LPTM - Laboratoire de physique théorique et de modélisation

Rapport Hcéres

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

Department for the evaluation of research units

AERES report on unit:

Laboratoire de Physique Théorique et Modélisation

LPTM

Under the supervision of the following institutions and research bodies:

Université de Cergy-Pontoise - UCP

Centre National de la Recherche Scientifique - CNRS

November 2013

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

Department for the evaluation of research units

On behalf of AERES, pursuant to the Decree of 3 november 2006[1]*,*

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

On behalf of the expert committee,

- Mr. Clément SIRE, chair of the committee

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

Evaluation report

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

The assessment contained herein is the expression of independent and collegial deliberation of the committee.

Unit name:	Laboratoire de Physique Théorique et Modélisation
Unit acronym:	LPTM
Label requested:	UMR
Present no.:	UMR 8089
Name of Director (2013-2014):	Mr Trong Tuong TRUONG
Name of Project Leader (2015-2019):	Mr Philippe LECHEMINANT

Expert committee members

Chair:	Mr Clément SIRE, Laboratoire de Physique Théorique, Toulouse
Experts:	Mr Pascal BASEILHAC, Laboratoire de Mathématiques et de Physique Théorique, Tours (representative of CoNRS)
	Mr David DEAN, Laboratoire Ondes et Matière d'Aquitaine, Bordeaux (representative of CNU)
	Ms Claudine LACROIX, Institut Néel, Grenoble
	Mr Senya SHLOSMAN, Centre de Physique Théorique, Marseille

Scientific delegate representing the AERES:

Mr Marc KNECHT

Representative(s) of the unit's supervising institutions and bodies:

Mr Dominique LAURENT (Directeur ED n°417 Sciences et Ingénierie)

Mr Stéphane SERFATY, Université de Cergy-Pontoise

Mr Barend van TIGGELEN, DAS, Institut de Physique du CNRS

1 • Introduction

History and geographical location of the unit

For a period of nearly 10 years before its actual creation, the LPTM grew steadily to become successively an Équipe d'Accueil (EA; "host team") of the University of Cergy-Pontoise (hereafter UCP) and an UPRES of the CNRS and UCP, in 1999. In 2002, it gained its current status of Unité Mixte de Recherche CNRS/UCP 8089 and ultimately moved to its current premises on the Saint-Martin campus of the university of Cergy-Pontoise, Building E, 4th floor.

Management team

During the present contract and until September 2013, Mr Trong Tuong TRUONG was the director of the LPTM, before retiring and obtaining the emeritus status. Since then, and for the future quinquennial contract, Mr Philippe LECHEMINANT (PR UCP) has replaced him as the head of the LPTM, assisted by Mr Jean AVAN (DR CNRS)

AERES nomenclature

ST2 – Physique

Unit workforce

Unit workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	15	12
N2: Permanent researchers from Institutions and similar positions	5	4
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)	1	1
N5: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	**23**	**19**

Unit workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	3	
Theses defended	8	
Postdoctoral students having spent at least 12 months in the unit	6	
Number of Research Supervisor Qualifications (HDR) taken		
Qualified research supervisors (with an HDR) or similar positions	9	

2 • Assessment of the unit

The LPTM conducts a wide variety of research activities in the field of condensed matter and quantum physics, mathematical physics, statistical physics and stochastic systems, soft matter physics, and complex systems, using a large range of sophisticated analytical and numerical methods. The scientific production of the LPTM is quantitatively remarkable, and the committee was favorably impressed by some of the scientific results obtained at the LPTM and mentioned in the theme-by-theme section of the present report. Although most of the scientists at the LPTM work independently from each other, they have developed an extensive network of external collaborations. The involvement of LPTM' scientists in master programs (notably the local *Master in Theoretical Physics and Applications - TPA*, taught in English), and the organization of scientific events (conferences, and local topical semesters) are strong elements illustrating the local activity and external appeal of the LPTM. Despite a very low level of external resources (and hence PhD and postdoc grants), the LPTM appears as a fruitful environment for their PhD students mostly funded via the doctoral school *Sciences et Ingénierie* (ED SI N°417). The high quality of recruitment at LPT is illustrated by the third CNRS Bronze Medal obtained by a LPTM' scientist, in 2012.

Strengths and opportunities related to the context

1. The scientific activity of the LPTM is considered by the AERES experts committee (hereafter, dubbed as "the committee") to be of high quality, with an impressive quantitative output (220 peer-reviewed articles), especially considering that ¾ of LPTM's researchers are UCP employees (with a heavy teaching load, which is more and more "fractionalized": fewer classes, and hence more topics to teach in order to fill the mandatory 192h).

2. The organization of local topical semesters in association with the *Institut d'Études Avancées* of the UCP (two so far), and the resulting activity and impact at the LPTM greatly impressed the committee. Such semesters or trimesters should offer in the future some opportunities for LPTM' scientists to strengthen their local interactions, develop new research projects, and enlarge even further their collaboration network.

3. The projected rapprochement with the local mathematics and economics community, already engaged within the Laboratoire d'Excellence (LABEX) MME-DII (*Modèles Mathématiques et Économiques de la Dynamique, de l'Incertitude et des Interactions*), and illustrated with the expected move of the LPTM to a new doctoral school, should not only offer novel opportunities in the domain of complex systems, but also in mathematical physics, and probability theory.

4. The presence of a local master in theoretical physics is a fantastic opportunity (for the LPTM and the UCP) which must be preserved in the difficult context of a decreasing number of students in fundamental sciences, and in particular, physics.

Weaknesses and threats related to the context

1. The major weakness of the LPTM noted by the committee (and duly recognized by the LPTM itself) concerns the extremely low level of external resources, in order to hire PhD/postdocs, or even ensure other important aspects of the scientific life (travel expenses for LPTM's members and their guests, conference fees, local organization and funding of workshops, computers…). Considering the modest (but rather typical) level of the funding by the CNRS (10k€/year) and the UCP (40k€/year) and the few PhD grants obtained from the doctoral school, this situation could soon hamper the development of the scientific activity of the LPTM. In addition, formal contracts are a positive way to formalize and solidify external collaborations, whereas a larger number of PhD/postdocs at the LPTM would also certainly foster internal and external collaborations, and would help developing even further LPTM's scientific output.

