



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

Department for the evaluation of
research units

AERES report on unit:

Jean-Pierre Bourgin Institute

Under the supervision of
the following institutions
and research bodies:

Institut National de la Recherche Agronomique - INRA

AgroParisTech - Institut des sciences et industries du
vivant et de l'environnement

Centre National de la Recherche Scientifique - CNRS



January 2014



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et de l'enseignement supérieur

Department for the evaluation of
research units

*On behalf of AERES, pursuant to the Decree
of 3 november 2006¹,*

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

On behalf of the expert committee,

- Mr Pere PUIGDOMÈNECH, chair of the
committee

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



Evaluation report

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

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

Unit name:	Institut Jean-Pierre Bourgin
Unit acronym:	IJPB
Label requested:	UMR
Present no.:	1318
Name of Director (2013-2014):	Mr David BOUCHEZ
Name of Project Leader (2015-2019):	Mr David BOUCHEZ

Expert committee members

Chair:	Mr Pere PUIGDOMÈNECH, Centre for Research in Agricultural Genomics Barcelona, Spain
Experts:	Ms Marie BAUCHER, Université Libre de Bruxelles, Belgium
	Ms Leonie BENTSINK, Wageningen University and Research Centre, The Netherlands
	Ms Jacqueline GRIMA PETTENATI, Université Toulouse 3 - Paul Sabatier
	Mr Olivier LEPRINCE, Agrocampus Ouest CFR Angers (representative of CNECA)
	Mr Avraham A LEVY, The Weizmann Institute of Science Rehovot, Israel
	Mr Olivier MATTHIEU, CNRS Clermont-Ferrand
	Mr Christophe MAUREL, CNRS Montpellier (representative of CoNRS)
	Ms Françoise MONEGER, ENS Lyon
	Mr Sébastien MONGRAND, CNRS Bordeaux
	Mr Laurent NUSSAUME, CEA Cadarache
	Mr Denis POMPON, CNRS Toulouse
	Mr Tony PRIDMORE, University of Nottingham, United Kingdom
	Mr Wim SOPPE, Max Planck Institute for Plant Breeding Research Köln, Germany
	Mr Jan TRAAS, ENS Lyon
	Mr Téva VERNOUX, ENS Lyon (representative of INRA CSS)



Mr David WENDEHENNE, Université de Bourgogne Dijon

Mr Nicolaus VON WIREN, Leibniz Institute of Plant Genetics & Crop Plant
Research Gatersleben, Germany

Scientificdelegates representing the AERES:

Mr Steven BALL

Mr Christophe ROBIN

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

Ms Monique AXELOS, INRA

Ms Carole CARENTA, INRA

Ms Marianne DELARUE (AgroParisTech, Doctoral School nb 145)

Mr Thierry DORÉ (AgroParisTech, Doctoral School nb 435)



1 • Introduction

History and geographical location of the unit

The IJPB, one of the first TGUs (Très Grosse Unité: Large Research Unit) was created in its actual administrative configuration in 2010 from the fusion of 5 pre-existing Plant Science units from the Versailles and Grignon Campuses: i.e. Cell Biology Laboratory (LBC, Director Herman HÖFTE), Plant nitrogen nutrition (NAP, Director F. Daniel VEDÈLE), Seed Biology laboratory (LBS, Director Annie MARION-POLL), Genetics and Plant Breeding station (SGAP, Director Philippe GUERCHE) & Biological Chemistry Laboratory (LBC, Director Thierry CHARDOT, formerly on the Grignon Campus). This TGU was built on the already existing informal self-organized association of the four Versailles laboratories. It is now under the dual supervision of INRA and AgroParisTech and obtained recently official recognition by the CNRS as an ERL (Equipe de Recherche Labellisée) (ERL 3559). The IJPB staff is located in several buildings of the Versailles Campus. With approximately 350 people including almost 100 senior, permanent researchers in plant biology, IJPB is currently the largest Plant Biology research unit in France. The vast majority of the scientists belong to INRA and AgroParisTech but some belong to CNRS or to several universities of the Paris area. The IJPB played a key role in the creation of the Labex “Saclay Plant Science”. The institute has an outstanding reputation worldwide in a number of areas including evolution and regulation of plant genomes, plant metabolism and responses to environmental cues, cell division, growth and morphogenesis, cell wall biology and seed germination. Some research activities are linked to applied purposes such as those dealing with plant biomass uses.

The IJPB has 26 research teams organized in five departments as well as seven technology platforms regrouped under the so-called « Plant Observatory » including cytology/imaging, chemistry/metabolism, protein biochemistry, plant culture, the phenotyping platform and biological resources centers for Arabidopsis and Brachypodium. Each of the platforms is headed by a senior scientist. The plant growth facilities are very important with for instance 5,500 m² of green-house surfaces. Most of the studies carried out at the IJPB use the model plant Arabidopsis, but Brachypodium is becoming the second model plant and species of agronomic interest such as corn, rapeseed, barley or tobacco are also used by some teams.

Management team

The directory board of the IJPB is composed of Mr David BOUCHEZ the unit's director, Mr Herman HÖFTE, scientific director, Mr Philippe GUERCHE, human resources director, and Ms Magali NAWROCKI-SERIN, administrative director.



AERES nomenclature

Unit workforce

Unit workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	19	18
N2: Permanent researchers from Institutions and similar positions	74	76
N3: Other permanent staff (without research duties)	137	137
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)		
N5: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)	39	24
N6: Other contractual staff (without research duties)	21	12
TOTAL N1 to N6	290	267

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	37	
Theses defended *	35	
Postdoctoral students having spent at least 12 months in the unit*	35	
Number of Research Supervisor Qualifications (HDR) taken *	8	
Qualified research supervisors (with an HDR) or similar positions	62	64

* since 1st january 2010



2 • Assessment of the unit

Strengths and opportunities related to the context

Over the years, the research centre has built up an excellent reputation. The IJPB bases its strength on the scientific quality of its groups which overall have a high publication record.

As it stands now, the new structure has the potential to maintain and even further increase its national and international visibility, to further optimise the use of state of the art facilities and to eventually attract new groups that may complement the work that is being done. The new structure is in principle also more attractive for students from France and elsewhere. The organization of the 26 teams in five departments allows a better coherence of the research activities of the teams within each department, creating synergies and opportunities for common projects.

The Plant Observatory provides an excellent combination of state of the art equipment and services in microscopy, plant culture, high throughput phenotyping and biochemistry.

The Institute plays an active role in projects of national importance (Investissements d'Avenir; Labex) that significantly complement funding for the coming years and will enhance the possibilities of collaboration with other groups. The formation of a strong research and University pole in Saclay, where the IJPB collaborates through the SPS Labex project is a clear illustration of this.

Weaknesses and threats related to the context

The new Institute has significantly increased its potential in terms of visibility and attractiveness. Conditions are also optimal for synergy between groups and projects. However, the committee had the strong impression that many groups have probably not fully exploited the potential that the new structure of the Institute provides in terms of building stronger groups and increasing their visibility. It is possible that they are working within a structure that has not the flexibility that is needed to structure groups and services. The Institute is working in a campus with independent buildings and without the possibility of creating a new building to gather all staff.

Although the Plant Observatory and associated services provide a solid basis for scientific excellence, certain technologies are under-represented. These concern cutting edge high throughput technologies such as Next Generation Sequencing but also bio-informatics and computational modelling. It also seemed that certain services were not optimally available (eg equipment for metabolomic/PO chemistry).

Some teams might be too small to remain competitive in a challenging international environment.

The public perception of Plant Science, and in particular Plant Biotechnology, in France and in Europe in general, does not place the Institute in a favourable context for its work and for attracting young people.

Recommendations

The Institute and its scientists have to be more proactive in a number of aspects, such as attracting students from France and from abroad, to apply for high quality European projects such as ERC grants and to take part in teaching activities, including teaching at the bachelor level, that exists in surrounding Universities. Some IJPB scientists provide good examples for this type of activities that should be extended.

The IJPB should be further encouraged in generating collaborations with groups working in crop plants that may provide interesting scientific insights and increase its visibility in the private sector to boost the possibility to find applications for some of the results they obtained.

The committee is concerned that the expertise and cooperation network built by the leader of team 4 over his career may be lost by IJPB (and INRA) upon the team leader's retirement in about 5 years. This point should be jointly addressed by the team leader, the IJPB directorship, and other IJPB scientists working in the field of nitrogen use.



The IJPB should critically establish a strategy for developing internal or on-site resources for bio-informatic analysis of the data generated. That plan should consider collaborations with neighbouring institutes, involving the incentive help of the INRA departments, attracting new leaders working in bioinformatic approaches and the training of students, postdocs, technicians and scientists in Bioinformatics. Likewise, it will be critical to increase the number of scientists using computational modelling and quantitative approaches.

It was not completely clear, if the current funding model of the Plant Observatory is sustainable in the long run. A calculation of their full cost, including salaries, should be made public and solutions for their complementary external and internal funding must be found in order to maintain and further increase the quality of the support provided.

The appointment of an external scientific advisory board could be useful for the systematic analysis of the strategy of the Institute and to provide advice to the Direction in many of their decisions. The SPS Board may, for example, be at least provisionally used in this sense.

The staff of IJPB should continue to be present in the public opinion to inform the public in matters related to Plant Science.



3 • Detailed assessments

Assessment of scientific quality and outputs

The Institute Jean Pierre Bourgin is one of the most prestigious institutes for basic Plant Science in France and among the most advanced in Europe. With almost 100 permanent scientists, 30 engineers and over a 100 technicians, it has achieved an excellent to outstanding output thanks to an important critical mass of high quality research groups some of which are leaders in their field. Its overall scientific production is very high. A detailed analysis is presented in the assessment of individual teams.

Assessment of the unit's academic reputation and appeal

The work carried out in the IJPB is well recognised worldwide as appears in the level of scientific publications and invitations to international meetings. As a whole the Institute has displayed an excellent reputation and appeal. This is especially relevant in European projects where some of its scientists often act as coordinators. External funds have allowed them to attract over 70 post-docs and PhD students and almost 20 technicians.

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

The Institute is essentially devoted to basic Plant Sciences. The scientific staff is aware that the development of its science will lead them towards application in different crops that would allow them a better interaction with the industrial sector. The Institute coordinates a number of projects of the “Investissements d’Avenir” actions that may be important in this direction.

The Institute has been proactive in the present discussions that involve the applications of new technologies for agriculture especially in France. This type of interaction can be assessed as very good and offers many opportunities for improvement. Hence, these actions have to be pursued and increased.

Assessment of the unit's organisation and life

The IJPB is the product of the merging of five different units from three INRA Departments. The overall process has been successful so far and the efforts of the management need to be recognized as outstanding in this respect. However, further progress is needed, especially when it comes to management of the Plant Observatory. The real costs of all services should be calculated and presented in a transparent way. Scientists should be charged in a realistic/reasonable manner to enable accessibility to most groups on the one hand and insure viability of the service on the long term.

The technical staff is highly motivated and recognizes the improvements gained by the creation of the TGU. However, some of those working on the platforms or common services have experienced communication problems with their hierarchy. They feel a lack of recognition of their work which seems to be diluted and less varied than in the former smaller units where they had more direct access to all levels of their hierarchy. The staff devoted to plant culture expressed some concerns about the aging of the growth facilities whose surface is very large, and about the organization of their work in the near future. The visiting committee encourages the management board to pay more attention to these concerns, to improve communication and involve the technical staff more in the decision-making process.

Assessment of the unit's involvement in training through research

In the IJPB, there are a number of University professors and assistant-professors, from AgroParisTech and the University of Paris South. The Institute has 37 Doctoral students (doctoral schools ABIES and SDV respectively ED435 and 145) and some members of the staff teach especially in the master degree. The setting up, within the SPS project, of a high profile Master in Plant Science and the new laboratory that has been built for teaching are excellent initiatives in this direction. The existence of a new University campus in Saclay should represent an opportunity to integrate the Institute in the new structure. The very good to excellent involvement in training through research also allows room for improvements. IJPB might also for instance consider attracting students from other countries and in particular from Asia. The possibility to complement the fellowships of these students in order to face the cost of living in the Paris area could be important in this direction.



Assessment of the strategy and the five-year plan

The scientific strategy of the Institute is essentially the strategy of its departments and the corresponding teams and can therefore be assessed as overall excellent. The challenges of the work in Plant Sciences are derived from the development of the disciplines, mainly in dealing with the complexity that arises from the analysis of full genomes and the interactions with different regulatory pathways in the context of the cell and the organism. The field faces also an increased international competition while the perception of plant biotechnology in Europe remains a problem. The board of directors has clearly identified the challenges that lie ahead. The overall strategy of the Institute is well defined in the Strategic Plan as outlined during the visit.



4 • Team-by-team analysis

Team 1 : Variation and Abiotic Stress Tolerance (VAST)

Name of team leader: Mr Olivier LOUDET

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	1	1
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	4	4
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	4	2
N6: Other contractual staff (without research duties)	3	2
TOTAL N1 to N6	14	11

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended *	2	
Postdoctoral students having spent at least 12 months in the unit*	11	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	1	3

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The outstanding research activities of this team, focuses on quantitative genetics application related to plant productivity in response to several abiotic constraints. The plant model used is Arabidopsis, a choice fully justified to do justice to the important material generated by INRA Versailles stock centre (such as the core collection or different recombinant inbred lines). They also rely on the excellent screening capacities for large scale phenotyping (phenoscope) they have been able to develop. This offered the opportunity to identify new unexpected actors involved in drought response such as eskimo (a component of xylem cell wall formation). Another good illustration of the power of their approach is provided by the discovery of allelic variation of the molybdenum transporter MOT1. Interestingly, this gene correlated among West Asian populations with the content of Mo present in soils offering a very nice example of evolution. We should also pinpoint the capacities of this team to use the most recent techniques (such as eQTL) to produce original and outstanding results. This team has published 29 publications for the period evaluated (24 research publications, 3 reviews, 1 book chapter) most of them in excellent journals (Science, Plos Genet, Plant J, Curr Biol...). A majority of this work (15) originates directly from the work of this team; others are related to fruitful collaborations.

Assessment of the team's academic reputation and appeal

This team has achieved excellent to outstanding reputation and appeal (both at national and international level). The group leader has been awarded an ERC starting grant in 2010. They have also been very successful with public calls, succeeding to get 7 ANR projects founded (3 as coordinators) providing outstanding funds for their research. The group leader is also editor for The Plant Journal since last year and has been editor of Plant Biology for the 3 last years. He is also involved in the activities of the Multinational Arabidopsis Steering Committee. The group leader was invited to several international conferences and seminars around the world providing again a good proof of the visibility of this group.

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

Besides a patent, this team displays excellent interactions with private partners supporting a PhD (Gautier Semence) or Syngenta. They have also been involved in two television documentaries to introduce Arabidopsis to a broad audience.

Assessment of the team's organisation and life

Currently, 7 permanent people are members of this team: 2 technicians, 1 AI, 1 CR1, 1 DR2 and 1 Associate Professor. There is also an important amount of non-permanent people (3 technicians, 4 post-doc and 1 master student) present in this group due to its capacity to raise excellent sources of funding. Four people left and 2 joined the group during this period.

Assessment of the team's involvement in training through research

Over the period, the team produced proofs of a very good to excellent involvement in training (7 post-doc and 2 PhD students). There are currently 4 post-docs in the team.

Assessment of the strategy and the five-year plan

The team continues to develop exploration of natural populations with state of the art approaches. This offers interesting perspectives (and complexities) to discover novel traits. New members in the team providing expertise in bioinformatics, genomics and network reconstruction should offer an excellent guaranty of success to such projects. The access of additional 'omics technologies (metabolomics, ionomics, transcriptomics...) will provide opportunities to open novel field for their researches. Beside work in continuity with their present work on drought stress they also intend to focus on a novel thematic: cold stress. This choice is driven by the arrival in the group of a new colleague, which provides good physiological expertise in the field. These objectives are relevant with regard to the expertise of this team and on the whole the plan can be assessed as excellent. The group has also impact beyond this team as illustrated by very good collaboration with the Epigenetic Natural Variation team.



Conclusion

▪ **Strengths and opportunities:**

This team has an excellent expertise in quantitative genetics. They have developed excellent tools (phenoscope phenotyping platform) to identify complex traits related to several abiotic stresses using best technologies to explore natural diversity present in the broad collection of Arabidopsis populations available. For this aspect, the IJPB provide an excellent environment as a resource stock centre for this plant species.

They have reached an international visibility and established strong partnership with several excellent teams based on the attractiveness of their work.

▪ **Weaknesses and threats:**

The team has to make choices for their future long-term orientation. It may be important to decide if they want to focus on specific biological pathways (this will imply to further analyse the candidate genes they identified) or prefer to focus on the development of the quantitative genetic field. If this last option is to be chosen, it would be reasonable to think about serving the scientific community by creating a very attractive structure suited for this purpose.

▪ **Recommendations:**

This team has obtained an outstanding international visibility and success in identifying many very interesting QTLs. Nevertheless, so far, they do not appear interested to study them further. They appear to rather concentrate their efforts on the identification process. On the long term such a strategy will probably reach its limits unless it is considered as an important technical resource with an appropriate structure.


