clear.

The functioning of the CPT is good, and to be put in proper context given the lack of technical and administrative support, as well as the various unfortunate events.

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

Strengths and possibilities linked to the context

The administration desk consists of four persons among which two do not have permanent positions (CDD). The team copes efficiently and dynamically with all tasks that are essential for the CPT to operate. In 2021 the desk underwent a financial control ("audit") by the "Délégation" of CNRS and the evaluation was very positive. The desk has continued to operate very well, in spite of a heavily deteriorated environment. The Covid-19 pandemics required remote working and the current asbestos works in the building imposed the relocation to a temporary place. Regarding the budgetary aspects, the CPT has benefited from an increase in its resources thanks to funding which are external to its supervising authorities and the Amu's performance bonus.

Weaknesses and risks linked to the context

Despite the recommendations of the former committee, the two CDD contracts of the administrative desk have still not been made permanent (one is on successive temporary contracts since 2015!), while the amount of resources of the laboratory has been multiplied by 4 during the last contract. One of the CDD hires is apparently in the process of getting a permanent position at Amu (CDI), but it is essential for the correct functioning of the laboratory to attribute a permanent contract to the second person as well. This is vital to be able to cope with the increase in financial resources, as well as to provide support for the organisation of the many conferences and workshops.

The absence of a network engineer is a genuine risk for a large unit such as CPT, with so many advanced numerical activities. It also puts at stake the security of data and codes. A person formerly recruited on an internal mobility opportunity at CNRS (Noemi) left Marseille, and since then, a staff member that has recently moved from another unit in Marseille to CPT fulfils the role of network manager. This situation is absolutely unacceptable, and the new CPT direction should consult with its authorities to find a rapid and sustainable solution to this problem.

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

Strengths and possibilities linked to the context

The CPT covers many different topics in theoretical physics and its numerous interfaces. Many themes are studied on a fundamental level and with high originality. The main objectives of CPT – as the committee has understood – is to maintain this rich multidisciplinary profile and to support all activities "as much as possible". A huge opportunity is to foster interdisciplinary, where added values residing at disciplinary interfaces are activated. This is ambitious but feasible at CPT, and is in line with local and national priorities. This will demand a good organisation between all partners, the courage to make important (top-down) decisions to adapt to contemporary changes and to create dynamic team structures. Several teams have become truly interdisciplinary and have come up with their own team's strategy, but no true general policy at the level of the unit is visible.

Many members of CPT from different teams are involved in social actions (events, books, even theatre...). Although, of course, the Covid-19 pandemic complicated many of them.

Weaknesses and risks linked to the context

The existence of so many different research areas (actually far more than the number of teams) is a risk. This diversity makes it very difficult for CPT to formulate a global strategy where everybody finds its place, with key words that concern all. Such a policy is highly desired because (bottom-up) would let CPT emerge out of the sum of all teams and (top down) would foster more exchanges between teams. The combination of high scientific diversity and individual research programs was already highlighted in the previous report, it may indeed be characteristic for theoreticians, but more collaborations inside teams and among teams can certainly be increased. Many teams face retirements soon and a global strategy on how to cope with that (e.g. by reshuffling teams, creating axes) is highly desired. The committee also encourages CPT members to ask for ERC (so far none, despite the large eligibility of many staff members) but also warns that such funding may lead to further individual action.

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 committee has found no evidence whatsoever that gender parity and discrimination with respect to staff are an issue. Some teams really worry about the difficulty to hire women in theoretical physics.

Weaknesses and risks linked to the context

The absence of a network manager at the CPT was mentioned earlier and constitutes a severe risk for data protection. An urgent and sustainable solution is needed.

The committee also wishes to emphasise the poor working conditions (working remotely and degraded offices in the university library) for all CPT staff due to the asbestos work at the Grande Barre. This, however, did not influence scientific production, and CPT managed this external disruption in the best way possible. Of course, the carbon footprint was largely reduced by the absence of mobility due to Covid-19, but CPT does not show an overall CPT carbon strategy.

EVALUATION AREA 2: ATTRACTIVENESS

Assessment on the attractiveness of the unit

The attractiveness of a research unit is determined by the flow of PhD students and postdocs, the international events organised, the diversity of collaborations outside CPT, and related to this the flow of external visitors. With this criterion in mind, CPT is a very attractive research unit, a notion that is well recognised in and outside France. It is important to say that all teams, despite their diversity in methods, topics and threats, are attractive in this respect.

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 high scientific quality and large thematic diversity are precious. The CPT has a large international visibility with many international collaborations. For more details on this item, we refer to the team assessments. Many teams have managed to justify new recruitment from Amu and UTLN on the basis of their scientific excellence.

Weaknesses and risks linked to the context

It is, of course, natural to use scientific excellence to justify new recruitment, but in practice difficult at universities because they have so many other constraints with limited means. However, at CNRS, jobs at the level of associate researcher (CR) exist with no predefined affiliation, and one may wonder why the irrefutable scientific excellence of some teams is not exploited to attract young researchers that compete at CNRS and finally settle at CPT.

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

Strengths and possibilities linked to the context

Given the many hosting problems (Covid-19 and asbestos, even floods in the cellar) we consider this item to be irrelevant for the past contract. The CPT did its very best to survive.

Weaknesses and risks linked to the context

Idem

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

In these days of funding with huge rejection rates and high prestige it has become impossible to say whether scientific attractiveness leads to a competitive position in calls for funding, or whether it is rather the other way around. It is certainly true that CPT is attractive on the basis of its high quality research. And it is a pleasure to see that CPT has become successful in getting more external resources, especially because the research environment (at Amu) has improved a lot, and CPT has been a major player in this process.

Weaknesses and risks linked to the context

See above

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

Strengths and possibilities linked to the context

Not relevant

Weaknesses and risks linked to the context

Not relevant

EVALUATION AREA 3: SCIENTIFIC PRODUCTION

Assessment on the scientific production of the unit

In the period 2016–2021, the CPT has produced 673 publications in peer-reviewed journals. That comes down to 84 on average per team, and given the fluctuations in team sizes and the different habits in different domains, this number is quite representative for all teams. On average each permanent researcher produced 14 publications. This is more than 2 per year. These numbers reveal a huge scientific productivity, despite Covid-19 and asbestos and renovation works. As to the quality of the publications, the committee has appreciated a lot their large topical diversity and their large impact on the scientific communities. The number of defended theses varies more from team to team. The CPT delivered 35 PhD in physics and mathematics. Most of them (24) graduated at Amu, 10 at UTLN (teams E7 and E8), and 1 in Tunis.

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

Strengths and possibilities linked to the context

Many publications appeared in high quality journals in physics or applied mathematics. Many were given highlights at local and national level. The committee estimates to have identified more than 10 genuine breakthroughs in physics and mathematics (and these are known to be rare events!). It is possible to mention the hadronic contribution to the muon magnetic moment from lattice QCD (E1), revealing a 4.2 tension of recent observations at Fermilab with the Standard Model, the gravitational birefringence of light (E2), the observationally obtained constraints on the speed of gravitational waves (E3), the finite lifetime of black holes in quantum gravity (E4), the stochastic rules of branching in dendrite morphogenesis of sensory neurons (E5) that creates a new domain in biophysics, the application of extreme value theory to climate (E7), the theory (E6) and observation of Andreev reflection in the fractional quantum Hall regime at NTT Research Labs (Atsugi – Japan), and the proof by E8 of a long-standing conjecture concerning the fractional smoothing effect of the Boltzmann equation for Maxwellian molecules, conjectured 20 years ago by Desvillettes, Villani and co-workers. Many more are on the cutting edge of science.

Weaknesses and risks linked to the context

The presence of high-risk and innovative projects varies considerably from team to team and it is difficult to make a global statement for the CPT as a whole. The committee has the impression that the emergence of such projects results from team policy, team spirit, and the level of connection of a team to its research environment, and not from an incentive policy of CPT direction. One may even speak of a competition between teams.