2. The major threat concerning the LPTM is the expected departures (retirements, end of a PAST contract, moves to other laboratories…) of 8 of its scientists. Indeed, 5 researchers are soon expected to or have recently left the LPTM and 3 more are expected to retire during the next contract. Although personnel movements are normal, the LPTM will be certainly affected by these departures, including some of the "historical" figures of the LPTM. The committee has recommended to the UCP (most of the concerned people are UCP employees) to strongly support the laboratory during this period. However, it is also the role and interest of the LPTM to consider and actively work on its scientific policy during this potentially uncertain period (see recommendation n°2).

3. Echoing point 4 above, the TPA master remains fragile and should be nonetheless supported by UCP. In fact, responding adequately to the point 1 above (see also recommendation 1) would help increase the PhD opportunities at the LPTM, hence increasing the attractiveness of the TPA master.

Recommendations

1. The committee is aware that current funding by the ANR of scientific projects centered on theoretical physics has reached the absurd level of the absolute zero. However, even in the context of ANR proposals, presenting projects with experimental groups (but negotiating with them a sizable share of the contract; typically a postdoc/PhD grant + ~20k€), or applying to the less competitive but topical "ANR international" call for tenders could only increase LPTM scientists success rate. More importantly, there exists a host of other programs, more modest, but which can in fact contribute enormously to the activity of a theoretical physics laboratory. CNRS PEPS or PICS projects (although modest, they offer funding to travel and invite collaborators, and again, would help formalizing/solidifying the numerous external collaborations, including foreign ones, of the LPTM), DIM *Systèmes complexes of the Région Île-de-France*, and EGIDE, DGA, CONICET (with Argentina), CEFIPRA (with India), along with a host of similar programs (with Brazil, China, Mexico…) are just a few examples of programs offering realistic funding opportunities, in particular for PhD or postdoctoral grants. In addition, some of these programs encourage the local partner to present a small coherent consortium (2-3 persons), which could be a good opportunity to increase the scientific links between LPTM's scientists, or even with their other colleagues in Cergy-Pontoise (mathematicians, biologists, economists…). Although the committee does not have any problem with the fact that LPTM scientists conduct their research independently, it appears that there exists several such natural collaboration opportunities which remain yet unexplored (e.g. cold atoms – semiclassical analysis, stochastic systems (e.g. mean-field games) – complex systems, biophysics – biologists at UCP, stochastic systems – mathematicians in probability theory at UCP…), and which could constitute the perfect seed for new projects (including ANR or other proposals).

2. As mentioned above, the expected departure of 5+3 LPTM' scientists (most of them UCP employees) represents a clear concern for the committee, and even more evidently, for the LPTM. The UCP has confirmed that the position of a recent retiree will be "republished" next year, and the committee has *strongly encouraged* UCP to republish the (currently "frozen") position of a researcher who recently moved to England on a professor position (the committee also regretted the end of the PAST contract). Hopefully, some/most of the following departures could be replaced in the future. However, it is also clear to the committee that the way the LPTM will handle the next positions available will be *absolutely crucial* and will help convincing the UCP of their mutual strategic interest in strongly supporting the LPTM. Hence, the LPTM should take this opportunity to state more clearly its scientific policy in the framework of serious, thorough, and collegial discussions, first within the 4 themes, and ultimately, in the entire laboratory. The committee is conscious that theoretical physics (a small community) job profiles must remain wide enough in order to attract enough high quality candidates (in fact, currently, 50 candidates per position is common in this field at French universities, including an impressive and even worrying number of very good candidates). This should not prevent the LPTM to be able to identify a short list of scientific priorities on each

position, even if all research themes are concerned and mentioned in the job profile. The first goal of any hiring committee should indeed be primarily to hire an excellent candidate. However, among those identified excellent candidates, there is generally still enough choice to allow for a voluntary scientific policy. The LPTM is hence strongly encouraged to define a few scientific objectives, the thematics needing to be strengthened and/or developed, and state these elements explicitly during the UCP selection committee(s), then adapting their policy to the actual choice of excellent candidates.

3. The committee obviously encourages the LPTM to solicit good candidates presenting a project at the LPTM to apply to CNRS. Again, the best strategy is to identify a few scientific priorities, and invite potential and promising candidates for seminars, accompanying them in the definition of their CNRS scientific project at the LPTM. For instance, noting that the future Theme D will only involve UCP employees, the LPTM is invited to pursue such an active strategy in the field of soft matter/biophysics (and/or complex systems), by presenting candidates in Section 02, 51, and even 05 (the LPTM could in fact ask CNRS for its association to Section 05, in regard to its current activity in soft matter/biophysics). Other possibilities could be in the domain of strongly correlated systems (Sections 02/03), cold atoms (Sections 02/04), or integrable systems (Section 02). In any case, the LPTM should prepare the future hiring of young CNRS researchers after a collegial debate (within the themes and the entire laboratory) on the future scientific directions of the LPTM, and the current needs to strengthen such or such thematics.

4. The committee was ultimately convinced by the interest (strategic but also scientific) for the LPTM to move to the doctoral school *Économie, Management et Mathématiques de Cergy* (ED EM2C N°405) from the current ED SI. Along with a stronger involvement within the LABEX MME-DII (*Modèles Mathématiques et Économiques de la Dynamique, de l'Incertitude et des Interactions*), this move indeed offers new perspectives to the LPTM. However, the LPTM should remain cautious that not only the activity around complex systems is supported by the ED EM2C. Hence, the LPTM must be involved from the beginning in the definition of the new doctoral school project to be presented soon. In particular, the new ED should be able to respect the list of top priorities of the LPTM concerning PhD subjects (provided good students apply to the selected subjects), hence allowing the LPTM to fully exert its scientific policy in this domain. In general, the committee can only encourage LPTM's researcher to develop scientific interactions with their colleagues at UCP (mathematicians, economists, biologists, engineers… and even other physicists!).

5. The LPTM scientists are encouraged to propose doctoral courses which can be funded by the doctoral school, or even, at a very moderate cost, by the LABEX MME-DII. These lectures could benefit the local community of PhD/postdocs and scientists at the LPTM, but also elsewhere at UCP (mathematicians, economists, biologists), and would increase the attractiveness/visibility of the local master/doctoral program.

6. UCP MCF and CNRS CR at the LPTM are encouraged to defend their HDR. In addition to their personal interest in doing so, it could strengthen the position of the LPTM toward the future doctoral school.

7. The UCP is invited to clarify its position with respect to the different (existing and future?) IDEX programs. Otherwise, this could put the LPTM in an awkward/isolated position, although the existing links with the IDEX Paris-Saclay are welcome (an IDEX PhD fellowship obtained at the LPTM with an ENS Cachan researcher).