Team 2 : Arabidopsis Responses to Nitrogen Availability (ARENA)

Name of team leader: Ms Anne KRAPP

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015 (Team NUTS)
N1: Permanent professors and similar positions	1	2
N2: Permanent EPST or EPIC researchers and similar positions	5	5
N3: Other permanent staff (without research duties)	4	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	10	10

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015 (Team NUTS)
Doctoral students	3	
Theses defended *	3	
Postdoctoral students having spent at least 12 months in the unit *	4	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	3	4



• Detailed assessments

Assessment of scientific quality and outputs

This team focuses its research activities on the molecular and genetic bases of plant response to nitrogen (N) availability, using the model plant *Arabidopsis*. This is an important socio-economic problem related to:

- the necessary reduction of N fertilizers used in intensive agriculture;
- the balance between the increase of food demand from growing populations and the availability of arable land.

The team covers a pretty large field, in which it has realized major scientific breakthroughs.

It has identified ribosomal protein encoding genes as major targets of N starvation.

The combination of quantitative genetics with stable isotope labelling provided improved knowledge on the relation between N (nitrate) availability to the plant, N allocation to roots and shoots and plant growth. Using quantitative genetics resources in collaboration with other IJPB groups, the team has also investigated the N impact on the physiology of seeds (yield and composition). Finally, the team investigated further the function of several genes identified in the past and connecting C and N metabolism. One major achievement was to identify SWEET17 as the first efflux transporter of fructose in plant vacuoles.

The team has revealed original functions for some members of the nitrate transporter NRT2 family. A NRT2.6 mutant was found to be more sensitive to pathogens due to abnormal production of ROS. An important role of NRT2.4 and NRT2.5 in nitrogen uptake and translocation to shoots was established. Finally, the study of NRT2.7 revealed its role in nitrogen storage in the vacuoles.

The team has investigated the role of several *Arabidopsis* genes (plastidial AtPIL and AtNLP) homologous to N master regulators in other organisms. One major significant result concerns the NLP7 transcription factor, which turned out to be a master regulator of nitrogen control genes acting in N signalling and metabolism.

Most of these results have been obtained thanks to fruitful internal and external collaborations, illustrating the dynamism of the team.

The scientific productivity is excellent to outstanding. The team has published 32 articles for the period evaluated, most of them in the best journals devoted to plant science (*Plant Cell*, *Plant J.*, *Plant Physiol.*, *J. Exp Bot.*, *New Phytol.*), but also recently in multidisciplinary journals (*Nat. Commun*, *Curr. Biol.*). It can be noticed that 16 of these publications (the best ones) are resulting from work directly produced by the team itself.

Assessment of the team's academic reputation and appeal

The team has an excellent national and international visibility. It has been very successful with national and international public calls, thereby obtaining good funding through several projects from ANR (4), EU (1) and the local Labex. As many other laboratories in the same field, the group recently has had more difficulties to obtain significant funding, which is a general matter of worries.

The scientists have been invited in several international conferences (Nitrogen 2013, Nitrogen 2010, SEB...) and seminars around the world offering a good proof of the visibility of this group.

One group member fulfils important scientific functions at the regional (Labex) and national (INRA) levels.

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

Several actions to promote science towards a non-scientific audience have been realised (Salon d'Agriculture, Plant Fascination day). However no connections to the private sector are reported in this overall very good interaction.



Assessment of the team's organisation and life

Currently, 10 permanent people are members of this team: 3 tech., 1 Engineer, 1 CR2, 2 CR1, 1 DR2, 1 DREX and 1 PR. It has to be noticed a positive flux of people during the period evaluated with 3 arrivals and no departure.

With respect to the size of the groups, there is currently a reduced amount of non-permanent people (3 PhD students) present in this group.

Assessment of the team's involvement in training through research

Over the period, the team has trained 4 post-doc and 3 PhD students which have left the team. There is currently no post-doc in the team. We can notice a very good to excellent involvement in training with 5 master students received during this period.

Assessment of the strategy and the five-year plan

The group has modified its name (for Nitrogen Use, Transport and Signalling) in order to take into account its ongoing reorganization, with three interconnected research axes involving 7 researchers. Besides the continuation of work in progress (NRT2.5, NRT2.7, TOR, NLP7, PII), the team intends to investigate *Brachypodium* as a model plant for cereals. This move is justified because of the potential economic transfer it might offer. Yet, the challenge will be to efficiently transfer in *Brachypodium* the knowledge and skills acquired with *Arabidopsis*. The group also intends, in association with other IJPB groups, to look for the connections between N limitations and others biotic (pathogen) and abiotic (water stress) constraints. This objective is in logical continuity with the current scientific activities of the group but the strategy may have to be clarified. Nevertheless, it may be difficult in the future to follow all these projects and a few choices will have to be done. Nevertheless, these objectives remain excellent with respect to the expertise of this team.

Conclusion

▪ **Strengths and opportunities:**

This group has an established international visibility in the field of nitrogen assimilation and perception. It has a very good network of collaboration (both at IJPB and international levels). The group masters quantitative genetic as well as functional genomic approaches. It has recently identified important key actors, which still offer many areas for exciting research. The different subjects of the team are well connected offering a good coherence for the work. The remodelling of the group offers new opportunities for increasing interconnected research between group members.

▪ **Weaknesses and threats:**

The group currently lacks collaborations with the private sector and due to its size has limited sources of funding. The choice of a cereal model may help the team to fill this gap. Nevertheless, the transfer of knowledge to a new model plant could reduce the scientific productivity for some time and thereby be a source of fragility.

▪ **Recommendations:**

The group has a good national and international visibility on which it should build new public and private partnerships. The group members have recently identified numerous exciting players for their research. In line with the group reorganization, they should keep exploring new interconnections between their previous or ongoing research topics. In particular, the relation between the TOR pathway and the other regulating proteins under study is calling for more solid evidence.

The introduction of *Brachypodium* is fully justified, because of the importance of cereals in agriculture, and the general efforts developed at IJPB. This is clearly a new challenge.



Team 3 : Signalisation and nutritional recycling (SIREN)

Name of team leader: Ms Céline MASCLAUX

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015 (Team SATURNE)
N1: Permanent professors and similar positions	2	1
N2: Permanent EPST or EPIC researchers and similar positions	3	2
N3: Other permanent staff (without research duties)	3	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	2	3
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	10	9

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015 (Team SATURNE)
Doctoral students	3	
Theses defended *	6	
Postdoctoral students having spent at least 12 months in the unit *	4	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	3	2

- since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The major research focus of the team is placed on the metabolic and molecular regulation of nitrogen re-translocation during leaf senescence. In this context, the regulatory role of the TOR signalling pathway was also investigated.

Mainly using reverse genetic approaches in combination of ^{15}N labelling studies, the team has uncovered a prominent role of autophagy in the cellular reutilization and remobilization of nitrogen in senescing leaves of *Arabidopsis*. Due to the selectivity of this cellular process and its importance for seed filling in *Arabidopsis*, the approach is currently transferred to the crop species barley. The group was also the first to investigate natural variation in leaf senescence allowing to characterize the regulatory role of sugars in different senescence pathways and to identify QTLs for leaf senescence and nitrogen utilization traits. The mapping and cloning of these QTLs is currently in progress. The group has further characterized the role of senescence-induced glutamine synthetases and asparagine synthetases in nitrogen export from source leaves. The team showed a high publication activity with several papers under their lead at an excellent level (*Plant Physiol.* (1), *New Phytol.* (3), *J. Exp. Bot.* (4)).

The work specifically dedicated to the role of the TOR kinase in nutrient signalling and autophagy has led to a number of publications describing mainly phenotypes related to the deregulation of TOR kinase or associated proteins and, more recently, to the identification of a new interacting protein, LST8, in the TOR protein complex (*Plant Cell*, 2012).

In total, the group has published 41 papers with 23 papers under its lead.

Assessment of the team's academic reputation and appeal

The team is very well recognized at the national and international level. Members have been regularly invited as speakers in international conferences on plant senescence or nitrogen nutrition and the work on the TOR signalling pathways is well cited. This is emphasized by the organisation of the 6th European workshop on leaf senescence in 2013. The team further succeeded to attract a young, talented researcher from Japan by an INRA package grant. The team was able to obtain 4 ANR grants (2 as coordinators) and was involved in 1 FP7-ITN project besides receiving some smaller grants from other public agencies (mainly INRA). The involvement of the group members in editorial work and general outreach refers mainly to the function of the team leader as editor for one special issue in *J. Exp. Bot.* In total, these points qualify for an excellent scientific visibility of the group.

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

In particular with the work on nitrogen remobilization, the group has made efforts to transfer their knowledge gained in *Arabidopsis* to rapeseed and barley and therefore displays a good level of interaction with the social economic and cultural environment. This has however not yet resulted in direct collaborations with private partners except one contract with CETIOM-INRA.

Assessment of the team's organisation and life

Currently, 8 permanent people are members of this team: 1 DR1 and 2 DR2, 2 tech, 1 Engineer and 2 Associate Professors (each at 50%). Third party-funded non-permanent staff includes 1 associated researcher (IR2), one post-doc and 3 PhDs. Thirteen people mainly funded by project grants left the group within the past 6 years.

There have been several common interests with the ARENA group, which resulted in a considerable number of common papers. In particular, one member acted as a link between both groups due to his involvement in NLP7 transcription factor signalling. Both groups have decided in 2013 to re-shape, thus leading to the NUTS and SATURNE (Senescence, autophagy, nutrient remobilization and nitrogen use efficiency) teams.

Assessment of the team's involvement in training through research

Over the period, the team has trained 4 post-docs, 6 PhDs and 4 Master students who have left the team. There are currently 3 PhDs and 1 post-doc in the team. This is an excellent output.



Assessment of the strategy and the five-year plan

The future concept of the team builds on a stronger focus on the cellular processes determining selectivity of proteins targeted for autophagy and on investigating also other nutritional constraints besides nitrogen. The approach relies on conducting proteome analysis in mutants defective in autophagy and glutamine or asparagine synthetases. This work is assured by an ANR grant (AutoAdapt). In cooperation with the DYSCOL group, it is planned to investigate the role of autophagy also in the maturation and germination of seeds. Another new collaboration has been initiated with the Nitrogen-Pathogen Interactions team to investigate the role of autophagy and N assimilation genes in pathogen resistance. The mapping and cloning of genes underlying QTLs identified for senescence and N remobilization traits will be pursued. These plans have been confirmed by submitting ERA-CAPS proposals.

The expansion of collaborations within the IJPB and the inclusion of sulphur nutrition will certainly provide new opportunities to make use of the acquired knowledge and established resources for further publications and additionally strengthen the already strong integration of the group within the institute. So far, the research plan mainly represents a logic consequence of the work conducted so far and leaves a very good and solid impression with excellent aspects. These objectives are relevant with regard to the expertise of this team.

Conclusion

▪ **Strengths and opportunities:**

This team brings into the department newly acquired knowledge on cell biological processes supported by a bunch of new markers and mutants. The team makes use of the established facilities at IJPB in the most effective way, in particular by employing Arabidopsis populations with QTL mapping, or by using microscopy, metabolome and screening facilities and in the future also facilities to study the proteome.

The team has clearly reached international visibility in a clearly defined research field and established collaborations mainly with European partners. The current and future research strategy is solid, strongly based on previous achievements and thus promising to maintain the current status of the group. The planned stronger combination of autophagy and N assimilation promises to enhance resource efficiency and bears the potential for new discoveries.

▪ **Weaknesses and threats:**

The loss of a key member working on TOR signalling weakens the chance of the team to identify additional upstream regulators for autophagy. A continuous close collaboration with the NUTS group is considered as important. Moreover, there appears to be little collaboration between the team and the Nitrogen Management and Plant Productivity team despite their overlapping interests in glutamine and asparagine synthetases. In this regard complementary expertise remains unexploited.

Although the future research strategy is solid and promising, it would be important to identify new players in control of autophagy or leaf senescence. However, screening assays for autophagy activity have not yet been developed. Thus, the perspective for a real scientific breakthrough and the publication of higher-impact papers in the future remains limited.

▪ **Recommendations:**

This team has established a highly original research subject at an internationally competitive level and contributed to it with important findings. A more intensive investigation of cell biological aspects of autophagy would allow settling the group's work also in basic research. This may be achieved by investing into targeted reverse or forward screening approaches for autophagy-related traits. In this regard, the group would profit a lot if searching for integration into an ERA-funded project that may provide new opportunities and access to more tools and mutants.

A second pillar of the group may be seen in the transfer of the established tools and competences to crops. An early assessment and manipulation of ASN and autophagy genes in either barley or rapeseed may be promoted by seeking collaborations with private research partners from plant breeding.



Team 4 : Management of Nitrogen and Crops Productivity (GAPV)

Name of team leader: Mr Bertrand HIREL

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	3	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	5	5

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended *		
Postdoctoral students having spent at least 12 months in the team *	3	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	2	2

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The overall goal of the team is to link genes and metabolic processes in the nitrogen assimilatory pathway with agronomic traits to increase nitrogen use efficiency in maize. A major breakthrough of this group relies on having established and conducted a large series of N trait measurements in field-grown plants subjected to different N regimes. Applying 'omics approaches but also enzyme assays to different maize populations has allowed setting up the first QTL maps for N use efficiency traits in maize. While most QTLs are followed up by mapping and await further characterization, a part of this information has already been adopted by plant breeders for marker-assisted selection.

Coincidences of QTLs for yield and N use efficiency indicated a substantial involvement of glutamine synthetase (GS) and glutamate dehydrogenase (GDH). Physiological functions of individual isoforms of these two gene families have been investigated in the model species *Arabidopsis* and tobacco in parallel to maize, which was an efficient way to characterize their contribution to overall nitrogen use efficiency and grain yield and their dependence on the plant developmental stage. Most recently, the studies have been expanded to association mapping populations in maize by intensive cooperation with private plant breeders.

The team has placed 1 international patent and published 15 papers, among which 9 papers were under their lead. Best impacts were achieved with 1 paper in *Plant Cell* (where the team leader is corresponding author) and others in *Plant Biotech. J.* (1), *New Phytol.* (2), and *J. Exp. Bot.* (2). Taken together, this is an excellent output.

Assessment of the team's academic reputation and appeal

The team leader is highly recognized at the national and international level for his contributions at the interface of plant nutrition and plant breeding. He certainly was a pioneer in bridging these two disciplines which now led him more and more into applied research approaches with a strong focus on field-grown maize. Over the last period, the team leader has been invited 15 times as speaker in international conferences on N nutrition or maize breeding. Through tight collaborations within France, he has been instrumental for transferring science-based knowledge to crops and the application of similar approaches to wheat. The group was able to obtain 3 ANR grants (1 as coordinator) and 1 OSEO grant, as well as 1 contract with Biogemma, most of them being initiated recently. Besides acting as a reviewer for many scientific journals, he takes over editorial tasks for *Front. Plant Sci.*, *Crop Sci. Biotechnol.* and *Maydica*. Therefore, the visibility of the team is excellent to outstanding in academics and breeding industry, but the team's efforts to attract young researchers, in particular PhDs, should be improved.

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

The team cooperates with French and international partners from scientific institutions and breeding companies. It has issued one patent. Furthermore, team members serve as consultant for breeding and biotech companies and have strong interactions with Biogemma. The team leader also acts as reviewer for European and US funding agencies. His successful interaction with the economic environment is emphasized by two projects that are fully granted by industrial partners. This represents an outstanding engagement in bringing the own scientific work to translation into crops.

Assessment of the team's organisation and life

Currently, the team is composed of 5 permanent staff members: 1 DR1, 1 CR1, 2 technicians and 1 Engineer. During the past 6 years another 3 post-docs had worked in the team.

Assessment of the team's involvement in training through research

The team leader teaches 25 h per year in a Master programme at the University of Amiens. However, the commitment to the training young researchers through research is poor and no ongoing thesis is currently supervised. Over the period, the team has trained 3 post-docs which can be rated as a "good" overall activity.



Assessment of the strategy and the five-year plan

The major goal is the functional validation of candidate genes underlying QTLs for N use efficiency in maize in cooperation with Biogemma. This approach mainly builds on an assessment of transgenic maize lines. In cooperation with Penn State University, a systems biology approach supported by flux balance analysis will focus on metabolic modelling of N assimilation in maize leaves.

The team has also expanded its approach from N assimilation in leaves to nitrate uptake in maize roots and root architecture. For this purpose, genotypic variation in high- and low-affinity nitrate uptake and in root architectural traits will be monitored and characterized for associations with yield traits. Moreover, research is extended to the contribution of N₂ fixation by endophytic bacteria to N use efficiency in maize. Applying the ¹⁵N dilution method in inoculated versus non-inoculated maize genotypes has been chosen as suitable approach in collaboration with a group from Brazil. These new research lines nicely expand the previous research performed on the same maize germplasm. These very good to excellent objectives are relevant with regard to the expertise of this team.

Conclusion

▪ Strengths and opportunities:

A clear strength of this team is the strong focus on the important crop species maize allowing to investigate several traits in the same population and increasing the specialized knowledge required to promote breeding efforts towards more N use-efficient maize lines. The new project lines related to metabolic modelling, root architecture and function and endophytic bacteria emphasize and may efficiently exploit the group capacities to further expand its integrative approaches on N assimilation in maize.

An additional strength is the strong relation to the private breeding sector. This created a lot of targeted funding and research opportunities, which have been and are currently successfully exploited by the team.