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

As mentioned elsewhere, the scientific production is surprisingly well shared between teams, despite diversity in practices and size. Publications are signed with PhDs as first authors where relevant. Inside teams the committee did not find inactive scientists, yet very many carry significant responsibilities outside CPT (Institutes, presidency, and CNRS Institute…). Many teams contest the "proportionality of research" as an assessment criterion, arguing it to be unmeasurable, ambiguous and non-exhaustive in view of other highly relevant duties such as teaching.

Weaknesses and risks linked to the context

As is mentioned in many places elsewhere, including in team assessments, only a few real collaborations exist inside CPT, and practically none between teams. Most scientific output is produced by a senior and his or her PhD or postdoc, or with external collaborations. This is not necessarily a "weak point", it is just an observation with a feeling of lost opportunity, and this method of sharing mostly with the outside works very well.

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

The entire scientific production underwent peer reviews and was published in well-recognised journals. Concerning open science: the entire scientific production is (in post-print version) accessible on open archives (HAL, ArXiv, Inspire) including the one of the mathematical community. This is one condition to be eligible for the "bonus performance" provided by Amu. An Open Code policy exists in the numerical teams E1 and E5. Team 1 is part of the SCOAP3 consortium on Gold open access, led by CERN, a pioneer in open science.

Weaknesses and risks linked to the context

Different disciplines have different habits of how to implement open science. Inside CPT, team E1 publishes under Gold with SCOAP3 whereas team E8 feels Gold open access has a poor scientific quality in their field. It may be useful to inform the CPT members about the challenges of open publications, often blurred by false or incomplete information, and to introduce a visible open science policy of CPT, non-existing for the moment.

EVALUATION AREA 4: CONTRIBUTION OF RESEARCH ACTIVITIES TO SOCIETY

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

All teams declare – as theoretical and mathematical physicists – not to be too much concerned by non-academic collaborations. One even gets the impression that many are not at ease with the implicit obligation to contribute to valorisation and industry. Concerning outreach to a broad audience, the CPT is exemplary, and arguably even more active than other units on theoretical physics.

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

Strengths and possibilities linked to the context

CPT auto-claims this aspect not to be applicable. It is, however, highly probable that several PhD students ended up working in private companies or as teachers in grammar schools and not in academia, which is an indirect way of the CPT to contribute to the non-academic world. This is, however, not discussed in the report.

Weaknesses and risks linked to the context

Idem

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

Strengths and possibilities linked to the context

Idem. However, team E5 contributed significantly to Covid-19 spread analyses. Team E7 has very direct connections with plasma technology at Iter and E3 is involved in aspects of data transmission of the Euclid space mission (launch in 2023).

Weaknesses and risks linked to the context

Idem

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

Strengths and possibilities linked to the context

On this point the CPT is very exemplary, and arguably even more active than other units on theoretical physics. Every team is involved in their own way, and the CPT houses several true outreach stars. We mention: Fête de la Science (all), many public lectures on antimatter (E1), Fermi paradox (E3), the publication of books on the history of science (E2), the order of time (E4), a position paper on the role of science in politics (E5), café des sciences in the French embassy in China (E7) and Theatre and Science in Turin (E8). A huge effort is made by all teams to highlight important discoveries for a broad audience.

Weaknesses and risks linked to the context

Some "stars" retire soon and the excellent outreach to a broad audience is hopefully going to be transmitted to the younger generation.

C – RECOMMENDATIONS TO THE UNIT

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

The present hiring policy is based upon the numerous micro-profiles proposed by the different teams, all seeking to replace as much as possible their upcoming retirements in order to survive. The committee thinks that, in order to explore new horizons in the future and to abandon obsolete activities from the past, a policy based on team survival is not desired. It is strongly recommended that the future hiring policy be centred on a few "axes" (for instance, the present 3 "groups" that currently have a purely administrative role) that propose large profiles for future recruitment. Members of CPT should be allowed to participate in several axes, in order to solve some overlaps among the various activities and to foster collaborations within the laboratory. A suggestion is to have one of these axes associated with "mathematical physics", which would remove the fragmented visibility of this important activity at CPT.

The axis or group structure should be visible in the Laboratory Council. Any decision taken by the direction after discussion or vote in this council should be transparent and respected by all members of CPT. The committee recommends encouraging the active participation of PhDs and postdocs in this council that seems to have been lost.

The role of the "Toulon referent" (inside the CPT governance) is ill-defined. In principle the director and deputy director of an UMR are unanimously appointed by its authorities, on the basis of their qualifications in management, their availability and their recognition inside the unit. If the desire exists, either by CPT or by Toulon University, to have an explicit "Toulon referent" inside the CPT governance, his role must be transparent, and be approved by all parties.

The CPT is currently still in remote working mode, and hopefully things will get back to normal by the end of 2023. The committee encourages CPT to anticipate this event, and to stimulate the physical presence of all members as soon as and whenever possible. In particular, the administrative desk should offer a physical presence of at least one member every working day of the week to cope with small problems of any kind.

Recommendations regarding the Evaluation Area 2: Attractiveness

The CPT is a very attractive research unit and the experts have no other recommendation than to maintain the current level.

Several teams working on mathematical physics complain about a lack of recognition of their activity by local and national instances. The committee would regret any event that would jeopardise the precious proximity of mathematics and theoretical physics at CPT. The committee recommends the different protagonists at CPT to join forces (e.g. by the creation of an "axis" in mathematical physics) and to be more proactive in their search for potential candidates for openings in sections 02, 41 and 51 of the National Scientific Committee (CoNRS). Experts point out that CNRS fosters this interface and often (such as in 2023) creates coloured openings to hire associate researchers.

The attractiveness of CPT for PhD students could be further enhanced by tracing the careers of their students after graduation. To attract young researchers to make a career at CPT it is important to create the necessary conditions (financial support, less teaching and responsibilities, attractive career mobility) for them to start up. Both Amu and UTLN provide this support for one year, also the creation of the *Chaires d'Excellence* at Amu helped a lot. It is important that efforts are continued to be made by CPT and its authorities to attract and accompany young talent.

The committee encourages the CPT to make sure that newly arrived researchers of all levels are well informed and well treated in the lab and obtain all the necessary help.

Recommendations regarding Evaluation Area 3: Scientific Production

The scientific production of CPT is excellent, in quantity, quality and diversity, and the committee has no recommendations to make.

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

The CPT is extremely active in its communication to a large audience. Several communication stars retire or have retired. It is essential that this activity be transferred to a younger generation. Many teams do not feel at ease with their "supposed" role for society. The training of Ph.D. students is a huge contribution to society, given that many of them find jobs outside the academic world. The committee recommends that CPT exploits and values this activity more by tracing the careers of their students after their dissertation.

TEAM-BY-TEAM ASSESSMENT

Team 1: Particle Physics

Name of the supervisor: Mr Laurent Lellouch

THEMES OF THE TEAM

The main scientific objective of team E1 is to provide the necessary theoretical work to constrain or find new fundamental physics beyond the Standard Model (SM) of particle physics. Another major objective is to improve our understanding of the strong interaction dynamics as described by Quantum Chromodynamics (QCD), which is a fundamental task in its own right but also crucial in many cases for new physics searches. The main areas of research are currently: precision calculations of the muon anomalous magnetic moment, quark flavour physics, dark matter, electroweak symmetry breaking, and hadron structure. An important method (but by far not the only one) to approach these topics is Lattice QCD.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

Recommendation: Recruit a researcher or teacher-researcher who can work in the field of lattice QCD following the team's methodology in order to establish a "critical mass" on this subject at the CPT and perpetuate this theme.

This recommendation was fully taken into account with two excellent hires in 2019, both experts in lattice QCD. This key activity of the team E1 has been reinforced.