8. In regard to the particularly strong implication in teaching of ¾ of the LPTM' scientists, the UCP (which ranks the university priorities in this matter) and the CNRS are invited to strongly support the LPTM in terms of CNRS "délégations". The UCP must ensure that the director of the LPTM (a university professor facing a demanding responsibility) is offered enough teaching dispensations by UCP and/or CNRS délégations during his mandate.

3 • Detailed assessments

Assessment of scientific quality and outputs

The LPTM is currently loosely structured in 4 research themes (with their associated keywords):

- Theme A: *Condensed matter, nanophysics, complex* systems (statistical systems and phase transitions, nano-systems (films, membranes), cold atoms, transport and diffusion, graphene, semi-classical systems)

- Theme B: *Integrable systems* (quantum integrable systems, exact solutions, exact statistical correlation functions, algebraic structures, combinatorics in statistical physics)

- Theme C: *Stochastic modeling of large systems* (random walks in disordered and inhomogeneous environment, couplings and hydrodynamic limits, complex fluids, interface dynamics, Genetics models - coalescence theory)

- Theme D: *Theoretical physics for biosciences* (polymers, macromolecules, materials, medical imaging, quantum effects induced by geometry on nano - and biological systems, structured fluids, foams, cellular assemblies. Inverse problems in imaging and inverse transport)

Within these "themes", which certainly do not operate as "teams", a typical situation in a theoretical physics laboratory of a modest size, the researchers conduct their research quite independently. The committee was impressed by the wide span of domains addressed, covering a large part of contemporary physics, excluding high-energy physics (although some of the methods used at the LPTM are not unfamiliar in this domain). The committee was unanimous to assert that the scientific output was quantitatively and qualitatively remarkable, especially considering that ¾ of researchers at the LPTM are in fact UCP employees ("enseignants-chercheurs"; EC) with a heavy and fractionalized teaching load. The 220 articles published by the 20 or so LPTM scientists have been essentially published in well recognized peer-reviewed international journals, from the favorite journals of the theoretical physics community (APS journals, IOP's *Journal(s) of Physics* and *JSTAT*,…), to more specialized journals illustrating the variety of topics addressed at the LPTM (*Surface Science, Journal of Applied Physics, Advances in Applied Probability*…). The quality of the research conducted in the four research themes, despite concerning very different topics, is quite homogeneous.

The large variety of methods mastered at the LPTM was also noted by the committee, ranging from various classical or quantum numerical methods to the most sophisticated analytical tools. The scientific activity of the LPTM has leaded to a certain amount of remarkable results (sometime noted by the Editors of the journal), which are reviewed in the theme-by-theme reports of the committee (see section 4b of the present document). In addition, the LPTM provided during the visit of the committee a list of invited talks by its researchers which confirmed the high recognition of the research conducted at the LPTM. Finally, although, as mentioned above, there are only very few internal collaborations between LPTM scientists, it is also clear that the researchers at the LPTM have all established a very convincing network of external national and international collaborations, although only a very few of them are formalized by means of a common funding (e.g. ANR contract). The variety of the topics addressed at the LPTM also leaded to collaborations with mathematicians (outside the UCP) and biologists (outside the UCP, and very recently, at the UCP).

Assessment of the unit's academic reputation and appeal

The committee noted the high quality of recently hired scientists at the LPTM. For instance, one of its recent recruits received the Bronze Medal of CNRS in 2012, in fact, the third researcher at the LPTM to receive this honor. As mentioned above, several scientists at the LPTM have established a clear international reputation, which manifests in several invitations in important international conferences. The scientists at the LPTM are also involved in various networks (in particular through LABEX MME-DII, IFRAF, or 2 ANR contacts) and several have been experts for AERES, ANR, or ERC projects, and of course, are referees for the best journals of their communities. Moreover, 3 LPTM scientists are in the editorial boards of 4 international journals.

However, the committee also noted that the external resources (for instance, ANR or EU contracts) of the LPTM are extremely scarce, with a mere reported 10k€ of external funding (and an IDEX Paris-Saclay fellowship). As a consequence, the total number of PhD and postdocs having worked at the LPTM remains modest and this situation also prevents the participation to more nationally or internationally funded projects, which could in fact also foster local collaborations between LPTM scientists, and increase the scientific impact of the LPTM.

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

As a laboratory of theoretical physics, mostly addressing very fundamental questions, the activity of the LPTM has naturally a very limited immediate impact on the social or economic environment. In a sense, the noted efforts of the laboratory in diffusing its results through conferences or by organizing topical semesters could be seen as a first step in this direction. In addition, some scientific contributions in the domain of imaging or in the "physics of society"/complex systems could have a shorter term impact in this respect. In conclusion, the committee considers that *this evaluation criterion does not really apply to the LPTM*, which does not mean that the LPTM should not embrace any opportunity which could present itself in this domain (for instance, within the expected links with the mathematics/economics LABEX).

Assessment of the unit's organization and life

As a laboratory of a modest size (although of comparable size as some other theoretical physics laboratories in France), the organization of the laboratory obeys a simple structure. The LPTM meets weekly for their seminar (where PhD/postdocs sometimes briefly present the evolution of their work) and during special meetings conducted by the head of the laboratory. The committee observed that the most important topics concerning the administrative life of a laboratory (budget, scientific policy, new positions, choice of guest scientists…) are discussed collegially within the LPTM, with only a slight unease concerning the allocation of PhD grants at the LPTM from the École Doctorale Sciences et Ingénierie (doctoral school SI), due to the fact that the ED SI does not necessarily follows the ranking of PhD proposals submitted by the LPTM.

The various separate interviews conducted by the committee indicated that the PhD students/postdocs were clearly satisfied of their stay at the LPTM, and that the two CNRS technicians (administration and computer systems) were working in very fair conditions. In addition, the meeting with LPTM scientists (without the ex and future directors) and the general feeling during the whole visit seemed to reveal a rather friendly atmosphere within the laboratory, which must be the basis of the important future debates concerning the scientific policy of the LPTM (see recommendation 2 of the committee).

