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

Section des Unités de recherche

AERES report on the unit

Institut des Nanosciences et Cryogénie - INAC

University or school

CEA

CNRS

Université Joseph Fourier - Grenoble

INP Grenoble

July 2010

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

Section des Unités de recherche

Rapport de l'AERES sur l'unité :

Institut des Nanosciences et Cryogénie - INAC

Sous tutelle des établissements et organismes

CEA

CNRS

Université Joseph Fourier - Grenoble
INP Grenoble

Le Président
de l'AERES

Jean-François Dhainaut

Section des unités
de recherche

Le Directeur

Pierre Glorieux

Juillet 2010

Unit

Name of the unit : INAC

Requested label : IFR

No. in case of renewal : UMR CNRS 5819, UMR CNRS 8191, FRE CNRS 3200, UMR-E A971080, UMR-E 9001, UMR-E 9004

Unit director : Mr Engin MOLVA (assistant directors : Mrs Armelle MESNARD and Mr Yves SAMSON)

Members of the expert committee

Chairperson :

Mr Marc DRILLON, IPCMS, Strasbourg

Reviewers :

Mr Frédéric PETROFF, UMR CNRS-Thales, Université Paris Sud

Mr Wolfgang WEBER, IPCMS, Strasbourg

Mr Jean-Yves DUBOZ, CHREA, Sophia Antipolis

Mr Andrei POSTNIKOV, Université de Metz

Mr Jean DAILLANT, IRAMIS/CEA, Saclay

Mr Ian ROBINSON, Centre for Nanotechnology, London

M. Henrik RONNOW, EPFL, Lausanne

Mr George PICKETT, Physics Dept, Lancaster

Mr Lazlo FORRO, EPFL, Lausanne

Mr Bernard PLAÇAIS, ENS Ulm, Paris

Mr Bruce SWINYARD, RAL, Cardiff

Mr Didier GOURIER, ENSCP, Paris

MrJean WEISS, CNRS, Strasbourg

Mr Mario RUBEN, Forschungszentrum Karlsruhe

Mr Daniel GUILLON, IPCMS, Strasbourg

Mr Ulysse ASSELINE, CNRS, Orleans

Mr Marco MASCINI, Chemistry Dept, Florence

Mr Karsten MEYER, Chemistry Dept, Erlangen

Reviewer(s) nominated by the staff evaluation committees (CNU, CoNRS, CNAP, CSS INSERM...) :

Mrs Christine LEROUX, représentant le CNU

Representatives present during the visit

Scientific delegate representing AERES:

Mr Claude LECOMTE

University or School representative :

Mr Jean-Philippe BOURGOIN, CEA, Direction des Sciences de la Matière

Mr Giancarlo FAINI, DAS-CNRS, Institut National de Physique

Mrs Pascale BUKHARI, Déléguée régionale du CNRS, Alpes

Mr Joel CHEVRIER, VP recherche adjoint, UJF, Grenoble

Research organisation representative :

Mrs Annick N'GUYEN, CEA/Direction des Programmes

Mr Jean-Paul VISTICOT, CEA/Direction des Sciences de la Matière

Report

1 • Introduction

- Date and conduct of the visit :

The evaluation of INAC was held from Monday, February 22, 2010 at 1:30 pm to Thursday, February 25 at 12:00. The documents made available to the committee – scientific report for the evaluation period (2005-mid 2009), detailed analysis per team, quantitative data related to the staff, budget, collaborations, industrial relationships, scientific project – have enabled to accurately assess the overall activity of the laboratory and its scientific impact.

The beginning of the visit was dedicated to the presentation of INAC (scientific report and project) by the institute director followed by the exposition of the 6 laboratories by the team leaders. These presentations gave rise to extensive discussions with the committee on the ongoing projects of the laboratory in the frame of CEA policy and on the synergy with the other institutes in Grenoble.

Then, a visit of the teams was organized by the committee divided into three sub-committes. The sub-committee A composed of F. Petroff W. Weber, J.Y Duboz, A. Postnikov, J. Daillant, Ch. Leroux and I. Robinson has visited SPINTEC and SP2M; the sub-committee B composed of H. Ronnow, G. Pickett, L. Forro, B. Plaçais and B. Swinyard has visited SBT and SPSMS; the sub-committee C composed of D. Gourier, J. Weiss, M. Ruben, U. Asseline, D. Guillon and M. Mascini has visited SCIB and SPRAM. J.Y. Duboz, B. Plaçais and D. Gourier have been appointed to chair the respective sub-committees. M. Drillon moved between the three sub-committees.

On Tuesday afternoon, the committee met the PhD representatives, then, on Wednesday afternoon, the INAC Laboratory Council and CEA, CNRS and Joseph Fourier University representatives. The last meeting on Thursday morning was a closed door one dedicated to the evaluation synthesis.

The Committee wishes to emphasize the quality of the presentations, the fruitful discussions with the staff, and the hospitality and availability of the direction to meet various demands.

- History and geographical location of the unit and brief description of its field of study and activities :

INAC, which is a multidisciplinary institute gathering six laboratories, is a major actor in Grenoble in nanoscience and nanotechnology. Its expertise covers fundamental research for the information and communication sciences, development of new technologies for energy, physics and chemistry at the interface with biology and low temperature physics and engineering. In that frame, INAC has implemented an ambitious policy to pursue together with major partners in Grenoble medium and large scale facilities (PTA, PFNC, Cryogenic tests, Nanosimulation platforms, beamlines at ESRF, neutron lines at ILL).

The INAC permanent staff consists of 279 people, namely 227 CEA (81.4%), 26 CNRS (9.3%) and 26 faculty members from UJF (9.0%) and INP (0.4%). Among these, 157 are researchers, 42 engineers and 80 technicians and administratives. Further, the institute hosts about 110 PhD students and 45 post-docs. Among the 157 researchers, 80 are HDR.

In the last 4 years, 63 permanent staff members joined INAC staff (70% are from CEA, 16% from CNRS and 14% from UJF).

The institute gathers 6 laboratories/services (UMR or FRE), each being divided in research teams, namely :

- Cryogenic Engineering (SBT) consisting of 3 teams.
- Inorganic and Biological Chemistry (SCIB) consisting of 3 teams.
- Spin in Electronics (SPINTEC).
- Physics of Materials and Microstructures (SP2M) consisting of 6 teams.
- Structure and Properties of Molecular Architectures (SPRAM) consisting of 3 teams.
- Statistical Physics, Magnetism and Superconductivity (SPSMS) consisting of 3 teams.

These laboratories are joint CEA – UJF research units, SPINTEC being further joint with CNRS and INP, SPRAM with CNRS, and SCIB being a FRE with CNRS.

Over the period 2005-2009, the number of PhDs starting every year increased from 25 per year to 35. In the same period, the number of post-docs increased from 30 to 50.

The overall financial resource of INAC, including salaries, amounting to 35 960 k€ in 2008, originated from CEA (71.4 %), CNRS (5.5 %), UJF (3.8 %) and INP (0.1%). External fundings amounted to 6 900 k€ vs 3 179 k€ in 2005.

- Staff : (according to the dossier submitted to AERES) :

N1 : Number of faculty members	26
N2 : Number of researchers from CEA and CNRS	132
N3 : Number of engineers from CEA and CNRS	42
N4 : Number of technicians and administrative staff	80
N5 : Number of non permanent engineers and technicians	3
N6 : Number of post-docs	47
N7: Number of PhDs	107
N8 : Number of HDRs	80

2 • Assessment of the institute

INAC is a world-class institute with a large panel of expertise ranging from nanoscale physics to chemistry and technology to the frontier of biology, encompassing photonics, spintronics, chemtronics, new technologies for energy and health, and cryogenic engineering.

The strategy of the institute to bridge fundamental research and advanced technology in some emerging research fields is very clear and corresponds to national priorities (new materials for energy, nanotechnologies for health, information and communication technologies).

Furthermore, INAC is at the forefront in the low temperature cryogenics and the development of advanced nanocharacterization equipments. It benefits from its unique environment and is strongly involved into the functionning of world-class facilities (PTA clean room, PFNC nanocharacterization Centre, European large instruments for X-Ray and neutron studies).

Among striking advances, one can notice:

- The studies on DNA damages and repair mechanisms.
- The development of spin transfer based RF oscillators using an out-of-plane spin-current polarizer.
- The Bose Einstein condensation of microcavity polaritons.
- The high-Tc ferromagnetism in self-organized Mn-doped Ge nanocolumns.
- The investigation by electron holography of heterostructures to map strain fields.
- The design of polyl(3-hexylthiophene) fibers showing efficient photovoltaic performances.
- The prediction of charge conductivity and mobility in doped graphene materials.
- The occurrence of superconductivity in doped diamond and silicon.
- The coexistence of superconductivity and ferromagnetism in uranium compounds.
- The spin dynamics of geometrically frustrated magnets.
- The delivery of the flight models of the cryocoolers of Herschel space telescope.

Over the reporting period, the scientific output is excellent, namely about 350 articles/year in international journals (around 2.2 articles/researcher/year), 43 book chapters, 444 invited communications in national or international workshops and conferences. In turn, the collaborative scientific production within at least two different laboratories is unexpectedly low (29 articles and 12 invited communications), and should be increased given the complementarities of the teams. Only 6 people are non publishing, partly due to administrative duties.

It should be noted that 192 papers are published in high impact factor journals (IF>6.5) whereas 635 papers are in journals of IF>3. The proportion of papers ranked among the 10% most cited worldwide fluctuates between 20 and 24%, while those ranked in the 1% most cited is close to 2%. Theses results show the very strong impact of INAC scientific production.

A1 : Number of publishing researchers and faculty members (among the staff members referenced to as N1 and N2)	152
A2 : Number of publishing people among the other permanent people N3, N4 and N5	20
A3 : Rate of publishing people of the institute [A1/(N1+N2)]	0.97
Number of defended HDRs since January, 2006	18
Number of defended thesis since January 2006	70

The scientific prizes awarded to researchers demonstrate the very high quality of the INAC achievements (5 prizes from the French Academy of Sciences, the “Science et Défense” prize, 3 prize from OSEO-ANVAR, the Quantum Device Award).

Furthermore, the dynamism and scientific status of the institute is evidenced by its strong involvement in national programs (44 current ANR projects, CNES and ESA contracts) and by its ability to meet industrial demands (12-15 ongoing licences per year). INAC is focusing on fundamental research activities, but it has a proactive policy to valorise results emerging from its research, usually in collaboration with partners. Over the reporting period, this has resulted in the filing of 80 patents. Note that the two start-ups Crocus Technology, created in 2004, and Mellitech, founded in 2005, are major partners of INAC.

Given its scientific objectives and targets, INAC has very strong relationships with the Institut Néel in basic research and is strongly involved in the Nanoscience Foundation and in MINATEC, thus giving a strong coherence to the Grenoble site in nanosciences.

In turn, it is noted from the common papers and projects that the interactions between INAC laboratories are quite limited and should be improved.

INAC has participated in the last three years to FP6 and FP7 european programs, but the relative lack of overseas collaborations is pointed out. An increased funding and networking on the international scene is highly recommended.

The external funding secured by the institute from contracts, amounting to 6 900 k€ which represents 19.2% of the overall resources (about 36 000 k€), has experienced a growth rate of about 15% per year since 2005.

The ratio of PhDs/ permanent researchers is equal to 0.71, which is actually a good figure on the national scale. Considering that the SBT laboratory, dedicated to cryogenics, has a much lower ratio as expected, the average for INAC is a very good value. In many INAC laboratories or teams, this ratio is close to or even larger than 1. The number of post-docs has also increased in recent years due to the increase of the contractual activities. As a result, the ratio of PhDs+postdocs / permanent researchers is equal to 1.02 for INAC, with variation from 0.9 to 1.42 among laboratories.

The scientific project is convincing, combining strength of the ongoing research with much more ambitious objectives. It puts INAC at the heart of some major societal issues in the sciences of communication and information technologies, innovative solutions for energy saving technologies or health and biosensors.

The proposed topics in nanomagnetism and spintronics, chemtronics, photonics, new materials for photovoltaics, fuel cell membranes, energy saving, biosensors, DNA repair and cryogenics are promising.

During the next reporting period, INAC strategy should focus on some important challenges: enhance its recognition at the European scale and links with other laboratories, moreover consolidate the emerging platforms within LETI, LITEN and IRAMIS in nanosimulation and nanocharacterisation.

The declared objective of building a CEA-UJF federative institute to improve the support from the university side appears fully relevant.

Finally, INAC organisation into six laboratories appears pertinent even if the frontier between some teams is not very clear and could have been reconsidered.

- Strengths and opportunities :
  - Outstanding competences in nanosciences and nanotechnology.
  - Excellent fundamental research combined with objective of applications.
  - Excellent quality of the scientific production in high impact journals.
  - Multidisciplinarity and originality of the targeted projects.
  - Very favorable environment in the local and national context (MINATEC, ESRF, LETI, Institut Néel).
  - Involvement in large scale facilities (PTA clean room, PFNC nano-characterization Centre, European large instruments for X-Ray and neutrons).
  - Quality of the staff, and attractivity for young students.
  - Unique competences in low temperature physics.