▪ Weaknesses and threats:

The scientific knowledge in the team builds almost exclusively on the team leader. He stands rather alone due to a lack of a younger permanent researcher. In the future this will probably prevent the group from successfully combining basic and applied research strategies. Moreover, there appears to be little collaboration between this team and the team SATURNE despite their overlapping interests in glutamine and asparagine synthetases. In this regard complementary expertise remains unexploited. Furthermore, the size of the group appears small with respect to the large international competition in the area of N use efficiency in maize.

▪ Recommendations:

This team has gained merits and a lot of international reputation in the field of N use efficiency in maize. The future research directions target for a further exploitation of the previous characterization of QTLs for N use efficiency by classical and non-GMO approaches. This double-tracked strategy should be pursued regarding the lack of public acceptance of GMOs.

The research programme remains clearly focussed on N use efficiency in maize and has been amended with innovative aspects, making it promising and competitive despite the large international competition in this field. However, continued funding from the private sector needs to be assured, and clearer priorities may have to be set for the individual research lines.

Nevertheless, efforts need to be undertaken to recruit a younger permanent scientists sharing some of the research work and exploring the promising directions drawn in the group. The committee is concerned that the expertise and cooperation network built by the team leader over his career may be lost by IJPB (and INRA) upon the team leader's retirement in about 5 years. This point should be jointly addressed by the team leader, the IJPB directorship, and other IJPB scientists working in the field of nitrogen use.



Team 5 : Phloem, Transport and Signaling (PATS)

Name of team leader: Ms Sylvie DINANT

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	3.5	3.5
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	7	6

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended *	2	
Postdoctoral students having spent at least 12 months in the unit *	3	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	2	2

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The PATS group investigates the role of phloem in nutrient allocation and signalling. The main strategy is to characterize by functional genomics a set of membrane proteins previously identified as preferentially expressed in this tissue. These studies are supported by *in vivo* imaging of phloem cells and metabolomic characterization of phloem exudates.

The group has realised three major advances:

Phloem lectins of the PP2 type (**Phloem Protein 2**) were characterized and a variety of molecular binding activities were identified. The most relevant function of PP2 lectins may be anchoring organelles to the sieve element plasma membrane.

Three ABC transporters expressed in phloem were shown to physically interact and share a common role in lipid: sterol homeostasis. Mutant analysis revealed that they play a role in vascular patterning.

A novel membrane protein which localizes to the plasmodesmata of companion cells was functionally characterized. Extensive analysis of transgenic plants indicated that this protein plays a role in symplastic transport of sugars and export to the sieve elements. In addition, SWEET sugar export transporters that act in sugar transfer between phloem and xylem are currently under analysis.

Thus, the group has realized breakthroughs in the field of sugar transport by phloem, showing in particular the role of symplastic transport. Several studies also point to mechanisms that interfere with vascular tissue development and patterning. Finally, the group masters an impressive set of techniques for characterizing protein phloem function in *Arabidopsis*.

In relation to its modest size, the scientific production, truly driven by the group, and related to phloem functions remains limited. Yet, the most significant results were published in good-to-high profile journals : *Plant Physiol* (1), *Plant J* (1), *Plant Cell* (1), demonstrating the ability of the group to achieve internationally competitive work which can be rated as overall excellent. It is expected that some other achievements (ie: role of phloem bHLH in ABA response) will soon be disseminated through high profile publications.

Assessment of the team's academic reputation and appeal

The two senior members have an excellent international recognition in their respective fields, phloem and auxin and root formation. They have contributed to the organization of several international meetings (3) and delivered invited lectures in congresses (3) or contributed several book chapters (4) or reviews (9).

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

Overall the activities of the group in this respect can be considered good. The group has had difficulties in obtaining significant grant money that would ensure a higher work power in its field. It is a pity since the topics investigated offer very relevant potential agronomic applications, as emphasized by the group itself in its report.

One senior member plays a very active role in promoting scientific interactions between Sweden and France. Bilateral meetings are organized every second year.

Assessment of the team's organisation and life

Whereas the group started as very a small team (2 researchers and two post-docs and two PhDs), its strength was substantially increased in 2011 with the arrival of two permanent researchers and two technicians. However, the publication record and the report suggest that the activities initiated and/or developed at IJPB and in Umeå are still rather separated.

Assessment of the team's involvement in training through research

The group delivers very few teaching hours but has developed a very good training activity with respect to a significant number of PhD (2) and post-docs (3) or Master (7) students.



Assessment of the strategy and the five-year plan

The proposed focus on the role of vascular tissues in carbon allocation seems highly relevant and defines a very good to excellent research plan. Three major topics have been identified. Firstly, the group has revealed an important role of symplasmic sugar transport that deserves future research. Secondly, the lateral exchanges of sugar between phloem and xylem offer an interesting opportunity to enlarge the scope of the group to the overall function of vascular tissues. Thirdly, the effects of sugar on vascular tissue formation represents a promising avenue for future research. Due to the restricted size of the group, choices will have to be made within these exciting directions.

Conclusion

▪ **Strengths and opportunities:**

The group possesses an internationally recognized position in the field of phloem. Increased human forces should allow more ambitious scientific development than in the past. In line with this, the group has identified promising directions for future research.

▪ **Weaknesses and threats:**

The synergy between the two historical parts of the team is as yet not optimal, probably because of the recent team reorganization. The capacity of the group to get its own financing seems to be modest. The group has no specific qualification in membrane transport (to address SWEET functions for instance) which may possibly be limiting on the long term.

▪ **Recommendations:**

The recent increase in size of the group offers unique opportunities for future development. However, the group should keep its focus and work on improving the synergy between the four research topics proposed in the project.

An improved networking with public and private partners should facilitate the ability of the group to obtain funding.


Team 6 : Nitrogen-Pathogen interactions (NPI)

Name of team leader: Ms Mathilde FAGARD

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	2	2
N2: Permanent EPST or EPIC researchers and similar positions	1	1
N3: Other permanent staff (without research duties)	1	1
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)	1	
TOTAL N1 to N6	5	4

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	2	
Theses defended *		
Postdoctoral students having spent at least 12 months in the unit *		
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	3	3

 * since 1st december 2012



• Detailed assessments

Assessment of scientific quality and outputs

The NPI team is composed of previous members of the "Laboratoire des Interactions Plantes-Pathogènes" (LIPP, UMR 217). The LIPP team ended up its activity in 2012. The activity report is therefore that of the LIPP team.

The team studied processes underlying plant-pathogen interactions by investigating both the virulence and the defense strategies of the respective protagonists. Necrotrophic pathogens (*Erwinia amylovora* (Ea), *Dickeya dadantii* (Dd) and *Botrytis cinerea* (Bc)) and *Arabidopsis thaliana* were used as biological models. Members of the team produced data related to:

- the role of iron in host-pathogen interactions. They demonstrated that the plant iron status can have a significant impact on resistance to Dd (and Bc) and showed that host proteins that sequester or transport iron are key components of this process. The modulation of host iron homeostasis and defence responses have been linked to the iron-scavenging properties of pathogenic siderophores;

- the importance of chitin synthases (CHSs) in the virulence and Bc-induced defence responses. Work dedicated to Bcchs3a, a Bc mutant displaying a reduced virulence, indicates that Bc triggers an overexpression of PAD3 together with a camalexin production in Col0. The team assumed that PAD3 induction could be related to the elicitor activity of a component of the altered extracellular matrix of Bcchs3a. The team further investigated the individual role of other CHSs and found that BcCHS6 is involved in Bc reproduction and virulence, thus representing a putative antifungal target;

- the molecular basis of the non-host resistance of *A. thaliana* against Ea. Ea weakly multiplies in *A. thaliana* through a type III effector DspA/E-dependent process. A transcriptomic approach led to the identification of genes contributing to *A. thaliana* non-host resistance. They include NRT2.6 encoding a putative nitrate transporter. Accordingly, preliminary studies highlighted a putative link between nitrate nutrition and resistance to Ea, Dd and Bc.

Quality of the research is very good. Notably, the demonstration that i) iron, as a nutrient, is essential for both microbial pathogens and their plant hosts on the course of infectious disease, ii) specific CHSs could represent antifungal target and iii) a cross-talk operates between N metabolism and the plant response to biotic stresses are relevant findings.

The publication output can be considered very good. A total of 12 manuscripts (IF = 4,5) authored by at least one member of the present team was published in peer reviewed journals over the last five years. This includes publications in very good impact journals including Plant Physiology, Plant Journal, Molecular Plant-Microbe Interactions and PLoS One. Team members are first and/or last authors on 6 of these articles. A book chapter, a manuscript in the open access journal FEBS Open Bio and a communication with proceedings were also published. All team members are publishing.

Assessment of the team's academic reputation and appeal

Members of the team have been successful to get academic grants as coordinator (ANR DSPCELLDEAT, INRA SPE ATMYB30 project) or participants (INRA BAP MULTIPASS project, ANR PIANO, AgroPariTech project). They are involved in several national and international academic collaborations and organized the 2012 SFP (Société Française de Phytopathologie) as well as a workshop dedicated to plant-pathogen interactions. Seventeen oral communications were also produced. Recently, the team attracted two PhD students who started their contract in 2012 and 2013. Overall, these statements reflect a very good academic reputation and appeal. However, it should be mentioned that no invited reviews in peer-reviewed journals were published in the 5 years period.

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

The team is aware of the economical importance of its research (such as the possibility to use siderophores in phytoprotection strategies and to target pathogen CHSs in plant protection). A partnership with a non-academic partner (ICE Company, Italy) is developed (characterization of natural stimulators of defense). A collaboration with Bayer Crop Science is also on-going (characterization of Bc mutants). The team's interaction with its socio-economic environment can be considered as excellent.



Assessment of the team's involvement in training through research

The team actively contributes to teaching as two members are Teacher-Researchers in the Pierre and Marie Curie University and in AgroParisTech. Both of them coordinate Master courses. Furthermore, two members belong to key committees including those of the Doctoral School ED145 and of the Plant Science Master 2 degree of University Paris Sud. The team trains Masters 1/2 students and PhD students (2 during the five years period). This activity can be considered excellent.

Assessment of the strategy and the five-year plan

The team 5-years project is a very good combination of follow-ups of former projects and of new projects:

- Studies devoted to the understanding of the molecular mechanisms of disease induced by necrotrophic pathogens (Ea, DdBc) will be pursued. Besides completing the on-going work, the role of glutamate metabolism in DspA-induced cell death as well as the link between autophagy and iron homeostasy will be investigated;

- A new project will focus on the interconnection between N metabolism and plant-pathogen interactions. This project, based on recent data (see above), aims at:

- i) analyzing the incidence of N nutrition on the plant capacity to trigger defence responses to pathogens and PAMPs as well as on pathogen infection traits in plants (growth and virulence);

- ii) understanding how Nitrogen Use Efficiency (NUE) impacts the interactions by studying defence parameters of *A. thaliana* mutants/overexpressors altered in the expression of CUE-related genes of interest and of 18 accessions of Arabidopsis showing distinct NUE;

- iii) identifying and characterizing genes which products play central roles in the interconnection operating between N metabolism and plant-pathogen interaction and help the plant to adapt its defence response according to N supply.

- The team will participate to a "multi-stress" collaborative project within the APE department.

The project is ambitious, has some very original aspects and will benefit from the expertise of other teams of the APE department. It is also based on a solid corpus of recent work. The tasks related to the interconnections between iron homeostasis as well as N metabolism and plant-pathogen interactions are particularly relevant and promise to substantiate our current, but limited, knowledge on the interplays between abiotic and biotic stresses. Importantly, although the overall research plan is strong, the question of its achievement should be raised taking into account that the group is small (only 4 permanent people including 2 members deeply involved in teaching duties) and that the field of research related to plant nutrition/defence is increasingly competitive.

Conclusion

▪ Strengths and opportunities:

The NPI team was created in December 2012. The research group has a good scientific background and the scientific achievement of the members is satisfying, reflecting a good level of dynamics. The research is very good and the project, dealing in a still poorly explored (but increasingly competitive) field, is well integrated in the APE department. Knowledge of general significance on the biology of plant-pathogen interactions should be produced by the team.

▪ Weaknesses and threats:

The team is new and is facing the challenge of building a competitive research team with international visibility. Although the project is straightforward and coherent with the team's expertise, the actual size of the group seems small regarding to the number of proposed tasks. Given this statement, the increasing competition and also depending on their success in obtaining new grants, their strategy must be carefully evaluated.



- **Recommendations:**

There are some concerns regarding the size of the group, currently having three permanent scientists including two Teacher-Researchers and only supported by a permanent technician. The task related to the interconnection between N metabolism and plant-pathogen interactions could be investigated in priority as it clearly opens new opportunities for collaborative projects within the department. Regarding to the impact of the work related to the role of iron in plant pathogen interactions, the team might consider following up this original and promising research.


Team 7 : Meiosis and Recombination (MeioRec)

Name of team leader: Ms Mathilde GRELON

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	5	6
N3: Other permanent staff (without research duties)	11	11
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	8	4
N6: Other contractual staff (without research duties)	5	4
TOTAL N1 to N6	29	25

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	2	
Theses defended *	6	
Postdoctoral students having spent at least 12 months in the team *	15	
Number of Research Supervisor Qualifications (HDR) taken *	3	
Qualified research supervisors (with an HDR) or similar positions	4	4

 * since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The MeioRec team includes five group leaders who cover meiotic and somatic DNA recombination as well as non-homologous recombination in a variety of plant genetic systems: the lower haploid plant, *Physcomitrella patens*; the diploid model system, *Arabidopsis thaliana*; and the polyploidy *Brassica napus*. Their studies include the analysis of the recombination landscape along the chromosome as well as the mechanistic aspects that govern both localization and rate of recombination and special features of recombination such as genetic interference. The genes and proteins they investigate cover all the stages of meiotic recombination, starting from DSB induction, pairing, strand invasion, crossover, recombination intermediates resolution, chromatid and chromosome segregation. The team has published ~ 60 publications between 2008-2013 most of which in leading journals such as Science, The Plant Cell, PLoS Genetics, Current Biology etc. as well as patents. All together the team has made enormous contributions to our understanding of meiotic recombination in plants. Historically, the long-term investment that was initiated at INRA to develop mutant populations in Arabidopsis has paid off. The new generations has used these populations to isolate systematically tens of tagged mutants in meiosis (usually screening for male-sterile plants), for reverse genetics and for suppressor screens. The achievements of the team are many and diverse and we mention here only some of the highlights. One sub-group has used Arabidopsis mutants to discover and characterize several genes that control the various stages of crossover, starting from the early phases of meiosis, DSB induction (works published in PLoS Genetics) and more recently (Dec 2013) a beautiful study published in the Plant Cell identifying the genes that control partner choice (homolog versus sister chromatid) during meiotic recombination. Another sub-group has made a seminal contribution, published in a landmark article in PLoS genetics, to the characterization of the non-random landscape of meiotic recombination, in the male and female lineage. A third sub-group has also developed a method called pollen typing that can be used to better identify and quantify recombination hotspots and they showed in a recent PLoS Genetics publication (Nov 2013), that this method can be used for the characterization of hotspots of recombination for crossover and non-crossover events and of the genes that control those events. The fourth sub-group has designed a brilliant genetic screen that lead to the discovery of the FANCM gene that is suppressing meiotic crossover. This work was published in Science and lead to a patent for enhancing meiotic recombination. The same sub-group has many other stellar achievements in both basic and applied research. Two other sub-groups are also working on recombination, not in Arabidopsis, but in different systems that offer some unique twists. One sub-group works on *Physcomitrella patens* to address the genetic basis for the proficient ability of this moss to integrate DNA *via* homologous recombination. This work, published in NAR and DNA repair, has identified some of the genes that are essential for gene targeting in this moss and he showed that loss of gene targeting is associated with an up-regulation of integration *via* non-homologous recombination. Finally, one sub-group is studying *Brassica napus*, a relative of Arabidopsis, to better understand the control of meiosis in polyploid species where pairing of homeologs is suppressed in favour of pairing between homologs. This sub-group showed that meiotic recombination is stimulated in a tetraploid compared to a diploid but remarkably the enhancement effect was much stronger in the triploid. Cytological analysis of this phenomenon suggested that the increase is in crossover events that are not associated with genetic interference. A series of publications, including in The Plant Cell, describe this phenomenon.

Overall, the scientific productivity of the team was outstanding both in terms of quantity and quality.

Assessment of the team's academic reputation and appeal

The team of 5 researchers constitutes an impressive critical mass of scientists, which has no equivalent worldwide and is recognized as one if not the most advanced centre for the study of DNA recombination in plants. The team has been successful in attracting large amounts of funding, including several EU consortia and an ERC grant. They are visible through their many publications including 9 reviews and 9 book chapters and their work has been often highlighted, e.g. F1000. The team gave 43 oral presentations and in some cases were organizers at international conferences in the field. The academic reputation and appeal of the team can thus be considered outstanding.



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

The team members have produced patents, some of which were licensed, and have interactions and contract with the Industry. The team served on several panels and participates to the national debate on GMOs in various forums. This outstanding interaction defines an exceptional success in combining basic research and applications in breeding and biotechnology.

Assessment of the team's involvement in training through research

The team has trained only 6 PhD students between 2008-2013 - considering that there are 5 researchers, this is a low number. There are many post-docs, which reflects the fact that this is an attractive group; however some effort should be made to educate the next generation of scientists at the Master-PhD level. Based on the report, it was not clear how much the group invests in teaching and this aspect was therefore rated as very good but by no means up to the standards of the team's scientific output and reputation.