Assessment of the unit's involvement in training through research

¾ of LPTM researchers being UCP employees, their implication in teaching is certainly extremely strong. LPTM scientists are in particular strongly involved in the master *Physics and Applications* and the master *Theoretical Physics and Applications (TPA)*, which is taught fully in English and which was created in 2010. Some TPA students come from the Spanish university of Saragossa in order to get a double Master degree, while other students depend on the European Erasmus program. The TPA master is a fantastic opportunity for the LPTM, but also faces a worrying decay of the number of applying students (see recommendations).

At the doctoral level, most PhD fellowships at the LPTM come from the doctoral school (école doctorale; ED) *Sciences et Ingénierie* (ED SI N°417), which harbors 12 other laboratories working in a very wide range of domains (applied physics, engineering, computer sciences…). The PhD students at the LPTM spend there an average of 39 months (a doctoral contract ensures funding for 36 months), which is certainly satisfactory. The very fundamental nature of LPTM's activity and the mode of allocation of PhD grants by the ED SI (they select subjects and do not preallocate grants to the laboratories) has two unfortunate consequences: (i) the number of PhD grants obtained through the ED remains modest (but the committee also stressed that there are many other sources to obtain such grants), and the committee has estimated that the share obtained by the LPTM was of the order of only half of what it could have expected simply counting LPTM's workforce; (ii) the mode of allocation of PhD grants prevents the LPTM to exert its scientific policy in this domain by choosing the topic/theme to be awarded a PhD grant, since the ED SI would not necessarily follow LPTM's internal ranking of PhD proposals. This situation is at the origin of the proposed change of doctoral school by the LPTM (see below and the committee's recommendations).

Finally, the LPTM scientists, in addition to a few conferences organized, have been strongly involved in the organization of two topical semesters, in coordination with the local Institut d'Études Avancées. The committee was impressed by the impact for the LPTM of the visit of leading scientists, the organization of seminars and of sizable workshops (60 visitors).

Assessment of the strategy and the five-year plan

The LPTM project as presented in its AERES report was considered to be too superficial by the committee, although it was supplemented by the oral presentation of the new head of the LPTM and his interview by the committee.

The project clearly states the will of the LPTM to keep on conducting research at an excellent level, promoting the development of collaborations, in particular with experimental groups, in a spirit of freedom for LPTM' scientists to pick their scientific subjects. It also proposes a renaming and slight revamping of two of the four research themes: Theme A (Condensed matter and quantum phenomena) will now concentrate on quantum systems, while Theme D (Soft matter and complex systems) will have a more coherent scope. The committee certainly approves this evolution.

Due to difficulties encountered in the doctoral school SI (detailed above in the present report), the LPTM has indicated its will to move to the doctoral school EM2C involving mathematicians and economists (their partner in the LABEX MME-DII), a move that the committee, initially slightly surprised, considers to be a promising, but not a sure bet (see recommendations).

The LPTM was frank and realist in exposing its main weakness (the absence of external resources, with several consequences, like the small number of PhD/postdoc), and the main threat to its future (the immediate departure of 5 scientists, and the expected retirement of 3 more researchers before the end of the next contract). However, the committee regretted that the LPTM did not put more effort in presenting a realistic and active strategy to overcome these hurdles. It is not surprising that the two main recommendations of the committee do concern these two points, by encouraging LPTM researchers to be more aggressive in finding external funding (in their full interest), and by inviting the LPTM to engage in a thorough and collegial debate to define a few scientific objectives, in order to handle the next job openings in a way which will convince UCP to support them on this account. In its meeting with the UCP (and CNRS) representative, the committee has very strongly encouraged UCP to do so, as long as LPTM plays their part of the bargain, in a difficult financial environment for all French universities.

4 • Theme-by-theme analysis

Theme A: *Condensed matter, Nano-physics, Complex systems*

Manager's name: Mr Hung T. DIEP

Workforce 2 PR, 1CR, 3 MCF, 1 PAST, 1 Postdoc, 1 PhD (1 MCF at 50 %) as of 30/06/2013

Theme workforce in Full Time Equivalents	As at 30/06/2013	As at 01/01/2015
FTE for permanent professors	2.5	1.75
FTE for permanent EPST or EPIC researchers	1	1
FTE of other permanent staff without research duties (IR, IE, PRAG, etc.)		
FTE for other professors (PREM, ECC, etc.)	0.25	
FTE for postdoctoral students having spent at least 12 months in the unit	1	
FTE for other EPST or EPIC researchers (DREM, etc.) excluding postdoctoral students	0	
FTE for other contractual staff without research duties		
FTE for doctoral students	2	
TOTAL	6.75	2.75

• Detailed assessments

7 permanent researchers at UCP or CNRS (2 PR, 3 MCF, 1 PAST, 1 CR1 CNRS) are involved in the Theme A addressing *Condensed matter, Nanophysics, Complex systems*. Theses researchers study a very wide range of systems, rather independently from each other, but working with a respectable network of collaborators outside the LPTM. The researchers involved in this theme have published a total of 81 refereed publications, a quite remarkable figure considering that most of them are university employees, with a heavy teaching load. Most of their work has been published in recognized general or specialized journals in the considered fields, such as *Physical Review Letters* (5 letters), *Physical Review A-B-E, Europhysics Letters, Modern Physics Letters, European Physical Journal, Journal of Physics, Physica, Nano Letters, Surface Science, Journal of Chemical Physics*... The researchers of Theme A are also regularly invited to International conferences.

Among the most notable contributions in this Theme A, one can mention the better understanding of phase transitions in frustrated magnets using sophisticated Monte Carlo methods, the study of a crumpled-to-tubular phase transition in anisotropic polymerized membranes, the possibility of observing particle “trajectories” in quantum systems in the semiclassical regime using “weak measurements”, the study of electronic confinement in rotated bilayers of graphene with interesting experimental implications, or the study of exotic quantum phase transitions (involving “fractional” effective degrees of freedom) in one-dimensional ultracold dipolar quantum bosons tubes (work highlighted by *Physical Review B* editors).

In more details, the different topic addressed within Theme A can be summarized as such:

- Study of various magnetic systems (spin transport, frustrated systems, surface magnetism...) and other classical problems (melting of crystals, surface melting), in particular using sophisticated Monte Carlo methods. This remarkable activity leaded to around 20 publications and also involved 3 PhD students, 2 Polish grants, or the organization of a STATPHYS24 satellite conference in Hanoi in 2010.

- Modelization of elastic and mechanical properties in material science using phase-field methods and general study of alloy thermodynamics and phase transitions, a series of work leading to 11 articles, involving a close collaboration with ONERA researchers. This activity is conducted by a part-time associated professor at LPTM (PAST). However, this position will probably not be renewed.