- Very good level of external funding, specifically from ANR.
- Positioning in the landscape of Grenoble, due to its ability to produce nanomaterials/devices and to provide their characterization.

The evaluation committee has been favorably impressed by the organisation of the institute and by the quality and efficiency of the management.

It became evident from the discussions with the council and PhD student representatives that the overall atmosphere is very good.

- Weaknesses and recommendations :
  - Some laboratories are involved in international programs, but this should become a general objective of the institute. It is recommended to develop stronger links with other leading laboratories in Europe, and, from a general viewpoint, aim at improving the international networking in order to increase external funding.
  - Scientific interactions between INAC laboratories should be improved.
  - High level recruitment abroad must be pursued to increase the international recognition and visibility of the laboratories.
  - Collaborations with industry should be reinforced, for instance in the area of new technologies for energy saving.
  - Running costs including cryogenic and clean-room fees are an increasing load that must be considered in the future, by increasing external fundings.
  - Integration to university teaching programs could be improved.
  - Reinforcement of numerical simulation towards the envisaged level can be recommended.

3. Team-by-team and/or project-by-project analysis

Name of the team : Cryogenic Engineering (SBT)

Name of team leader : Mr A. GIRARD (Deputy Head: Mr L. DUBAND)

SBT staff consists of CEA researchers and engineers (29), UJF reasearchers (1), technicians and secretaries (22). The numbers of PhDs and post-docs are 4 and 2 respectively.

This laboratory has a large pool of expertise in cryogenics under extreme conditions such as cryogenics in space, controlling the heavy and variable heat loads in Tokamaks and in ultra-intense laser environments. These define the research focus of the three groups of the laboratory. Being very technologically based, the output of the groups is not measured by the number of articles in scientific journals but rather by the successful delivery of engineering solutions, good design, the winning of contracts and the technological transfer of laboratory results. The SBT is organized into three teams of equivalent sizes, namely:

- E1 cryocoolers and space cryogenics, composed of 18 enginners and technicians, and 2 PhDs.
- E2 cryogenics for fusion, including 15 permanents (engineers and technicians) and 2 post-docs.
- E3 refrigeration and thermohydraulics, involving 11 permanents (engineers and technicians) and 1 PhD.

- Strengths :

The laboratory is performing excellently, especially in the domain of space coolers, with an overall excellent professional standard of work and the working environment. The SBT is an excellent place to train young engineers.

INAC and the local university and schools should consider the possibility of an undergraduate programme of project work to take advantage of the obvious potential of this resource. Overall SBT is an impressive outfit working at the highest level of professionalism and engineering excellence.

In conclusion, the main strengths are the quality of engineers, the broad range of technical expertise and the good national and European funding level.

- Weaknesses :

There is no obvious weakness of SBT. However, one may note the heavy reliance on external agencies for projects and funding, thus making the group exposed to the external funding climat. One should also take care that the service role does not overwhelm setting the group's agenda.

- Integration in the environment :

The relationship of SBT with the other laboratories of INAC, especially with the SPSMS, relies on a "provision-of-service" basis rather than on a collaborative effort. This could change in the future owing to the convergence of recent developments in space cryogenics toward pulse tube cryocoolers and very low temperature stages with current needs of academic groups working in nanophysics and for applications in nanoelectronics such as single electron devices for metrology. The projects themselves of the teams are driven by the calls/tenders of large national and European programmes, rather than by their own initiatives so that the assessment by the committee of this aspect of the work is difficult.

- Strategy, governance and life of the laboratory :

The global strategy of SBT to develop cryogenics in extreme environement is very good. The laboratory should consider setting up an internal "science" or "new opportunities" committee across the three teams to drive new directions/external opportunites. Also, the education and outreach into local universities/schools could be improved /explored. The laboratory life was found very statisfactory.

SBT E01: Cryocoolers and space cryogenics

The SBT Space Cryogenics Group is one of the world's leaders for the production and manipulation of cryogenic temperature platforms for space applications. The group has a portfolio of expertises covering the whole temperature range down to 50 mK, with capabilities in pulse-tube coolers, sorption systems and adiabatic demagnetization coolers. Relations with industry are good and the group makes a concerted research effort to maintain its position at the forefront of the field to position itself well for the provision of cryogenic services for upcoming missions.

- Scientific quality and production :

The group is one of the world's leading institutes for the development and production of cryogenic coolers for space applications. This is evidenced from the provision of the compact lightweight sub-one-kelvin coolers deployed on the ESA Herschel satellite, technology where this group's experience is clearly among the world's best. The successful transfer of several of the group's technological developments (such as the pulse coolers) to industrial exploitation indicates the group's outward-looking view and the desire to capitalize on the group's basic research. The cryogenic work on microgravity is an interesting developement. The group has a large number of contracts and grants from outside the CEA.

- International recognition and attractivity, local insertion :

The prominent end use of this type of technology inevitably gives the group a very high international profile. The group has developed excellent long-term relationships with major space agencies such as ESA and CNES and other groups across Europe and the rest of the world. This prominence ensures that they are often the first port of call for international groups needing cryogenic equipment and services for application in space.

- Evaluation of the project :

The assessors noted that the group has a policy of actively anticipating the cryogenic needs of future space projects and engaging in preliminary developments in order to be well positioned for providing competitive technology. Current work is directed towards providing the sorption/magnetic cooling system for the SPICA mission (nominated) and the possibility of providing the cooling for the IXO mission, the international X-ray observatory.

- Conclusion :
  - Strengths :
    - The expertise of the group members.
    - The good relations with industry and the space agencies.
  - Weaknesses :

As this is a "provision" group, the necessary need for a series of external customers and thus exposure to the external funding climate.

  - Recommendations :

The assessors thought the group's approach was just about right.

SBT E02: Cryogenics for Fusion

The Cryogenics for Fusion group has a very specific mission, principally for providing very precise delivery modules for inserting fusion pellets into laser confinement and Tokamak installations with extremely high temperature stabilities. This requires a range of relatively narrow but extremely demanding capabilities. In this sense the group is providing a very specific service and cannot be judged on normal scientific output indicators.

- Scientific quality and production :

The highly focused nature of the group's work demands a very specific range of capabilities. The group is essentially commissioned to do the work, which has both civil and defense implications. The insertion of fusion pellets into the various environments, the group is called upon to deal with, requires the marriage of a good knowledge of fusion nucleo-chemistry/physics, highly temperature-stable cryogenics along with very good precision engineering. The assessors judged the work of this group to be extremely good despite the relatively narrow focus.

- International recognition and attractivity, local insertion :

The visibility of the group is high on the national and international levels as indicated by the group's involvement in LMJ, HIPER and JET. Despite being an engineering group, with no scientific researchers, the publication output is substantial also contributing to the visibility. A group member was also awarded the "Science et Défense" 2006 prize by the French Department of Defense.

- Evaluation of the project :

The assessors judged that the work of the group was largely externally directed and thus any consideration of the "Project" was not relevant and this aspect was not assessed.

- Conclusion :
  - Strengths :
    - The expertise of the group members.
    - The good relations with external "customers".
  - Weaknesses :

Heavy reliance on external direction.

  - Recommendations :

Start an intiative looking at a development scale project in pellet injection for inertial fusion like HIPER. Look for at least a small amount of external contract work to broaden team expertise and develop external relations outside of immediate work in cryogenics for fusion.

SBT E03: Refrigeration and thermohydraulic group

The Refrigeration and Thermohydraulic Group works with the design, construction and testing of extremely large cryogenic installations, mostly for large-scale scientific experiments. As a measure of the magnitude of the group's mission, it has been involved in modeling the cryogenic system for the LHC (and one should add, not responsible for the failure thereof). As with all the SBT units, this gives the group a very specific mission largely driven by external "customers". Again the production as opposed to scientific output of the group must be taken into account for assessment.

- Scientific quality and production :

The group's involvement in providing modeling and smoothing of the refrigeration for LHC, JT60-SA and ITER exhibits an impressive capability in large-scale cryogenics which actually perform. This is a unique group with facilities hard to match anywhere else in the world.

- Evaluation of the project :

The assessors judged that the work of the group was largely externally directed and thus any consideration of the "Project" was not relevant and this aspect was not assessed.

- Conclusion :
  - Strengths :
    - Good engineering team well managed
    - Focussed on delivery solutions to "customer" needs
  - Weaknesses :

Direction driven almost entirely by service type role. This leaves the scientific endeavours of the group isolated

  - Recommendations :

To develop beyond the immediate large and long term projects (JT60 and ITER) new academic partners should be sought as soon as possible in the area of the turbulence « facility ».

Name of the team : Inorganic and Biological Chemistry (SCIB)

Name of team leader : Mr P. MALDIVI (Deputy Head : Mr M. BARDET)

SCIB is a joint unit CEA-UJF (UMR-E3) and CNRS (FRE 3200) involving 27 permanents researchers, 15 PhDs and 15 post-docs.

It develops fundamental experimental and theoretical studies in chemistry with connection and applications to biology and health (DNA lesions, imaging for diagnosis), nuclear chemistry (f elements chemistry) and nanosciences (functional and functionalized nanoobjects), with development of advanced magnetic resonance tools (high resolution solid state NMR, Pulsed EPR, etc.). It is composed of three teams: *Nucleic Acids Lesions* (LAN), *Ionic Recognition and Coordination Chemistry* (RICC), and *Magnetic Resonances* (MR). IRCC team was created in 2006 from the fusion of two teams (Ionic Recognition, and Coordination and Chirality).

- Strength :

Overall, the science performed in the SCIB is excellent, all teams being of equal quality. The scientific production was very good during the period (between 55 and 65 papers per year, averaging 2.1 to 2.4 papers per year for each researcher or research engineer. Of particular importance is the number of papers published in high impact factor journals (5 Nature and Nature group, 3 PNAS, 6 Angewandte Chemie, 12 JACS, etc…). 26 % of the papers are in the top 10 % most cited worldwide. Despite the fundamental character of the research, 7 patents were deposited during the period, with 24 extensions to other countries.

The mid term projects are all in the domains of excellence of SCIB, some of them being ambitious, such as the DNP project at low temperature.

The multidisciplinary is a strength of this laboratory and a privilege for students.

- Weakness :

There is no evident weakness of SCIB. However despite the CEA-UJF association, it must be pointed out an unbalanced composition among the 37 permanent staff (29 CEA, 7 UJF, 1 CNRS). Moreover, there is only one academic member who is professor, who belongs to the chemistry department of UJF (all teaching appointees coming from pharmacy and biology departments). The distribution of PhD students is also unbalanced, one team attracting less students than the others. However it can be anticipated that the “Chair of Excellence” recently granted to this team will draw good students.

- Integration in the environment :

SCIB is harmoniously integrated in its scientific environment. It has collaborations within INAC, notably with SP2M (nanowires), SBT (Dynamic Nuclear Polarization project), and especially with SPRAM (OLEDs, quantum dots, Pulsed EPR on polymers, probes for DNA damages). Outside INAC, SCIB has main collaborations with other divisions of CEA (Nuclear Energy, Technological Research, Life sciences) and with local institutes (Institut Néel for Q-bits, UJF for biology and chemistry, Grenoble hospital) and facilities (ESRF, nano-characterization at MINATEC). Outside Grenoble, SCIB teams collaborate with many Universities/Ecoles (ENS Lyon, Marseille, Chimie-Paristech) and hospital/foundations (Lyon hospital, Gustave Roussy, Institut Curie).

At the international level, the teams have collaborations in Europe (EPFL, Fribourg, Karlsruhe, Naples) and America (Lawrence Berkeley Laboratory, Sherbrooke University, La Pontificia in Chile, São Paulo).

- Strategy, governance and life of the laboratory :

The global strategy of SCIB is to develop a fundamental and multidisciplinary research at the best international level, with the three teams being independent for the choice of their collaborations outside SCIB. It is evident that the atmosphere of the laboratory is good. The life of the laboratory is classical, with 2 to 4

seminars per month, a general scientific assembly each year, and external communication via the "fête de la science", a "petit journal" and a website via the webmaster of INAC.

SCIB E04: Nucleic Acid Lesions

- Scientific quality and productivity :

This team provides an excellent quality of research, clearly recognized as being at the best international level, in the field of DNA damages induced by physical and chemical agents that include ionizing radiations, UV light and oxidative stress. Over the reporting period, new topics in relation with human health (DNA-targeting anticancer drugs effects, neurodegenerative diseases) and environmental concerns (nanoparticles) have been also investigated.

The strategy involves the identification of new damages, the understanding of their formation, the study of their repair and the proposal of protection strategies (selenium supplementation). New methods to study DNA damages and repair have been developed. They give access to the quantification of the DNA lesions into intact cells and to the kinetic of their removal. The proposed mechanisms are validated by quantum chemistry approaches. The conformational changes induced by the presence of lesions were also studied by EPR in collaboration with the team E06. DNA repair is also more precisely investigated by parallelized studies on microarrays. The development of the DNA repair microarray has led to 3 patents, showing the global impact of the team activities.