Assessment of the strategy and the five-year plan

The planned projects are a natural continuation of existing projects, including a deeper analysis of phenomena and a translation into crops (apomixis in crops and manipulating crossover in crops). The team proposes to perform more genetic screens, more detailed analysis of recombination landscape in various mutants backgrounds, determining the underlying mechanism for enhanced crossover in triploids and cloning the PrBn locus in Brassica, further studying the causes for efficient GT frequencies in *Physcomitrella* through a transposon-tagging screen. All these make sense. The proposed plan for improving GT in higher plants was not so clear therefore defining a plan which can be rated as excellent with outstanding aspects. In addition, the need for a bioinformatician for all the aspects involving whole genome analysis or mapping should have been addressed.

Conclusions

- **Strengths and opportunities:**

The team has an outstanding record, with very strong genetic tools and a combined exceptional expertise in research on DNA recombination. The team has great opportunities for synergy and for translation of basic findings - some of which patented- into crops.

- **Weaknesses and threats:**

Two threats that were not mentioned in the report and probably should have been taken into consideration in the future strategy are: (i) the ability of competitors to effectively exploit genomic and bioinformatic tools for whole genome sequencing will be increasingly important in the field; (ii) the CRISPR-Cas technology is now booming offering new opportunities for gene targeting and manipulation of crossover.

- **Recommendations:**

The group is doing very well and has many exciting projects in its pipeline. We expect that it will remain productive in the years to come. In order to remain at the top of the field on the long term, they will have to incorporate new approaches, including bioinformatics. Increasing activities in training PhDs and in teaching should be encouraged.


Team 8 : Host-Retrotransposon Interactions (RETROS)

Name of team leader: Ms Marie-Angèle GRANDBASTIEN

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	4	4

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended *		
Postdoctoral students having spent at least 12 months in the team *	5	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	1	1

 * since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

Research of the team focuses on transposable elements (TEs) that form up to 85% of large plant genomes and can generate genetic variation and provide a raw material for genomic rearrangements. The major type of plant TEs are LTR retro transposons (LTR-RT) that move by replicating *via* an RNA template. The team was created after the first discovery of a functional LTR-RT (Tnt1) in tobacco and developed research lines on impact (stress responses, molecular evolution) of such elements on host genomes. More recently focus was placed on TE-associated changes generated by allopolyploidy of tobacco. Coupled with previous expertise on tobacco stress-responsive LTR-RTs, the approach provided a framework for studying transposon-associated alterations accompanying allopolyploid speciation. In parallel, the team became increasingly interested in large-scale reprogramming of gene expression via LTR-driven co-transcripts and is exploring the roles of co-transcribed ESTs driven from Tnt1 LTRs in reprogramming tobacco gene expression in stress conditions.

Major research results include (i) the demonstration of genomic instabilities at early stages of the response to the genomic shock of allopolyploidy in the model tobacco. These instabilities are associated to amplifications of specific retro transposon, as well as restructurings around parental insertion sites. (ii) the demonstration of evolutionary trajectories that are specific to different families of TEs in natural young and recent allopolyploid Nicotianae; (iii) the demonstration of the production of co-transcripts that may modulate the expression of adjacent gene driven from tobacco LTR-RT. The importance of co-transcription varies depending on the element's family and the expression of co-transcripts parallels the differential expression specific to each family; (iv) the development of new sequencing strategies of RT-PCR amplicons allowing the global analysis of retro-transposon expression and the production of LTR-driven co-transcripts. These strategies have revealed new co-transcripts and differential expression of sub-populations of several retro-transposons, as well as a differential response to stress conditions.

Considering publication level, 20 publications (5 more are indicated in preparation or submitted but not yet accepted) are reported over the 2008-2013 period (with a burst in 2009). However, among them, 8 correspond to book chapters or reviews. Concerning original work only 4 publications, (IP-3.5-6.7, last ones in 2012) are signed in first or last position by present or past team members. Particularly, publications related to new sequencing technologies are all co-signed in intermediate positions indicative of collaborative works. There is no report of patent application involving team members as co-inventor. Globally the rate of publication of original papers where a team member had a major contribution is relatively limited and was decreasing over the period. This in part balanced by a significant activity in publication of book chapters or reviews. The new permanent researcher (CR2) has written one review with the PI. The overall output of the group is thus considered to be very good to excellent.

Assessment of the team's academic reputation and appeal

The publication of 3 invited reviews and book chapters are indicative of a significant academic reputation in the research field. The PI participated as member of ERC panel LS2 and was appointed member of the sectorial scientific commission of IRD and acted since 1999 as associated editor of *Genetica* and as communicating editor for journal *Mol. Gen. Gen.* She participated as a member of organizing committee of "Polyploidy and Biodiversity international meeting in 2009 and regularly acts as member of PhD/HDR committees. The overall academic and reputation can thus be considered excellent.

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

The PI is vice-president of the "association pour la Recherche sur les Nicotianées" and had a long time interactions with the Tobacco Institute in Bergerac. The team had a small, 2 year contract with SEITA. Interaction with social, and cultural environment is thus very good.

Assessment of the team's involvement in training through research

There is no mention of PhD student training but several stays (4 on ANR project funding, 2 on others funding) of post-docs in the team. The PI was member of several PhD/HDR and student selection committees including at international level and acts as member of recruitment panels for universities which can define a good to very good involvement in training through research.



Assessment of the strategy and the five-year plan

The excellent project is a direct continuation of present projects, trying to integrate the next generation sequencing technologies into her themes of research. The PI tries to overcome current limitations and particularly the inability to obtain progenies from various synthetic hybrids. The project targets the development of new LTR-targeted capture technologies allowing recovery of multiple LTRs and adjacent regions. These strategies would target genome-wide characterization of polyploidy-associated changes in LTR-gene associations. The objectives remain to explore the importance of LTR-driven cotranscripts in gene expression alterations associated with allopolyploid speciation and the modification of cotranscript populations in response to stress by LTR capture on natural and synthetic hybrids in various stress conditions. Work is expected to provide novel insights into the impact of LTR-RTs on the structure and the function of plant genomes in response to genome shocks and external stress. Another novel interesting aspect of the proposed research is to compare genomic stress in interspecific hybrids and external environmental stress. While projects are interesting and a natural continuation of the PI's research, it will be challenging to move into a strong bioinformatics demanding project. This will depend on the ability of the PI to recruits competent bioinformatician as well as on the ability of the unit as a whole to provide support for this kind of genomic research.

Conclusions

- **Strengths and opportunities:**

The team is internationally recognized, had clearly played an innovative role and has acquired in the past a strong expertise in the field. Tobacco, the developed biological model, remains well-adapted to objectives, but, due its allopolyploidy, still suffers from limitations in genomic sequence references. However, this point is expected to rapidly improve, as suggested by the recent publication of first diploid genomes and with the generalization of modern high throughput sequencing techniques.

- **Weaknesses and threats:**

The team approach should be better incorporated into the mainstream of IJPB models and researches. Bioinformatics, that is becoming the real bottleneck for up-to-date high throughput sequencing technologies, is also covered by a too limited expertise within the team. This was partially balanced in the past by suitable collaborations but this remains a question to be addressed.

However the major weakness is the shrinking size of the team, even if this could be balanced by the recent recruitment of a young CR2. Another point of concern is the absence of recent research contracts, which in turn is reducing work forces, particularly at post-doctoral level. In addition it can be questioned why the team in not regularly training PhD students that could bring-in fresh views. Publication level of the team is good but is also on the decrease and if the bioinformatic challenge is not met, this will be a major threat.

- **Recommendations:**

While past work of the team was original and pioneering, the dynamics appear in part to be broken in the recent period. Even if the recent recruitment of a CR2 researcher can bring an impulse, the size of the team remains critical and no clear evolution can be forecast. The team could better exploit opportunities to collaborate with other groups within IJPB. New sequencing technologies are demanding on the bioinformatics side, and considering the importance of the approach for the team project, this bottleneck must be successfully addressed.



Team 9 : Epigenetics and Small RNAs (epiARN)

Name of team leader: Mr Hervé VAUCHERET

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	2	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	5	
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	9	5

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	1	
Postdoctoral students having spent at least 12 months in the team *	10	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	2	2

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team focuses its research activities on dissecting the molecular complexity of silencing pathways. The team has been pioneer in the field of silencing, and this long history and expertise with this research field is associated with an outstanding track record. Developing a set of transgenic lines subjected to different types or strength of silencing, the team has been using powerful genetic approaches (mainly forward screens) to isolate an impressive number of mutants, many of these yet to be characterized. One important contribution of the team in the recent past was the identification of the JM14 histone demethylase, which targets endogenous genes but not transgenes, thus allowing the cell to discriminate between self and non-self DNA material based on the specific pattern of histone marks. As another major contribution to the field, the team has identified the *RTL1* gene encoding a type III RNase that counteracts RNA silencing by degrading long double stranded RNAs. The team has further shown that *RTL1* expression is responsive to viral infection and that some viruses encode suppressors of *RTL1*. Over the evaluated 2008-2013 period, the team has been the main contributor of 11 primary research articles, 11 review / book chapters, and has been involved as collaborator in a total of 11 additional papers. Among the main contributions, several were published in high-ranking journals, including two articles in *The Plant Cell*, one in *EMBO Reports* and one in *PLoS Genetics*. The work related to *RTL1* is currently under consideration at *PLoS Biology*. This is an outstanding scientific output.

Assessment of the team's academic reputation and appeal

The team leader has an outstanding academic reputation in the RNA silencing field, illustrated by the recent award of the prestigious 2009 Louis D. price from the French Academy of Sciences and numerous invitations to speak at international meetings. Additionally, the PI is a permanent EMBO member since 2005. The team has continuously attracted external funding, mostly from the French ANR research funding agency (4 grants as coordinator and partner in 2 others) and the PI serves as expert for several national and international funding agencies, including the ANR, BBSRC and ERC. Some past and current post-docs have been granted individual research fellowships. The team is collaborating with several national and international groups, including two well-renowned laboratories in the field located in the USA (Riverside, CA).

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

The team leader is participating in national and international PhD committees. However there is no reported contact with the industry. Nevertheless the team leader has contributed an article in the journal "Biofutur" intended for a general audience, as well as articles for the INRA webpage which insures a minimal good social and economic interaction.

Assessment of the team's organisation and life

The team is currently composed of 4 permanent staff (1 DR1, 1 CR1, 1 IR2, 1 TRNO), 5 post-docs and 1 PhD student. Although the size of the group is limited compared with that of international competitor laboratories, it is a rather decent size for a French group. The team leader is deputy manager of the "dynamics and expression of the genomes" department of the institute. The organization and life of the team in terms for instance of internal meetings and implication of team members in common management cannot be assessed based on the report.

Assessment of the team's involvement in training through research

The activity of the team with respect to training through research can be considered very good. It indeed had two PhD students but no Master student over the 2007-2013 period, which appears rather few.



Assessment of the strategy and the five-year plan

This is an outstanding and ambitious project, which objectives are very well rooted in previous work of the group and constitute an exciting series of integrated projects. This includes screening for additional PTGS-deficient mutants, analysis of *jmj14*-like mutants affecting differently genes and transgenes, grafting-coupled genetic analysis of RNA silencing signalling, extended analysis of the function of components of the RNA-trafficking THO/TREX, investigation of the impact of prolonged warm temperatures on the heritability of epigenetic changes at transgenes and endogenous genes. The expertise and the high quality of the past research achievements of the group largely ensures the feasibility of the different projects in the proposed timeframe. However, the funding sources supporting these efforts are not mentioned.

Conclusion

▪ Strengths and opportunities:

This is a world leading team in the field of plant RNA silencing with high scientific productivity and strong connections to the national and international scientific community. The team has a solid and well-focused research activity.

▪ Weaknesses and threats:

No specific weaknesses. Although the team has been particularly successful in attracting funding from the ANR, alternative funding sources should however be considered in light of the current funding environment of public research in France.

▪ Recommendations:

Given the high expertise of this team and the reputation of its leader in the RNA silencing field, applications to European/International research grants (e.g. ERC) should be strongly encouraged. If possible, the team should consider training more Master students.


Team 10 : Epigenetic Natural Variation (VarEpi)

Name of team leader: Mr Nicolas BOUCHÉ

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	1	1
N3: Other permanent staff (without research duties)		
N4: Other professors (PREM, ECC, etc.)		1
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		1
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	1	3

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *		
Postdoctoral students having spent at least 12 months in the team *	1	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions		

 * since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The major results presented in the evaluation report describes the identification of new targets of the micro-RNA miR398, the characterization of a naturally occurring epiallele and its role in genetic incompatibility, and the identification of the SG1 factor that controls epigenetic patterns through modulating transcription of the IBM1 gene. Additionally, the team has analyzed the establishment of silencing of the Tobacco transposon Tnt1 when introduced in Arabidopsis, and has done some work on the GABA-shunt metabolic pathway. Obviously, the team has had a quite motley scientific interest over the last years. The team leader appears as senior author on 3 primary research articles published, and he has contributed one comment paper and one review about miRNAs. The PI appears as collaborator on two research papers from two other groups of the institute. This represents an excellent scientific output given the size of the team and the diversity of topics studied over this period.

Assessment of the team's academic reputation and appeal

The team has close internal collaborations with two groups of the IJPB. It also has several international and national collaborations, in particular with laboratories interested in plant miRNAs which testify to a very good reputation in its field. The PI was a member of the AERES evaluation committee of the Plant Biology Departement of the Toulouse University. In addition the PI has been a member of a lecturer recruiting committee for Paris Sud University. However, the academic reputation of the team seems to be still limited at the moment, illustrated by the fact that no participation/invitation in an international conference was mentioned in the report. Lack of high profile publications with the team leader as a senior author likely reduces the team visibility.

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

The absence of contact with the industry limits the otherwise good interaction with the environment.

Assessment of the team's organisation and life

The team currently consists of only the team leader and a PhD student. The team has lost two permanent staff over the 2008-13 period (1 TR and 1 IR) and has no dedicated technical help.

Assessment of the team's involvement in training through research

The team currently has one PhD student and had two Master students over the 2008-2013 period. The team also has been succesful in attracting two post-docs. This can be considered very good given the small size of the team. In addition, the team leader is frequently participating in thesis committees. The PI was also part of the PhD recruiting committee of the Sciences du Végétal Doctoral School of the Université Paris Sud.

Assessment of the strategy and the five-year plan

The proposed project can be considered very good but with the following comments. The plan is very focused on the identification and characterization of epialleles, both natural and experimentally induced, it fits well with the expertise of the team leader and is in good continuation with some part of the previous work. The proposed research is developed in close collaboration with the VAST team at the IJPB. There is no mention of ongoing projects dealing with miRNA biology, therefore continuation of the previous collaborations with groups in this field appear unclear. The competition in the study of experimentally-induced epialleles is rather high, and because *met1* and *sg1/ibm2* mutants are both impaired in *IBM1* gene expression, the chance of identifying and studying similar epialleles and/or molecular mechanisms should not be underestimated. Additionally, the size of the team may be sub-critical in light of the manpower and financial resources of competitor laboratories.



Conclusion

▪ Strengths and opportunities:

The team has developed close collaboration with other teams of the institute and the team leader has a good expertise in plant epigenetics.

▪ Weaknesses and threats:

The team is of sub-critical size, especially considering the workforce of direct competitors.

▪ Recommendations:

The team projects are developed in close collaboration with other groups, which is a good strategy in view of the limited size of the team. Nonetheless, particular attention should be paid by the team leader to publish as a senior author in order to increase the team visibility and raise external funding. The team would highly benefit from a dedicated technical assistance. The PI should be encouraged to merge with one of its collaborators in order for him and for his students to enjoy the benefits of being part of a larger group.



Team 11 : Chromatin Dynamics and Gene Regulation (CHROMA)

Name of team leader: Ms Valérie GAUDIN

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	1
N3: Other permanent staff (without research duties)		
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)	1	
TOTAL N1 to N6	3	1

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	2	
Postdoctoral students having spent at least 12 months in the team *	3	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	2	1

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team is very small, with one group leader in addition to a senior scientist who just retired. The team is studying the connection between chromatin structure and gene expression. More specifically, they study how the Polycomb group of proteins (PcG) repress and maintain the transcriptionally silenced state of chromatin. It is known that the repression involves histone modification, but there are still many open questions that the group is addressing: how the PcG interact with their target? how this process is modulated by stress or during development? and whether spatial 3D localization of silenced chromatin is related to gene function? These are very interesting questions at the cutting edge of epigenetic research. A claim to fame of the PI was to have identified PRC1, the first plant functional homologs of the animal PcG proteins. One important achievement of the team was to identify LIF2 as a partner of LHP1 (a protein of the Polycomb complex). LIF2 is an RNA-binding protein that controls cells identity during floral development. This work was published in PLoS One. A continuation of this work is apparently submitted, using CHIP-Seq, to determine what are the targets of LHP1 and LIF2. This work points to a connection between stress response and PcG activity (Book Chapter 2013). Another achievement of the group was to develop a 3D-FISH protocol to study the dynamics of the chromatin/heterochromatin within the nucleus and to use it, in collaboration with another IJPB group, to provide evidence in support of repulsion between heterochromatin compartments in the nucleus. The group also collaborated with another IJPB group to show the evidence for extensive changes in chromatin-associated genes during protoplasts regeneration. Overall the work is very good to excellent but the productivity was not very high with 5 publications as lead author in good but not top journals (IF=5.5) and 3 review articles (IF=4.3), 2 book chapters and one edited book.