- Study of electronic transport in graphene and quasicrystals using *ab initio* numerical simulations, a series of work (8 articles, including 3 *Physical Review Letters*) involving a close collaboration with the *Néel Institute* in Grenoble.

- Study of ultracold fermions trapped in a one-dimensional optical lattice, mostly using sophisticated quantum numerical methods widely popular in condensed matter physics. This activity is developed through several national collaborations (Orsay, Toulouse; participation in IFRAF and a GDR). Interesting results have been obtained on exotic phase transitions arising in strongly correlated and low dimensional fermionic gas: superfluidity, topological phases, Mott insulator, Haldane phase (with intriguing possible experimental implications)...

- Statistical physics of membranes studied by non perturbative renormalization group (NPRG) methods, in collaboration with LPTMC (Paris VI). This was the first application of these sophisticated NPRG methods to membranes, allowing characterizing, among other results (6 articles, including 1 *Physical Review Letters*), a crumpled-to-tubular phase transition in anisotropic polymerized membranes.

- Complex systems studied with the tools of statistical physics (random-field Ising model, networks, agent-based models...). The application of these methods to social systems (5 articles + 1 submitted) involve several collaborators in Argentina, with for instance, applications to the understanding of multicultural/"mono-cultural" organization of societies, or the analysis of election data. This activity is associated to the Laboratoire d'Excellence MME-DII and the UniTwin UNESCO *Complex Systems Digital Campus*.

- Semiclassical study of some fundamental aspects in quantum mechanics. This activity developed by a CNRS researcher (at LPTM since 2010, from LIPHY Grenoble; 11 articles) addresses the emergence of entanglement in a quantum system with the dynamics of the underlying classical dynamics, and various aspects of "weak measurement", including a work already mentioned above (published in *Physical Review Letters*).

Although the project concerning the LPTM, and hence Theme A, remains to be more extensively developed, a reorganization will occur, since one researcher from theme D is expected to join this theme, whereas 2 researchers from theme A are expected to join Theme D, in better agreement with their current activities. This evolution appears quite natural, as Theme A is bound to focus on condensed matter physics and other quantum systems.

Conclusion

- **Overall opinion of the theme:**

In conclusion, the researchers involved in Theme A are addressing a large variety of systems and problems using a wide range of quantum and classical methods, analytic and numerical. The overall scientific production associated to Theme A is certainly significant quantitatively, and several results obtained, including those mentioned above, are well recognized at the international levels.

- **Strengths and opportunities:**

There exists, in principle, natural opportunities for collaborations and interactions among current Theme A scientists. For instance, the study of classical spin/agent systems in the condensed matter/social science contexts could offer such opportunities. In addition, the activity on ultracold atomic systems could greatly benefit from the local expertise in the study of magnetism (arguably mostly for classical systems) and, even more naturally, in semiclassical quantum systems and methods, widely used in the cold atoms context. The arrival of a CNRS researcher in 2010, as well as the reorganization of the themes could help Theme A to develop more internal collaborations and scientific projects.

- **Weaknesses and threats:**

Finally, among the 3 students starting their PhD in Theme A this year, 2 were hired to work on the same activity (see the general report concerning the doctoral school policy), and one can easily guess that additional PhD students and postdocs could have helped the researchers of Theme A to develop further their activity. On this account, the Committee could not fail to notice that the LPTM (and hence, Theme A) has attracted very few external funding (such as ANR or EU contracts), which could be a natural source of PhD and postdoc fellowships, a good mean to foster internal collaborations.

- **Recommendations:**

Despite the gloomy (and rather absurd) current situation of ANR funding to theoretical physics, the Theme A, which has a lot of national and international collaborations, is encouraged to the host of French and international programs (for instance with India, Eastern Europe, South America...) available and even international ANR (with a little less competition than for their usual programs).

Theme B: *Integrable systems*

Manager's name: Mr Jean AVAN

Workforce 1 DR, 2 MCF as of 30/06/2013

Workforce to be given in FTE.

Theme workforce in Full Time Equivalents	As at 30/06/2013	As at 01/01/2015
FTE for permanent professors	2	2
FTE for permanent EPST or EPIC researchers	1	1
FTE of other permanent staff without research duties (IR, IE, PRAG, etc.)		
FTE for other professors (PREM, ECC, etc.)		
FTE for postdoctoral students having spent at least 12 months in the unit		
FTE for other EPST or EPIC researchers (DREM, etc.) excluding postdoctoral students		
FTE for other contractual staff without research duties		
FTE for doctoral students		
TOTAL	3	3

• Detailed assessments

There were three members in the research theme *integrable systems* of the LPTM. One MCF left in 2010 to become a professor at the Institut de Mathématiques de Bourgogne and was replaced by another MCF in theme B.

The research activities concern the domain of classical and quantum integrable systems, related algebraic structures as well as combinatorial aspects and applications. Four directions are considered, with some overlaps.

(i) Algebraic structures, classical and quantum integrable models

In the framework of Faddeev-Reshetikin-Takhtadjan (FRT), the construction and study of classical and quantum integrable systems is essentially based on the Yang-Baxter equations. Historically, solutions of these equations are fundamental objects (so-called 'Lax operator') for the construction of integrable systems: rational, trigonometric and elliptic solutions have been proposed. In each case, different structures of the quantum group are considered (Yangians, or with one or two deformation parameters). To each solution (according to the finite or infinite dimensional representation chosen), it is possible to associate an integrable model. Among the models that describe emerging phenomena in low-dimensional systems on the lattice, the most famous example is the Heisenberg spin chain (XXX, XXZ or XYZ) corresponding to rational, trigonometric and elliptic solutions, respectively. In the vicinity of phase transitions of first or second order, among the most famous examples one finds the sine-Gordon model and its generalizations (affine Toda field theories).

In the last twenty years, an extension of the FRT framework to other families of equations has been developed (Cherednik-Sklyanin). In this case, the so-called reflection equations (or boundary Yang-Baxter) are considered, which solutions (so-called 'Sklyanin operator') allow constructing and studying integrable models with general boundary conditions (which helps in the description of systems coupled with an external source). As far as the algebraic structures are concerned, such equations are connected with the theory of coideal subalgebras of quantum groups and affine Hecke algebras. The results obtained at LPTM improve the understanding of these structures. Among the results obtained, let us mention: the construction of a third version of the dynamical reflection equations (beyond the ones by Behrend-Pearce-O'Brien or Arutyunov-Chekov-Frolov/Nagy-Avan-Rollet); a complete classification of dynamical R-matrices ; new representations for the Ruijsenaar-Schneider and Calogero-Moser integrable models on the lattice and continuum, which find applications at the semi-classical limit of string theory (giant magnons).

