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

Section des Unités de recherche

Evaluation report

Research unit :

Laboratoire de Physique Théorique et
Modélisation (LPTM) – UMR 8089

University of Cergy-Pontoise



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Le Président
de l'AERES

Jean-François Dhainaut

Section des unités
de recherche

Le Directeur

Pierre Glorieux

february 2009



Evaluation report

The research unit :

Name of the research unit : Laboratoire de Physique Théorique et Modélisation (LPTM)

Requested label : UMR

N° in case of renewal : 8089

Head of the research unit : Mr The Hung DIEP

University or school :

University of Cergy-Pontoise

Other institutions and research organization:

CNRS

Date(s) of the visit :

November 13 and 14th 2008

Members of the visiting committee



Chairman of the committee :

Mr Peter HOLDSWORTH (ENS Lyon)

Other committee members :

Mr Livio TRIOLO (University Tor Vergata, Roma)

Mr Eric RAGOUCY (LAPP, Annecy le Vieux)

Mr Daniel MALTERRE (University of Nancy)

Mr Fabrice SCHEURER (University of Strasbourg)

CNU, CoNRS, CSS INSERM, (représentant INRA, INRIA, IRD...) representatives :

Mr Alberto ROSSO (University of Paris 11) representative of CoNRS

Mr Pierre PUJOL (University of Toulouse) representative of CNU

Observers

AERES scientific representative:

Mr Jean Michel ROBBE

University or school representative:

Mr François GERMINET

Research organization representative (s) :

Mr Patricio LEBOEUF and Mr Christian CHARDONNET, CNRS MPPU



Evaluation report

1 • Short presentation of the research unit

- Numbers of lab members (38), including researchers with teaching duties and full time researchers (21 plus 1 emeritus), engineer (1), PhD and students (13), technicians and administrative assistants (2)
- Numbers of HDR (12) and of HDR who are PhD students advisors (10)
- Numbers of PhD students who have obtained their PhD (9) and average length of a PhD during the past 4 years 3.5 years)
- Numbers of PhD students currently present in the research unit (13); Numbers of PhD students with fellowships (13)
- Numbers of lab members who have been granted a PEDR (7)
- Numbers of “publishing” lab members (21)

2 • Preparation and execution of the visit

The Comité d'évaluation du LPTM has reviewed the activities of the two laboratories (Laboratoire de Physique Théorique et Modélisations, LPTM, UMR8089 and Laboratoire de Physique des Matériaux et Surfaces LPMS, EA 2527) on 13-14 November, as requested by the University of Cergy-Pontoise. On the 13th of November, after a short welcome and presentation by the Director of the LPTM laboratory, the Committee listened to oral presentations covering the varied research activities carried out by the laboratory. The Committee then split to discuss with the five teams in more detail, in an informal atmosphere and finally met with the PhD students. On the following day, the Committee met with the representative of the University Cergy-Pontoise and of the CNRS. The committee also met with the 'conseil de laboratoire' where it discussed with representatives of different aspects of the working life of the lab and on the project of fusion of the two laboratories. The Committee held a closed session dedicated to the preparation of the evaluation report based on the Committee findings.

The meeting was declared closed at 14:00.

All material presented to the Committee was of high quality and appreciated but the planning was rather dense: the atmosphere was relaxed, allowing the Committee to work with maximum effectiveness. Nevertheless, the Committee would have profited from more time for internal discussions, discussions with the management and the speakers.



3 • Overall appreciation of the activity of the research unit, of its links with local, national and international partners

The committee appreciated the scientific activity generated by both the LPTM and LPMS over the last four years. This is reflected in the large number of active researchers, by a solid publication list and a generally good scientific profile both at the national and international level. Areas of research that deserve particular mention are condensed matter in the study of cold atom systems and of surfaces, integrable systems, imagery through diffuse X-ray scattering and the surface experiments of the LPMS. These aspects were presented during the visit of the evaluation committee on the 13th and 14th of November 2008. The seminars presented during the visit gave an excellent overview of the research activities of both laboratories, even though the programme was rather too dense. The coordination between the presentations of the LPTM and LPMS could have been improved. The committee enjoyed a frank exchange with “the conseil de laboratoire”, with the administrators of the Université Cergy Pontoise and with the Ph.D. students of the LPTM.