The team reports a large number of publications (137, or 2.4/scientist/year) with an appreciable number in high impact factor journals. It is very active in the training of researchers with a rather high number of PhD defenses over the reporting period (11 PhDs and 7 ongoing) and 4 post-docs. The team shows active participation in national and international meetings (88 invited communications, including 51 abroad).

One start-up was created in November 2005, Mellitech, to exploit the previous research results obtained by the team. This start-up develops activities to design diagnosis and innovative therapy for type II diabetes.

The findings of the team have been acknowledged by the awarding of several prizes to group members.

The scientific activity is supported by 6 ANR grants (2 as coordinators), 2 InCa grants, 2 participations in FP programs, industrial funding and CEA programs.

- Attractivity and integration of the team in its environment :

The team benefits of its excellent reputation in the field of DNA lesions on the international scene. This team also takes full advantage of the scientific environment and the facilities provided by the institute to develop highly multidisciplinary research activities. The multidisciplinary character of the research is highly attractive for the training of PhDs and post-docs. Over the reporting period, the team has also hired three young assistant-professors, 2 from the Pharmacy Department of UJF, 1 from IUT.

- Strategies, governance and team life :

The team has been involved in the organization of three national meetings (in 2006, 2007 and 2009). It is also involved in the scientific animation of the laboratory through the organization of seminars, and joined activities on a regular basis.

The scientific strategy of the team is based on development of comprehensive approaches of chemical problems supported by a strong expertise in oligonucleotide chemistry, the access to a large panel of analytical techniques provided by the institute facilities and the scientific environment. The aim is to maintain the acquisition of long-term expertise driven by fundamental challenges in relation with human health and environment. This visibility attracts many collaboration solicitations including industrial partnerships, favours a very good funding level and allows securing the critical mass.

- Evaluation of the projects :

Three main projects are identified. The first concerns aspects of DNA damage directly related to human health and clinical applications (repair of DNA damages induced by antitumor drugs that target DNA, studies to understand the link between DNA repair and human pathologies, specificity of damaging properties of novel radiotherapy technique). The development of this project is based on a network of already emerging collaborations with teams of biologists and clinicians. The project number two is dealing with environmental concerns. The aim is a better understanding of the genotoxic effects of atmospheric pollutants and industrial chemicals in relation with the REACH regulations. This project will be developed in collaboration with Grenoble University, INRA (Toulouse) and Montréal University. The last project concerns the creation of a start-up on DNA repair with applications in two main fields of human health (cancer and ageing). This project has been awarded a prize from OSEO-ANVAR. Internal collaborations with Teams E05 and E06 are also planed.

The quality of the projects is excellent with low risks. The hiring of three young assistant-professors over the reporting period secures the human potential of the team and the orientations of the research programs should provide good opportunities for academic and industrial funding.

- Global evaluation :

Excellent scientific research based on solid fundamental research with efforts towards applied fields.

- Strengths :

Strong internal resources (knowledge, team) and existing excellent international visibility.

- Suggestions :

This team could benefit from an increased international funding.

- Recommendations :

There is no specific recommendation for this team.

SCIB E05: Ionic Recognition and Coordination Chemistry

- Scientific quality and productivity :

This team provides an excellent quality of research concerning both the selection of research topics and results. It has acquired an extremely solid reputation and expertise in coordination chemistry with a particular emphasis on the structure-property relationships in lanthanide complexes. While excellence is maintained on established topics, emerging activities also appear promising and will provide solid basis for innovative projects.

Taking advantage of expertise in the design of ligand architectures, interesting turns have been taken into the application of grafted lanthanide complexes or porphyrins for the development of hybrid molecular memories, lanthanide-based OLEDs, and coordination of biologically relevant metals. The significant amount (6) of patents (FR, EU and WO) is a good indicator of the global impact of the team activities.

The team reports a significant amount of publications (93, or 1.6/scientist/year) in mostly high impact factor journals. It is very active in the training of researchers with a rather high number of PhD defences over the reporting period (7 PhDs and 6 ongoing). The team also displays a high activity in communication, with 19 invited conferences in meetings and 41 oral communications (including local meetings).

- Attractivity and integration of the team in its environment :

The team benefits of its excellent global reputation on the international scene that initially originates from the expertise in lanthanide coordination chemistry. This team also takes full advantage of the scientific environment and the facilities provided by the institute to develop highly multidisciplinary research activities.

The steady number of past and ongoing PhDs demonstrates the excellent attractivity of this team which should be increased by emerging topics. It should be emphasized that the multidisciplinary character of the research is highly attractive for the training of PhDs and post-docs.

One acknowledges a significant external funding and activity in national (ANR) and international (FP6) programs and good proportion of external funding, that could be however significantly improved on the international scene (outside Europe).

- Strategies, governance and team life :

The team offers an active communication policy and animation through the organization of seminars, and joined activities on a regular basis.

In terms of strategies, the team presents a good balance between strong established research topics and emerging new topics (e.g. grafting lanthanide complexes) which confirms an excellent tendency to explore new orientations and also illustrates fruitful interactions with the environment.

The team does not comprise teaching appointee(s). Some group members are involved in teaching for a modest contribution.

- Evaluation of the projects :

The global quality of the projects is excellent. Several challenges are identified and priorities will certainly need to be fixed according to the general policy of the institute and individual interests of the team members. However, projects transverse to the team appear more attractive as they rely on existing excellence and require less financial investment. On the long term, the team members are quite young and have nice perspectives. The development of some of the projects does not only depend on institutional money, but also, to some extent, on international funding. The projects also offer a good low/high risk balance.

- Global evaluation :

Excellent scientific research based on solid fundamental research with efforts towards applied fields.

- Strengths :

Strong internal resources (knowledge, team) set the base for strong track record and enhancement of the existing good international visibility.

- Suggestions :

This team could benefit from an increased funding and networking on the international scene (outside Europe) based on its excellent recognition.

- Recommendations :

A strong support to the team activities is highly recommended.

In the scope of the joined institute with UJF, the hiring of a teaching appointee (in the Chemistry Department of the University) may be extremely valuable for both the team structure and activities.

SCIB E06: Magnetic Resonances

- Scientific quality and productivity :

Excellent team with recognized expertise in NMR/EPR including instrumentation and advanced numerical calculation. The scientific projects are very broad, from coherent spin control for quantum information to molecular magnetism, geometrical aspects of DNA damage, structure and dynamics of bacterial cell walls, nanosciences, degradation of archaeological materials, etc…This variety of themes may give the feeling of scientific dispersion. However the optimized control of concepts and advanced methodologies in various magnetic resonances techniques leads to highly visible papers. We note a regular increase of the scientific production, with

a constant growth of papers with high impact factor (2 Nature, 2 PNAS, 4 JACS, 1 Angewandte). We note beautiful results on the analysis of DNA damages by Double Electron-Electron Resonance and on bacterial cell walls by NMR.

The only weak point is the small number of PhD students (1 PhD defence over the period).

- Attractivity and integration of the team in its environment :

The research is conducted in part in collaboration with other teams and laboratories. Grant supports are mainly national: 2 ANR grants, 1 « Chaire d'excellence », one grant from the RTRA « Nanosciences », and participation to the European FP7 program. Additional but limited Industrial contracts were obtained from BioMérieux.

The overall reputation of this team is very good on the international level, due mostly to the expertise in various magnetic resonance techniques and the fruitful association of EPR, NMR and theory.

Compared to other teams of SCIB, the very small number of PhD students is the weak point of this very active team. This can result from the constant decrease of interest of students to physical chemistry. It may be anticipated that the "chaire d'excellence" and the attractivity of several projects will solve this problem.

- Strategies, governance and team life :

The atypical character for chemistry of several research projects, which are clearly out of the standard mainstream in the field, shows a good ability of this team to develop new risky projects and new collaborations. The racy character of some projects should help this group to catch new external grants and PhD students.

Except one associate professor at UJF, the participation of this team to teaching is low, which could explain the small number of PhD students. Teaching is obviously an appropriate way to connect with the student reservoir.

One CEA researcher actively contributes to structuring the French EPR community, and to regular summer schools in the field.

- Evaluation of the projects :

All the scientific projects presented by this team are elegant and (sometimes) risky, and are mainly focussed on methodology and instrumentation. The DNP project is original and very ambitious in the context of nanosciences. Funded by an ANR "chaire d'excellence" 2008, an IEF Marie Curie fellowship 2009 and an IRG Marie Curie 2009, the project is developed in collaboration with SBT in INAC for the low temperature part. This team is at the top level to develop such project in the INAC environment.

- Global evaluation :
  - Excellent dynamic and pluridisciplinary team.
  - Several projects are ambitious and clearly out of the mainstream in chemistry.
- Strengths :
  - Multidisciplinarity and originality of the projects, quality of the publications.
  - The well recognized expertise makes this team the cornerstone of a broad collaboration network.
- Suggestions :

In order to avoid a scientific dispersion resulting from the variety of projects, it is of utmost importance to hire Master and PhD students.

- Recommendations :

The main recommendation is to attract more PhD students.

Name of the team : Spintronique et technologies des composants (SPINTEC)

Name of team leader : Mr A. SCHUHL (Deputy Head : Mr B. DIÉNY)

The SPINTEC laboratory is made of a single team. It is evaluated as team 07, and also as a laboratory.

The permanent staff amounts to 15 researchers (7 CEA, 4 CNRS, 2 UJF, 1 INP, 1 RTRA) and 7 Technician/Engineers. The non permanent staff includes 15 PhDs and 9 post docs.

- ### Mission and activity of the laboratory :

The laboratory SPINTEC has the goal to bridge fundamental research and advanced technology in the field of spin electronics. On the one hand, the frontiers in nanomagnetism and in the field of spin-dependent electron transport are explored, such as the spin-transfer torque effect, domain wall motion in perpendicular magnetized samples, the spin-dependent transport at the ferromagnet/silicon interface, and the perpendicular magnetic anisotropy at magnetic metal/oxide interfaces. On the other hand, it is the goal of SPINTEC to develop new paradigms and designs for future spin electronics devices, such as magnetic multilevel storage, thermal assisted magnetic memories, spin transfer torque writing in thermally assisted magnetic memories, and hybrid CMOS/magnetic logic circuits. A part from this mostly experimental and technical work, there is also a group of theorists working on micromagnetism and their application to spin electronics devices. The group is very close to the experiments and delivers a lot of precious information for a better understanding of the experimental results.

- ### Scientific quality and production :

After having visited SPINTEC one comes to the conclusion that the goal of bridging fundamental and applied research has been completely achieved. This is shown in an impressive way, firstly, by the important number of publications of high quality (2 publications/researcher/year) both of fundamental and applied character, secondly, by the important number of patents (23 in the evaluation period), and thirdly by the creation of CROCUS Technology in 2004, which is supposed to create the next generation MRAMs.

- ### International recognition and attractivity, local insertion :

SPINTEC has an excellent international recognition. This is proved by 34 invitations to international conferences, a large number of international collaborations with academic and industrial laboratories, and its capability to attract high level researchers. In fact, 8 well-recognized experts in spin electronics could be attracted during the evaluation period.

The laboratory is also very attractive for PhD students and post-docs. In the reporting period 13 PhD thesis were defended. At the moment, there are 15 ongoing PhD thesis and 9 post-docs working at SPINTEC. Thus, the ratio (non permanent/researcher) is 1.6, which is extremely good on the national level.

The external funding of the laboratory is very good. In the reporting period 20 projects were funded: 10 ANR grants, 2 RTRA, 5 European projects, 3 industrial fundings by Seagate, Headway and mostly CROCUS Technology (1.2 M€). In addition, SPINTEC has been awarded a senior ERC chair, showing the high visibility of the laboratory.

The integration of the laboratory in its environment is excellent. There are strong collaborations with the other laboratories of INAC, with Institut Néel from CNRS, the nanoscience foundation, and PTA.

Particularly important are the collaborations with LETI and CROCUS Technology.

- Evaluation of the Project :

The six scientific projects combine solidity of the ongoing research with much more ambitious research. Apart from challenge 4 (self consistent modelling of micromagnetic dynamics and spin-dependent transport), which is proposed by the theorists' group, the final goal of all projects is application. Challenge 2 (mastering spin transfer driven large amplitude magnetization dynamics: towards spintronics based frequency synthesis), challenge 3 (ultimate scalability with low power thermally assisted spin transfer torque in perpendicular magnetization MRAM cells), and challenge 5 (domain wall manipulation: from theory to applications) are based on the large experience the team has already acquired in the last years on the spin transfer torque effect, on thermally assisted magnetic memories, and on the domain wall motion in perpendicular magnetized samples.

A completely new topic is challenge 6, in which new functionalities of magnetic particles will be explored for biological applications. As central project of SPINTEC - at least for the next evaluation period – appears challenge 1, which concerns the realization of hybrid CMOS/magnetic devices. Within this project SPINTEC is part of a larger consortium in France, comprising SPINTEC, CROCUS Technologies, LETI, IEF, LIRMM, and CMP. It is emphasized that there exist only two consortia in the world that are active in this area; the other is in Japan. The goal of this project is very ambitious but reachable for the team. It should be mentioned that this project is backed by a recently obtained ERC senior grant (5 years project, 2.5 M€, 19 man-year manpower).