(ii) Combinatorial and statistical mechanics

This direction of research concerns the study of integrable systems and related combinatorial aspects. These last years, a link has been established between the problem of counting alternating sign matrices of a given dimension and the calculation of the ground state in some integrable models. A major contribution in this field has been obtained: a proof of the Razumov-Stroganov conjecture and its refinements (with spectral parameter) is proposed, which relates the structure of the eigenstates of the O(1) dense loop model to the enumeration of 'fully-packed loop' configurations with alternating boundary conditions. The Hamiltonian of the XXZ chain with twisted or periodic boundary conditions being a conjugate representation of the O(1) model, this result allows deriving the emptiness formation probability (probability to observe a state with k-spins up) previously conjectured. For these results, let us point out that a young researcher of LPTM got the CNRS Bronze medal 2012 for his work on the Razumov-Stroganov conjecture.

(iii) Correlation functions in quantum systems

One of the major problems in the study of quantum integrable systems concerns the explicit calculation of correlation functions and form factors. Among the models considered, the XXZ spin chain with boundary conditions constitutes a basic example which better understanding is necessary to study models with higher symmetries. For certain types of boundary conditions, one approach is the algebraic Bethe ansatz which potentially gives a way to express correlation functions in terms of multiple integrals of meromorphic functions. From 1994 to 2007, the correlations functions have been known only in the thermodynamic limit (Jimbo et al.) using the frame of the vertex operator approach associated with the quantum universal enveloping algebra of affine sl2. In the frame of the algebraic Bethe ansatz, members of LPTM have succeeded in deriving correlation functions and form factors for the XXZ spin chain with diagonal boundary conditions in the massive and massless regime (according to the range of the anisotropy parameter), confirming the results of Jimbo et al. in the thermodynamic limit. This is a very important result. The correlation functions being expressed as multiple contour integrals, the extraction of the asymptotic behavior (spin-spin correlations at long distance) or at the temperature remains a difficult problem to solve. Until 2010, this has been considered at LPTM with interesting progress.

The total number of publications is (13+5+4=22), a subset of these being well-cited for a field in which the number of citations is usually rather small. The articles are published in recognized and specialized journals of the field: J. Phys. A, Nucl. Phys. B, J. Math. Phys., SIGMA, Lett. Math. Phys. Comm. Math. Phys., JSTAT, JHEP, J. Combin. Theory.

Conclusion

- **Overall opinion of the theme:**

Despite the fact that the theme *Integrable Systems* within LPTM is of a rather small size (3 staff members), the activities conducted and the results obtained are of a high quality, with a major result obtained by a LPTM researcher (CNRS Bronze medal 2012).

- **Strengths and opportunities:**

Let us mention that the directions of research considered within the theme are rather original, important and complementary to other directions studied in labs of the Paris area.

- **Weaknesses and threats:**

Like for the three other themes (see the Theme A report and the general assessment of the LPTM and recommendation 1), very low external resources limits the opportunities in hiring PhD and postdoctoral students (although Theme B is involved in ANR Diadems with 3 other French partner laboratories, with a modest but useful contribution for travel expenses for LPTM).

- **Recommendations:**

From a scientific point of view, and considering the future project - in particular the change of doctoral school – the committee would encourage the members of Theme B to try to interact further with members of the local mathematics department. For instance, the subject of quantum reflection equations – considered at LPTM - is directly related with the representation theory of double affine Hecke algebras – considered at the mathematics department, which is becoming a hot topic in recent years.

Up to now, financial supports for these research activities are partly from an ANR research project (DIADEMS ‘Open Projects) which implies researchers from various institutions in France (Angers, LAPTH Annecy, ENS Lyon, IMB Dijon, LPTHE Paris) or abroad (Steklov Mathematical Institute of St Petersburg). This ANR project ends up this year. For this reason, we would encourage the members at LPTM to apply to other grants including “light” ones (such as CNRS PEPS and PICS) which are well adapted in supporting collaborations in this field.

Theme C: *Stochastic modeling of large systems*

Manager's name: Mr Thierry GOBRON

Workforce 2 PR, 2 CR, 2 MCF, 1 PhD as at 30/06/2013

Theme workforce in Full Time Equivalents	As at 30/06/2013	As at 01/01/2015
FTE for permanent professors	1,75	1,25
FTE for permanent EPST or EPIC researchers	2	2
FTE of other permanent staff without research duties (IR, IE, PRAG, etc.)		
FTE for other professors (PREM, ECC, etc.)		
FTE for postdoctoral students having spent at least 12 months in the unit		
FTE for other EPST or EPIC researchers (DREM, etc.) excluding postdoctoral students		
FTE for other contractual staff without research duties		
FTE for doctoral students	1	
TOTAL	4,75	3,25

• Detailed assessments

In the years 2008-2013 the group `stochastic modeling' of LPTM has had 6 permanent researchers (one also working in Theme D).

The group has produced around 50 publications in the reporting period, published in a wide variety of international journals, including probability and statistics journals as well as theoretical physics journals and soft matter/colloid journals (although these publications are by a member who is also listed under theme D). One member of the group has made a dominant contribution to the scientific output, having written 32 papers in this period. The level of activity across the group is thus rather heterogeneous.

The topics of the group activity are numerous and contain rigorous statistical mechanics, interacting particle systems, spin glasses, coding theory.

Statistical mechanics of interfaces

The behavior of the interfaces separating different phases of the matter in the phase transition regime is a classical topic of statistical mechanics, with some questions still open. One example is the roughening transition in the 3D Ising model. Another question is the behavior of the interface in the half-space model, when the interface interacts with the wall. There the sequence of layering transitions is expected to occur, as the temperature of the model increases. In one publication such a sequence of transitions is proven to occur in the SOS approximation of the Ising model, when the interface interacts with the wall via the pinning potential. This sequence terminates at the value of the temperature when the interface starts to be rough, and complete wetting occurs. This result is a continuation of the earlier studies by Frohlich-Pfister, Basuev, Cesi-Martinelli, and it enriches our knowledge of the interface behavior. The corresponding results for the Ising model are much harder technically; the anticipated behavior has been studied at a heuristic level. In another publication a different model of the interaction between the interface and the wall is considered, here the interaction is long range, and decays algebraically. Also studied is the model where the coexistence of wet and dry phases takes place, due to the presence of the grooves on the wall. It is shown that such coexistence happens in the range of the parameters of the model, so the finite system goes from dry phase to wet and back.