Recommendation: Clearly identify new directions for the future and formulate a clear strategy for recruitment. Apply for ERC/ANR funding to maintain the number of post-docs/students.

This recommendation has been followed with the ANR JCJC grant for one of the two new team members who are allowed to hire two Postdocs in addition to two Postdocs and one PhD student connected to the chaire d'excellence. There are members of the team E1 with a very high international reputation who could also apply for an ERC grant. The team has quite clearly identified Dark Matter research as a new direction supported by the excellent hire in 2014 and several external collaborators. One of the members, hired in 2019, keeps the expertise on hadron structure in the team which was considerably weakened after the retirement of former team members working on this field. This research is done in the context of the international HadStruc collaboration of which the newly hired researcher is a member.

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	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	**5**
Non-permanent teacher-researchers, researchers and associates	2
Non-permanent research supporting personnel (PAR)	0
Post-docs	2
PhD Students	3
Subtotal non-permanent personnel	**7**
Total	**12**

EVALUATION

Overall assessment of the team

E1 is an excellent team, made up of 5 permanent members: 4 CNRS (2 CR, 2 DR), 1 Amu professor and one non-permanent member: an Amu Chair of Excellence. One of its members devotes all of his time to high-level administrative activities. Over 70 articles have been published since 2016 with high quality results in all of the team's research areas, a highlight being the impressive precision calculations of the anomalous magnetic moment of the muon where the team plays a leading role at the international level. Two PhDs graduated in this team at Amu. They are members of Budapest-Marseille-Wuppertal (BMW), HadStruc and CKMFitter international collaborations.

Strengths and possibilities linked to the context

The theoretical work on the muon g-2 has a long tradition at CPT and the team clearly has an outstanding expertise at the international level with contributions from 5 members of the team. A highlight is a first complete ab initio evaluation of the hadronic vacuum polarisation (HVP) by the BMW collaboration published in Nature, with uncertainties matching for the first time those of the data-driven determinations. This result again has received a lot of attention since the central value obtained by the lattice calculation does not agree with the reference SM prediction based on a data-driven evaluation of the HVP, the lattice result bringing the SM prediction in agreement with the measured value. The experimental value will be improved in the next couple of years and the team at CPT is well positioned to continue to play a leading role in this area. The team has been reinforced by the recruitment of two outstanding lattice theoreticians) in 2019 with expertise in precision calculations and hadronic physics such that it remains to be a lattice QCD leader in France being very competitive internationally.

Another area of strength of the team with high quality publications of three members (in PRD, JHEP, EPJC) is flavour physics which offers another possibility to discover evidence for Beyond Standard Model (BSM) physics, mainly through rare decay modes or loop processes sensitive to short-distance physics. For instance, a member of the team has investigated the limitations of and sensitivity to new physics in neutral □ meson mixing at future facilities. Moreover, the rare decays of a heavy to a light meson and a pair of leptons have received much

attention from the particle physics community, including members of the team, due to the longstanding anomalies reported by LHCb and Belle in several observables. The team has also explored the possibility to detect similar anomalies in analogous decays of the meson or of the kaon where long-distance QCD effects contribute sizably in the whole region of the di-lepton invariant mass. It is noteworthy that some of this work has been done in collaboration with a PhD student of the CPPM Marseille working for LHCb. The team also plays a major role in the internationally highly visible CKMfitter collaboration. A strength of the team is the possibility to combine the necessary expertise in QCD and BSM physics.

The team has successfully developed dark matter research as a new direction, driven by the recruitment in 2014, with a significant number of well-cited publications in high quality journals (JEHP, PLB, EPJC) over the last couple of years. There is also a significant amount of research on composite Higgs models again by combining expertise in strong interactions dynamics and new physics with the potential for input by lattice calculations.

The team covers a wide range of cutting edge topics in particle physics and all the "phenomenological" activities are closely connected to experimental programs in particle physics.

The team published 73 articles in peer-reviewed journals and graduated 2 PhD students which is an excellent balance sheet.

Weaknesses and risks linked to the context

There could be more collaborations between team members in particular in the areas of flavour physics, dark matter and hadron structure where each team member is working alone or with external collaborators.

For the next five years, the research strategy is rather clear with one focus on the anomalous magnetic moment. However, no clear picture exists so far from what the longer-term outlook is for this line of research once the experimental program of the E989 Muon g−2 Collaboration at Fermilab (FNAL) ends. Of course, it is clear that the research in theory depends very much on the experimental results which are difficult to predict.

An effort should be made to stabilise the current situation by a) making sure that the "chaire d'excellence" will get tenured and b) trying to find a solution for the situation of one of the newly hired team members whose wife is a highly qualified lattice theorist (she is shortlisted for an MCF position in Nantes) who is a professor at Frankfurt University. Bringing families together should be part of equal opportunities considerations and should play a role in the considerations of the authorities to bring her to CPT. Otherwise, there is a risk that this person might leave the CPT at some point.

Even if a new recruitment for the team is currently not the top priority of the laboratory, in the next five years two members of the team will retire, one of them contributing actively to the muon anomalous magnetic moment, flavour physics and composite Higgs activities. Therefore, it will not be easy to replace them by excellent candidates and one should already start scanning the pool of talented researchers on the market and be proactive not to miss opportunities.

There is a risk to have less funding for Postdocs and PhD students once the ANR JCJC and another new ANR are running out. Indeed after the end of the Labex OCEVU all Postdocs and one PhD students were connected to the chaire d'excellence and the ANR JCJC. Once this source dries up, new opportunities for funding will have to be identified. It should also be noted that this funding was related to the muon g-2 project.

RECOMMENDATIONS TO THE TEAM

Stabilise the situation for the current team, i.e.: a) convert the "chaire d'excellence" position into a tenure position and b) look for possibilities to hire the wife of one of the team members in the next couple of years.

Be opportunistic about a new recruitment should there be a brilliant candidate on the market in view of the retirements of two team members in the next five years.

Applications for ANR and ERC grants should be considered to obtain additional funding for Postdoc and PhD students in the future.

Several of the younger team members should be encouraged to obtain the HDR.

Team 2: Geometry, Physics and Symmetries

Name of the supervisor: Mr Serge Lazzarini

THEMES OF THE TEAM

The Team E2 "Geometry, Physics & Symmetries" is mainly focused on the study of abstract structures occurring in physics, in particular on the algebraic, geometric and combinatorial side. This covers quantum groups and algebra, representation theory, symplectic geometry, quantisation, noncommutative geometry, quantum field theory, combinatorics. A part also concerns cosmology and general relativity, in collaboration with E3. The themes in E2 slightly overlap activities in teams E1, E3, E5 and, due to its mathematical component, with E8.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous evaluation recommended that the team reinforces its links with the rest of CPT, and with the community in general. It also noticed the danger due to past and future retirements.

Some members of the team participate in other teams and several common publications are to be noticed during the evaluation period, in particular with E5. An ANR grant was obtained jointly with Bordeaux.

No hiring has occurred during the period, and in fact not since 2002. The possibility of hiring a lecturer (maître de conférences) or a CNRS researcher (chargé de recherche) in the near future is mentioned in the report.

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	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)	0
Subtotal permanent personnel in active employment	**5**
Non-permanent teacher-researchers, researchers and associates	3
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	2
Subtotal non-permanent personnel	**6**
Total	**11**

EVALUATION

Overall assessment of the team

The team has a very good reputation, both at the national and international levels. Some members have interesting collaborations with other members of CPT. International conferences or seminars are frequently organized. An important danger still concerns the number of participants in the team, which has decreased over the years and will continue to do so.

Strengths and possibilities linked to the context

The team is an important historical component of CPT (two of the three founders of CPT created the GPS team). Questions involving geometry and symmetries naturally occur in many physical applications, so that E2 is at the crossroads of all the other teams within CPT. There are indeed existing links with E1, E3, E4 and E5. There could probably be collaborations with the other teams.