- Management, life of the laboratory :

SPINTEC is organized around 4 thematics: mass storage, semi-conductors /magnetic hybrids, MRAM&Logic devices, and spin transfer. However, the majority of actors are contributing to more than one thematics, so that these ones do not correspond to teams. These thematics can find a good support from transversal activities such as functional materials, characterization, the PTA, modelling & theory, and instrumentation. This matrix organization finds its roots in the creation of the laboratory. It proved to be efficient and well suited to the mission of the laboratory, and is still in place. We had the feeling during the visit that the management around this organization was good. In the future, the thematics will be modified to become: advanced nanodevices, recording & sensors, MRAM & Logic devices, and spin torque oscillators. This shows the flexibility of this organization, which can rapidly follow changes in the scientific directions.

The laboratory life appears to be well organized and active, with seminars of different kinds.

- Conclusion :
  - Strengths and opportunities :
    - Very good quality of the staff.
    - Very favourable local environment (MINATEC, ESRF, PTA, PFNC, LETI, Institut Néel).
    - A clearly defined mission.
    - Results are highly valued through CROCUS Technologies.
    - High international visibility of the Grenoble site.
  - Weaknesses and threats :

None identified.

  - Recommendations :

Stay focused on a few subjects so as to maintain a critical mass on each one.

Name of the team : Physics of Materials and Microstructures (SP2M)

Name of team leader : Mr J.M. GERARD (Deputy Head : Mr P. BAYLE GUILLEMAUD)

SP2M gathers 63 permanent staff and 45 non permanent members. If we add up the members of the joint team coming from Institut Néel - CNRS, the permanent staff reaches 80. It is the largest laboratory of INAC, and represents 22% of the permanents staff members.

The SP2M laboratory is made of 7 teams. Two of them (NRS+SGX) were evaluated as a single entity, team E12.

- Scientific quality and production :

The scientific quality of the laboratory can be first estimated from the quality of its teams considered one by one. In general, the scientific quality of the staff is very good, with slight variations from teams to teams. The scientific production varies significantly (factor of 2) among the teams. While some teams have an outstanding production, others are producing much less. Even if it is not obvious to compare the production of teams working in different domains, it is nevertheless clear that an effort has to be made by a small part of the laboratory to meet the production level of the rest (largest part) of the laboratory.

Of course, the scientific quality of a laboratory must also be evaluated from a more global perspective and by looking at the coherence between all activities and the general impact. SP2M has recently modified its activity to move towards nanoscience with a special emphasize on nanowires. All the teams are now working in this area, with an impressive consistency. Hence, the added value at the level of the laboratory is clear. Hence, the scientific value of the laboratory is larger than the average value of its teams. Hence, it is excellent.

- International recognition and attractivity, local insertion :

The international recognition of the laboratory as a whole is very good. However, some important variations can be found within the laboratory. Some teams have a reduced visibility, with very little international collaboration, while others are extremely visible. The low visibility teams are those with a lower scientific production that have been mentioned earlier, they represent a small part of the laboratory. This weakness has been identified by the management and will likely be corrected in the near future.

Concerning the local insertion at the laboratory level, one must take into account the collaborations between teams. These collaborations are based on scientific exchanges and are numerous. In addition, SP2M has strongly contributed to the build-up of facilities (PTA and PFNC) that are operated and used by many of its teams (and other teams outside SP2M as well). The achievement of the facilities is definitively a brilliant success of this laboratory, and very positively reinforces its status.

- Evaluation of the project :

The project mixes continuity and changes with a good balance. First, given the good success of the present activity, one would not understand drastic changes. Second, this laboratory operates sophisticated and costly equipments (PTA, PFNC, epitaxy,…etc) which imposes some continuity. Third, this does not prevent some new subjects to emerge as can be seen in the report on each team. Teams which have been mentioned earlier as less visible and producing (again they are a minority), have a good project which should help to improve their status.

The objectives of the project are in general not precisely defined, which is expected in basic science: global trends are defined (sensors, energy, interface with biology, nanowires). Hence the project is realistic and is a good project for fundamental research.

Again, we observe that the project is consistent at the laboratory level. The use of the facilities, or of the simulations, has been organised at the laboratory level, even if the challenges of the project are written in such a way that only 4 out of 14 are shared by more than one team.

- Management, life of the laboratory :

The management at the level of SP2M has been very active in building the facilities (PTA and PFNC) and operating them. Concerning the characterization, a certain compromise has to be found in the localisation of tools with the PFNC. A total localisation of tools within the PFNC allows SP2M to buy the most sophisticated equipments but tends to weaken the relation between the scientific thematics and characterization. The delocalisation of tools allows for a good coupling between the scientific thematics and the characterization but does not allow the laboratory to acquire modern and expensive equipments. The SP2M management has succeeded so far in maintaining this compromise.

As far as the laboratory life is concerned, one can regret that the laboratory is split on two geographical sites with a distance of about 1 km between them. Life seems to be more organized on the level of teams than at the level of the laboratory. While this is regrettable, it is also unavoidable in large size laboratories. In addition, many actions are taken at the INAC level in terms of communication ("feuille rouge" bulletin) so that one can understand that lesser actions are taken at the laboratory level. SP2M has also taken similar communication actions at its own level (the "bulletin du SP2M")

- Conclusion :
  - Strengths and opportunities :
    - Very good quality of the staff.
    - Very favourable local environment (MINATEC, ESRF, PTA, PFNC, LETI, Institut Néel).
    - High international visibility of the Grenoble site.
    - Large scientific coherence within the laboratory.
  - Weaknesses and threats :
    - Two geographical sites.
    - Some non uniformity among teams for scientific production and international visibility.
  - Recommendations :

Keep the good balance between state of the art characterization performed on best equipments and facilities, and proximity characterization which is essential for developing materials and epitaxial processes on a daily basis.

SP2M E08: Nanophysics and Semiconductors

This team has the unique peculiarity in INAC to be a joint team between CEA and CNRS. Researchers belong to their own institution, INAC-CEA or Institut Néel-CNRS and they work together and share the same pieces of equipment.

In the written report and during the evaluation visit, the SP2M director and the NPSC director were very careful when giving figures to precise whether they were for the whole team or for the CEA part of it only. As the work within this team has been organized as a consistent activity for all actors, we will not separate the CEA and CNRS part in this report and present our conclusion for the team as a whole.

The team includes 25 researchers (8 CEA, 13 CNRS, 4 UJF) and 6 engineers/ technicians for technical support. Given the equipements operated by this team, the technical support seems to be quite small at first glance. The discussions during the visit confirmed that, although the technical support is sufficient, it is critical in the sense that any departure and absence of one technical staff member would immediately lead to a problematic situation.

The team has 28 non permanent people (4 post-docs and 24 PhDs). The PhD/permanent researcher ratio is close to 1, which is the average value in INAC and a large value on the national scale for this domain.

- Scientific quality and production :

The NPSC team achieves outstanding experimental demonstration by exploiting state of the art samples that are fabricated by the team. In addition to epitaxy which has been at an international level for a long time, the team is now able to provide processing at a high quality level thanks to the PTA facility. Hence the full fabrication chain is under control and at the top level. This has led to first class demonstrations such as single photon sources, Bose-Einstein condensation, the study of single spin state, intersub-band devices in nitrides, etc. Researches are mainly fundamental, with possible applications in some domains. The team in general limits its action to proof of concept demonstration and rarely device optimisation. The scientific production is large (in average 2.4 publications per researcher per year) and with a high impact level (5 Nature, 16 PRL, 58 PRB, 62 APL in the reporting period).

- International recognition and attractivity, local insertion :

The international visibility is high as can be seen from the number of invited conferences (125) and contracts, including international contracts. 13 patents have been filed. The team has been able to attract high quality students. It has also been able to attract or recruit brilliant researchers (7 from 2005 to 2009) showing its undeniable attractivity on the national and international scale. Prizes have been obtained by some researchers. An international conference has been successfully organized in 2006.

Contractual collaborations have strongly increased in recent years due to the ANR creation and due to the financial pressure. Although this team historically had little connection with industry, a long-term collaboration was established with a Japanese company (now ended). This team is now very strongly involved in the PTA facility with one full time technical support. It also works in close collaboration with the PFNC facility and the LEMMA team. The relation with other Grenoble actors (LETI, ESRF, Institut Néel) is good. Hence, it fully takes advantage of the positive local environment and of the MINATEC development.

- Evaluation of the project :

The project mixes the continuity of existing projects and the emergence of new ones. Lets us point out the clear thematic reconfiguration recently made by the team towards nanowires. Due to the nanofabrication possibilities now offered by the PTA facility, the team will now combine top-down and bottom-up approaches to the “nano” world. Given the good success of the present activity and the associated technological difficulties and costs, it is non desirable to modify the scientific content on a short term. Hence, the project is a realistic project, feasible as it is very broadly defined. Objectives are not precisely defined; however it would be difficult in basic science to define them more precisely. In terms of characterization, it will benefit from the PFNC facility with state of the art tools. This does not mean that other tools should not be maintained. For instance, while TEM at PFNC will be at the highest technical level, keeping TEM based on more usual equipment but much closer to the material expertise will very likely be needed.

- Conclusion :

Excellent team which should not have any problem in the short and mid term future.

- Strengths and opportunities :
  - Very good quality of the staff.
  - Very favourable local environment (MINATEC, ESRF, PTA, PFNC, LETI, Institut Néel).
  - High international visibility of the Grenoble site.
- Weaknesses and threats :

This high tech activity requires large budgets. Any drop in funding would lead to financial difficulties: this is a threat.

- Recommendations :

Material characterization requires sophisticated tools but also expertise based on a good knowledge of the materials and the epitaxy process. Keeping some people doing characterization on more usual equipments but with the highest material expertise can prove as efficient as doing characterization on the most sophisticated tools with an expertise more oriented towards the technology of the tool than towards the material. It will be probably wise to keep a good balance between both types of characterization.

SP2M E09: Silicon Nanostructures and Nanophotonics

This team includes 9 researchers (8 CEA, 1 UJF), 2 Technicians and 7 non permament people (6 PhDs). The PhD/permanent researcher ratio is smaller than the average at INAC, which is however large, so that the figure for SiNaPS is a good value. On the contrary, there is no post-doc, which is more surprising in the present day context of laboratories having many contracts.

- Scientific quality and production :

SiNaPS is carrying out studies on Si based nanostructures, in some cases in relation with LETI. Some impressive achievements were reported such as the record high Q in a 1D photonic crystal cavity. Results on a microtoroidal cavity doped with Er are also interesting. The technological quality is good. However, there are very few new concepts. The inventiveness, the analysis of the context seems not to be at the level of the technological realisations. This team needs to collaborate with other teams (internal or external INAC) in order to fully master its research. Research on GeMn is very interesting and original. It is shared by many INAC teams, in particular the NM team of SP2M. However, it seems that no paper on this thematic has been published in 2009.

SiNaPS is producing less publication than the INAC average. The production over the reporting period is close to 1 publication/year/researcher. The number of patents filed is quite large (5).

- International recognition and attractivity :

Invitations to conferences which amount to 7 for the team and for the reporting period, i.e. less than 0.25/researcher/year, are too few. External funding comes essentially from ANR contracts while collaborations are mainly national. They point to a limited international recognition and visibility. This point is by the way acknowledged by the SP2M management in the project.

On the national level, the strong relation with the “Institut de Bourgogne” on nanophotonics is a clear bonus. The local relation with LETI is also positive. However, it has been noted that the typical response time of LETI is too long for basic research, and SiNaPS starts to use more and more the PTA facility, which will help a lot in developing the technology with short response times. The attractivity of this team in terms of recruitment (permanent or post-doc) seems to be limited.

- Evaluation of the project :

Most of the tools have been bought and installed. The PTA and PFNC facilities are operational, the growth reactors are running and the collaborations are established. Hence, the conditions for developing the project are very good. The nanowire project will move in the direction of biology and energy, which are currently very fashionable. The nanophotonics is going towards sensors (the idea of exploiting high Q cavities with the field intensity maximum in the air between two waveguides is very good).

GeMn nanostructures will be studied in collaboration with other teams, the morphological studies being mainly a SiNaPS thematics, while magnetic properties will be treated by the NM team. Hence the project is quite new and ambitious, although not very precise. The team does not seem to have all the culture and expertise needed to carry out the project by itself, and the support of external teams will be needed. This point is apparently clear for the team itself.

- Conclusion :

SiNaPS can take advantage of very good technological skills and equipments to carry out its research. The team still has to find the exact targets to reach and develop the associated concepts. Collaborations will be important.

- Strengths and opportunities :
  - Very favourable local environment (MINATEC, PTA, PFNC, LETI).
  - Relation with "Institut de Bourgogne".
  - The nanomaterial/biology interface is a good opportunity nowadays.
- Weaknesses and threats :
  - International visibility.
  - Analysis of concepts and context.
- Recommendations :
  - Focus on some topics and improve the knowledge and understanding of all aspects related to the subject, including applications.
  - Exploit collaborations to gain expertise.