Concerning the project proposed for the next four years, the committee welcomes the initiative to orient projects toward applications and experiment in the fields of nanophysics, complex systems and biology. However not all aspects of the project « theoretical physics for biosciences » are convincingly orientated towards biology or biophysics. This project would be improved by, on the one hand re-enforcing the intent of developing interdisciplinary collaborations and on the other hand by motivating certain aspects, which remain interesting, on purely theoretical grounds.

4 • Specific appreciation team by team and/or project by project

Transitions de phase et criticalité

The members of this group have produced research of good quality and a consequent number of good scientific publications. The quality of the research is confirmed by the fact that members of the group have been invited to make presentations in prestigious international workshops and schools. In addition a number of book chapters, review articles and lectures notes have also been written. Noteworthy is the work on cold atoms, which is one of the most exciting subjects in condensed matter at present. Work on spin transport in magnetic multilayers is also very topical and is begging for contact and interaction with experiment. The proposed scientific project is also very interesting, as it deals with very important developments in these novel subjects, where recent experimental results are very promising, particularly in the case of cold atom physics. Work on polymer physics is also of high quality. Its impact will be improved by, as proposed, taking the project towards contact with experiment in biophysics and soft condensed matter. Work on the electronic properties of graphine is also promising; the contact with experiment discussed in the report is strongly encouraged. There are some interesting results in statistical mechanics; particularly on the random field Ising model, stacked triangular lattices and in frustrated polymers, which would benefit from greater exposure at national level, as in these cases France has a world leading tradition. The members of the team are in general using their acquired technical expertise competently (for example in field theory, bosonization and programming) to investigate these novel topics. Some of the group’s members also enjoy important international visibility, as can be seen again from the numerous invitations to international events or their extensive collaborations in France and abroad. One concern for the team is the small number of internal collaborations. There are exceptions, such as for example, the collaboration in frustrated polymer systems and the research project proposes the development of others. It is hoped therefore that further collaborations will develop in the future. Increasing student numbers would also help the productivity of the team as a whole.



Note de l'équipe	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
A	A	A	Non noté	B

“Systèmes Intégrables”

This team has existed since the creation of the Laboratory and, despite its small size, has always been at the forefront of research in its field, particularly in the domain of dynamical quantum group theory. More recently, the team has recruited a junior member of very high quality allowing an enlargement of the research activities to the calculation of correlation functions in spin chain models.

The group is very dynamic, all its members publishing in high-level international journals. It has good national and international collaborations, resulting both from personal relations and involvement in national (ANR) and European (TMR) networks. Its worldwide visibility is reflected in regular invitations to international conferences and seminars.

The small size of the team is partially compensated by a regular hiring of post-docs, a practice that has to be carried on. However, the number of PhD theses is rather low. This is in part due to the highly technical nature of the domain. The group has to be vigilant on this point: a PhD student has been appointed this year for the correlation function research activity, but a second (working on the second subject) should be hired in the near future.

The committee rates very highly the recent results on correlation functions in spin chain models, such as the determination of their asymptotic behaviour in the thermodynamic limit. These excellent results are part of a long-term international project into which the group is well integrated.

The group has also obtained very good results in the field of classification of classical (semi-) dynamical structures: this work should lead to new physical models, as suggested in the proposed project on this subject. There may also be some mathematical consequences, as discussed in the project. A long-term project is however lacking in this domain, and the team has to work on this, which could facilitate the elaboration of a project for a PhD student.

Connections between the different research activities of the team also need to be worked on. From discussions with the team members, it seems that this is already being thought about. Similarly, some connections with the LPTM A-team could also be possible. It is again a long-term prospect that would strengthen the laboratory's research profile. The committee is in no doubt that the friendly atmosphere existing in the laboratory will favour these developments.