The team research activities are diverse and touch upon different subjects. The publication list is impressive and very diverse, ranging from pure mathematical works to more applied physical papers. Many conferences and seminars were organised, including "écoles thématiques CNRS" for postdocs and researchers in general.

The team published 62 articles in peer-reviewed journals and graduated 5 PhD students which is an excellent balance sheet.

Weaknesses and risks linked to the context

The team has very strong relations with Russia. Many conferences were organised there. Some members had a sabbatical in the CNRS UMI Poncelet in Moscow. These strong links were already jeopardised by the Covid-19 pandemics. The current international situation threatens even more joint activities with Russia.

The team is in danger, due to an unfavourable demography. Its size has constantly decreased in the last decade and no successful hiring has occurred since 2002. There were 10 permanent members in 2011, 7 in 2016 and 5 at the time of this evaluation. One will retire in 2023 and another one is expected to retire in 2025. The possibility of hiring a new assistant professor or CNRS researcher is mentioned in the report but this might not save the team in the long run, and it is not clear whether what efforts are undertaken by the team to accomplish this.

RECOMMENDATIONS TO THE TEAM

The members of the team should continue their research at the current high level. More interactions with other teams could still be developed.

During the interviews, some members expressed their desire to better integrate into the mathematical community, both within CPT and in general. The committee supports any move in this direction, has some suggestions elsewhere in the report, but insists that this requires a significant effort from themselves.

The unfavourable demography requires making important decisions concerning this team. The report mentions the possibility of opening a position but remains vague with regards to the long-term strategy. This must be addressed frankly by CPT. A new position would be a way to open new directions of research.

Team 3: Cosmology

Name of the supervisor: Mr Christian Marinoni

THEMES OF THE TEAM

The team research tackles important open questions in observational cosmology, namely understanding the large-scale structure of the Universe employing basically statistical tools, unravelling the nature of dark energy following either a phenomenological or a theoretical approach, challenging the consistency of the foundations of the cosmological model by means of possible observational data. These studies will further push our understanding of the standard cosmological model, the validity of its assumptions and its consistency with data. The team is involved in ongoing research of the Euclid Consortium and participates in the Vipers research consortium.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has judged that collaboration with the team 4 on Quantum Gravity – as recommended previously – is difficult to be realised due to the difference in scientific methods and goals among both two teams. Nevertheless, some efforts from both teams aiming at identifying some common research ground could have been beneficial.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	3
Lecturer and associate lecturer	2
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	**5**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	0
Post-docs	0
PhD Students	5
Subtotal non-permanent personnel	**6**
Total	**11**

EVALUATION

Overall assessment of the team

The team produces very good research physics, with numerous contributions in peer-reviewed journals, proceedings, and internal collaboration reports. Members of the team are involved in the development of pedagogies, while others are active in a variety of outreach activities in particular since the topic of cosmology is rather popular within different non-scientific audiences. Unfortunately, the teaching and administrative obligations of the team members seem to impose some research limitations.

Strengths and possibilities linked to the context

The research team focusses in three topics with slightly distinct objectives and methodologies, but all three are focussing on interpreting the Euclid survey. The research outcome is of very good quality with a variety of publications and involvement in international consortia, despite the teaching and administrative load of the academics. Various collaborations with external colleagues. The scientific products of the team are solid and well received by the relevant international community. The affiliation with the Amu Institut de Physique de l'Univers is beneficial. Team members are also involved with a variety of outreach activities.

The team published 63 articles in peer-reviewed journals and graduated 4 PhD students.

Weaknesses and risks linked to the context

The scientific work of the team is well focussed, but to some extent a bit constrained (understandable with the current number of academics in the team) and it seems that the team does not benefit from clearly existing synergies with either the particle physics team or the quantum gravity team, e.g. in their study of quantum effects in cosmological metrics.

RECOMMENDATIONS TO THE TEAM

The team could proceed with recruitment of researchers (CNRS) and if possibly also of faculty positions at University that will allow the team to have more research time. It seems to be that now there are difficulties even to plan some basic common research activities within the team. Possible expansion of the research themes and investigation of possible synergies with the particle physics and quantum gravity teams should be explored and encouraged. Further research funding from either France (ANR) or Europe (MC or ERC) should be planned.

Team 4: Quantum Gravity

Name of the supervisor: Mr Alejandro Perez

THEMES OF THE TEAM

The overall theme of E4 can be summarised by Loop Quantum Gravity (LQG). With string theory that exists in parallel, LQG makes an effort to provide a unified description of quantum mechanics and general relativity. It is characterised by a discrete space-time at the Planck scale that eliminates many divergences and should have observable consequences in cosmology and for gravitational waves that are under study. This theme declines into a rich collection of current sub-themes, such as the explosion of black holes by quantum tunnelling, the cosmological constant as a result of quantum granularity, information theory and entropy for black holes, the consequences of wave function collapse for cosmology, the numerical implementation of the spin foam model in quantum gravity and the renormalisation of tensor networks.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous evaluation recommended reinforcing links with E2 (Geometry) and E3 (Cosmology), to calculate the lifetime of a black hole from LQG and to seek new grants, ERC in particular. One team member moved to E2. Team E4 wishes to focus more on the phenomenological aspects of LQG and in that context the link with the mathematical team E2 is less obvious. The finite lifetime of black holes in LQG has been the subject of a Letter (2017) in Nature Astronomy. Finally, E4 does not seem to suffer from funding problems of any kind: many (17) PhD scholarships have been obtained from different funding (among which 4 are still running), and the large international grant (4 M€) by the Templedon foundation has been renewed for 3 more years. Having said this, both young permanent members do have the profile for an ERC-advanced grant.

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	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)	0
Subtotal permanent personnel in active employment	**2**
Non-permanent teacher-researchers, researchers and associates	1
Non-permanent research supporting personnel (PAR)	0
Post-docs	1
PhD Students	4
Subtotal non-permanent personnel	**6**
Total	**8**

EVALUATION

Overall assessment of the team

This team performs research with high quality and great originality. Many subjects are on the cutting edge of physics, with many publications with high quality. The team also makes a considerable effort in outreach and training of PhD students.

Strengths and possibilities linked to the context

The strengths of this team are its contemporary research with major challenges, its high quality of researchers on a worldwide level, their very high international visibility, and their considerable effort for outreach and history of science.

The team published no less than 124 articles in peer-reviewed journals, some of the subjects approach the philosophy of science, and graduated 12 PhD theses.

As opportunities we can see the reinforcement of collaborations with E3 on cosmological issues, to put more priority on the loop-twistor debate in QG (Nobel laureate Roger Penrose suggested that a final QG theory is likely to contain features of both), to recruit at CNRS section 02, to apply for ERC. The high level of the team has stimulated the engagement of the Amu Vice President for a lectureship in 2023.

Weaknesses and risks linked to the context

A clear threat is that with one protagonist having obtained emeritus status and undoubtedly stepping back from his activities at CPT, only 1 PR (with teaching duties) and 1 DR CNRS are left as staff members so that the team is to become subcritical. The large scope of different themes may dilute its key action.

A possible weakness is the absence of collective action among the different staff members.

RECOMMENDATIONS TO THE TEAM

It is very important that this team continues to operate at the large scientific level that they now have achieved.

We support the decision to focus more on phenomenological aspects of QG and encourage the team to work more on the loop-twistor debate that is somewhat avoided in the report.

With one recruitment Amu likely coming up, a second recruitment at CNRS seems desirable, one should start looking out for good candidates. After all, they train so many young students (PhD and interns) that will look out for jobs at some point. It would be useful to trace the careers of these PhD after graduation, undoubtedly not all find a job in quantum gravity, but they do find jobs and their training has been "beneficial" to society.

The committee applauds the efforts of E4 in outreach (including primary schools), and the philosophy and history of science.