SP2M E10: Nanostructures and Magnetism

This team of moderate size (7 researchers, 1 assistant professor, 2 engineers, 2 technicians) has a long-standing experience and an established scientific reputation in the production and the characterization of magnetic nanostructures.

- Scientific quality and production :

The main achievements within the period 2005-2009 are the spin-torque effect on the domain wall propagation, the probing and controlling of exchange bias at the level of a single nanocluster, the ferromagnetism with a high Curie temperature in self-organized Ge-Mn nanocolumns, and the demonstration of spin injection in semiconductors. All these results are highly relevant for the realization of magnetic devices at the nanoscale. The publications are in respected journals and provide a good citation history. However, it should be noted that the most glorious publications (Nature Materials on Ge-Mn nanocolumns, PRL on magnetic clusters, and PRL on domain wall propagation) are published in 2006 and 2007. The steadiness of the scientific production is thus not markedly pronounced. Moreover, the production per year and per researcher is around 1, which is well below the average value of the SP2M laboratory. Three patents were acquired in the evaluation period.

- International recognition and attractivity :

At least five members of the team are demanded speakers at international conferences. The number of PhD thesis defended over the period 2005-2009 is 8, while the number of ongoing thesis is 7, i.e. equal to the number of researchers. A noticeable part of the PhD thesis is done in collaboration with other teams of INAC or Institut Néel. The employment of postdocs and long-time visitors, on the other hand, is rather an exception, which should be intensified in the future.

The team is well positioned within the landscape of INAC and, more broadly, of the Grenoble site, due to its ability to produce nanostructures/devices and to provide their characterization.

The team's participation in scientific cooperations and the ability to attract external funding is on a good level. It should be noted, however, that all the contracts are exclusively on the national level, with no European cooperations, and to a large extent confined to local (inter-Grenoble) cooperations. In this sense, an increase of international visibility is recommended.

- Evaluation of the project :

The scientific projects presume the participation of the NM team in three challenges set by the SP2M laboratory. They reasonably combine solidity of the ongoing research with more ambitious advances. Scientific importance of all the subjects is beyond doubt.

The first topic (challenge 9 of SP2M), related to spin transport and the spin Hall effect, is a collaboration with Thalès-CNRS. The goal is to build novel spintronics devices that do not require ferromagnetic materials or magnetic fields. Special hopes are linked to the recent recruitment of a specialist in this area.

Challenge 10 (confinement effects in GeMn and SiMn nanostructures) is a joint project of NM, SiNaPS, L_Sim and LEMMA. It envisages an extension of previous studies on GeMn and SiMn nanostructures, by concentrating now more specifically on the role of the size confinement, and by using new growth techniques.

Challenge 11 (tuning magnetic properties by an electric field) is in the sole responsibility of the NM team. It envisages two activities: first, tuning of the magnetic anisotropy of FePt thin films by an electric field, and, second, studies of multiferroic materials. For the first part, preliminary measurements of the electric field effect have already been performed. In the second part of the project, two classes of systems will be studied: first, nanometric heterostructures made of intertwined ferroelectric and ferromagnetic materials, and second, oxynitrid perovskites grown under non-equilibrium conditions. The goal of this project is very ambitious but reachable for the team.

- Conclusion :
  - Strengths and opportunities :
    - Long-standing experience, high quality of publications.
    - Good positioning within the landscape of INAC and, more broadly, of the Grenoble site.
    - Interesting and ambitious projects.
  - Weaknesses and threats :
    - Low level of scientific production, as compared to the other INAC laboratories.
    - Lack of steadiness in engaging post-docs and long-time visitors.
    - Limitation of contracts by those on the national level only.
    - Reduced international visibility
  - Recommendations :
    - The employment of postdocs and long-term visitors should be intensified in the future.
    - European cooperations should be sought in order to increase the international visibility.

SP2M E11: Advanced Electron Microscopy

The permanent staff comprises 4 permanent researchers and one technician, all appointed by the CEA; 2 researchers joined the team during the reference period. The non permanent staff is composed by 1 post-doc and 3 PhD students. Over the reference period, 3 Phd thesis were defended.

Two researchers have the HDR degree (one obtained in the reference period).

- Scientific quality and production :

The quality of the research is outstanding, and the accomplishment of the team during the reference period is impressive. The team provided original results in the development of news characterizations methods and tools, related mainly to transmission electron microscopy.

Among the main achievements, one can mention the strain, electric and magnetic mapping in various materials at nm level, with a contribution of the new MEIS device to strain mapping. The team is also involved in resolving the atomic structure of nano-objects, whose physical properties are studied by other teams of the SP2M.

53 papers were published in international journals, half of them in journals with high impact factors (>3). This is an excellent output for a group of 4 permanent researchers. 12 talks were held in international conferences, among them 3 invited talks, and 14 oral communications in national conferences. One has to mention that the number of talks is perhaps higher, as some communications were not identified as being oral communications or posters.

- International recognition and attractivity :

The team provides the structural characterization in the frame of many research topics developed by other teams of SP2M, thus are well inserted in the laboratory. It is also very active in the PFNC facility of MINATEC, created in 2006, and is an essential part of this facility. Through these activities in the PFNC, the researchers have also collaborations inside INAC, and with other laboratories such as LETI or LITEN.

The team has also a national recognition, enhanced in the reference period through their participation in the French national network for electron microscopy, METSA.

The acquisition of the new high resolution EELS TEM and the support of the FEI Company in this project is clearly a strong evidence of recognition and attractiveness.

However, the amount of invited talks in international conferences is lower than it could be, and it seems that there is almost no collaboration with teams from other countries.

- Evaluation of the project :

The project of the team is well balanced, with an ambitious and challenging task on one hand, and research topics already developed by the team on the other hand. The new EELS TEM is expected to provide chemical information at an atomic range. The development of experimental know-how with this unique microscope, along with the development of numerical simulations (in collaboration with L_Sim team) is a long term challenging project. The team will also carry out the development of Dark Field Holography and Nanobeam Electron Diffraction, as well as the characterization at an atomic scale of magnetic nanostructures. The entire project focuses on transmission electron microscopy, and Medium Energy Ion Scattering (MEIS) is barely mentioned.

- Conclusion :

The team leads an outstanding research in transmission electron microscopy and no doubt will further produce excellent results in that field.

- Strengths and opportunities :
  - Very favourable local environment (MINATEC, PFNC).
  - High scientific quality of the team.
- Weaknesses and threats :
  - Small team in terms of human resources, considering the available microscopy equipment and the research topics developed in INAC.
  - The integration of MEIS in a team mainly devoted to transmission electron microscopy is not straightforward.
- Recommendations :
  - The team should develop international collaborations and participation to international conferences.
  - At least one additional permanent researcher should be hired.

SP2M E12: X-Rays for Materials and Nanostructures

This team is composed of 11 researchers (8 CEA, 1 UJF) and 1 technician. 7 non permanent people (5PhDs, 2 post-docs).

- ### Scientific quality and production :

In addition to its own research, the mission of the NRS team is to operate a CRG beamline devoted to surface scattering and white beam micro-diffraction at the ESRF to the benefit of the national and international community. The combination of advanced synchrotron tools with local fabrication facilities at INAC obviously opens wide possibilities and the team has developed original or even unique research axes using synchrotron radiation like the in-situ study of growth mechanisms of semiconductor nanostructures or wafer bonding.

On the more technical side, the methodological developments, like strain and interdiffusion measurements in nano-structures, and white beam micro-diffraction applied to stress/strain measurements are original. It is more difficult to judge the activity of the SGX part whose mission is only service.

Publications reported for the 2005-9 period are of a consistently high caliber. Of the ~75 major publications, there are 5 PRL 26 PRB, 8 APL and one paper in Science plus two patents and 17 invited talks. For a group of 9 full-time researchers, this represents an excellent output. A significant number of the papers, first-authored by external groups, originate from the operation of the CRG facility at ESRF. Based on comparisons with other facilities, there is about the correct ratio of internal self-motivated projects to outside user experiments with contributing/helping authors within the group.

The NRS team participation to national projects is excellent and a significant number of international collaborations are reported (including a RTRA chair of excellence). The strong link to CEA-LETI and SOITEC (wafer bonding) is an excellent example of successful collaboration with industry.

- ### International recognition and attractivity :

The NRS Team is famous for its grazing incidence scattering studies of nanostructure growth mechanisms. The recent work on AuSi eutectic ordering and enhanced supercooling is for example an excellent example of the benefit of running a CRG beamline, as multiple periods of beamtime are necessary to examine a number of samples. It is also remarkable that this activity is well linked with INAC and SP2M priorities.

The SOITEC collaboration is a highly important opportunity that must not be allowed to escape from the group. SOITEC has the patents on the 'smartcut' technology that is likely to make it a very successful company, possibly supplying the raw materials of the whole electronics industry in the future. Building on the patent portfolio is the job of a seamless INAC (fundamental) - LETI (applied) - SOITEC interaction. Many questions need to be answered about the steps involved with smartcut, which are likely to lead to significant improvements in the technology as well as basic scientific insight.

The micro-diffraction facility is unique in Europe. It is a particularly good choice for a bending magnet at ESRF. The technique does not need undulator radiation, but it does benefit from a small source and high energy beams. The beamline has a very broad scope from mineralogy to catalysis and microelectronics.

- ### Evaluation of the project :

In the long term, the responsibility for running CRG beamlines might be considered as a liability, where INAC resources are 'wasted' on providing services to the user community at large. Instead, we recommend the view be taken that the CRGs are a big asset for the following reasons: i) “incidental” publications where the staff members are included in beamline user publications. ii) there is a strong element of leadership by control of the equipment. The optimization and exact configuration gives the home team a big advantage over outside users. The equipment can be used more effectively by those who build and maintain it.

There is a clear opportunity to pioneer techniques and take intellectual leadership of those. The micro white beam Laue diffraction is a good example which has no equivalent in Europe. A big local advantage will follow from developing the technique.

- Conclusion :

  - Strengths and opportunities :
    - High scientific quality of the team.
    - First class synchrotron radiation beamline, with in particular a white beam micro-diffraction capability which is unique in Europe.
    - Collaboration with LETI and SOITEC.
  - Weaknesses and threats :
    - There is a critical mass of personnel needed to run a facility like the CRG beamline. Everyone's productivity will suffer if they are short staffed and unable to handle the burden of outside users. This could happen as active team members have left or are going to retire.
    - Some researchers in the group, possibly more involved in user support, are less active from the point of view of publications.
  - Recommendations :
    - Maintaining an appropriate level of staff should be considered as a high priority. Appropriate funding for future refurbishment should also be secured. It is not optimal that this is done at the SP2M level only.
    - It is strongly recommended to develop internally a strong research program, consistent with other SP2M priorities using the micro-diffraction facility in order to bring the science done on this instrument at the level of excellence of the others. Collaborations with external groups about indexing software in order to identify multiple orientations simultaneously from a Laue pattern could also save time and efforts.
    - The staff members who are publishing less should be encouraged to take the lead on scientific projects that are likely to lead to publication. They should be given the clear message that regular publication is important and possibly given mentoring by more established researchers.

SP2M E13: Atomistic Simulations L_SIM

This team involves 6 researchers (CEA), 5 PhDs and 5 post-docs.

- Scientific quality and production :

Scientific activity of the group covers a broad range of topics related to numerical simulations: 1) development and promotion of efficient *ab initio* code (BigDFT) which uses wavelets as basis functions; 2) development of atomistic semi-empirical method (TB_Sim), to be used in combination with the *ab initio* one in a multiscale simulation; 3) multi-resolution approach for model treatment of magnetic systems. All these components (in different realisations) are highly demanded in computational materials science community worldwide. While comparable approaches can be found, in a different form, under development elsewhere, the unique situation of L_Sim is that it offers a package with which multiple properties of nanosystems (electronic structure, magnetism, and quantum transport) can be addressed. Moreover, an overlap between the results obtainable on different lengths scales is assured. An about ideal balance must be pointed out in sharing the group's efforts between front-end method development (algorithms), work on numerical efficiency (issues of parallelization, hardware tuning) and practical calculations related to different material science problems.

Each of six permanent staff members of this team has his clear domain of specialisation. Yet multiple joint works emerge in different combinations, an indication of flexibility and vividness of the research atmosphere in the group. The number of publications over the reporting period is impressive (42 articles in 2005-2009, including three PRL and four APL). Moreover each member of the team had at least one invited talk at international conferences (some have much more, up to 10). Two patents were filed, one resulting from cooperation within SP2M and the other a product of internal team work, which is a not self-obvious decoration for a theory group.

The group regularly employs postdocs (whose number roughly equals that of permanent staff members) and about the same number of PhD students. This nearly 1:1:1 structure of working forces seems about ideal and performs well in terms of overall scientific productivity and job perspectives of post-docs and PhD students after leaving the group. Such large proportion of post-docs became possible thanks to an impressive portfolio of contracts, which includes academic as well as more applied national and European ones. Large part of the contracts which kept the group afloat expires in 2009 and 2010; however, in view of existing cooperations and high scientific impact, the chances are good for maintaining the external funding at roughly the same level. International cooperations of the group are not excessively numerous but well established (notably with Basel University) and provide a solid basis for research.