Assessment of the team's academic reputation and appeal

The team has an excellent standing in the field of chromatin dynamics in plants but is not considered as a world leader. It has been successful in attracting funding and it has taken the lead in several consortia and participates in a EU-funded consortium. The number of seminars/lectures at international conferences is reasonable. The group participated in co-organization of 3 EU workshops, gave presentations in Madrid & Oslo University. It participated in National networks as a partner in INRA AgroBI (integrative Biology) on Nuclear architecture. The group participates to committees and to juries for thesis in France and abroad. The group is also a partner in projects of SPS LabEx, Genoscope URGI and at the international level with the Plant Molecular Biology Center (ZMPB) in Tubingen.

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

The group has been involved in very good interactions with industry research as part of consortia EU projects (ITN EpiTRAITs) on plant chromatin but has no contracts with industry per se, no patents and no direct applications in crops.

Assessment of the team's involvement in training through research

The group has trained 3 PhD students and 3 post-docs between 2008-2013, there is only one PhD student left at the moment. It has published book chapters and co-edited a text book for which it received a prize in education (Prix Roberval 2010). In short, this activity can be considered outstanding.

Assessment of the strategy and the five-year plan

The question between stress response and PcG is very interesting and original in particular with respect to the RNA/PcG/DNA complexes and the excellent plan proposed should be feasible by the group. The planned projects to go deeper into the connection between chromatin 3D structure (in collaboration with the MiN team) and patterns of gene expression is more challenging—the lab won't be able to do it on its own unless it grows considerably to integrate new skills in bioinformatics, image analysis and modelling that are not available in the lab. The group leader has built a network of collaborators that might enable her to achieve some of her goals but this would probably entail loss of leadership in these projects.



Conclusions

- **Strengths and opportunities:**

The strength of the group is in a broad expertise of chromatin analyses, such as cytological tools, CHIP and molecular biology and genetics. New technologies in this field present strong opportunities for future growth and it is likely that the field will undergo much expansion. The group was in this field from the beginning and is asking very interesting questions. It is, therefore, well positioned to gain leadership. The connection of Polycomb and stress is an opportunity to make an impact on Agriculture.

- **Weaknesses and threats:**

The field is becoming very competitive. It will be important to gain new skills in nuclear structure analysis, e.g. 3C and 4C and in cell biology and microscopy for in vivo chromatin labeling. It will also be critical not to fall in the trap of finding correlations without trying to address mechanisms in a direct manner. One of the threats of depending on collaborations will be to lose leadership and visibility and autonomy. The group did not realize its potential to make an impact in Agriculture.

- **Recommendations:**

The group has been productive but it is in a field that is competitive and that demands very expensive resources and skills in imaging and bioinformatics that the group does not have. To remain competitive and improve its performance in terms of publication quality and quantity, the group should grow, and/or have strong collaborations or join forces with other groups at IJPB or focus on topics that are less demanding and competitive. The connection of Polycomb and stress might be a topic on which to focus, in particular due to its relevance to agriculture.



Team 12 : Modeling and Digital Imaging (MiN)

Name of team leader: Mr Philippe ANDREY

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	1	1
N2: Permanent EPST or EPIC researchers and similar positions	1	1
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	2	1
N6: Other contractual staff (without research duties)		1
TOTAL N1 to N6	6	6

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *		
Postdoctoral students having spent at least 12 months in the team *	1	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions		1

* since 1st january 2011



- Detailed assessments

Assessment of scientific quality and outputs

This is a very new team, being formed in 2011 with only 1 Senior Lecturer, 1 Researcher and 2 Engineers. Of these, only one devotes 100 % of his time to the group. MiN has since recruited 2 post-doctoral scientists and 1 PhD student, but remains a small unit. Even so, the team has produced 15 primary articles, 13 conference papers, and 7 software tools within the review period. Though some software tools are quite small, others, most notably Free-D, represent a sizeable amount of work. The number of outputs is good, and the work is of excellent quality. The methods supporting integration of data across samples is of particular value and interest.

MINs publications are a healthy mix of technique and application focussed articles which can be considered excellent in its field of research. The impact factors of some of the papers produced, however, are low compared to those reported by other teams. This is in large part due to the area of work: computer science/image analysis journals have much lower IFs than comparable biology outlets. Pattern Recognition Letters, for example, is an excellent journal in its field, but has an IF of only 1.53.

Assessment of the team's academic reputation and appeal

The team's reputation is very good and increasing. Their strength in the statistical foundations of shape modeling and image analysis gives them a clear place in the field and a solid starting point from which to grow. They play a key role in national and international projects (TEFOR, EpiTraits and LifeGrid) and members of the team have given invited talks at events focusing on both biological and technological subjects. They are hitting the right conferences and, given the short period of time they have been together, are attracting very good numbers of students. MiN would, however, benefit from closer links with other groups developing 3D models of plant components.

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

Though they currently have no formal industrial contacts the team is interacting with a range of individuals and groups. Their publications show evidence of wider collaboration and the four permanent members are actively engaging with INRA through the "imaging" transversal animation committee. Their software tools are used both within and outside IJPB which testifies to its good level of interaction with its environment.

Assessment of the team's involvement in training through research

The team is very active in training, having successfully instigated and delivered a number of excellent targetted training events for researchers. Though it has very few PhD students, five Masters students have passed through MiN.

Assessment of the strategy and the five-year plan

The plan is clear, well-structured and makes excellent use of MiN's strength in statistical shape modeling. The work is novel, and expected to produce valuable results and high quality outputs. The planned modeling of morphogenesis of plants is a particularly interesting extension of their previous work.



Conclusions

▪ **Strengths and opportunities:**

The team has a good mix of skills and close ties to a range of biologists, which is crucial to successful work in bioimage analysis and modelling. More importantly, their skills centre around a clear focus point - imaging and statistical modeling of shape. This, I think makes them less susceptible to mission drift than some similar groupings. There is significant potential to develop internationally-leading multi-dimensional and multi-scale image analysis and modeling work within IJPB.

▪ **Weaknesses and threats:**

The group is very small, particularly for such a widely applicable and growing research area. Though there are four permanent members of staff only one is affiliated to IJPB 100% of the time. There is also only one PhD student.

▪ **Recommendations:**

The challenge for MiN is to expand while maintaining a clear research focus. While this is difficult, they should make every effort to increase the number of PhD students within the team.

As they note themselves, the team does need to improve its publication profile. Publication of MiN's methods in e.g. the Breakthrough Technologies sections of high-quality plant science journals is clearly possible, and would increase the team's recorded impact and visibility within plant science.

Though they should maintain their current focus on statistical methods, the team would benefit from closer links with other groups working on 3D models of plant components.



Team 13 : Branching Control in Plants (CORAM)

Name of team leader: Ms Catherine RAMEAU

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	3	3
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	6	5

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	3	
Postdoctoral students having spent at least 12 months in the team *	3	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	3	3

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team is interested in the establishment of plant architecture, focusing on the hormonal control of branching. Current work is largely on the characterization of the role of Strigolactones (SL) in the establishment of plant architecture as well as on the interaction between SL and other plant hormones. The use of two very distinct model species, *Pisum sativum* and *Physcomitrella patens*, puts the work in an evolutionary context.

The team has an excellent to outstanding publication record. It has played a major role in the discovery of Strigolactones as plant hormones (corresponding authorship on Nature article in 2008). Since then, they have further investigated the role of SL in branching, integrating the interactions with other hormones. Crosstalks with auxin and cytokinins have been identified, it seems, however, that SLs act independently from Gibberellins. In parallel, work on *Physcomitrella* suggests a highly conserved role of the hormone in branching and outgrowth. Finally analyses aimed at elucidating the structure of SL have given further insight in the function of the hormone.

The overall output of the team is thus excellent to outstanding. Their involvement in the discovery and further functional characterization of SLs has led to an excellent international and national visibility. The results have been published in very good to outstanding journals, including Nature, PNAS, Development and Plant Physiology. Of a total of 30 publications since 2008, 19 have been published with team members as first or last authors. The results of the team have also led to a total of 4 patents.

Assessment of the team's academic reputation and appeal

Their work on SLs has had a clear positive impact on the reputation of the team. The group leader has a very productive and solid network of collaborators, both national and international, which has allowed her team to maintain the excellence of its scientific production. They are currently actively involved in the coordination of a COST action (STREAM), and in the ANR funded PEAMUST project. Regular funding has been obtained over the years, mainly via the ANR. The group leader has been invited to several conferences, to write reviews and has received a prize from the French Academy of Sciences. The team's reputation and appeal is thus outstanding.

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

The team has made appreciable efforts to find applications to their research and issued 4 patents. As mentioned earlier, several patents have been filed, and one of the team members has been involved in a project aimed at evaluating SL as a new class of plant hormones, which involved Bayer Crop Science. The group leader has communicated on her research on radio and TV. This type of interaction with the social and economic environment can be considered excellent.

Assessment of the team's involvement in training through research

The training is mainly limited to the training of PhD students, 4 over the period of the evaluation which with respect to the team's size can be considered excellent.

Assessment of the strategy and the five-year plan

The research project for the coming five years is a logical follow up of ongoing projects. A number of well defined aims have been identified. The long standing experience with the Pea model as well with *Physcomitrella*, provide the team with a significant strategic potential. Overall, however, this very good to excellent project concerns a wide range of aspects and seems to lack focus for such a relatively small team. This is particularly important as the report mentions increasing competition.



Conclusion

- **Strengths and opportunities:**

- The team has a unique expertise in Pea and *Physcomitrella* biology, which should provide them with a comfortable strategic position for the coming years;
- The team has played an important role in the SL field and has acquired an excellent reputation;
- Excellent network of active collaborators.

- **Weaknesses and threats:**

- Size of the team, in particular with such an ambitious programme;
- A certain lack of focus, which can become a problem because of international competition.

- **Recommendations:**

The committee encourages the team to remain focused on topics where they can maintain a leading position.


Team 14 : Transcription Factors and Architecture (FTA)

Name of team leader: Mr Patrick LAUFS

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	4
N3: Other permanent staff (without research duties)	3	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	3	1
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	8	8

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	3	
Postdoctoral students having spent at least 12 months in the team *	5	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	2	3

 * since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team is interested in morphogenetic processes occurring in meristems and during early phases of organ development. The team's project is focused on two families of meristem regulators: the KNOX 1 class of homeodomain transcription factors and the NAM/CUC transcription factors. These factors work in concert to establish and maintain meristems and boundaries throughout plant life.

The group significantly contributed to our understanding of the role of CUC genes in leaf development and branching in Arabidopsis and also to the role of these genes in leaf development in Angiosperms. The team is in an internationally leading position in this field. It also showed the role of KNOX 1 genes in inflorescence patterning, organ abscission and flower formation. All together, this pioneering work produced 23 publications, 16 reporting original work in outstanding journals (Science, PNAS, Plant Cell, Development, Current Biology), 10 of them through collaborations in which the team was not the main leader. There are also 2 reviews articles, 3 short format articles, again in outstanding journals (PNAS, Current Biology). Considering the small size of the team, the scientific production can be considered outstanding, both in quality and quantity.

Assessment of the team's academic reputation and appeal

Several invitations to international meetings are mentioned and an invitation to write a review (Current Opinion in Plant Biology). The team leader has participated in an AERES evaluation panel and is a nominated member of the CNRS committee CoNRS Section 23 since 2012. In addition, he is expert for the EC-funded plant phenotyping platform (EPPN). The team permanent scientists show an excellent implication in expertise activity through participation to several PhD, HDR committees as well as recruitment of professor and lecturer. The team has regular fundings with 5 ANR grants and 5 collaborations with national and international scientists. The team had a post-doctoral fellowship from the Ile de France region (2008-2010). In addition, the team leader co-organised a conference on miRNA in plant and animal development. Finally, three publications of the team were recommended by F1000. All this shows an outstanding scientific visibility of this group.

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

The team shows an excellent involvement in social environment through participation of its leader to “La fête de la Science”, to seminar at the French Academy of Science and to scientific animation at high school.

Assessment of the team's involvement in training through research

The team contributes to scientific training of students at master and PhD levels. It also trained several post-doctorant scientists showing an excellent implication in training through research.

Assessment of the strategy and the five-year plan

The excellent to outstanding projects of this small team are very well focused, original and promising. The collaborations are perfectly adapted to the scientific questions. The different projects are highly coherent regarding the team's objectives. They are now developing genomic approaches to characterize the targets of the transcription factors of interest and construct gene regulatory networks. They are also using modeling approaches to provide an integrated view of leaf development. This evolution is very positive and should be supported. Regarding the scientific project for the future, the objectives are clear and pertinent, in particular the integration of the auxin part to the general team project is scientifically pertinent.



Conclusion

The scientific production of this small team during the past years is outstanding. In particular, it has been pioneer in demonstrating the role of the NAM/CUC genes in leaf shapes in Angiosperms. The team was initially focused on two families of transcription factors and used classical molecular genetic approaches to investigate the function of these genes. Then, the team broadened its investigations and started an evo-devo study on the roles of CUC genes in leaf shape across Angiosperm species. They are now developing genomic approaches to characterize the targets of the transcription factors of interest and construct gene regulatory networks. They are also using modelling approaches to provide an integrated view of leaf development. This evolution is very positive and should be supported.

- **Strengths and opportunities:**

The topics of the team are well focused. The team has well established collaborations. Two new staff members have integrated the team in 2014 and will strengthen the potential of the team.

- **Weaknesses and threats:**

Due to the rapid increase in permanent research scientists and the broadening of the projects, the technical support will become insufficient. The team relies on collaboration for the modelling and genomic approaches. The field is quite competitive in particular, the auxin field.


Team 15 : Cell Differentiation and Polarity (DIPOL)

Name of team leader: Mr Jean-Denis FAURE

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	1	1
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	3	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	6	6

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	2	
Theses defended *	2	
Postdoctoral students having spent at least 12 months in the team *	3	
Number of Research Supervisor Qualifications (HDR) taken *	1	
Qualified research supervisors (with an HDR) or similar positions	2	2

 * since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The DIPOL team is addressing a very fundamental question: how cell polarity in plants is linked to differentiation. Focusing on plasma membrane activity and lipidic composition, the team aims at answering the following questions: How is cell differentiation determined by cell polarity? How does membrane lipid composition influence cell polarity?

Earlier results from the team based on mutant screens have pointed out the importance of fatty acid elongation in cell differentiation and polarity. The characterization of three genes (PAS1, 2 and 3) has showed that they are all involved in the elongation of the very-long-chain fatty acids (VLCFAs) and play a role in tissue patterning and cell polarity. The study of phloem differentiation, which is a polarized process allowed the identification of a phloem specific and polar localized protein (OPS). OPS is one of the few known phloem determinants and promotes the differentiation of protophloem cells. This research required specific methodological development. Translational research is also achieved by the team to try and improve oil yield and quality using *Camelina sativa* as a model species.

The scientific production is composed of 33 publications mostly in top quality journals (Plant Cell, PNAs, Plant J, Plant Physiol, Dev Cell, Current Biology, Development) among which 3 reviews. The team has also produced 2 patents. This publication record is excellent to outstanding both in quality and quantity due to the relatively small size of the team and the publication rate is pretty constant over the years.

Assessment of the team's academic reputation and appeal

The team has an excellent academic reputation and has been successful in getting fundings so far. Three reviews have been published. One participation to a keystone symposium is mentioned and the team leader has indicated regular invitations during the discussions. The team leader has been participating to the INRA evaluation committee (CSS) for 8 years, was member of the scientific committee of the INRA Plant Biology department (2008-2012), represented AgroParisTech in the direction committee of IJPB and for the Labex steering committee, was member of the doctoral school Science du végétal. He was also training manager at AgroParisTech. In addition, six collaborations are established, 4 being with teams from abroad. A total of 6 papers have been cited in F1000.

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

The project on *Camelina* constitutes an excellent translational research project and is a direct contribution to the economic environment. In addition to the 2 aforementioned patents, excellent interaction with the environment is also evidenced by participation to a TV show (E=M6).

Assessment of the team's involvement in training through research

The team has trained 4 master students and 4 PhD students, as well as 3 post-docs. In charge of the teaching module "Biologie-Santé" and Integrative Biology. Member of the doctoral school Science du végétal. This shows an excellent involvement in training.

Assessment of the strategy and the five-year plan

The excellent project proposed for the next 5 years is very well structured and promising. Each permanent scientist has a well defined project and the different projects are coherent regarding the team's objectives. The multiscale approach describing the first steps of embryo development is original and will be done in collaboration for the modeling part. The genetic dissection of the regulatory network associated to fatty acid elongation is in perfect continuity with previous work of the team and exploit very well the characterization of the PAS genes. An effort for bridging the different components of the project would however have a positive impact on its long-term potential, given the competition in the field.



Conclusion

- **Strengths and opportunities:**

The team has a very good expertise in plant genetics, imaging and lipid biochemistry. It has generated a large collection of markers and mutants and has developed a unique expertise which is beneficial both at the level of the team and at the level of the institute. The development of the translational research on Camelina could open excellent opportunities.