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Comment on the project “Physique Théorique pour les Biosciences”

Different themes already active in the LPTM, with connections to research in life sciences will be developed in the future project, in the form of a new research team. These themes use sophisticated tools of mathematical physics, with applications in biomedical imagery, folding and entanglement and in complex fluids with biological applications. These subjects are both fundamental and applied and the research teams have already showed their competence in these domains. This development should therefore be encouraged and supported by the laboratory. The success of these projects will require a considerable effort in making contact with more experimental and applied groups in biology and in biophysics. There should also be an effort to coordinate activities in order to construct a unified and identifiable team working on problems in biophysics. Other subjects, such as quantum entanglement and studies of topology seem less well placed in the new organisation. While these themes are also encouraged, perhaps they should appear under different headings in the research project.

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Non noté	Non noté	Non noté	Non noté	B

“Modélisation stochastique des grands systèmes”

The results of the research assessment for 2006-2008, for the group « Modélisation stochastique des grands systèmes » is positive : for the most part the objectives were realized, as the scientific production for the team as a whole clearly shows. A diverse set of subjects were studied: phase transitions, foams, interfacial dynamics, signal processing and stochastic processes. This richness is based on the group's knowledge and competence in exact results, probability theory, topology, large deviations and mathematical aspects of information theory. These skills are, in our opinion, the strong points of the team. A second strong point is the teams participation in a well established network of international collaborations. The project for the next four years is built around four different directions: the dynamics of surfaces and interfaces, divided media, exact results and mathematical techniques in signal processing. This project is a natural continuation of the group's activities, but it also proposes new directions of study, notably towards biology and models of population genetics. In order to maximize the impact and visibility of the team, we encourage the development of stronger links and collaborations, both within the LPTM and with other laboratories in the Paris region. For this reason we strongly recommend the continuation of the international conference « Inhomogeneous Random Systems » organised by the group at the Institut Henri Poincaré, despite possible budget restrictions in the near future.

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B	A	B	Non noté	B



LPMS

The Laboratoire de Physique des Matériaux et des Surfaces is a small team of experimental physics made up of two « maîtres de conférence », one « professeur » and one « professeur emerit ». Technical support is provided by one technician and one engineer, both working part time for the laboratory. Subjects studied are i) semi-metallic oxydes, ii) diluted magnetic semi-conductors, iii) quasi-crystals. The main goal of this research is the understanding of the electronic, magnetic, structural properties of these materials. The groups activities are based on “in house” experiments using angularly and spin resolved photoemission techniques on samples prepared by MBE epitaxy in their own chamber, as well as and on numerous synchrotron radiation experiments using beam time at large installations (BESSY, SLS, ELETTRA, ALS). The team is also implied in the photoemission beamline CASSIOPEE in SOLEIL.

The groups are responsible for numerous high quality publications and oral presentations during the past four years on difficult and up to date research subjects. Many collaborations, at the national and international levels have been developed, mainly with groups using synchrotron beamlines. A breakthrough has been obtained in the analysis of the semi-metallic character of LSMO compounds, using the resolved photoemission technique. A theoretical interpretation of the results has also been proposed in the framework of a collaborative PhD thesis with SLS.

Strong points to be mentioned are the cohesion and the skills of this team in electronic spectroscopy techniques (photoemission, absorption, EXAFS); their efficiency in publishing important and timely results and a considerable capacity in setting up permanent collaborations. Another strong point is the implication of the members in the teaching administration of the UCP and in accommodating numerous undergraduate in the laboratory for research projects.

A weak point is clearly the small size of the group. Another is the group dependence on getting beam time at synchrotron facilities. A third point is the obsolescence of part of their “in house” equipment.

The scientific project is based on building a new photoemission experiment using a Ti-Saphir laser as the excitation source. This technique was recently developed in USA and Asia; the interest in it being the improved flux, resolution and sensitivity to volume electronic states, compared to existing techniques. The project is to couple a laser excitation with a spin detection to study highly correlated systems. It is an ambitious project that this team is quite able to bring to completion. However, the successfully developing and running the new project implies that the group would have to simultaneously reduce its synchrotron activity. Even with this change of direction, the group would need extra human resources - a post doc for example.

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A	A	B	Non noté	A

5 • Appreciation of resources and of the life of the research unit

The committee appreciated the agreeable working atmosphere and unity of the LPTM and particularly the excellent working conditions for Ph.D. students in the laboratory. It is hoped that this will be built on in the future to create more internal collaborations.