- International recognition and attractivity :

The group is well known in European world of first-principles simulations, and has clearly defined profile and visibility. The quality and contents of the Web site of the team is exemplary in INAC (the decision to restructure the institute's web presentation in the sense of that of L_Sim can be therefore welcomed).

The group is perfectly integrated in the research context of SP2M, offering solutions to numerical simulations on different materials and for different problems.

- Evaluation of the project :

In the ongoing research project, L_Sim participates in five Challenges formulated for the SP2M, offering a good balance between a more secure low-risk work and ambitious daring aims.

Challenge 1 (atomistic study of Si nanowires), with L_Sim as the main player, is, in part, a natural extension of previous activities. A sensitive element is, however, a reasonable combination of approaches - *ab initio* / BigDFT with activation-relaxation technique (ART). In case of success, a novel approach is likely to emerge, able to lead to interesting reality-near simulations of catalysis.

Challenge 3 (atomistic Green's functions for transport properties), purely method development, to be done exclusively by L_Sim. The realisation in the frame as intended (with electron-phonon coupling etc.) is not obvious, but ambitious and certainly interesting for both practical ends and methodological progress.

Challenge 4 (nanostructures for energy conversion) involves three INAC teams and external cooperations. The simulation part assigned to L_Sim is, in view of previous experience, rather routine and does not suggest trouble.

Challenge 10 (confinement effects in nanostructures) is joint project of four teams, of quite applied character (growth conditions, characterisation etc.). The unspecified but obvious problems of simulation are, a priori, well suited for an attack by the tools under development by L_Sim; however the real outcome of joint application of experimental and simulation techniques is difficult to foresee.

Challenge 12 (interpretation of EELS results) is an initiative of LEMMA and L_Sim: the measured spectra are to be compared with predictions from BigDFT, that would allow to decipher structural information. A priori the combination is reasonable. Its implementation would demand certain extensions of BigDFT in order to treat inner-shell ionisations. It looks like a long shot, but certainly a daring and interesting one.

Note that with 6 permanent members only, this is a tough program, yet not unrealistic - provided the external support enabling to hire experienced post-docs will materialize at about the same level as so far.

- Conclusion :

The group delivers a top world-class research and provides valuable theory support for research programs run by many teams of the laboratory. The diversity of tasks and efficiency of performance, given a very compact size of the group, is remarkable.

In view of ambitious research program, the suggestion formulated in the Project of SP2M, to reinforce L_Sim in terms of human resources, seems justified.

- Strengths and opportunities :
  - Good balance between methodological development, optimization of algorithms and applied materials research science.
  - Broad scope of complementary competences within the group, flexibility in adapting to new challenges.
  - Good connectivity to experimental environment.
  - Efficient management of work sharing between permanent staff, post-docs and post-graduates.
- Weaknesses and threats :
  - Relative lack of overseas cooperation.
- Recommendations :
  - When orchestrating a development of essentially open-source software packages of potentially broad interest, more effort could be invested in creating a self-supporting impetus in the users' community. Popularisation efforts for BigDFT and TB_Sim can be done somehow more aggressively.

Name of the team : Structure and Properties of Molecular Architectures (SPRAM)

Name of team leader : Mr J.P. TRAVERS (Deputy Head : Mr R. CALEMCZUK)

SPRAM is a joint unit CEA-CNRS-UJF (UMR 5819), involving 24 permanent researchers, 16 PhDs and 16 post-docs.

It develops a multidisciplinary (physics, physical chemistry, chemistry, electrochemistry, biochemistry) fundamental research on molecular, macromolecular, supramolecular and nano systems with applications targeted to information and energy technologies, and to biology and health. It has been recently reorganized and is composed of five teams: *Molecular, organic & hybrid electronics* (LEMOH), *Chemistry for recognition and studies of biological assemblies* (CREAB), *Ionic conducting polymers* (PCI), *Self-assembling & structuration for organic systems* (LASSO) and *Theory*. It seems that the restructuration is not fully achieved, owing to the similarities of the research topics of LASSO and LEMOH on the one hand, and the multiple connections of the *Theory* team with other teams on the other hand. For this reason the research activity of SPRAM is identified around three scientific themes, (i) *Ionic conducting polymers*, (ii) *Chemistry and physics for organic and hybrid electronics*, and (iii) *Dynamics of biological interactions*.

Following the mainstream of Grenoble site towards nanosciences, SPRAM activity progressively and partially shifted to this domain during last years.

- Strength :

On the average, the scientific level and the productivity of SPRAM are excellent, however all teams are not equivalent in terms of productivity (see evaluation of teams). With 234 publications referenced in the web of

science, SPRAM has a mean value of 2.4 publications per researcher per year over the period. 10 % of the papers are published in journals with impact factor larger than 6.5, and 21 % are among the 10 % most cited papers. Two members of SPRAM received national prizes (CNRS bronze medal in 2005 and prize from Académie des sciences in 2008). The valorisation of results is excellent, with 14 patents registered during the period.

SPRAM proposes many good projects, including a transition to technological transfer with the creation of a platform for elaboration and study of model solar cells (in connection with SP2M).

Fund raising from ANR and Europe is very efficient in SPRAM, with 19 ANR projects during the period (5 as coordinator) and 4 European programs in FP6 and FP7.

- Weakness :

The main weakness is an unbalanced productivity between the different teams.

- Integration in the environment :

SPRAM is very attractive for students, as shown by the 24 PhDs defended over the period. The laboratory is well integrated in the local environment.

SPRAM has a well established collaboration within INAC, especially with SP2M (14 publications) and SCIB (7 publications), and with many Grenoble labs and local networks. SPRAM has also an excellent integration in large scale facilities of Grenoble (ESRF, ILL).

- Strategy, governance and life of the laboratory :

The strategy of SPRAM is based on multidisciplinary and relatively independent teams. The life of the laboratory is classical, with internal and invited seminars, and a general scientific assembly each year.

SPRAM E14: Ion Conducting Polymers

- Scientific quality and productivity :

This team has acquired a solid reputation and expertise in the study of transport processes through different membrane materials (by neutron and X-ray scattering, NMR spectroscopy, MS spectrometry) with a strong emphasis of fuel cell testing scenarios. The quality of the research can be considered as good, whereby the topics are typically close to applied research (proton transport water management in organic polymers, comparative aging).

The amount of publications, around 1.0 per scientist per year in mainly medium impact factor journals, is lower than the standard, but an increase of the average IP factor can be observed. The team obtained 5 invitations to conferences, and contributed to 13 oral communications, among them 11 on local (French) meetings. One patent is filed at the moment. The team participates in one European project (FP7) with very limited input (17 k€), and has obtained one industry contract (Nissan, 84 k€).

In conclusion, the scientific standards, in both quality and quantity, could be significantly improved.

- Attractivity and integration of the team in its environment :

The team benefits from a solid reputation on the French level, but has only limited impact to international scene. Part of the competences relies on the in-depth research integration with the large-scale infrastructure of Grenoble (collaborations with CEA-LITEN-DTH, CNRS-LMOPS, LEPMI). The impact to industry is rather good, but has led only to one patent. A low number of only PhD theses (4 PhDs defended over the four year period) contrasts strongly with 5 attracted post-docs during the evaluation period.

E14 exhibits a remarkable success as regards French awards: (1) Emilia Valori Award of the French Academy of Sciences, (2) Saint Gobain Award to one young researcher, (3) award of the "French Club of Membranes" to one PhD student.

- Strategies, governance and team life :

Due to close proximity to applied research, in terms of strategies, the team takes only limited risks in the ongoing research. In future, an increased scientific dynamics exploring new scientific orientations could be achieved by the integration of new group members with appropriate competences (partially on-going) and by strategic changes in the research policy (as proposed during the visit e.g. energy storage). Rather well integrated in the academic environment; the team comprises 2 teaching appointees on the list of members.

- Evaluation of the projects :

The projects are related to applied problems concerning new technologies of energy and especially those related to fuel cell technology. The three proposed challenges 1-3 are thematically very close and could be partially merged. In order to take increased profit of the excellent integration of the team into the large-scale environment at the Grenoble place (e.g. neutron scattering), the evaluation committee supports the proposed introduction of new research directions related to energy storage devices. However, due to the high competition in that field, the envisaged new scientific projects have to be defined in more detail and the local competence may need to be strengthened by strategic recruitment actions or collaborations.

- Global evaluation :
  - Good scientific research based on solid fundamental research and strong entanglement with applied fields.
- Strengths :
  - Solid internal resources (knowledge, team) enhanced by the very good integration of the large-scale facility based research .
- Suggestions :
  - This team could achieve an increased research dynamics by taking strategic decisions redirecting the research towards new topics (e.g. energy storage).
- Recommendations :
  - To achieve an increased scientific production, strong support to the team in the scientific redirection process is highly recommended. Towards this end, new research goals have to be defined, their feasibility has to be examined in the light of the local specificities, and, eventually, the local expertise profile has to be adapted.

SPRAM E15: Hybrid Organic Electronics

- Scientific quality and productivity :

This group reports an excellent research work taking advantage of a strong synergic collaboration between chemists and physicists. Significant contribution to the understanding of structural parameters controlling the physical properties of self-assembled materials involved in molecular electronics. Fluorenone based materials and P3HT structuration are very nice, as well as InP/ZnS nanoparticles synthesis and the H-bonding grafted linkers on silicon. We note a high number of papers (144, *i.e.* about 3 publications per researcher per year), a high quality of publications in high impact journals, and a fast citation for the majority of articles. 9 PhD theses have been defended over the last four years.

The group exhibits dynamic and active research of external funding, with 8 ANR grants (3 as coordinator) and 3 participations in FP programs. These financial supports have been obtained regularly along the period but the corresponding amount of these external resources decreases with time.

The 15 patents during the period give a high added value potential. This is a very important output for the team research.

Two distinctions have been awarded to group members and the team members show active participation in international meetings.

- Attractivity and integration of the team in its environment :

A positive evolution of the structure in agreement with previous recommendation in terms of thematic mobility of the researchers is observed. Nevertheless, collaborations seem a little frozen and should eventually be developed on either short or long term periods to render the structure a bit more reactive to emerging topics for example.

Still, the structure represents an attractive scientific emulation for external co-workers and students. The fruitful synergy between chemistry and physics definitely represents a highly attractive environment for foreign researchers at any level (e.g. 4 post-docs).

This group also shows a strong and successful ability to respond to call for proposals. A large part of the funding is external (400 to 500 k€ in average per year). From this successful tendency, more collaboration could be launched with foreign research teams.

- Strategies, governance and team life :

Team members report a high involvement in the organization of meetings, with a particular highlight on the success of the biannual international meeting ElecMol.

The implication of team members in teaching can be considered as low, with only 1 teaching appointee.

- Evaluation of the projects :

This pluridisciplinary team proposes 6 projects in its domain of expertise, ranging from synthesis (novel types of Q-dots, self-assembly of organic 1D structures, n-channel FETs) to devices and model devices (AFM nanostencils, organic & hybrid photovoltaics). Some of them are highly competitive and thus highly risked (organic and hybrid photovoltaics for example). However, the results already obtained indicate that this team has the potential to become among the leaders in the field. The hiring of a teaching appointee is suggested in order to anticipate the decreasing amount of students and be connected with the student community.

- Global evaluation :
  - Excellent scientific research in the field of molecular electronics with a particular emphasis on plastic solar cells and new hybrid materials, involving local collaborations in different disciplines.
- Strengths :
  - Very good fundamental research combined with objectives of applications. A large number of patents certify the suitability of the investigated systems.
- Suggestions :
  - Collaborations with industry should be envisaged, in particular in the domain of solar cells.
- Recommendations
  - Owing to the remarkable results recently obtained, the team should be supported significantly.

SPRAM E16: Dynamics of Biological Interactions

- Scientific quality and productivity :

This group has acquired a very good reputation in its field of expertise based on the combination of micro- and nanochemistry, electrochemical and optical detection methods with instrumentation development, interactions with theory and simulation, and biological applications.

The scientific production is very adequate and the group has a high level of publications (with also 3 patents) even if the number is rather limited (~1 paper per researcher and per year). A decrease of the number of publications after 2005 must be noted, in spite of the increase of the permanent research staff during the period.

- Attractivity and integration of the team in its environment :

The team has an excellent reputation in the field of electrochemistry and optics (SPRI) on the national and international scene.

The realization of a complex apparatus and a procedure for the specific immobilization of proteins is the main feature of the team. The number of PhD students recruited in the period is on the average of the laboratory and reveals a good attractivity of the team. The team has reported several international contacts with other scientific groups in USA, Brasil, Australia etc. It has good contact with industrial partner in France and some participation to EU proposals.

- Strategies, governance and team life :

It is one of the few groups dealing with biological elements in INAC, which also has good relation with several French academic laboratories as well as with French industry.

The activities in the field of electrochemistry as well in the optical detection are very interesting.