- **Weaknesses and threats:**

The team lacks expertise in quantification of imaging and in the field of biochemistry of membrane proteins. The field of membrane micro and macro domains is highly competitive. The team is technologically dependent on imaging and biophysics of membranes. No funding appears for 2014 onwards.

- **Recommendations:**

The project is highly pertinent. However, a better integration of the different components of the project could increase the competitiveness of the team. In addition appropriate collaborations could fill the gaps in expertise and technology, at least in the short term.



Team 16 : Spatial Control of Cell Division (SPACE)

Name of team leader: Mr David BOUCHEZ

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	3	3
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	5	5

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	1	
Postdoctoral students having spent at least 12 months in the team *	1	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	1	1

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team works on the regulation of cortical microtubule spatial organization in the context of cell division and cell growth. They are focusing in particular on mitotic entry and on the formation of the preprophase band (PPB), an array of microtubule specific to land plants whose localization correlates with the localization of the future division plane.

The team has a long history in the field and is one of the very few groups working on the *ton1* and *fas* mutants that lack a PPB. Over the 2008-2013 period, they have reported the identification of a large protein complex to which TON1 and the PP2A FASS participate, the TTP complex. In addition to TON1 and FASS, the TTP complex contains proteins of the TRM family identified from protein-protein interaction screens. The team has shown that the TRMs allow for the recruitment of the TTP complex to the microtubules both during cell division and in interphase. The team is currently investigating the mechanistic link between the TTP complex and the cell cycle machinery. They have also identified and are investigating a combination of *trm* mutants that might completely lack the PPB and still have limited cell division plane defects. Their current research thus not only provides tools for investigating the role of the TTP complex but also raises question on the role of the PPB in the control of the plane of cell division. The identification of the TTP complex by the team is all the more important that it might be a conserved complex in eukaryotes whose function needs to be fully analyzed.

The team has published a limited number of publications on the period (7 research publications, 1 book chapter; 1 publication corresponding to the post-doc work of a CR2 recently recruited in the team) but all of them are in excellent journals. Two recent papers (Plant Cell 2012, Nat Com 2013) illustrate the solidity of the work performed in the team. The group has also 1 patent. The overall quality of the scientific output can be defined as excellent.

Assessment of the team's academic reputation and appeal

The work of the team is recognized nationally and internationally. Its academic reputation and appeal is considered excellent. Notably 2 of the publications of the team have been highlighted in F1000 (2008 and 2010). The team has coordinated one ANR project on the period and has one co-publication with the other partner. It has a network of collaborators mainly in France and one main collaborator at the VIB in Belgium (with whom they have a shared publication in Nat Com 2013). The team leader has been a member of the Multinational Arabidopsis steering committee for France (2006-2010) and of national scientific and grant committees. The team leader has also been a member of the Austrian Science Fund Committee (2008) and a team member provides expertise for the Hungarian Scientific Fund and the Rhône-Alpes region (ARC).

Members of the team have been invited to several conferences and for seminars.

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

Beside a patent evidencing a very good interaction with the social economic and cultural environment, the team does not have other strong types of interactions.

Assessment of the team's organisation and life

The team is currently composed of 5 permanent researcher and technicians (1DR1, 1CR1, 1CR2, 2 AI) and 1 PhD student, the group leader being director of the IJPB and the two technicians working only part-time (80 % and 50 %) in the team. This is thus a small team with a leader that can contribute only a small portion of his time to the science. The operational organization of the team cannot be evaluated from the report.

Assessment of the team's involvement in training through research

Over the period, the team has trained a reasonable number of persons and can be considered as very good in this respect. They have indeed trained one post-doc (funded by ANR) and 2 PhD students.



Assessment of the strategy and the five-year plan

The five-year project proposed by the team is excellent and in direct continuity with its current scientific focus. It proposes to continue the work on the TTP complex through the analysis of the intracellular localization of the proteins of the complex and the analysis of the function of the TRM proteins. The team will also continue the analysis of the role of the TTP complex in cell cycle regulation and in the dynamics of microtubules (notably by analyzing the effect on nucleation). The team further proposes to follow on the analysis of the *trm* mutant combination with no PPB and mild effect on cell division plane to explore whether the PPB can be indeed dispensable for cell division plane specification. The use of these mutants for challenging mechanical models of cell division patterning in collaboration is mentioned. Finally the team mention also briefly a line of reseach to explore TTP function in various eukaryotes.

The proposed project is highly pertinent given the unique expertise of the team on the function of TTPs and the fundamental importance of understanding how the dynamics of microtubules is controlled during development. However given the limited size and funding of the group, focusing on the most pertinent of the research lines proposed would be strategically more reasonable. During the discussion, the team leader has indicated that he is fully aware of the need to focus and that the fonction of the PPB in division plane specification remains their priority.

Conclusion

▪ Strengths and opportunities:

The team has a unique and recognized expertise on a protein complex that is essential for the coordination of cell division activity and orientation throughout development; and the members of the team are all working on complementary projects to understand the function of this TTP complex. The team has recently discovered that the TTP complex is likely to have functions throughout the cell cycle and also in other eukaryotic organisms, thus opening an avenue for new and likely extremely instructive lines of research. The general scientific environment and the facilities at the IJPB are also of excellent quality for conducting such a research (very favorable to collaborations).

▪ Weaknesses and threats:

The team taskforce is limited, not only due to its size but also to the fact that it is led by the IJPB director and that it benefits from limited technical support. In addition the team does not have any external funding to support its research activity (2008-2013 funding was also limited). This might impact negatively their scientific production and thus their capacity to attract external funding and to maintain a good scientific visibility, notably if the number of competitors increases (which is likely given the general interest of their theme of research).

▪ Recommendations:

Exciting results have been obtained and the committee encourages the team to rapidly publish their ongoing work in order to increase their chance to attract external funding to support their research. Given their limited taskforce, focusing on the most promising research directions should be continued. Further support from permanent technical staff would also help strengthening the team, allowing it to maintain and further develop its unique expertise.



Team 17 : Biology of the Cell and Plant Regeneration (BCR)

Name of team leader: Mr Pierre HILSON

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	2	2
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)	1	1
TOTAL N1 to N6	8	7

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended *		
Postdoctoral students having spent at least 12 months in the team *		
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	1	1

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The BCR team works on *in vitro* plant regeneration, both from a fundamental (totipotency, cell differentiation) and applied point of view (biotechnology). Over the last five years, the group has been working on (i) the regeneration of protoplasts from Arabidopsis, (ii) the development of a toolbox for the genetic engineering of Brachypodium, (iii) somatic embryogenesis and genetic engineering of cotton. More recently, the arrival of several new team members, including a new group leader, since 2011 and 2012 has led to a further extension of the scientific activities to (iv) organogenesis and meristem plasticity, (v) peptide signalling in plant development.

The BCR team has an established reputation in the field of plant regeneration. Major results obtained in Versailles since 2008 concern:

- the development of a protocol for protoplast generation in Arabidopsis, as well as an in depth transcriptomic analysis of the regeneration process, using natural accessions with varying regeneration capacities;
- the development of an optimized transformation protocol for Brachypodium, based on the *in vitro* culture of immature embryos. This development is of major interest for the scientific community (including several groups at IJPB) performing functional genomics in this species;
- the development of novel methods for cotton transformation with the aim to increase transformation efficiency. As a follow up, the production and testing of transgenic cotton plants with potentially increased drought tolerance.

The report cites a total of 35 publications. The work on Arabidopsis regeneration was published in Plant Cell. Other major articles have appeared in Developmental Cell, Plant Cell and PNAS. It should be noted that most of these (28 articles) have been produced by the new team members before joining the BCR team. Nevertheless, this justifies the leading role they will play in future projects. The new group leader seems to have a high profile network of collaborators. However the group structure is too new to be able to give it a detailed and valid qualitative assessment within the framework of IJPB.

Assessment of the team's academic reputation and appeal

The work was presented at multiple international meetings and the expertise of the team in the field of regeneration and genetic engineering has led to multiple collaborations, both nationally and internationally. As a result, the group has attracted constant funding between 2008 and 2013, allowing them to hire three engineers during that period. The appeal of the current team is still difficult to assess, as they have just started as a new group. The committee notes, however, that no ongoing external funding is mentioned, which is potentially worrying.

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

The team has good relations with several private companies in France (Biogemma, PalmElite) and abroad (Evogene). It is, and has been involved in several translational research projects. It is may be surprising that no patent is mentioned. Past and present members have put a substantial effort in communication with the public and press on biotechnology in agriculture. The current head of the group participates in the INRA committee in charge of promoting plant biotechnology. This kind of interaction can be considered excellent.

Assessment of the team's organisation and life

There have been important changes in the composition of the team over the last two years including the group leader which impacts the management of the team which can be considered as "novel".

Assessment of the team's involvement in training through research

The report does only mention the training of three M2 students, no PhDs have been funded by the ongoing projects. The arrival of two lecturers since 2012 should improve training activities, and might help to attract good PhD students, which appears to be a major problem for the group.



Assessment of the strategy and the five-year plan

The group has decided to reduce the number of research topics and proposes a program around two major themes: (i) somatic embryogenesis in cereals using *Brachypodium* as a central model, (ii) organogenic reprogramming to shoot identity during the regeneration of *Arabidopsis* roots. In principle the idea to focus the research on a limited, coherent number of topics is excellent. However, in its current version the project is written at places in relatively broad terms, which gives a very good rather than excellent assessment.

Conclusion

▪ Strengths and opportunities:

The team has an excellent reputation in the field of biotechnology and regeneration, an optimal combination of basic and applied research. It is well integrated in the local research community, with an excellent network of collaborators. Although biotechnology is still negatively perceived by the public, it is likely that the field has a brighter future in the longer term. The renewal of the staff, from different backgrounds, should allow emergence of new ideas and approaches.

▪ Weaknesses and threats:

The team is still in a transition phase after the arrival of two lecturers/scientists and a new group leader. The research project is written in very broad terms and the synergy between the different parts is not clearly defined. There is currently no external funding. The group has no PhD students. The report mentions that the group has no expertise in imaging. Note that this should in principle not be a problem, as extensive expertise is available on site.

▪ Recommendations:

Assure focus of the research team and synergy between team members. In particular, the genetic approaches should be tailored to the size of the group. The rationale for the second theme of the project sounds still somewhat vague and descriptive. Long term goals aimed at understanding mechanisms at work could be better defined.



Team 18 : Primary Cell Wall (PAR)

Name of team leader: Mr Herman HÖFTE

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	5	5
N3: Other permanent staff (without research duties)	3	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		1
N6: Other contractual staff (without research duties)	2	2
TOTAL N1 to N6	10	11

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	4	
Postdoctoral students having spent at least 12 months in the team *	7	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	4	4

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team is currently composed of eight permanent staff including one DR1 INRA, 4 CR1 INRA, 1 IE1, 2 TRNO recruited in 2011 and 5 non-permanent staff including one PhD student close to his defence, 2 Master2 students, 1 TR and 1 IR. Thirteen other non permanent staff worked in the team during the contract including most significantly 7 postdocs, 4 PhD students, 2 M2, 1 ASC I IE.

The general topic is the primary cell wall and its role in growth control. The overall objective is original and aim to understand cell expansions patterns within an organ in terms of space- and time-controlled changes in the chemistry and physical properties of cell walls or cell wall domains. This objective is declined in three main subtopics with identified leaders or co-leaders: Cellulose deposition/ Role of pectins in cell growth and development /Wall integrity signalling.

Among the major results, this team highlighted the unique regulation of cellulose deposition, demonstrating that cortical microtubules control the insertion pattern of the cellulose synthase complexes CSCs into the plasma membrane (PM) through interaction with the golgi apparatus. They made a significant technological breakthrough by developing atomic force microscopy (AFM) to measure the mechanical properties of living cells in the shoot apical meristem. This allowed them to demonstrate that pectin de-methylesterification controls wall mechanics and is necessary and sufficient for primordia formation and causes a decrease in the rigidity of the cell walls in contrast to what was previously thought (increase in rigidity). The team also showed that the brassinosteroid signalling pathway is part of a feedback loop controlling pectin methylesterification status-dependent cell wall homeostasis, shedding new light on the role of this auto/paracrine signalling pathway in growth control.

In addition to the core research dedicated to the primary cell wall, the team is also coordinating translational research aimed at improving dedicated biomass crops in collaboration with other teams within the departement PAVE.

The team is one of the top international leader in the field of cellulose biosynthesis and development as demonstrated by the outstanding number and quality of its scientific production. The main research projects of the team led 27 papers in high impact journals such as Plant Cell, Plant J, New Phytol, Development. In addition, the team published 6 collaborative papers, 11 reviews and 1 book chapter. They have also generated one patent.

Assessment of the team's academic reputation and appeal

The international recognition of the team is very high and primarily demonstrated through the outstanding reputation of the group leader. He played a key role in coordination and steering efforts of large national and international projects. He is editor of world leading journals in plant biology: Plant Cell, Current Biology... He is (or has been) member of six scientific advisory boards of excellent research centers in Belgium, Australia, Sweden, Germany.

Members of the team and especially the team leader have been invited at many international conferences (41 oral communications), international Institutes (17), and have also been invited to write 5 reviews.

Members of the team co organized a symposium Académie des Sciences and the first brachypodium' workshop.

The team has been efficient in attracting postdocs: three had they own fundings (German Univ, US NSF & FEBS Fellowships).

Strong national and international collaborations were acknowledged by excellent co-publications. The team has attracted an impressive volume of external funding with 7 ANR projects, (4 of them were coordinated by team members) and its participation to 5 EU projects.

Hence overall the team's academic reputation and appeal must be considered outstanding.

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

The team is coordinating the project Investissement d'avenir "Biomass for the future" 7 years, 22 partners including 12 private companies, 2 local governments budget 22 M€. it also participated to the "création d'une société de préfiguration pour le développement économique autour du projet BFF".



The group leader is a panel member of several national evaluation or recruitment committees (ANR, ATIP CNRS, AERES, recruitment committee AgroParisTech(chairman). The team was actively involved in several scientific popularization events: Fascination of plants day, fête de la science, salon agriculture...

The overall social, economic and cultural interaction can thus be considered outstanding.

Assessment of the team's organisation and life

Inside the team, the different topics have identified leaders and good interactions between senior scientists within the team are proven with co-published papers and reviews.

The team is part of the department of plant cell wall, function and utilisation (PAVE) created in 2012 which contains 3 other teams: the group leader is the manager of this department whose goal is to foster synergies at the interface between biology and chemistry in the study of the synthesis and utilization of plant cell walls.

Meetings between researchers of the departement are organized on a weekly base with two short presentations: one in biology, one in chemistry. Many interactions exist among the 4 teams, leading to major project funded such as ALICE FP7 renewal, Investissement d'avenir BFF. Notably, two members of the PAR team are leading common platforms.

Assessment of the team's involvement in training through research

The team trained 7 postdocs but only 4 M2 and 4 PhD which is modest taking into account the number of senior scientists (5). Nevertheless, the group leader gave courses in Summer schools: glycoscience, & tailoring plants for biorefinery testifying to a very good involvement in training.

Assessment of the strategy and the five-year plan

For the coming years, the group proposes to pursue its work on cellulose synthesis, matrix deposition/modification and cell wall integrity signalling. The overall quality of the research project is assessed as outstanding. The team shows in addition a strong will to better integrate basic research to more applied objectives.

Conclusion

This is a highly productive group with a very dynamic leader, an excellent publication record in major journals, strong external collaborations and success in obtaining funds.

▪ Strengths and opportunities:

The group has original niches in a competitive research area and has developed multidisciplinary approaches, powerful skills and cutting edge technologies. They will have access to advanced quantitative imaging and have started to collaborate with teams from other departments within the IJPB. Notably, they plan to collaborate with INRA Nantes to develop biomimetic approaches for comparing interaction of polymers in cell walls and in nanomaterials.

▪ Weaknesses and threats:

The main threat is the currently low number of PhD (one close to defense) and no postdocs. Another weakness is the lack of integration between applied project and fundamental research. There might be some concerns about funding since the three last ANR projects are ending in 2014. The BFF project is running until 2019 but is not encompassing Arabidopsis academic research. Moreover, there might be difficulty in the future to find funding especially in a context where the interest for biofuels is dwindling and where the competition is increasing.

▪ Recommendations:

As proposed in the project, it will be important that all senior scientists integrate more applied research into their projects in order to get funding. They should also be more involved in teaching at Universities to increase the visibility of the team for M2 and PhD students.



Team 19 : Secondary Cell Wall (PARSE)

Name of team leader: Mr Richard SIBOUT

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	1	
N2: Permanent EPST or EPIC researchers and similar positions	1	1
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	1
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	5	4

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	3	
Theses defended *	3	
Postdoctoral students having spent at least 12 months in the team *	1	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	2	2

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The research group is studying the secondary cell wall with an emphasis on the lignin biosynthesis pathway and the interaction of lignin with cell wall polysaccharides. The biotechnological improvement of lignin content and composition in the biofuel production perspective is the main application field. This team was a pioneer and has a worldwide recognition in the field. Two plant models have been developed, *Arabidopsis* for eudicots and *Brachypodium* for monocots. Major contributions of the team published in top journals (1 *Nature*, 2 *Curr Biol.*, 1 *Plos Pathogens*, 2 *Plant Cell*, 3 *Plant J.*, 4 *Plant Phys.*, ...) concern the identification of genes involved in the biosynthesis, the glucosylation and the polymerization of monolignols and the impact of lignin and phenolic compounds on pathogen susceptibility. In addition, the team developed numerous genetic and genomic resources/tools for the new model plant *Brachypodium*, which are very time consuming when considering the mutants produced, the large collection of natural accession and RILs. These resources are highly valuable for the scientific community.