Hydrodynamic limit for conservative particle systems

Interacting particle systems and their hydrodynamic limits is an important chapter of the modern mathematical physics. The most well known example is the Simple Exclusion Process, for which many results are known. But the number of models for which such a detailed analysis is possible is quite limited, due to the techniques used. Work on this theme has as a consequence that the class of models, which can be investigated by the coupling method, is enlarged. The main important idea of the authors is to find the conditions under which there exists an attractive coupling between two versions of the process. This condition holds for a class of systems, which includes physically relevant examples, one being the Hammersley-Aldous-Diaconis model. As a result, the authors are able to derive the hydrodynamic limit for those models, displaying a wide range of possible behavior.

Population genetics

In this topic the problems considered are centered on the Dirichlet partitions of an interval and subsequent sampling from them. The results are related to several classical problems: abundance estimation of species, coupon collector and birthday problems for species, and the question of estimating the size of the population.

Soft Matter Theory

The statistical mechanics of soft matter systems has been studied, in particular mesophases of star shaped copolymers. The dynamic of foams and their consequences for rheology have also been investigated. This theme is less orientated toward rigorous results and is closer to experimental systems.

Conclusion

- **Overall opinion of the theme:**

The results of the group and its activity are of high quality. It is well recognized by the Paris community of rigorous statistical physics.

- **Strengths and opportunities:**

The group has a good network of collaborations with both physics and mathematics laboratories.

The group organizes the annual meeting on Inhomogeneous Random Systems at the IHP. It provides the forum for ideas exchange over wide area of subjects, and gives the group high international visibility.

There are certainly possibilities to open new research directions in complex systems studies, related to economics and social sciences, notably interacting agent and network models.

- **Weaknesses and threats:**

The group is composed of mainly senior members and in the coming years will suffer from retirement. Future directions for research and a strategy for continuing the group is not obvious from the project of the laboratory. Like for the three other themes (see the Theme A report and the general assessment of the LPTM and recommendation 1), very low external resources limits the opportunities in hiring PhD and postdoctoral students.

- **Recommendations:**

Within the context of Cergy-Pontoise the exploration of complex systems (in association with Theme D) such as interacting agent models seems to be a possibility as it is related to the themes of the LABEX MME-DII. Exploring possible local interactions with engineering sciences is another possible opportunity.

Theme D: *Theoretical Physics for Biosciences*

Manager's name: Mr Trong Tuong TRUONG

Workforce 2 PR, 1 CR, 3 MCF (1 MCF at 50 %), 1 PhD as at 30/06/2013

Theme workforce in Full Time Equivalents	As at 30/06/2013	As at 01/01/2015
FTE for permanent professors	2,25	2
FTE for permanent EPST or EPIC researchers	1	
FTE of other permanent staff without research duties (IR, IE, PRAG, etc.)		
FTE for other professors (PREM, ECC, etc.)		1
FTE for postdoctoral students having spent at least 12 months in the unit	2	
FTE for other EPST or EPIC researchers (DREM, etc.) excluding postdoctoral students		
FTE for other contractual staff without research duties		
FTE for doctoral students	1	
TOTAL	6,25	3

• Detailed assessments

The group *Theoretical Physics for Biosciences* consists of 6 researchers (one is also involved in Theme C) with rather diverse interests, including activities that are not clearly related to biosciences. The reorganization of the research groups of the laboratory will mean that this group no longer exists as such. The proposed reorganization seems entirely logical from a scientific point of view, leading to more coherent groups.

Since 2008, it has published 58 papers in international peer-reviewed journals of recognized quality. The rate of production is excellent given that most researchers are UCP employees with heavy teaching loads and significant administrative responsibilities.

One aspect of the group's activities concerns two aspects of quantum mechanics. Firstly there is interest in geometry-induced potentials in quantum mechanics. The goal is to develop an effective quantum mechanical description of nanostructures such as bent bilayer graphene sheets. There have been a number of interesting results including the demonstration of an effective quantum potential for electrons due to the interaction between their spin and geometry. These results have lead to publications in quality journals such as *Physical Review A* and *Physics Letters A*. In particular, results on geometry induced charge separation on helicoidal ribbons appear to have attracted a fair number of citations. Another area of quantum research concerns the physics of semi-conductor quantum dots and how well known effects in atomic physics such as the Stark effect and Lamb shift are manifested in these systems. These activities will move to the new theme A as a result of the restructuration of the research groups.

Another area of research, more obviously connected to biophysics is the statistical mechanics of polymers. Here, model polymer systems are studied using transfer matrices, DMRG, Bethe Approximation. There is particular interest in polymer translocation, where lattice gas simulation methods are being developed to avoid the large computational times associated with MD simulations. This activity has lead to collaborations with biophysicists at Cergy-Pontoise. However, the activity has been fragilized by the departure of one of the principal researchers in this field. Again the output of this activity has lead to publication in international journals such as *Physical Review E* and *Journal of Physics A*. To maintain the high scientific level of this activity, it is now essential to recruit a new permanent researcher for this interdisciplinary research.

This research group also has a long-standing interest in imaging theory for medical applications, in particular the analysis of inverse problems using the method of Radon transforms. In the past, they have worked on the development of a new imaging principle where the imaging camera does not need to rotate. Subsequently, theory of Compton tomographic imaging using the methods of integral geometry has been used to develop new imaging protocols. The results on imaging theory have been published in specialist journals concerned with this field. The research in this area seems to have been particularly widely presented at international conferences.

Finally there is an activity directly related to and in part carried out in collaboration with biologists/biophysicists as well as soft matter/colloidal science. A program based on Delaunay-Laguerre tessellations has been developed to analyze the topology and contact networks of macromolecules such as proteins. This development has led to a number of publications with biologists in high quality biology orientated journals (e.g. *Nucleic Acids Research*) and appears to be very promising. There is also collaboration with biologists on the subject of DNA-protein interactions.

Researchers of Theme D are not involved in any ANR projects, and suffer from the low financial resources of LPTM. The interdisciplinary character of their research should help them to become involved in research projects (ANR, Labex MME-DII…). More PhD students could also be attracted through such projects.