The development of new oligosaccharides chips shows the vitality of the group and the talent to look for novel routes full of unexpected risks.

The strong activity of the group is also well identified by the number of contacts with several national and international teams.

- Evaluation of the projects :

Three projects have been appreciated : the first related to the chemistry of micro and nanopores with very innovative and possible new applications; the second dealing with specific shapes and functionality of nanoparticles for specific biological applications especially for using them in vivo; the third related to the interactions of individual biological objects (bacteria, cells) with modified surfaces.

The possible analytical application for the detection of pathogenic bacteria or cells is very attractive.

All three projects are considered very innovative and full of new perspectives from scientific point of view.

- Strengths :
  - Very good scientific activity based on fundamental research but also looking at quite innovative specific applications.
  - Very good contacts with other French laboratories, international groups and French industry.
- Suggestions :
  - The group can attract more PhD students and apply more actively for International (EU) funding. More publication could be expected.
- Recommendations :

- The group has limited interactions with others groups in INAC. These interactions could be extended, resulting in more common papers and projects.
- Moreover the group could accept more PhD students and post-docs due to the interesting links with French industries and international contacts already existing.
- The group should increase its scientific production.
- The projects are very interesting in view of possible new applied results that can be obtained in the next period.

Name of the team : Statistical Physics, Magnetism and Superconductivity (SPSMS)

Name of team leader : Mr J.P. BRISON (Deputy Head : Mr F. LEFLOCH)

The SPSMS is a world class research unit that contributes to the strong reputation of the country in the domains of quantum transport in nanostructures, superconductivity and magnetism as well as correlated electron and spin systems. This influence is supported by the number and the quality of publications in best journals (8 Nature series, 1 Science, 69 PRLs and 1 RMP in the period), the large number of invited conferences, international prizes (1 prize per team in the period) and the strong reputation of the visitors and post-docs.

Research is mainly focused on modern topics and takes best advantage of the high level of technical skills achieved in the three groups over the years which allow them to push physical understanding of electronic systems in the most extreme conditions of temperatures (mK), pressures (gigabar) and high magnetic fields.

The SPMS staff (78) is ditributed among CEA researchers and engineers (31+ 3 advisors), CNRS researchers (3) UJF reasearchers (2), technicians and secretaries (11). The laboratory also hosts 17 PhD students and 11 post-docs. The number of PhD defended per year is 4. The number of publishing researchers is 31 out of 32.

The SPSMS has six groups organized into three teams of equivalent sizes.

- Strength :

The strength of the SPSMS is first the quality of researchers and the attractiveness to young scientists. A second factor is the very broad range of technical expertise and the excellent integration to the local technological environment. Finally we have noted the high level of European funding (32 contracts among which 6 European, 19 national and 2 local).

- Weaknesses :

The weakness of SPSMS is the increasing load of running costs including cryogenic and clean-room fees. Also the integration to university teaching programs could be improved.

- Integration in the environment :

It is a wise policy of the laboratory to have an active participation in the Grenoble large scale facilities and technological platforms. The close collaboration with LETI is of course a precious asset.

- Strategy, governance and life of the laboratory :

The laboratory is right in his will to maintain, with full control, independent research from crystal growth or nanostructure fabrication to theoretical analysis including a broad spectrum of characterization tools.

Besides, assessors have been strongly impressed by the quality of the recently recruited members and their efficiency to carry new challenging projects.

The recommendation of the committee is to continue to strenghten the international visibility and to hire young talented scientists.

SPSMS E17: Quantum Nanoelectronics

- Scientific quality and production :

Team E17 comprises the Electronic Quantum Transport and Superconductivity (LaTEQS) plus a part of theory group (GT). Since 2005 the group has published an average of 30 papers a year, with an impressive fraction in a high-impact factor journals. They carry out high-quality basic research in quantum-dot transport, hybrid nanostructures and superconducting films. They have obtained very important results in silicon and germanium based single electron transistors, the superconductivity of doped insulators, the superconductor-insulator transition, the shot-noise in hybrid structures.

Assessors have noted the successful takeoff of the activity on coherent spintronics in quantum dots and nanowires. The wise strategy of the group to work on technologically relevant materials should lead to important applications in the fields of metrology and information technologies. The quality of the research is outstanding.

- International recognition and attractivity, local insertion :

The group has an excellent visibility as evidenced by the two chairs of excellence, several prizes and a high level of national and European funding in many cases as coordinator. They have also several collaborations with very well-known US groups. They have an excellent record in attracting PhD students, post-docs, talented young scientists and very reputated visitors.

- Evaluation of the project :

The group plans a number of excellent projects, some of them having already been positively assessed by the European Research Council. The group wishes to apply single electron transport to quantum metrology in collaboration with European centers. The planned developments of electrically detected ESR techniques will give them a leading position in quantum spintronics.

The group is well positioned for the study of graphene hybrid devices. It will strongly benefit from theoretical inputs of recently integrated members in particular in the field of high frequency quantum transport. In this field cutting edge instrumentation is often inherited from developments in space projects. The group should benefit from collaborations in THz superconducting electronics and space cryogenics.

- Conclusion :
  - Strengths :
    - The quality of researchers, the attractiveness to young scientists.
    - The broad range of technical expertise, the integration to the local technological environment.
    - The good national and European funding level and the broad range of international collaborations.
    - The key position at the interface between basic mesoscopic physics and applied nanoelectronics which is quite unique in France.
  - Weaknesses :
    - The increasing load of running costs including cryogenic and clean-room fees.
  - Recommendation :
    - Continue along the same lines.

SPSMS E18: Correlated Electron Systems

The team consists of the electronic correlation group (IMAPEC) and part of the theory group (GT).

- Scientific quality and production :

Since 2005 this team has published in average 30 papers a year, with a large number of high quality papers (impact factor >6.5), a solid achievement for a team of ten people. The group has an excellent scientific strategy by putting a great emphasis on crystal growth, on the development of original experimental methods, especially high pressure techniques, and by relying on very good theoretical support. The impact of the research at the international level is exceptional.

- International recognition and attractivity, local insertion :

The team is among the world leaders studying quantum phase transitions in heavy fermion systems. The group also has a much respected presence in the study of unconventional superconductors. Their international visibility is shown by their receipt of three international prizes for the discovery of neptunium-based superconductors and an ANR chair of excellence, and enables them to attract excellent foreign scientists. In the the last three years, the group has obtained sizeable external funds. Nevertheless, for such a high profile group, it would be expected to have attracted EU-FP funding. The group has collaborations with the UK, the US and Japan.

- Evaluation of the project :

The new work on the uranium-based conductors and superconductors is especially exciting. The group will extend the range of the measurements to extremely high pressures, millikelvin temperatures and higher magnetic fields. It is a good strategy for the group to explore the Fermi surface by quantum oscillations making use of their single crystal growth facility.

The assessors caution against the aim to join the already busy field of iron-based superconductors.

- Conclusion :
  - Strengths :
    - the unique competence in high pressure and low temperature measurements.
    - the crystal growth facility and the enviable competence in quantum phase transitions.
  - Weakness :
    - A low level of European funding.
  - Recommendation :
    - Reconsider the extension of activities to graphene, pnictide superconductors.

SPSMS E19 : Quantum Magnetism and Frustration

Team SPSMS-E19 comprises the groups Magnetism and Neutron Scattering (MDN), Frustrated Magnetism (GMF) and the related part of the Theory group (GT). A speciality of this team is that MDN operates 4 neutron scattering instruments as a Collaborating Research Group (CRG) at the neighbouring Institute Laue Langevin.

- Scientific quality and production :

The neutron scattering instruments are well designed and provide very competitive capabilities. In particular IN22, which is cleverly positioned between cold and thermal neutron spectra, supports high fields and advanced polarization options. The new non-magnetic D23 allowing high fields and polarization analysis attracts a

number of complex problems in magnetic diffraction. IN12 (shared with Julich Center for Neutron Scattering) has reputation for best resolution and signal to noise, and is projected to undergo significant upgrades.

The team produces a significant average of 40 papers/year, with a large number of high quality papers. While a good number of projects are completely in-house, for other results the drive often comes from outside. Nevertheless, the team should be fully credited for the output because it is always scientifically involved and their instrumentation is essential for the output.

The effort in frustrated magnetism is significant and contributes to the main current topics in the field. The assessors have noted the excellent theoretical support. The originality in instrumentation establishes a niche for in-house research, and for collaborations with leading groups in the fields of magnetism and high-Tc superconductors. Several members are renowned for their contributions to these respective fields.

- International recognition and attractivity, local insertion :

Exploiting the neighbouring world leading neutron scattering facility in ILL, the team is well integrated in the local research environment. It is recognized worldwide for its expertise in neutron scattering and the quality of the instruments as shown by the number of leading experimental groups coming to make use of the facility. Within the reporting period, it has attracted an increasing number of PhD students. The assessors were worried by the low level of funding. It is understood that there is a lack of funding schemes to support large scale instrumentation, but efforts to fund post-docs could be beneficial.

- Evaluation of the project :

The assessors approved the strategy of continuously upgrading the instrumentation specialized in the core strength of polarized neutrons and high fields. The fact that they have achieved 30 Tesla pulsed fields and are planning 40 Tesla with two orders of magnitude greater neutron count rate is remarkable with such modest funding.

- Conclusion :
  - Strengths :
    - The expertise of team members.
    - The unique neutron instrumentation, being an independent CRG at a large scale facility, offers simultaneously flexibility to push through new initiatives, such as the pulsed fields, and to focus on long term strategies, such as the specialized polarisation capabilities.
    - The strong inhouse theoretical support.
    - Large number of leading international collaborators.
  - Weakness :
    - Limited external funding
    - Few young (non-permanent) staff members.
  - Recommendation :
    - Aim to obtain larger contribution from projects to which the team participates.
    - Explore more external funding schemes, for instance European fellowships for post-docs and visiting scientists.
    - While it could benefit other INAC groups, the assessors were not convinced that engaging research on nanomagnetism and the related small-angle scattering option is the best way for the team to profit from their expertise and facilities.

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+	A+

Nom de l'équipe : SBT

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+	A+	A

Nom de l'équipe : SPINTEC

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+	A+	A+

Nom de l'équipe : SP2M

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+	A+	A+

Nom de l'équipe : SPSMS

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	A+	A+

Nom de l'équipe : SCIB

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+	A+	A+

Nom de l'équipe : SPRAM

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+	A+	A

energie atomique • energies alternatives

L'Administrateur Général

Monsieur Pierre GLORIEUX
Directeur de la section des Unités de recherche

AERES
20, rue Vivienne
75002 PARIS

Saclay, le 07 mai 2010

N/Réf. : DPg/AN/np/2010-127

Objet : Observations du CEA sur le rapport d'évaluation de l' « Institut des Nanosciences et Cryogénie » (INAC)

Monsieur le Directeur,

Je remercie tout d'abord l'AERES pour la qualité du rapport d'évaluation sur l'activité de l' « Institut des Nanosciences et Cryogénie » et pour la pertinence des recommandations qui ont été faites.

En tant qu'Administrateur Général de l'Etablissement CEA, ce rapport très élogieux n'appelle pas de commentaires particuliers de ma part. Je puis vous assurer que je prêterai la plus grande attention à la mise en œuvre des actions qui permettront de répondre aux recommandations formulées par l'Agence.

Veuillez agréer, Monsieur le Directeur, l'expression de mes cordiales salutations.

Bernard BIGOT

Commissariat à l'énergie atomique et aux énergies alternatives
Centre de Saclay – 91191 Gif-sur-Yvette Cedex
Tél. : 33 - 1 64 50 10 00 – Fax . 33 - 1 64 50 11 86 – bernard.bigot@cea.fr

Etablissement public à caractère industriel et commercial
R.C.S. PARIS B 775 685 019

PRESIDENCE

Nos Réf. LD/GG/FT 327 -10
Tél. 04 76 51 48 29 - Fax 04 76 51 43 12

Grenoble, le 26 Avril 2010,

AERES
Monsieur le Président Jean François Dhainaut

Objet : Réponse de l'Université Joseph Fourier Grenoble 1 au Rapport du Comité de Visite
Institut Nanosciences et Cryogénie (INAC) – Directeur : Engin Molva
INAC est un institut constitué de six unités mixtes :
SPRAM, UMR CNRS 5819 - CEA, UJF, CNRS
SPINTEC, UMR CNRS 8191 - CEA, UJF, CNRS
SCIB, FRE CNRS 3200 - CEA, UJF, CNRS
SP2M, UMR-E A971080 - CEA, UJF
SPSMS, UMR-E 9001 - CEA, UJF
SBT, UMR-E 9004 - CEA, UJF

Monsieur le Président, Cher Collègue,

Nous avons examiné le rapport préliminaire d'évaluation mis en ligne sur votre application le 12/04/2010 pour :
Institut Nanosciences et Cryogénie (INAC)

Au nom de l'établissement et de l'ensemble des membres de ce laboratoire, nous tenons à vous faire part de nos remerciements pour cette évaluation approfondie.

Nous nous associons aux observations générales formulées par le directeur de l'unité ci-après.