Team 5: Statistical Physics and Complex Systems

Name of the supervisor: Mr Alain Barrat

THEMES OF THE TEAM

The themes of team E5 cover many kinds of statistical physics, ranging from very mathematical to strongly applied. Specifically, it includes mathematical results on traditional models and equations in quantum and classical settings, theoretical and applied work in complex networks, epidemiology, neuroscience and biophysics. Recent work is moving away from mathematical models in statistical mechanics towards complex networks and even beyond, and includes biophysics in a broad sense as a result of new interests of recent recruitment.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has changed a lot since the last evaluation. These changes are all very positive and have led to a new strategy and dynamism. These changes are mainly initiated by the arrival of the Amu Centuri Institute on the Luminy campus and the strong implication of the team in this initiative. We congratulate the team members for this foresight. The previous evaluation recommended new hires in complex networks, which have been both achieved. The team has very successfully put an emphasis on the study of complex networks that has increased its visibility and societal impact. Another recommendation concerned funding and encouragement to consider ERC applications: while the team has ANR grants, this is, of course, a running recommendation and the encouragement should still (and forever) hold. The team is attempting to obtain ERC grants.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	3
Lecturer and associate lecturer	3
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	**10**
Non-permanent teacher-researchers, researchers and associates	3
Non-permanent research supporting personnel (PAR)	2
Post-docs	3
PhD Students	7
Subtotal non-permanent personnel	**15**
Total	**25**

EVALUATION

Overall assessment of the team

This is a very dynamic team. Thanks to new permanent staff, interactions with the Centuri ecosystem and its growing strength as a centre for applied and theoretical network science, the team has reoriented its research towards very modern topics. The team has gained dynamism and research visibility. The team has developed new interactions within the Marseille-Toulon research ecosystem involving the units IBDM, CIML, CINAM, INMED, INS, and has strong international collaborations. The team has been successful in funding acquisition and organises many conferences in the lab.

Strengths and possibilities linked to the context

The future directions, as shaped by the demography of the new permanent recruitment, are centred on biophysics and network science. These are subfields with a lot of current research and these themes ensure that the team will continue to thrive and develop if these directions are expanded, as is the team's desire stated in the report.

The team published 125 articles in peer-reviewed journals and graduated 4 PhD students.

An existing strength that has been very well developed is the area of complex networks. The team is also heavily involved in cutting edge epidemiological and social network initiatives, maintaining a solid balance between basic research and applications. During the Covid-19 crisis, the team helped society through its unique network analysis skills set. The team is involved in work with concrete societal impact – its analysis on how testing should be implemented in schools was included in official recommendations from the national scientific council for Covid-19. The team studied the group dynamics of introductory physics students at the University of Helsinki, showing how group dynamics are formed. This work makes use of a data collection technology that the team helped developing (SocioPatterns). More generally as a co-founder of the SocioPatterns collaboration, the team is one of the world leaders on the collection and analysis of data describing contacts between individuals, with high temporal and spatial resolution. In general, a big interest is in temporal networks, their formation, stability and looking at higher order interactions. Altogether, this is a very active area, with a huge opportunity to work with other groups worldwide that is being well exploited.

The team has strongly benefited from interactions within the Centuri ecosystem: three new permanent hires, new PhD students and postdocs, new funding and most importantly, new modern scientific directions and interactions. This has completely resculpted the team's landscape, bringing in previously non-existing scientific topics and collaborations with other units at Amu and UTLN. The main new directions include neuroscience and biophysics. While the CPT researchers are theorists, they have strong interactions and grants with both experimental physicists and biologists. The topics are centred on cellular mechanics: biomechanics of tissues during development, links between cell mechanics and signalling, self-organized deformation of biological tissues, mechanical properties of disordered systems and tissues. In another direction, completely new topics include place coding in a 3D environment representation in the brain.

A huge strength of recent years has been to create new links between complex systems and biophysics, which has led to work on the dynamics of functional connectivity in the brain. This will likely lead to further valuable discoveries.

The statistical mechanics part of the team has started modern and interesting work on the arrow of time, both in classical and quantum systems.

Weaknesses and risks linked to the context

There are no major weaknesses for this team that has found its new wings with new hires and strong financial support, in the areas of complex networks and biophysics.

There are inequalities in the team between these new dynamic areas (biophysics, network science) and more traditional areas (mathematical and statistical mechanics). The team states the directions it wants to develop, focusing to expand the new themes (biophysics, complex systems, and network science). However, strengthening links to other teams, such as Nanophysics, or Quantum Dynamics and Spectral Analysis, and possibly Dynamical Systems (to which links already exist) could be a way forward for the mathematical and statistical mechanics part of the team.

Another risk, rather than weakness, comes from the dangers that the team has identified itself in its future when one of its senior team members becomes lab director. Maintaining the same level of dynamism in the complex network field during this period will be hard and some concrete solutions should be envisioned.

In the general theme of equality, all team members should publish. Even among the dynamic directions, there is some inequality, of course, driven by the subfields and types of research.

RECOMMENDATIONS TO THE TEAM

Due to the recent dynamism, this team is overall in a very good shape. Of course, it is unlikely that the present level of recruitment will continue but the general trend has been set and should be followed. There are possibilities for further interactions between complex systems and biophysics that could lead to exciting science.

The team should be accompanied to develop in the desired directions (biophysics and network science), in order not to lose what they have managed to create.

The complex network area, a huge strength of the team, should be maintained despite upcoming new responsibilities (director of CPT) of its core member. A new recruitment in the broad field of complex systems could help to achieve this aim.

The recently recruited permanent staff should be encouraged to get the "habilitation à diriger des recherches" as soon as possible. This is linked to the more global problem of encouraging, supporting and paying attention to the future career development of the permanent junior researchers. They should be encouraged and supported obtaining students and postdocs to remain competitive.

The team should also make sure it continues being part of the Centuri ecosystem that has resulted in the team's new-found scientific directions (biophysics) and thematic revival.

Team 6: Nanophysics

Name of the supervisor: Mr Benoit Grémaud

THEMES OF THE TEAM

The nanophysics team works on theoretical condensed matter topics, originally with a specialisation on nanophysics but with a broader range in its current state. The first one has mesoscopic physics and electron quantum optics which aims at describing and exploiting the properties of elementary excitation in quantum Hall devices. More generally, transport properties of meso and nano-devices are at the heart of the team's expertise, with contributions on current noise, thermal transport, tunnelling, the relation between heat and charge transport, in close contact with experimental results. Another line of research is topological superconductors and their possibility to host Majorana zero energy modes, protected by particle antiparticle symmetry. A related topic is flat band superconductivity in 1D. Also typical of cold atoms simulators is the study of the Bose gas. These themes are all related to the last research direction of the team, quantum information theory.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team has met the major global recommendation for the laboratory. First, with 3 arrivals in 2018–2019 and 1 recruitment in 2022, it expanded and thus helped to reduce the risk of retirement losses in the next decade. Second, around the active and historical core collaboration of the group, several joint collaborations have been punctually carried out with success. All researchers are very active and work on related topics so that, despite the absence of common publications for some members, the team has a strong scientific coherence. This helps to avoid fragmentation and creates visibility.

Regarding specific points made to the team, it was recommended to publish in journals with higher impacts. The team did not find it relevant, the Committee tends to agree, and the laboratory also has an overall policy not to pay expensive fees for some journals. Since the team publishes in well recognised international peer-reviewed journals, actually the best in the condensed matter community, they reasonably did not take this recommendation to be the most urgent. The risk of lacking financial support was addressed by the team by obtaining two ANR grants. The last specific point was to initiate an activity on cold atoms physics. This was efficiently realised by the recruitment discussed above, with immediate effects on scientific production.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	3
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	**9**
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	**12**

EVALUATION

Overall assessment of the team

The nanophysics team presents remarkable scientific contributions is internationally renowned and a leading group in the French condensed matter theory community. It has deep connections with experimental groups. It has shown a positive dynamic over the last years by recruiting people and broadening its field of expertise.