The team has 29 publications (21 articles, 4 reviews, 2 book chapters, 2 proceedings) and is editor of one book on lignins. Considering the size of the team (5 permanent staff among which 2 technicians and 1 teacher researcher) and the competitiveness of the research field, this production is excellent to outstanding and is indicative of the scientific quality of the group.

Assessment of the team's academic reputation and appeal

The team is active in fund raising and has been involved in numerous national projects (among others 5 ANR and 1 AgroParisTech), and in 2 European projects (KBBE). The team is very well integrated in national and international networks as reflected by the amount of collaborations and its active involvement in the COST FP0905 network. Several co-publications have been made or are in preparation. It has organized the first *Brachypodium* European workshop and is invited as speaker to international meetings. A team member is also Editor for *Plant Cell Reports*. The team has been involved in a large number of assessments of national research laboratories, of national and international research projects as well as in the assessment and the juries of PhDs and HDRs. The team thus displayed excellent to outstanding reputation and appeal.

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

The team had one industrial contract and has generated one patent. The previous team leader is expert for the CTPS (Comité Technique Permanent de la Sélection) of fruit tree producing companies and was chair of this prestigious institution and is member of the scientific council of several Regional and National organisations. The overall social, economic and cultural interaction can be considered excellent.

Assessment of the team's organisation and life

The team leader is responsible for the *Brachypodium* Genetic Resource Center of the unit and is involved in the management of the platform as deputy director. The team is expert in genomics, crossing and transformation tools for this model species. A large number of mutants, accessions, etc is managed and available for the community. The team has also been involved in the development of the micro-dissection technology in this model.

Assessment of the team's involvement in training through research

The group is attractive for young researchers since in the past 3 PhDs and 1 post-doc and currently 3 PhD students are supervised. The past team leader has been office member of a PhD school. Many short-term trainees have been supervised. The involvement in training through research is therefore excellent.



Assessment of the strategy and the five-year plan

This ambitious yet excellent project is focused on lignin biosynthesis and vascular development in plants. First is the characterisation of biochemical properties of laccases and the alteration of laccase expression in *Brachypodium*. The second is the identification of lignin genes specific to grasses and their alteration of expression in both *Arabidopsis* and *Brachypodium*. The third concentrates on the identification of regulators of the development of the vascular system in *Brachypodium*, a process largely unknown in grasses. The 3 thematics are well justified and the team possesses the molecular tools to develop it.

Conclusion

▪ Strengths and opportunities:

The team has a high international visibility. It was a pioneer and is still a leader group with a strong expertise in lignin biosynthesis. The recent development of the large number of tools and resources for the monocot model *Brachypodium* gives the team the opportunity to gain a leader position in the field. A efficient transformation procedure for this model has been developed in collaboration with the MSM department. Collaborations with other teams are also active (lignin and tilling).

▪ Weaknesses and threats:

The departure of 1 permanent (teacher-researcher) is a threat for this small team. In addition, the new team leader has only been in charge since two years. However the transition between the previous and the new leader seems to have occurred smoothly and leads to a new promising orientation. The new leader should try to reinforce its position (HDR for instance).

▪ Recommendations:

Considering the relevance of the research topics on both fundamental and applied level, the main recommendation is to reinforce this young team by the integration of other researchers involved in closely research topics. This group is certainly performing well enough to be able to collaborate with other international leader teams to build projects for funding. In the meantime, financial support should help this team to reach such a goal. Given the size of the team, the project is very broad and priorities should be made.

**Team 20 :**

Lignocellulosic Biopolymers: from Cell Wall Assemblies to Synthons for Green Chemistry (APSYNTH)

Name of team leader: Ms Stéphanie BAUMBERGER

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	2	2
N2: Permanent EPST or EPIC researchers and similar positions	4	3
N3: Other permanent staff (without research duties)	3	3
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	10	8

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	3	
Theses defended *	2	
Postdoctoral students having spent at least 12 months in the team *	1	
Number of Research Supervisor Qualifications (HDR) taken *	2	
Qualified research supervisors (with an HDR) or similar positions	5	5

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The objectives of the team are to study the lignin polymer at the chemical and at the structural level. A better knowledge of the lignin reactivity, polymerization and structure is essential to develop strategies for the development of new products involving lignin and to improve biofuel production. The research is made mainly on maize as a model but other plants such as wheat, Brachypodium and arabidopsis are also studied. Lignin is investigated in vivo by studying modifications in lignin transgenic plants and in vitro by analysing its reactivity. The main results obtained by the team include a better understanding of the polymerization of the monolignols according to the type of monomer. A new working model for the radical coupling has been proposed. In addition, several factors affecting cell wall deconstruction in the context of saccharification, such as the degree of p-coumarylation of S units, the proportion of B-O-4 linkages and the amount of ferulic acid have been identified. The properties of isolated lignins, synthetic biopolymers and biobased materials is also investigated for applications. The team has developed efficient and up-to-date analytical methods to reach its objectives.

During the period the team has had 77 publications in Plant Biology and in Chemistry (60 papers, 5 book chapters, 11 proceedings, 1 edited book), this high amount of publications testifies to an excellent to outstanding level of scientific output. The team is composed of 9 permanents (4 researchers, 2 teachers-researchers and 3 technicians) and 6 non permanents (1 post-doc, 3 PhD and 2 M2). Past members count a high number of non permanents (19).

Assessment of the team's academic reputation and appeal

The team has been involved in numerous projects including 3 ANRs, 1 EU project, and 6 other national projects. The team was coordinator for 1 ANR. The team has 3 industrial contracts and is coordinator for two of them.

The national collaboration network is large and involves other teams of the institute but also other academic research institutes as well as private companies. The team has main international collaboration with US (University of Madison) and Finland (Aalto University). It has been taking part of the scientific committees of a large number of international conferences and has been invited as speaker to 2 international seminars. The team has therefore achieved an excellent level of academic reputation and appeal.

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

The team has many contacts with industry (3 research contracts) and has one patent. It is member of the Chair AgroParisTech-Marne, it has been involved in the building of the KBBE project comprising 9 SMEs and has consulting activity for several maize breeding companies. Three PhDs have been supported by CIFRE contracts. This can be considered as an outstanding level of interaction of the team with its social and economic environment.

Assessment of the team's organisation and life

The team is expert in lignin chemistry and structural biology. It has developed methods to analyze lignin content, composition and structure that are very useful for the scientific and industrial community.

Assessment of the team's involvement in training through research

Two teachers teaching for M1 and M2 of the engineering training of AgroParisTech are integrated into the team giving a high capacity to attract students. Other training activities are the training of 4 apprentices, of school teachers, the participation in meetings on support to project based management, supervision of M2 and PhD students. The team has also taken part of in the steering committee of PhDs and is coordinating a module of the Doctoral School ABIES. Two members have obtained their HDR. Hence the involvement of the team in training can be considered excellent.



Assessment of the strategy and the five-year plan

The group will continue along the same line its multidisciplinary approach to further position itself in the field of biorefinery and biopolymers. The project is straightforward and articulated on three main research axis. Both fundamental and applied aspects are planned. The development of high throughput methods (pyrolysis-GC-MS and near infrared) for the screening of samples as well as method for elucidation of structure (NMR) is foreseen. The overall assessment of the research plan is excellent to outstanding.

Conclusion

- **Strengths and opportunities:**

The team is recognized as an international expert in lignin chemistry and has a good visibility. The team has good interaction with other teams and industry and is actively involved in teaching and training. Opportunities are the political support for the development of green chemistry and many lignin applications.

- **Weaknesses and threats:**

The group leader started in April 2013 and has a large team to supervise.

- **Recommendations:**

Considering the topic and its importance in industrial perspective, and to further reinforce its position, it would be important for the team to have other patents.



Team 21 : Biomass Quality and Interactions with Drought (QUALIBIOSEC)

Name of team leader: Mr Matthieu REYMOND

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	5	5
N3: Other permanent staff (without research duties)	3	4
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	2
N6: Other contractual staff (without research duties)	2	1
TOTAL N1 to N6	11	12

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	2	
Theses defended *		
Postdoctoral students having spent at least 12 months in the unit *	1	
Number of Research Supervisor Qualifications (HDR) taken *	1	
Qualified research supervisors (with an HDR) or similar positions	3	4

* since 1st september 2012



• Detailed assessments

Assessment of scientific quality and outputs

The team was created only very recently in 2012. Its research focused on biochemical, genetic and molecular determinisms involved in the establishment (biosynthesis and/or regulation) of the lignocellulosic biomass with an emphasis on the response to water deficit. A specificity of the team is to combine approaches on monocot and dicot as well as model plants and plants of agronomic interest. Major models used are *A. thaliana* as a paragon of dicot model species, *Brachypodium distachyon* as a model for monocots. Maize is also studied for its potential for forage, bioenergy, biofuel and as a source of starch/carbohydrate. The addressed questions are the identification of key parameters involved in the variation of biomass quality and stability under water deficit and the identification of genes involved in biomass quality and responses to water deficit associated with functional analysis of the identified candidate genes.

Considering the recent creation, the following items relate mostly to previous achievements of current team members and include: (i) the demonstration, using a set of maize lines with variable cell wall degradability and similar lignin content, that lignin structure and p-coumaroylation are the two main parameters explaining cell wall degradability variations; (ii) the variability of the histological profile within the maize stem was demonstrated in a set of inbred lines together with variations in cell wall composition and degradability. These variations were affected by drought stress. A method to quantify key traits related to histological pattern in maize stem has also been established; (iii) the identification of quantitative trait locus (QTLs) for biomass degradability (digestibility and saccharification); (iv) the identification of a transcription factor belonging to the monolignol biosynthetic pathway associated with leaf growth responses and anthesis-silking interval during water stress; (v) the demonstration that a *tesk1* mutant exhibits similar phenotypes with that of wild-type plants subjected to water deficits. Suppressors of the mutations increasing biomass, while keeping interesting features for the production of biofuels have been identified and analyzed.

During the reference period, this work resulted into 52 publications co-authored by at least one of current team members and 3 book chapters. Most papers were published in excellent and sometime exceptional journals (Nature Genetic, Plos Genetic, Proc. Natl. Acad. Sci). However, the majority of these papers are issued from collaborations. Only 15 over 52 were signed as first or last author. In addition, a single publication in 2012 and none in 2013 suggest that the team is increasingly investing into new research questions as a result of the creation of the team. Due to the very recent creation of the team, the quality of its output cannot be correctly assessed.

Assessment of the unit's academic reputation and appeal

Current team members were successfully involved into several national collaborative networks, including the long term research program AMAIZING (2011-2019) with "Unité de Recherche en Génomique Végétale" (URGV, Evry) on maize, the NoStressWall project (2012-2015) with Lille University, the Biomass for future (2012-2019) project, the HistQTL project (2012-2014) in interactions between BAP and CEPIA INRA Divisions in the BILI framework. In contrast, the team was more weakly involved into international networks with the exception of a short collaboration (Dublin University College, Ireland) and the participation to a FP7 collaborative program with Brazil (2010-2014). The team coordinated one ANR project and was involved in seven others (Genoplante, Blanc, Investissement d'Avenir, Bioadap). It was also successful in obtaining several AIC INRA funding.

Team members gave 5 oral presentations, mostly at a national level. They were involved in the scientific committees of two national and one international (in Bordeaux) meetings. One member acts as member of the editorial board of Plant Signaling Behavior. Hence the overall academic reputation and appeal of the team were found to be excellent.

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

The team regularly interacted with the socio-economic world through two successive research contracts with Gautier Semences (2010-2013) a contract with Promais, collaboration with Biogemma. The team coordinates the project TOMTOM in the framework of labex-SPS APP INNO. Team members are co-inventors of 4 patent applications testifying to an excellent level of social and economic interaction.



Assessment of the team's involvement in training through research

The team was involved into the training of 3 PhD students (2 currently), 2 post-docs (1 currently), several M2 students and CNAM engineers. Team members are regularly involved in PhD thesis jury. However, the very recent creation of the team did not allow for a correct assessment of its training abilities on a sufficiently extended period of time.

Assessment of the strategy and the five-year plan

Being in a consolidation phase, the scientific project appears mostly as a very good continuation of the current work. Characterization of genes involved in biomass quality will be pursued taking advantage of engaged and already funded projects. The aim is to demonstrate the role of orthologs of identified genes in crops (tomato, maize). Functional analysis of *atesk1* mutant suppressors will be tested for their impact in agronomical context with an emphasis in drought stress conditions and in biomass valorization process (animal feeding and bio refineries).

Conclusion

▪ Strengths and opportunities.

The work force is significant. The team exhibits a range of expertise and is able to develop multidisciplinary approaches. Several complementary biological models, including crops are worked in parallel. The publication record is significant both in volume and quality, even if it results mostly from collaborative works in which the team was not necessarily a driver. Important interactions with various economic partners and strong participation into several collaborative networks are opportunities.

▪ Weaknesses and threats

The visibility of team members and collaborations are mostly national. Large amount of outsourcing for field experiments seems sometime difficult to manage and has significant costs. While the large amount of collaborative projects displays strength, it can also be a threat causing too much dispersion, with a risk of impeding research progress and decreasing publication rate. The absence of real rupture approaches into the work program that stays mostly a continuation of existing subjects and partnerships can also be seen as a threat.

▪ Recommendations

The work program is mostly in continuity and constrained by the follow-up of current long term collaborations. Care must be taken to rapidly find an appropriate equilibrium between innovative internal projects and collaborative works that rely on the team know-how. In this respect, the team should set a priority on improving its international visibility by implementing strategic international collaborations. Also the team has the potential to gain in visibility, attractiveness and scientific output by developing on its own original or rupture-based approaches based on their multidisciplinary skills.



Team 22 : Organelles and Reproduction (OrgaRepro)

Name of team leader: Ms Françoise BUDAR

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	2	2
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	1
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	5	5

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	3	
Postdoctoral students having spent at least 12 months in the team *	3	
Number of Research Supervisor Qualifications (HDR) taken *	1	
Qualified research supervisors (with an HDR) or similar positions	2	2

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

This team focuses mostly on the nucleocytoplasm/mitochondria genetic interactions in plants. It has successfully used a combination of molecular, genetic and genomic approaches that testify of its ability to investigate in depth this unique genetic circuitry at work in eukaryotic cells and particularly in plants and algae that accommodate three genomes (nuclear, plastid and mitochondrial). The team members performed molecular studies of the Cytoplasmic Male Sterility (CMS)/Restorer of fertility (Rf) interplay. In recent years, they have identified and/or characterized some plant CMS genes. They did provide a most significant contribution in 2008 by demonstrating a molecular interaction between the mitochondrial mRNA of a CMS gene and a PPR protein acting as its specific Rf factor. They further gathered evidence for a translational inhibition of this CMS target by its Rf factor. The team also characterized further the subfamily of Rf-like genes in *Arabidopsis* and identified three of them as having constitutive functions in mitochondrial respiration, which raises the intriguing question as to whether they can interact as well with CMS targets in another mitochondrial genetic context.

The other research line is devoted to genomic studies of cyto-nuclear co-adaptation using the unique *Arabidopsis* resources accumulated in Versailles. In a very solid and convincing study, the team members used plastid and mitochondrial polymorphism to build up a phylogeny of plastid and mitochondrial genomes leading to the demonstration that they are congruent, thus defining a cytoplasm phylogeny that does not correlate with the nuclear diversity pattern among 86 *Arabidopsis* accessions. This observation set the grounds for studying co-adaptation processes that the team identified in several instances in germination tests. The team prepared well stabilized cytolines (combining the cytoplasmic and nuclear genomes from two distinct accessions) that should be of invaluable interest to those that study nucleus-organelle interactions, whether at the genetic or metabolic levels.

The above research projects are clearly on-going projects. Basically, the team wishes to further characterize gene expression in several of the cytolines it has produced, and to better define the mitochondrial targets and the mode of action of those Rf-like genes that proved critical for mitochondrial function. Both projects should provide valuable insight into the nucleus-cytoplasm dialog in plants.

During the past 6 years, the team has published 9 research papers in which the team members played a major part and 3 review articles in high quality journals thereby defining an excellent scientific output (*Plant Cell*, *J. Mol. Biol.*, *Plant J*, *NAR*, *Plant Mol.Biol.*, *Plant Physiol.*).

Assessment of the team's academic reputation and appeal

Although not being world leaders in their field of research, the two senior scientists of the team are regarded as highly qualified experts in CMS and PPR protein research. This is illustrated by their invitation in several international meetings, including the Gordon Research Conference on Mitochondria and Chloroplasts. It is of note that the team took the proper move towards an integrated research with other groups within an ANR consortium that should make up in part for the lack of (wo)menpower within the team. The team's academic reputation and appeal can thus be considered excellent.

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

The team has strong interactions regarding hybridization genetic systems with the private partner Syngenta. In view of its expertise in population genetics, genomics and CMS, the team thus has the proper contribution to both basic and applied research. The team's interaction with the socio-economic environment can thus be considered outstanding.