Nous vous prions de recevoir, l'expression de nos cordiales salutations.

P/ Le Président de
l'Université Joseph Fourier Grenoble I
Farid OUABDESSELAM

P/O Le Vice-président
du Conseil Scientifique de
l'Université Joseph Fourier Grenoble I
Laurent DAUDEVILLE

PJ : Courrier du Directeur d'Unité formulant les observations générales et mentionnant les erreurs factuelles à corriger avant la publication finale

Comments of the INAC management team on the evaluation report of AERES

The management of INAC and its six laboratories would like to thank the president and all the experts of the visiting committee for their careful and exhaustive evaluation and for the excellent report they produced.

The presentation of the evaluation results for INAC and for each of the 6 laboratories and 19 teams is very clear and well detailed. The committee has taken into account precisely both the scientific and the technological excellence of INAC, which is a multidisciplinary institute.

The comments on the strengths, opportunities, weaknesses and the recommendations are very appropriate and useful for the future. This report will become a constructive reference for improving our research strategy and for still improving the level of our scientific and technological production. The management committee of INAC will use these recommendations in order to establish a plan of actions which will be carried out carefully during the next period.

We would like to add only a few comments on this excellent report:

INAC, and general comments:

The report emphasizes a low level of interaction between the laboratories of INAC. It might be noticed that there are already strong links and synergies which exist: (i) through transverse programmes & joint prospective meetings; (ii) through shared tools & facilities (such as PTA - advanced technological facility, PFNC – nanocharacterization facility, nanosimulation, common facilities for X-ray diffraction, SQUIDS, NMR & EPR, etc.); (iii) and through support at INAC level in specific areas, such as monitoring of PhD students and Post-docs, interface with universities, CEA, CNRS, contracts & IP management, patents, business development, communication and information resources.

The building of new facilities such as PTA, or transverse programmes such as basic research towards photovoltaic applications, which are essential for the programmes of INAC, has been allowed by bringing up together the capacities of several laboratories. For example SP2M, SPSMS and SPINTEC have been strongly involved together for building PTA in close collaboration with other CNRS and University laboratories.

During the next period, scientific interaction between INAC laboratories will still be increased with amplifying the volume of transverse research programmes.

As recommended by the committee, high level recruitment abroad will be pursued. In 2009 INAC staff originated from 31 countries worldwide (28 in 2008, 18 in 2007).

The report recommends improving our integration into university teaching programmes. INAC permanent staff is already strongly involved in teaching with 899 hours in 2008-2009 college year (in addition to teaching by professors and associate professors belonging to INAC staff). Furthermore PhDs and Post-docs teaching activities amounted to 1434 hours.

The committee considered that building a CEA-UJF institute to improve the support from the University is fully relevant. This will also strengthen the links with the University in the next period.

The committee recommended to develop stronger links with other leading laboratories in Europe, and, to improve the international networking in order to increase external funding. It might be noticed that external funding is already very important and represents 19.2% of the overall resources (36M€), and 29.7% including the internal contracts within CEA and CNRS. The growth rate is 15% per year since 2005. Although the external resources will still continue to grow, we expect that this growth will slow down during the next period. INAC laboratories are already strongly involved in worldwide collaborations; however the international and more specifically European networking will be amplified. This is one of the main strategic objectives of INAC.

It is recommended that collaborations with industry should be reinforced, for instance in the area of new technologies for energy saving. It might be noticed that in 2009 INAC hired a highly experienced engineer who is in charge of business development in INAC. He helps the teams to establish strong partnerships with industrial companies. Also the number of projects in the field of new technologies for energy is rapidly growing, and will continue to grow in close collaboration with industry and with technological departments of CEA/DRT.

More specific comments on each of the six laboratories of INAC are given below:

SBT:

We are grateful to the committee for having considered carefully the technological excellence of SBT. Oriented towards technological developments, it is quite natural, as emphasized by the committee, that SBT focuses on programmes driven by external “customers”. However it is important to notice that these “customers” are either in strategic domains of the Fundamental Research of CEA, such as magnetic fusion (JET, ITER, JT60 SA), astrophysics (Herschel), High Energy Physics (CERN), or in a strategic domain of CEA (Defence: LMJ, also associated with basic challenges), and also where civil applications are of a fundamental interest (physics with intense lasers).

Our participation to so many large projects is strongly correlated with our very good insertion in the programmes of CEA, which is itself inserted in a vast community of Research.

It is also important to notice that SBT is not only “commissioned to do the work”, which is the job of industry. Indeed SBT has to define and to investigate novel fields of cryogenics by proposing innovative solutions. This could be shown

through the following examples: (i) for LHC, at CERN, SBT proposed and tested HeII two-phase flow cooling for the first time; (ii) For LMJ, the Division for Military Applications of CEA decided to launch the program proposed by SBT, instead of choosing a solution proposed by the American project (and cancelled later…); (iii) Also for ITER, CEA started the project very early and defined most of the basic architecture at the end of the nineties. We focus only on challenging developments and we do not answer to call for tenders or to quasi-industrial requests, even when they are in our technological expertise, if they do not raise challenging aspects.

The implication of SBT into Grenoble Universities is increasing since the association with University Joseph Fourier. Eventually, SBT is one of the leading actors of the future Grenoble - CRYOPOLE. This will give novel opportunities to increase the excellence of SBT.

SCIB:

The committee pointed out *"the unbalanced composition"* among the permanent staff, and the lack of academic members from chemistry department of UJF, almost all members coming from pharmacy and biology departments, only one professor belonging to chemistry department, whereas molecular chemistry is a major activity of the laboratory. This situation could be improved during the next period.

Concerning the project of team E05 (Ionic Recognition and Coordination Chemistry), the committee suggested to fixe priorities according to the general policy of the institute. It might be noticed that all the projects of the laboratory are within the general objectives of INAC in the fields of energy, nanoscience, and interface with biology & health.

In team E06 (Magnetic Resonances), the committee pointed out an apparent dispersion of the team. Indeed the various themes that have been developed in theses fields have all yielded novel concepts and instruments, and thus, high level publications.

SPINTEC:

No additional comment

SP2M:

The committee recommended keeping a good balance between state of the art characterization performed on best equipments and facilities, and proximity characterization. SP2M is deeply aware of this requirement. Indeed for optical and magnetic studies, characterization set-ups are located in close proximity with growth equipments. Advanced structural characterization involves much more expensive equipments such as TEMs, and synchrotron lines,…. Concerning electron microscopy, our strategy is not and will not be to buy novel TEMs dedicated to materials characterization and located close to epitaxial growth facilities, since that approach would be very costly in terms of financial resources and technical manpower. The number and diversity of electron microscopes on the PFNC is large enough to perform state of the art experiments, develop novel experimental approaches and meet the needs in materials characterization. In practice, the more advanced exploratory experiments are taken in charge by members of the team E11 (Lemma) and PFNC colleagues, whereas materials characterization is mostly endorsed by researchers of the other teams, who have access to the PFNC tools. Such an organization leads to a very fruitful interaction between microscopy experts and microscopy users, and will be further favoured in the future.

The committee pointed out the geographical splitting of SP2M over two sites (C5 building, MINATEC). The participation of SP2M to the MINATEC project has been highly fruitful, and the move of the teams E11 (Lemma) and E9 (SiNaPS) towards MINATEC was obviously necessary to strengthen the links with our partners from CEA/DRT on nanocharacterization (PFNC) and on Si related basic research. On the other hand, moving all SP2M towards MINATEC was not possible for financial reasons and not desirable since it could have weakened the very strong links with the nearby Institut NEEL and with other INAC Laboratories, especially SPRAM and SCIB. Four years after the move toward the MINATEC buildings, one can see that the interactions between these teams and other SP2M teams have not decreased, but rather increased over the period. This is mainly due to the very lively scientific life of SP2M and to the numerous transverse topics of interest for several teams (nanowires, GeMn…). This is also the consequence of managerial efforts of SP2M's staff such as the publication of an internal review (Le bulletin du SP2M), the organization of SP2M seminars at both locations, and, needless to say, the meetings of SP2M head of teams on a very regular basis.

A strong emphasis has been put in the report on the development of the facilities (PTA, PFNC) and on the technological activities related to the materials fabrication and characterization. More emphasis could have been put on the scientific output of SP2M, since our main goal is to produce high quality scientific results.

The committee noticed for the team E9 (Silicon nanostructures and nanophotonics) that there is no post-doc, despite many contracts. It is a fact that that in June 2009, there were no post-docs in this team. However, several post-doc or visiting scientists have been hosted by SiNaPS over the reporting period. The SiNaPS team had to focus its financial resources on the purchase of a new equipment (new CVD growth chamber) in 2008-2009, which explains the lack of Post-docs in the lab in June 2009. Post-doc recruitment will be resumed as soon as possible.

It has also been pointed out that the team E9 (Silicon nanostructures and nanophotonics) does not seem to have all the culture and expertise needed to carry out the project by itself, and the support of external teams will be needed. Indeed a team rarely has all the necessary resources to carry out an ambitious mid or long term project, and the ability to find and involve the right collaborators has to be seen as a strength. Over the last years, this team has demonstrated this ability, by nurturing strong links in nanophotonics with Institut d'Optique (numerical simulation) and Institut Carnot de Bourgogne (near field optical studies) as well as nanowire synthesis (CEA/LETI, CNRS/LTM). Such strong links will also be

established in the frame of the future projects of the team, and notably for the applications of nanowires to biosensing (with INAC/SCIB under way) and photovoltaics (with CEA/DRT, INAC/SPRAM).

SPRAM:

The main weakness pointed out in the report concerns the unbalanced productivity between the different teams. It might be noticed that this imbalance appears mainly because the researchers taken into account for the evaluation of the productivity were those who were present at mid 2009 in each team. However, it is a matter of fact that during the period of evaluation there has been a strong renewing of the permanent staff in SPRAM which particularly affected teams E14 (Ion Conducting Polymers) and E16 (Dynamics of Biological Interactions), as well as a long term absence of one permanent researcher in each of these two teams. More precisely, 37 % of the team E14 staff (2 researchers, 1 associate professor) and 40% of the E16 staff (2 researchers, 2 associate professors) joined them during the reference period. Therefore, the average production calculated per full time equivalent researcher and per year is close to the average of SPRAM.

Concerning the comment about publications of team E14 (Ion Conducting Polymers) in mainly medium impact factor(IF) journals, we would like to mention that more than 50% of the papers during the reference period have been published in journals with IF>3. Moreover, there is clearly a positive dynamics as pointed out in the report by the committee since all the papers published in 2009 were in journals with IF>3.

Although the participation of the team E14 (Ion Conducting Polymers) to European projects is limited, it must be pointed out that external funding of team E14 coming from ANR grants is rapidly increasing since 2006. The European project funding should increase in the next period due to new opportunities in the field of new technologies for energy.

Concerning the project of the team E14 (Ion Conducting Polymers) the evaluation committee suggested merging the first three challenges. It is a matter of fact that all the challenges are focused on ionic conducting membranes. But more precisely, the scientific questions addressed by each challenge are very different. Furthermore, to our knowledge, no other groups all over the world are working on challenges 1 and 3.

We appreciate the recommendation of the committee for supporting the scientific redirection process which has been initiated in the team E14 (Ion Conducting Polymers) towards new topics in the field of energy storage.

The committee suggested to increase the scientific production of the team E16 (Dynamics of Biological Interactions). It might be noticed that the peak on the number of publications observed in 2005 was mainly related to a high number of proceedings with a rather low impact factor (IF<3). A positive dynamics is now observed, since 10 publications are reported for 2009 (the figures in the report were limited mid-2009) with 2 having a high IF>6.5.

The committee recommended attracting more PhD students and post-docs in the team E16 (Dynamics of Biological Interactions). The majority of the post-docs accepted in this team over the reference period arrived only on years 2008 and 2009. We will take care to strengthen this positive dynamics.

SPSMS:

It has been recommended reconsidering the extension of activities to graphene in team E18 (Correlated Electron Systems). It might be noticed that this team is not involved strongly in graphene related projects which are rather developed in the team E17 (Quantum Nanoelectronics) and in other teams of INAC. The team E18 has only a specific contribution using their capacity in growing graphene by the sublimation of SiC.

A low level of European funding has been pointed out as the main weakness of team E18 (Correlated Electron Systems). This team had already several Marie Curie Post-docs, and participates to a network of excellence COST. Also recently in February 2010 a young researcher of the team E18 has been selected at the first step of ERC junior call (in addition to 2 other young researchers of the team E17 also selected in the first step of the same ERC call). Nevertheless there are no other FP7 projects in the team, since the thematic on correlated electron systems are not well represented in European calls. We hope that this situation will change in the next period.

The management team

Engin Molva	Director of INAC
Armelle Mesnard & Yves Samson	Deputy Directors of INAC
Alain Girard	Director of SBT
Pascale Maldivi	Director of SCIB
Alain Schuhl	Director of SPINTEC
Jean Michel Gérard	Director of SP2M
Jean Pierre Travers	Director of SPRAM
Jean Pascal Brison	Director of SPSMS