Strengths and possibilities linked to the context

The team is well known for its numerous contributions to electronic transport properties in nanosystems. The historical developments since the creation of the team and its strong involvement in experimental activities represents a strong asset for the team. Its expertise includes tools such as Keldysh Green function formalism, path integrals, Luttinger liquid theory, and numerical techniques. It has collaborations at the national level (CEA Saclay, ENS Paris, Grenoble, Palaiseau, Nice) as well as at the international level (Tokyo, Aalto, Madrid, Dusseldorf, Santiago, Bouira and Singapore) that are most often supported by grants.

The team produced 62 articles in peer-reviewed journals and graduated 6 PhD (some in 2022, some graduated outside Amu).

Its expertise allows the team to make analytical and numerical calculation directly relevant to experiments since transport properties are routinely measured. Beyond that, they make proposals for protocols, important observables and range of parameters in order to probe interesting physical effects. With the recent recruitment, expertise emerged on strongly correlated systems and topology. It gives the team the possibility to study transport properties on new scales and for different types of systems.

The team is successful in obtaining grants. Its productivity is remarkable both in quality and quantity with all members very active, and with genuine collaborations inside the team.

Weaknesses and risks linked to the context

The scientific topics studied by the team are still very active but also quite established.

The team demography does not meet high risks in the short term. The team looks quite robust against the risk of fragmentation, although several members only have external collaborations.

The team struggles with the support of the Institute AmuTech that has very applied orientations.

The team also seems to be too little implication in participating to general public events or outreach activities. Condensed matter physics usually has a lower visibility for the public than astrophysics or high-energy physics.

Over the last years, the number of PhD students is found to be relatively low compared to the strength and dynamics of the team.

RECOMMENDATIONS TO THE TEAM

The team is encouraged to maintain its momentum in making high-level quality scientific production.

Members could go on with developing collaborations within the team.

Some attention should be given to place some of its members in good position for promotion.

If possible, the team could try to attract more PhD and postdocs.

More efforts towards general public events and outreach are welcome.

Team 7: Dynamical Systems

Name of the supervisor: Mr Xavier Leoncini

THEMES OF THE TEAM

The team research is interdisciplinary, at the interface between mathematics, theoretical physics, economy, biology and plasma physics. The team uses tools of nonlinear physics and dynamical systems for applications in many fields. Besides, several theoretical tools advancing the theory of dynamical systems were developed (recurrence, Hamiltonian systems, extreme value theory). The main applications were in statistical physics (phase transition), biophysics (biomolecular forces, self-organisation), plasma physics (reduction of dimensionality), finance (chaos, statistics), and climate (extreme value statistics and recurrence).

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The team results from the merging of two previous teams as recommended by the previous assessment. This merger did not (yet) lead to a one single team with one coherent team spirit. The remnant of the former team structure is still clearly visible in the report that is a compilation of individual contributions (especially from former E7) often written in the first person singular.

The team has hired an MCF at University of Toulon, on dynamical systems, to reinforce the team. A recommended fusion with E5 is not likely since E5 has a strong desire to go its own new way.

WORKFORCE OF THE TEAM

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

EVALUATION

Overall assessment of the team

The team produces excellent interdisciplinary physics, with numerous contributions in peer-reviewed journals, and proceedings. It contributes to societal challenges (fusion, climate, and biophysics) and to the training of many young researchers. Some members of the team are actively involved in editorial or collective responsibilities. The team is also involved in outreach activities. Funding is ensured by one major grant linked with the fusion activity. Moreover, the future of the team is compromised due to recent departures and 3 future retirements before 2027.

Strengths and possibilities linked to the context

The team results from the merging of two previous teams as was recommended by previous assessment and is organized around common methods, drawn from nonlinear physics and dynamical systems, while each individual team member conducts specific research to different applications. The French system usually organises activities by subject rather than by method, so that this may look like an apparent heterogeneity and generate criticism. However, this committee thinks that it is not really a problem, as the team members share the same tools, and speak the same language.

The team produces excellent interdisciplinary physics, with numerous contributions (88) in peer-reviewed journals and proceedings.

The team has achieved important progress in dynamical systems, with new progress in randomly perturbed dynamic systems, statistics of recurrence of extreme and solutions for the Maxwell-Plasma problem. This part finds important applications to societal challenges (climate, fusion), some of which have been completed in collaborations with climate experts. The more applied activity on fusion has links with Iter, which enables the team to collect funds from the Eurofusion project, which is the most important source of funding for the team.

The team is also engaged in interesting applications, ranging from statistical physics (phase transitions) to finances and biophysics. This last activity is conducted in collaboration with experimentalists, and is of high level.

The team is attractive and was able to graduate nine PhDs and hire two postdocs during the last six years. All team members are active scientifically.

Some members of the team are actively involved in either editorial responsibilities or collective tasks. The team is also involved in outreach activities.

Weaknesses and risks linked to the context

The team members are scattered among three sites, which are far apart. No comment is provided about this in the report, but this multi-site activity could induce a lack of coherence of the research, and does not favour team building. In addition, the fusion did not lead to one team spirit and this may jeopardise future recruitment inside this team and create internal conflicts.

The team activity is mainly theoretical and numerical, so that its requests for equipment are not very severe. However, the team members did not succeed so far to obtain ANR grants which limits its possibility to recruit postdocs or other non-permanents researchers.

The age pyramid of the team is not favourable, with only one junior member. Additionally, the team is only composed of faculty members, which restricts their research capacities. The senior members are very active institutionally, with many additional duties, that severely jeopardise they ability to perform research.

Finally, the direct future of the team is compromised by 3 retirements before 2027. The team may become subcritical, in which case a reorganization into a larger group structure may be helpful.

RECOMMENDATIONS TO THE TEAM

The main recommendation to E7 is to continue fostering team building and to rejuvenate both its composition and its research themes. This team must stand up against a large diversity in themes, as well as to a very bad age pyramid, with majority of its researchers being senior with many responsibilities and teaching duties. The team should formulate a collective team strategy to share and attract collaborations, students, financial and practical resources. The hiring of one or several young researchers, especially from CNRS, would help a lot to produce such a dynamic. Senior member should apply to IUF, to get more research time and recover some dynamics.

The team should continue to hold regular group meetings, to favour communication between the team members.

Given their present difficulty to get ANR funding, the team should try to look out for support using the application of dynamical systems and nonlinear physics to currently fashionable themes like climate or energy. Probably, collaboration with well identified laboratories in these topics would be helpful.

At least two recruitments should be conducted soon within the next 3 years, to guarantee a critical mass in the future. Given the proximity with CEA Cadarache and Iter, it would be essential to look for people at the interface between nonlinear physics, dynamical systems, and fusion and energy. The physical location of these new members should be overthought thoroughly, maybe try to regroup the team at a single spot.

Team 8: Quantum Dynamics and Spectral Analysis

Name of the supervisor: Mr Jean Marie Barbaroux

THEMES OF THE TEAM

The themes are contemporary and of very high quality. They can be summarised by finding mathematical foundations of existing major developments in theoretical physics: Landauer-Büttiker conductance, Dyson self-energy, Dirac cone, quantum Hall effect, quantum fluctuation theorem, Van der Waals forces, Boltzmann equation, renormalisation in quantum field theory, inverse problems. The members are all in CNU section 25/26 (pure and applied mathematics) and mainly located at the University of Toulon. The mathematical tools are mostly on the analytic side.

CONSIDERATION OF THE RECOMMENDATIONS OF THE PREVIOUS REPORT

The previous committee expressed some worries concerning the support coming from the University of Toulon and explicit threats on positions. It was advised to establish a common strategy with UTLN concerning the hiring of young researchers.

A second recommendation was to strengthen the relations with physicists at CPT-Luminy and in general.