The committee noted the participation of certain groups in ANR and other financial networks and strongly encourages other groups to participate in future national and international projects.

The committee appreciated the considerable investment in both teaching and teaching administration at Université Cergy Pontoise. Maîtres de Conférences and Professeurs are strongly engaged in the administration of the degree programmes, in the “école doctorale” and in University administration. Despite this investment, most teaching professors are active in research.



6 • Recommendations and advices

– Strong points :

Areas of research that deserve particular mention are condensed matter in the study of cold atom systems and of surfaces, integrable systems, imagery through diffuse X-ray scattering and the surface experiments of the LPMS.

– Weak points :

Not all aspects of the project « theoretical physics for biosciences » are convincingly orientated towards biology or biophysics. This project would be improved by, on the one hand re-enforcing the intent of developing interdisciplinary collaborations and on the other hand by motivating certain aspects, which remain interesting, on purely theoretical grounds.

– Recommendations :

1. The committee remarked the necessity, in the future, of preserving the working conditions of the Maîtres de Conférence and Professeurs that make their research activity possible. Further to this, the committee notes the presence in the laboratory, of senior Maîtres de Conférence who are outstanding in their field and making a significant contribution to the scientific production of the laboratory. The committee advises the University to make every effort to provide a future for such researchers in the laboratory by opening Professeur positions to which they can apply.
2. The committee discussed in great detail, the proposed fusion of the LPTM and LPMS into a single unit. The committee does not recommend this project in the form proposed although it does understand the desire of the University to absorb the LPMS, which has only four permanent members, into a larger structure. There is no scientific basis for the fusion as no scientific links exist between the two laboratories and no groundwork has been done to try to create them. In addition, the two laboratories are located on different sites and there are no plans or possibilities for creating a single site. The committee therefore recommends that a different solution be sought. In the long term, some scientific connections could be made through the nano-physics and surface sciences activities of the LPTM but this will require motivation and interest from both laboratories. This recommendation is, on no account, a reflection on the scientific activities of either the LPTM or the LPMS. On the contrary, the committee stresses that it found the research performance of both parties to be highly satisfactory. The committee does, however recommend strengthening relations between the LPTM and the mathematics laboratory “Analyse Geometrie et Modélisation”. There seems to be good scientific grounds for this project based on the activities in mathematical physics and integrable systems.

Note de l'unité	Qualité scientifique et production	Rayonnement et attractivité, intégration dans l'environnement	Stratégie, gouvernance et vie du laboratoire	Appréciation du projet
A	A	A	A	B

LA PRESIDENCE

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Prof. Peter HOLDSWORTH
ENS Lyon
Président du comité d'évaluation AERES

Réf. : FMC/FG/HTD/KH - 09_500324

Cergy, le 21 mars 2009

Affaire suivie par : Pauline Dreux-Palassy
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Objet : Remarques de fond sur le rapport de l'AERES des laboratoires LPTM - UMR 8089 et LPMS EA 2527

Monsieur le président,

Veillez trouver ci-dessous les remarques des directeurs de ces deux unités : Hung The Diep (LPTM) et Karol Hricovini (LPMS) ainsi que celles de l'université.

Hung The Diep (LPTM) :

« Nous apprécions la justesse de l'analyse faite par le comité de visite de l'AERES. Le rapport reflète bien les activités du LPTM aussi bien sur le plan scientifique que sur le plan d'organisation, nous estimons cependant que les points suivants nécessitent quelques précisions et commentaires :

1. Sur le thème "modélisation stochastique des grands systèmes" : nous regrettons la place insuffisante accordée à l'analyse des activités du thème "modélisation stochastique des grands systèmes". Nous avons également relevé plusieurs contre-sens portant sur le fond de la thématique, et à ce titre particulièrement malencontreux : l'emploi de "résultats exacts" au lieu de "résultats rigoureux" et l'allusion au "traitement du signal" alors qu'il s'agit de "traitement de l'information". Nous souhaitons vivement que ces aspects du rapport soient améliorés.