Conclusion

- **Overall opinion of the theme:**

The overall report is well written but often it is a rather chronological account of research output. The reader is often left wondering what are the main challenges of the field and to what extent the researchers of the group have contributed to their resolution. The group would certainly have benefited from the possibility to recruit more PhD students and post-docs (it suffered from the general problem of lack of research grants suffered by the laboratory as a whole and as pointed out in their report). In particular during the reported period only two PhD theses were defended.

- **Strengths and opportunities:**

The strength of the group includes its level of scientific production, the wide variety of activities undertaken, active external collaborations with theorists and especially experimentalists. In the future, there will also be scope for collaboration with economists and social scientists at UCP, and via the laboratory's association with the LABEX MME-DII on these themes. Like all themes at the LPTM, they also benefit from the opportunity of having a local master's program in theoretical physics, which is quite rare, even for much larger theory groups. Unfortunately, due to lack of research funding for PhD grants, they are unable to fully benefit from the students they have educated in their program.

- **Weaknesses and threats:**

The principal weakness of the group is that the fact that the research activities are varied and restricted to small groups means that they suffer in the context of French scientific funding, where preference is given to larger more visible groups.

- **Recommendations:**

Given that the group is dominated by university staff highly involved in teaching and administration, reinforcement of their activities and the development of intergroup collaborations would probably be best served by the recruitment of a CNRS researcher in Section, 02, 05, or 51. The future Theme D is invited to develop local (at the LPTM and UCP) collaborations in its two now well defined scientific axes: soft matter/biophysics and complex systems. Like for the three other themes, the committee's general recommendation 1 concerning external resources applies to Theme D.

5 • Conduct of the visit

Visit dates:

Start:	25th November 2013, at 9h00
End:	26th November 2013, at 17h00

Visit site:	Laboratoire de Physique Théorique et Modélisation (LPTM) - UMR 8089 CNRS/UCP
Institution:	Université de Cergy-Pontoise
Address:	2 avenue Adolphe Chauvin, Pontoise, 95302 Cergy-Pontoise cedex

Program of the visit:

Première journée (bilan et projet de l'unité, présentations scientifiques)

9h00 - 9h30 :	accueil
9h30 - 10h00 :	réunion du comité d'experts à huis-clos
10h00 - 10h45 :	présentation et bilan de l'unité par le DU sortant
10h45 - 11h15 :	présentations scientifiques
11h15 - 11h30 :	pause
11h30 - 12h30 :	présentations scientifiques
12h30 - 13h30 :	repas et discussions à huit-clos du comité d'experts sur place (plateaux repas)
13h30 - 14h00 :	présentation du projet de l'unité par le futur DU portant le projet
14h00 - 17h20 :	rencontre entre l'ensemble du comité d'experts et les membres du LPTM travaillant dans chacune des 4 thématiques
17h30- 18h15 :	premier bilan du comité d'experts à huis-clos

Pour la seconde journée, la matinée est consacrée aux diverses rencontres du comité d'experts avec

9h15-9h40 :	doctorants, postdoctorants, et ATER du LPTM
9h40-10h00 :	directeur de l'ED Sciences et Ingénierie (n°417 ; UCP)
10h00-10h20 :	personnel IT (séparément ; 10 minutes chacun)
10h20-11h10 :	ensemble du personnel chercheurs et enseignants-chercheurs (sans le directeur sortant, ni le futur directeur)
11h10-11h15 :	pause
11h15-11h30 :	entretien avec le DU sortant
11h30-12h15 :	entretien avec le DU portant le projet

12h15-14h00 : entretien avec les tutelles (DAS CNRS, DR CNRS Meudon, VP CS UCP) se poursuivant au cours du déjeuner sur place.

L'après-midi (14h15-16h45) a été consacré à la discussion bilan du comité d'experts, à huis-clos.

Specific points to be mentioned: (unexpected events, etc.)

Some members of the committee traveling to Cergy-Pontoise on Sunday 24th November received their ticket with the final schedule on Friday 22nd November afternoon, despite filling and sending the AERES form as soon as the 22nd of October, with no reply to emails sent to the AERES between these two dates. This is simply unacceptable.

6 • Supervising bodies' general comments

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M. KNECHT, Coordinating Scientific Delegate AERES
M. SIRE, Chairman of the Expert Committee
Experts Committee Members

Cergy, 2014 february 18th

Contact person: Laurence PUECHBERTY,
Head of Research Transfert and Doctoral Studies Office
06.78.85.37.95

Subject : Response to the comments on the pre-report AERES by the LPTM Lab– UMR 8089.

The President of the University of Cergy-Pontoise and the Vice President in charge of Research are pleased to recognize the quality of evaluation committee work. The university and the CNRS have appreciated the quality of the discussions and the constructive in exchanging views and propositions. We will assuredly take your comments into account to further improve the research policy of the LPTM lab.

However, we would like to share with you some highlights :

1) In Weaknesses and threats page 12, it is indicated that two students, starting their PhD this year, were hired to work on the same activity.
We would like to point out that it is a misunderstanding. Indeed, the students arrived almost at the same time in the LPTM and completed their training by learning some general background on magnetism theory, statistical physics, and numerical methods. They will now work on very different topics during their thesis. In this respect, Aurélien Bailly-Reyre will investigate aspects of physics of liquid crystals whereas Sahbi El Hog will work on magneto-elasticity effects on spin transport.
Maybe the formulation of the sentence in the report should be accordingly modified.

2) Regarding now the more general point of external funding's of LPTM, the AERES committee suggested both in their recommendations (number 1 page 5) and their assessment of the strategy (page 9) that LPTM researchers be « more aggressive in finding external funding ». In this respect, the committee advised us on various possibilities: presenting projects with experimental groups, applying to a host of programs such as CNRS PEPS,PICS, ERC, and programs with foreign countries.
We wish to point out that LPTM Lab has definitively chosen this strategy for several years and has proposed, in various contexts a significant number of projects (non exhaustive): 2 ANR selected on 13 ANR submitted, 2 PEPS selected on 6 PEPS submitted, 1 ERC submitted, 1 DIM selected on 2 DIM submitted, 2 PHC selected on 5 PHC submitted, 4 others international research projects selected on 13 submitted). Several projects involved a close collaboration with experimental groups.

We hope that this information will make clear some points of weaknesses and threats section.
Please accept, Sir, the assurance of my consideration.

François GERMINET
President of Cergy-Pontoise University