The relations with UTLN seem to have been largely improved. In particular, an MCF position was filled recently. A candidate with a physics background was chosen to ensure a better integration into CPT. The good equilibrium between Amu and UTLN staff should prevent thematic and geographic isolation.

WORKFORCE OF THE TEAM

Permanent personnel in active employment	
Professors and associate professors	3
Lecturer and associate lecturer	4
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	**8**
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	**11**

EVALUATION

Overall assessment of the team

This is a very dynamic team, with an excellent publication list on the mathematical aspects of quantum physics, using mainly tools from spectral theory, functional analysis and inverse problems. It is mostly located in Toulon, which poses some threats to its integration in CPT in Marseille, in particular in the current deteriorated working environment. Also in Toulon, the team was dispersed at different locations. It has staff members from Amu and UTLN but not from CNRS.

Strengths and possibilities linked to the context

The report – of extreme clarity – really gives the impression of a cohesive and enthusiastic team with a common strategy and long-term engagement.

The team has an excellent list of publications (81), including papers in the best mathematical and mathematical physics journals (JEMS, ARMA, CMP…). The team also graduated 7 PhD with scholarships obtained from Amu, UTLN and Tunis University.

Its scientists are well recognised at the national and international level. They have participated in the organisation of several conferences and workshops, some of which playing an important role for the mathematical physics community (e.g. the 9th meeting of the GDR DynQua in 2017 and a large conference at CIRM on complex quantum systems in 2019).

The team often welcomes foreign guests. Several grants were obtained, both at the international (PRC) and national (ANR) levels.

One member is writing theatre plays on science and another one helped a comics author for science books. Those activities help in passing the mathematics and physics way of thinking to the general public.

Weaknesses and risks linked to the context

The team is mainly located in Toulon, hence rather far from the CPT antenna in Luminy. Until recently the interactions were maintained at a very good level, with the members regularly commuting to Marseille for seminars. With the Covid-19 pandemics and the deteriorated working conditions in Marseille and until recently in Toulon, this has now become rare, to the point that this jeopardises the coherence of the team.

Two retirements are expected in the coming years and there is a risk that the team might be weakened if UTLN does not pursue its support for the team at the appropriate level.

The self-evaluation report notices that more efforts could be made to communicate the theoretical achievements of the team to other scientists and to a broad audience.

RECOMMENDATIONS TO THE TEAM

The members of the team should continue their activities at the current high-level of research.

They should continue to develop their communication skills, both towards physicists and the general public. For instance, they could try to publish some of their findings in Physics journals.

A strategy has to be developed with CPT, Amu and UTLN to ensure that the team is supported at the proper level in the future, in particular concerning the renewal of positions after some of the members retire or get promoted. The team should try to attract a young CNRS chargé (e) de recherche.

CONDUCT OF THE INTERVIEWS

Date(s)

Start: 07 novembre 2022 à 08 h 00

End: 08 novembre 2022 à 19 h 00

Interview conducted: online

INTERVIEW SCHEDULE

Lundi 7 novembre

8 h 55	5 mn	Connexion
9 h 00	5 mn	Introduction des entretiens par le président du comité
9 h 05	1 h 40	Présentation du bilan et de la trajectoire de l'unité par le directeur de l'unité (60 mn présentation, 25 mn questions). Présence : personnel de l'unité
10 h 45	10 mn	Pause et connexion
10 h 55	1 h	Equipe E5 : Statistical Physics and Complex Systems 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe

11 h 55	1 h 30	Pause déjeuner

13 h 25	5 mn	Connexion
13 h 30	1 h	Equipe E6 : Nanophysics 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe
14 h 30	5 mn	Connexion
14 h 35	1 h	Equipe E7 : Dynamical Systems 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe
15 h 35	10 mn	Pause et connexion
15 h 45	1 h	Equipe E8 : Quantum Dynamics and Spectral Analysis – 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe
16 h 45	5 mn	Connexion
16 h 50	1 h	Equipe E1 : Particle Physics – 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe
17 h 50	10 mn	Pause et connexion
18 h 00	1 h	Réunion à huis clos du comité

Mardi 8 novembre

8 h 55	5 mn	Connexion
9 h 00	1 h	Equipe E2 : Geometry, Physics, and Symmetries 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe
10 h 00	5 mn	Connexion
10 h 05	1 h	Equipe E3 : Cosmology 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe
11 h 05	10 mn	Pause et connexion
11 h 15	1 h	Equipe E4 : Quantum Gravity 30 mn présentation, 15 mn questions + 15 mn discussions sur le laboratoire. Présence : équipe

12 h 15	1 h 40	Pause déjeuner

13 h 55	5 mn	Connexion
14 h 00	30 mn	Rencontre avec les IT
14 h 35	5 mn	Connexion
14 h 40	1 h	Rencontre avec les doctorants et avec les post-doctorants
15 h 40	20 mn	Pause et connexion
16 h 00	1 h	Rencontre du comité avec les tutelles du CPT : CNRS/INP, Amu, Université de Toulon
17 h 00	10 mn	Connexion
17 h 10	1 h	Rencontre du comité avec l'équipe de direction
18 h 10	5 mn	Connexion
18 h 15	45 mn	Réunion à huis clos du comité

Mardi 8 novembre

9h	4h	Travail du comité

PARTICULAR POINT TO BE MENTIONED

Two members of the Committee (Ollitrault and Van Tiggelen) together with the Hcéres representative (Chanfray) have visited the CPT (in the BU premises) on September 22, 2022, and discussed with the direction.

GENERAL OBSERVATIONS OF THE SUPERVISORS

Le Président de l'université

au

Département d'Évaluation de la recherche - Hcéres

Objet : Observations de l'unité relatives au rapport d'évaluation des experts Hcéres

N/Réf. : VPR/LS/AMS/CM – 23-07

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

Vos réf :
DER-PUR230023048 - CPT - Centre de physique théorique

Marseille, le jeudi 11 mai 2023

Madame, Monsieur,

Je fais suite au mail que vous nous avez adressé le 03/04/2023 dans lequel vous me communiquiez le rapport d'évaluation Hcéres de l'Unité CPT - Centre de physique théorique

Comme demandé dans ledit mail, je vous fais part des observations de portée générale qui ont été émises par le laboratoire:

We thank the HCERES committee for its informed evaluation of CPT, which undoubtedly required a substantial effort in analyzing the auto-evaluation document. While we agree on most points mentioned in the document, we have a few comments.

In the committee's opinion, during the present contract, the director of CPT was hardly able to have a well-defined scientific policy with regards to hiring strategy. The committee concludes that due to the multiple demands for hiring initiated by the different teams of CPT, the direction of CPT was "only" able to "spread" hirings among the majority of CPT teams rather than to make "hard" choices. The direction of CPT, especially its director, feels that this is not an accurate conclusion.

First of all, one goal that the director of CPT set in the previous contract was address the subcritical size of the particle physics team E1 by hiring a (female) CNRS researcher. This goal was aggressively pursued in the present contract with first the creation of the chaire d'excellence AMU in lattice QCD (A. Gerardin), second, by the hiring of a CNRS researcher on the same topic (S. Zafeiropoulos). In addition to giving this team a critical size, the planned (for 2024) tenureship of A. Gerardin as a university professor will be relevant for teaching high energy physics related courses at the Masters level in the physics department of AMU.

Moreover, the direction of CPT was able during the present contract to bring a better balance between "high" and "low" energy topics in the laboratory and to dramatically increase the effort on pluridisciplinary topics.

• First, the direction of CPT was able to seize opportunities with the creation of the CenTuri institute (by hiring three PI's and one MCF), as year after year, three CNRS researchers positions (J.-F. Rupprecht, M. Merkel, and H. Rouault) were obtained for the statistical physics team during this contract. This constituted by no means a trivial matter, as the director of CPT had to argue with the Institut de Physique of CNRS to justify that the recipients of the CNRS context would be placed at CPT rather than in another laboratory. As a result of these hiring, numerous contracts were obtained for research funding in frontiers areas of physics such as complex systems, physics of living systems/biophysics, epidemiology, social sciences and so on.