2. Sur les biosciences :

Nous rappelons ce qui est écrit dans le projet : "Le thème 2 regroupe les activités de physique théorique qui ont pour finalité des applications dans les bio-sciences. Il concrétise une démarche du LPTM pour faire déboucher une recherche en amont riche en structures mathématiques abstraites et en concepts physiques complexes sur des conséquences exploitables à un niveau susceptible d'intéresser le milieu industriel. Quatre directions de recherche ont été définies dans cette optique pour la période du prochain contrat quadriennal 2010-2013. Elles visent donc à développer le côté attrayant -à travers la mise en œuvre d'applications au monde réel- de la physique théorique à la fois pour la formation doctorale comme pour le monde économique.

Leur formulation est le résultat d'une réflexion menée par les chercheurs regroupés dans cette thématique, à partir de leurs domaines d'expertises respectifs en physique théorique. Elles représentent donc une évolution naturelle et cohérente, visant maintenant une finalité commune plus appliquée de leurs activités précédentes. De plus, comme nous allons voir, ces axes proposés de recherche affichent une cohérence méthodologique qui repose sur une approche « géométrique »

susceptible d'apporter un éclairage nouveau par rapport aux approches conventionnelles et donc propice pour générer des applications innovantes.

Notre commentaire: C'est bien la physique mathématique et numérique ayant "pour finalité des applications en biosciences" que nous faisons. Nous ne faisons pas la biologie, mais des sujets en biosciences telles que le repliement des protéines, les canaux trans-membranaires (pour ne citer que ce qui a été étudié par Ch. Oguey et JérémY Esque). Le comité n'a pas non plus relevé les 2 (au moins) publications avec des biologistes, des expériences de RMN, des complexes ADN-protéines très concrets (papillomavirus par exemple).

Nous ajoutons enfin que c'est une nouvelle thématique du laboratoire dont les buts se modifieront au fur et à mesure qu'elle se développe. C'est un pari pour les 4 ans à venir. Bien évidemment au fur et à mesure de ces développements les contacts nécessaires avec les disciplines pertinentes en biosciences seront développés, comme ils le sont déjà en imagerie.

3. Un petit nombre de sujets étudiés au LPTM tels que les membranes n'ont pas été abordés. »

Karol Hricovini (LPMS) :

« Le rapport du comité sur LPMS est juste et pertinent, et nous en remercions le comité. Nous actons bien volontiers du caractère ambitieux du projet de photoémission avec laser et du fait que cela suppose l'abandon d'une partie de l'activité sur synchrotron. Nous notons en réponse qu'un tel projet impliquera la venue au laboratoire de collaborations (nationales et internationales), et donc renforcera l'activité scientifique sur le site. »

Hung The Diep (LPTM) et Karol Hricovini (LPMS) :

« Nous regrettons que le projet d'association n'ait pas été retenu par les membres du comité d'évaluation. Les laboratoires prennent acte de l'avis défavorable mais ils s'efforceront de créer des liens scientifiques lors du prochain contrat quadriennal »

Université :

Pour sa part, l'université remercie également le comité pour son écoute et pour la qualité de son rapport. L'université est satisfaite de voir ainsi mise en avant la dimension internationale de certaines directions de recherches de ces unités et elle souhaite que s'intensifient les liens avec le CNRS.

Concernant l'unité LPTM, l'université note que suite aux recommandations de l'AERES, un poste de professeur a été ouvert au concours 2009 pour le LPTM.

Concernant le LPMS, l'université est satisfaite de son évaluation très positive et souhaite qu'une solution institutionnelle soit trouvée afin que cette unité puisse continuer à développer sa science dans de bonnes conditions. Elle regrette que la solution proposée d'intégrer le LPTM n'ait pas recueilli l'assentiment du comité. Si l'université n'a pas minimisé dans sa lettre introductive à la présentation des laboratoires l'absence de collaborations scientifiques entre ces deux équipes, elle mettait néanmoins en avant la pertinence d'un rapprochement entre physique expérimentale et physique théorique au sein d'un département de physique à ce jour divisé. Elle en appelle désormais au ministère pour régler la question, sur la base cet avis de l'AERES et de l'évaluation à mi-parcours du LPMS rendue par la DGES début 2008 et qui préconisait l'intégration de l'unité dans une structure plus grande.

Recevez, monsieur le président, mes salutations distinguées,

La présidente


Françoise Moulin Civil