• Second, the direction of CPT was able to bring a (female) mathematical physicist to strengthen the effort on dynamical systems (team E7). While more efforts may be required in the future because of retirements in this team, this constitutes certainly a positive outcome. The hiring of university staff from Toulon at CPT was put on hold for several years, and in addition to the E7 hiring, the direction of CPT obtained another mathematical physicst MCF for the spectral analysis and quantum dynamical systems team E8. We consider this to be a huge success as interactions with our Université de Toulon "tutelle" have been improved.

• Third, the direction of CPT was able to hire a MCF in nanophysics E6 (after an absence of university faculty hiring in this team which lasted 20 years), thus bringing a better age balance in this team, as well as strengthening interactions with excellent experimental teams world-wide, in particular with the laboratoire de physique of Ecole Normale Supérieure in Paris. The team was moreover strengthened during the present contract by the arrival of A. Verga, L. Raymond (who moved from AMU lab IM2NP) and the arrival of B. Gremaud as a CNRS director of research, without any "cost" (or without any contest opening), which constitutes a big bonus.

The direction of CPT is extremely satisfied with this outcome for the low-energy side of CPT topics, which is undoubtedly the result of a (very) strong scientific policy (and which required a huge effort on the part of the direction of CPT).

Concerning the administrative pole, the direction of CPT is very glad that the committee noticed the necessity for providing a permanent position for L. Trano, who has been on temporary contract for 8 years now. However, given the fact that at CPT only the scientific staff is fluent in English, the direction of CPT would have welcomed that all comments concerning the administrative pole be translated in French, the working language of this pole.

Notably, since the visit of the HCERES committee moreover, a crucial issue has been solved, namely concerning the lack of a system manager. Thanks to the help of the Institut de Physique du CNRS, we have been able to hire on a permanent position a system manager who has obtained a promotion by moving from a different laboratory.

Concerning the (planned) functioning of this pole when we move back to the permanent IGH building TPR2, the report mentions that for the future, a single administrative staff should minimally be present every day of the week in order to "accommodate researchers requests". We feel that this remark is inappropriate for the following reasons.

• Teleworking (two days a week; three days a week during the pandemic and the relocation in our degraded temporary housing conditions) has been introduced by CNRS and is here to stay. The administrative staff functions not as individuals but rather than as a team, and it is crucial that this team spirit be preserved.

• As we move back to our normal offices in the renovated TPR2, it is planned that the teleworking will be reduced to 2 days, meaning that the physical presence of the administrative team will be increased to three days per week, which, from our past experience, allows all researchers to be able to discuss physically with the team with good enough frequency. Obviously all members of the team are easily reachable by phone or email during their days of telework.

• It is very important that the administrative pole meets together these three days of the week in the future. In fact, the suggestion that (at some times of the week) a single administrative pole be present each day of the week goes against the recommendations of CNRS about "insulated workers" ("travailleur isolé"). If a scientific staff needs a "pencil", in practice given the fact that the director, the deputy director, or the computer engineer are (usually) present rather often at the laboratory (and they have access to all offices/rooms), these types of punctual requests can be satisfied anyway in an informal way. Other requests by the scientific staff of CPT toward the administrative pole (for instance regarding travel or contracts) have so far been successfully addressed using email or phone, and we feel that the laboratory is functioning rather well in in fashion.

Finally, the committee echoes some comments of the previous HCERES (2017) committee regarding the structure of the laboratory in 8 (well defined) thematic teams. It feels that a structure in "larger" groups (with a lower number of groups) might be more efficient in hiring campaigns. The structure

in specific thematic teams is the result of the contract which started in 2012 (which required such a structure), and (contrary to the suggestions of the past and present HCERES campaigns), seems to be well accepted by CPT members over the past and the present contract. Granted, some subcritical/small teams could in principle be regrouped in larger groups, and this indeed was suggested and discussed by the direction of CPT in the context of several laboratory councils. The result of such discussions is that a status quo is preferable. The direction of CPT feels uncomfortable to use executive power to impose a change towards larger groups to CPT laboratory members. After all, when hiring is desirable/priorized for a rather specific topic, the present fine structure may be the best option.

Once again, we thank the HCERES committee for its thorough work. The current and future direction of the CPT are thankful for the many positive comments, but also for the suggestions concerning scientific policy and organization of the life at the CPT, which will feed our thinking concerning e.g. the scientific structure (in particular with regards to mathematical physics), the implication of the PhD students in the CPT council and the organization of more events able to stimulate the physical presence of CPT members. We hope that new opportunities will be reached by CPT as a result of this analysis.

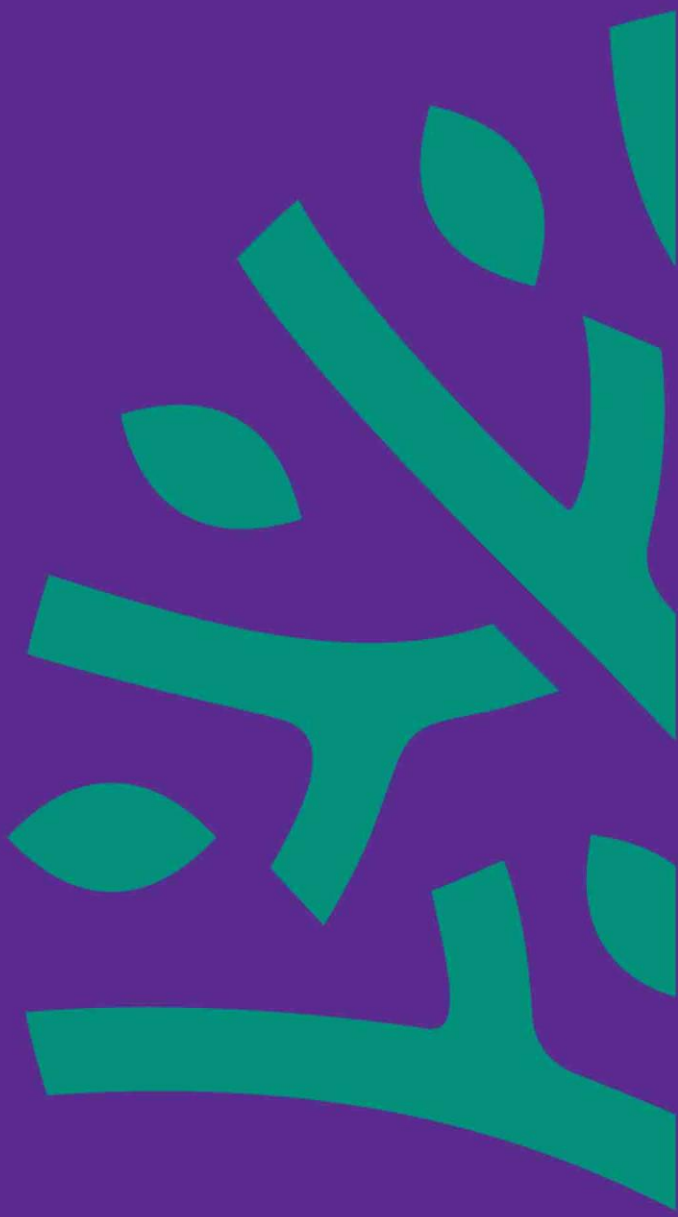
Vous souhaitant bonne réception des présentes,

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

Eric BERTON

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

Evaluation of Universities and Schools
Evaluation of research units
Evaluation of the academic formations
Evaluation of the national research organisms
Evaluation and International accreditation



2 rue Albert Einstein
75013 Paris, France
T. 33 (0)1 55 55 60 10