Assessment of the team's involvement in training through research

The team leader contributes to teaching instances at the master and doctorate level. She also organized a teaching module, which is to be noted, since the research institute is located away from the various university campus and the INRA members do not have compulsory teaching duties. This testifies to an excellent involvement in training through research.



Assessment of the strategy and the five-year plan

The team had, up to now, reasonable success in its two major research lines. The two senior members consider their future research efforts as a continuation of their previous ones. Is this a reasonable strategy? A rapid comparative glance through the past and present group members shows that the team now has lost, in average, one technician and one (post-)doc. On the other hand, it is of note that, out of their 12 recent publications, the two senior team members co-authored only two of them. Given the small size of the team and the general prospect of a lower capability to attract PhD students and post-docs in French laboratories due to funding and employment restrictions, the team should seriously examine the possibility that the two senior scientists gather their efforts on one major research line only, while developing additional projects only if they succeed in recruiting dedicated (wo)manpower.

Conclusion

▪ Strengths and opportunities:

The team members have international recognition for their contribution to CMS and Arabidopsis genetics and genomics. Their publication record is very reasonable given the small size of the group. Owing to the increasing international competition in the field of PPR proteins, the group has developed appropriate collaborations in several cases to make up for its small size. Also, the construction of arabidopsis cytolines is both an original move and an asset for future work on nucleo-organelle interactions.

▪ Weaknesses and threats:

The two PI type of team organization of the team can also be seen as a threat.

▪ Recommendations:

In the near future however - and unless some marked change in funding/recruitment occur - the team should seriously consider focusing on one major issue only, that would involve tighter collaboration between its two senior members. This may be necessary to continue being among those that contribute to internationally-recognized science in this field of research.


Team 23 : Germination Physiology (PHYGERM)

Name of team leader: Ms Annie MARION-POLL

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	2	1
N2: Permanent EPST or EPIC researchers and similar positions	3	3
N3: Other permanent staff (without research duties)	8	8
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	
N6: Other contractual staff (without research duties)	1	
TOTAL N1 to N6	15	12

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	3	
Theses defended *	4	
Postdoctoral students having spent at least 12 months in the team *	3	
Number of Research Supervisor Qualifications (HDR) taken *	3	
Qualified research supervisors (with an HDR) or similar positions	5	4

 * since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team focuses on seed research and aims to identify molecular mechanisms controlling seed dormancy, germination and viability. The team can be divided in three sub-groups that study different aspects of the common topic consisting of (1) hormonal control of germination focussing on ABA, (2) proteomics and post-translational regulation of seed quality and (3) seed coat development and function.

The team made significant progress in several areas that contributed to the understanding of seed dormancy and germination. Major results obtained during the reporting period for sub-group (1) include novel information about differential ABA production in seed tissues and its impact on dormancy induction, based on the spatiotemporal regulation of NCED genes. The group is also identifying novel factors in ABA signalling and germination capacity using QTL and forward genetic approaches. The proteomics sub-group (2) made a major contribution to the new insights that selective translation of mRNAs act as an important mechanism controlling seed germination. The group also highlighted the important role of protein post-translational modifications in germination capacity, which will probably be an important topic in future studies of dormancy and germination. Sub-group (3) made major contributions in the study of the seed mucilage layer, which is still poorly understood. A study of natural variation in mucilage suggested that it plays a role in local adaptation due to improved seed dispersion by water. Finally, transparent testa mutants were used to study the function of flavonoids in seeds. During the reporting period a detailed study of the TT15 protein, a UDP-glucose-sterol glucosyltransferase, has been performed and it was shown that tannins are absent in the endothelium layer of tt15 in teguments.

All five researchers within the team contributed to the excellent output of 40 publications within the reporting period, 24 of these have a first and/or last authorship of a group member. Several papers were published in major plant journals including Plant Cell, Plant Journal, and Plant Physiology.

Assessment of the team's academic reputation and appeal

The team PHYGERM has an excellent academic reputation and appeal with a high international visibility and participated during the reporting period in 14 national and international programs, of which several were coordinated by the team. In addition, the team has collaborations with both French and foreign laboratories, which also resulted in joined publications. Several members of the group were invited or selected for talks at international conferences. The high reputation of the team is also reflected by its contribution to two reviews that have been published in the top plant review journals Annual Review of Plant Biology and Trends in Plant Science.

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

The research topic of the team is of important practical value for the seed and plant breeding industry. Although the team has obtained two patents which defines a very good level of interaction, it is recommended that they will try to enhance these interactions with industrial partners in the future in order to facilitate the transfer of their research.

Assessment of the team's organisation and life

The research group exists in its present form since May 2010 after the fusion of the IJPB research groups "Dormancy, longevity and germination vigour" and "ABA and seed physiology". This has led to a single strong seed research group with complementing expertise. However, most of the research that has been performed in the group during the last years still seems to be split between the former groups. Although a few papers with authors from both former subject groups have been published, enhanced integration of the research topics and techniques would be recommended and could further enhance the scientific output.



Assessment of the team's involvement in training through research

Two researchers are actively involved in teaching. The group has trained 4 PhD students during the reporting period, of which 3 are still working in the team. In addition, the team has coordinated an FP6 Marie Curie Early Stage Research Training project. This when taking the size of the group into account can be considered as a very good involvement in training through research.

Assessment of the strategy and the five-year plan

Future work will be directed at a continuation of ongoing successful research, consisting of (1) regulation of ABA biosynthesis and new elements of the ABA signalling network, (2) the role of post-translational modifications, (3) identification of new elements involved in flavonoid or polysaccharide metabolism. This is an excellent plan with a logic and sensible approach, which very likely will enable the team to continue making important contributions to the progress in the field of seed science.

Several new approaches will also be initiated that can make use of the combined expertise of the three sub-groups of the team. A new major goal of the team is inspired by its participation in a European consortium and aims to investigate the impact of environmental conditions by the mother plant on seed germination and vigour. Additional new approaches will be directed at seed protection mechanisms, whereby the impact of seed flavonoids on protein carbonylation under oxidative stress and interactions between ABA and flavonoid pathways will be studied.

Conclusion

▪ Strengths and opportunities:

The team has a high scientific output that is internationally recognised. A fusion of two research teams in 2010 has brought together experienced researchers with different expertise that can lead to a synergistic effect on the research within the team. Relatively few research groups work on molecular mechanisms of seed traits, and the existing combination of expertise in this team place it in an excellent position to make major contributions to this field in the coming years.

▪ Weaknesses and threats:

One of the five researchers has left the group recently, which has reduced its strength. In addition, the team has obtained major progress with 2D/gel based proteome studies, but should consider that this approach might become outdated in the near future.

▪ Recommendations:

The possibilities within the team could be better exploited by an enhanced integration of the existing research topics and expertise of the sub-groups. This goal could be reached within the new projects that the team has planned for the coming years.



Team 24 : Homeostasis Lipid-Protein in Seed (HLP)

Name of team leader: Mr Philippe GUERCHE

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	2	2
N3: Other permanent staff (without research duties)	2	1
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)		
N6: Other contractual staff (without research duties)		
TOTAL N1 to N6	4	3

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students		
Theses defended *		
Postdoctoral students having spent at least 12 months in the team *		
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	1	1

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The team investigates the genetic determinism of lipid/protein partitioning in Arabidopsis seeds using QTL characterisation based on near-infrared reflectance spectroscopy (NIRS) and functional genomics of candidate genes. This question is further addressed in relation with N availability at the whole plant level in collaboration with other teams from IJPB. The development of a NIRS method to phenotype lipid/protein composition in Arabidopsis seeds is reported as a major result. Most progress has been made with fine mapping of QTLs involved in 5 seed traits (plus senescence and flowering time) obtained in different growth conditions using a very high number of genotypes including 3 RIL populations, 48 core-collections and heterogeneous inbred families. The team also cloned a QTL bearing a new isoform of the *KCS18* gene controlling very long chain fatty acid synthesis in Arabidopsis.

Overall, the team reports 10 publications (9 primary with average IF = 6.5) that can be classified in two categories: 7 papers originate from previous work that was carried out before 2008 and only 3 came from the 2008-2013 period. For both categories, the level of journals ranges from good (Gene, BMC Plant Biology, PlosOne) to excellent (Plant Cell, PlosGenetics). This demonstrates the PI's ability to achieve internationally competitive work. However, only 3 publications are signed as leading authors (first and/or last one) and none is directly linked to C/N partitioning in seeds. Such a low proportion can be partially explained by the physiognomy of the team which is composed of only 2 scientists. Taking into account the size of the team this output can only be considered as good with respect to the aforementioned comments.

Assessment of the team's academic reputation and appeal

The development of the NIRS method has initiated one informal international with a world-leader in genetic adaptation using GWA in Arabidopsis (Magnus Norborg, Gregor Mendel Institute). The team is a partner in the ANR Genoplante project SOLAR, which represents its most important funding source. In the frame of ALICE project, priority of INRA department, four teams of IJPB (DYSCOL, SEEDEV, SIREN, LPH) gather to study the optimisation of grain filling for green chemistry with *Arabidopsis thaliana* as model plants by quantitative genetic, functional genomic and proteomic approaches in relation to N fertilisation. The team does not appear to participate to international networks and has not been invited to write reviews or give seminar/conferences. Hence its reputation and appeal has to be considered as good with respect to the aforementioned comments.

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

The team does not appear to be engaged into partnerships with non-academic partners or outreach activities. The PI participates to one national steering committee (High Council for Biotechnology) and three scientific and management councils within INRA (SPE, BAP and CNOC). The PI nevertheless holds one patent which can be considered as a good level of interaction with the aforementioned comments.

Assessment of the team's organisation and life

The team was created in 2008 *ex nihilo*. The team head is also the deputy director of the research unit. He was the leader of the development of the Phenoscope, a high throughput phenotyping robot. The Phenoscope is an essential resource for several teams for the IJPB. The team also produced seed stock resources for the community.

Assessment of the team's involvement in training through research

During the period, the team trained one Bachelor and one Master student. It did not host PhD. students. In respect of this comment, the team's involvement in training can only be considered as good.



Assessment of the strategy and the five-year plan

Addressing the genetic determinism regulating the partitioning of C/N reserves in oily seeds and its interaction with N homeostasis of the mother plant is an agronomically relevant and timely question. The proposed project is straightforward and continues the current work on validation of QTL for lipid, protein, C and N contents in seeds followed by fine mapping and analysis of candidate genes. This work is not innovative but coherent with the expertise of the group. However, the objectives, work plan and expected output are not clearly defined, considering the strong impact of the environment on the traits studied. Moreover, the contribution of the different partners with other team of the IJPB and the workplan is not clearly explained. Likewise, the comparison with rapeseed (collaboration with colleagues at INRA Rennes working on seed lipids and N metabolism) makes sense, but it is unclear where the authors want to go with this collaboration. The group will also continue to phenotype a Swedish collection of 305 accessions by NIRS (collaboration Mr Magnus NORDBORG). It is also surprising that no collaboration with other teams from the RG department is foreseen. The team also plans to design a new prototype for the Phenoscope platform and projects have been submitted to fund the development of this equipment.

Considering that funding is not yet secured after 2014 and the actual small size of the team, it is not yet clear how the team will set its priorities and the research plan must be in this context considered as fair.

Conclusion

▪ Strengths and opportunities:

Addressing the genetic determinism regulating the partitioning of C/N reserves in oily seeds and its interaction with N homeostasis of the mother plant is an agronomically relevant and timely question. The development of a new automated phenotyping platform that monitors the entire plant life cycle coupled to NIRS is also seen as an opportunity. The outstanding genetic resources at the IJPB and multidisciplinary expertise in genetics of Arabidopsis and N metabolism within the IJPB are assets that the team can rely on. The collaboration with a world leader in GWA in Arabidopsis can be very promising.

▪ Weaknesses and threats:

The team has a low publication record and a critical size that is exacerbated by the breadth of the research questions addressed in the project and the different collaborations (current or planned). The perspectives in terms of research priorities are not well defined. The team needs two additional years of work (or more) to map interesting QTLs but has not yet secured funding after 2014. The exclusive focus on Arabidopsis and the absence of partnerships with the industry while there is competition with other laboratories working on oilseed rape might be risky.

▪ Recommendations:

To remain viable in the long term, the team needs to rapidly improve its publication record and secure funding. Unfortunately, its critically small size together with the labor-intensive phase of fine mapping do not offer much leverage. Considering the research on storage accumulation in crop seeds is highly competitive, the team needs to forge a unique identity in terms of technical competence and scientific expertise and to narrow its scientific questions regarding N/C partitioning regulation in seeds. An alternative would be to merge with another team that shares the same tools and expertise in genetics or is complementary in terms of biochemistry and plant physiology.



Team 25 : Development and Seed Quality (SEEDDEV)

Name of team leader: Mr Loïc LEPINIEC

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions		
N2: Permanent EPST or EPIC researchers and similar positions	5	5
N3: Other permanent staff (without research duties)	4	5
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	6	1
N6: Other contractual staff (without research duties)	1	
TOTAL N1 to N6	16	11

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	3	
Theses defended *	2	
Postdoctoral students having spent at least 12 months in the team *	4	
Number of Research Supervisor Qualifications (HDR) taken *	1	
Qualified research supervisors (with an HDR) or similar positions	3	3

* since 1st february 2009



• Detailed assessments

Assessment of scientific quality and outputs

The research group is studying seed biology and quality. The main objective is to identify and characterize key functions and to elucidate genetic, molecular, and cellular mechanisms that control seed development and quality, particularly in relation to lipid stores. During the past years the group has been working on four main topics: metabolic pathways, triacylglycerol storage and translational biology, flavonoid biosynthesis and seed coat development, structure and functions of the LAFL regulatory network and WRINKLED1 and the regulation of fatty acid biosynthesis. The group published 41 research articles in high impact journals (average IF 6.8) including Plant Cell, TIPS, PNAS which is an excellent scientific achievement.

Assessment of the team's academic reputation and appeal

The team has an outstanding reputation and appeal as can be seen by the large number of national and international collaborations, invited lectures at international conferences and scientific awards. Moreover, the team has many joint publications. The team was successful in obtaining and/or coordinating EU grants (KBBE-STREG, EC-PF6 "Flavo"). Some well-funded national grants (SOLAR, CERES, Flagship Project) will be ongoing the coming years. Furthermore, the team coordinates the LabEx project "Saclay Plant Sciences". However, the most visible person of the team is the PI.

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

The team has two patents and was involved in a consortium including four private partners. It participates to the Investissement d'Avenir Biotechnology "Rapsodyn", aiming at improving rapeseed in collaboration with private partners which can be considered as an excellent level of interaction with the socio-economic environment.

Assessment of the team's organisation and life

The team has undergone some changes over the past years including the loss of four permanent staff members. One team member is for 10 % of his time the responsible of the plant imaging and microscopy within the Plant Observatory platform.

Assessment of the team's involvement in training through research

The team displays an excellent involvement in training through research as it has trained 2 PhD and 11 master students over the past years. Currently there are three PhD students as member of the group. Furthermore, the team is heavily involved in PhD. committees (40). Being full time researchers, the involvement in teaching is also significant (80h/year + a workshop).

Assessment of the strategy and the five-year plan

The proposal is to continue with the current research topics (AFL network, the regulation of fatty acid biosynthesis, seed coat development) that the group is successful in. Due to the departure of colleagues working on flavonoid metabolism, this topic will now focus on the regulatory gene networks that control the development of the endothelium. Furthermore, the group has chosen to spend a large part of its time in developing new techniques in order to overcome limitations associated with very small Arabidopsis seeds and genes that are often weakly expressed. This techniques together with the prospects of developing systems biology approaches are considered as very promising but the expected results deserve to be more clearly defined. Nevertheless, the strategy altogether is considered as excellent.



Conclusion

Overall this is an excellent team working on important questions using innovative approaches. The group is one of the leaders in the field of transcriptional regulation of seed development. The team regularly publishes in high impact journals and was successful in obtaining major grants and developing many national and international collaborations, including with private partners. The output is excellent considering the high number of researchers.

- **Strengths and opportunities:**

Because of its outstanding academic visibility, the team can rely on its ability to develop national and international collaborations with leading laboratories. The synergy within the team is also a strength. Its high reputation together with new technological developments to study transcription factors at the cellular level are seen as opportunities. The ever increasing demand in plant oil world-wide might be an economic incentive to develop long term industrial partnerships. The prospective of the group for the coming years (2014-2019) looks promising and the proposed plans are well supported by national and international grants. The team is committed to train PhD students and engage into teaching activities.

- **Weaknesses and threats:**

The visibility of the group is mostly depending on the PI. The sole reliance on Arabidopsis seeds as a model can become an increasing threat for the development of public/private partnerships. There is not a clear vision of the expected outputs resulting from the development of an *in silico* modeling of a “virtual” seed.

- **Recommendations:**

The team should maintain its excellent scientific output and seek to develop partnerships with the private sectors. It will be important to broaden the visibility of the group. Furthermore it will be important to keep up the good collaborations and search for possibilities to finance these common interests with i.e. European funding.



Team 26 : Dynamics and Structure of Lipid Bodies (DYSCOL)

Name of team leader: Mr Thierry CHARDOT

Workforce

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
N1: Permanent professors and similar positions	3	3
N2: Permanent EPST or EPIC researchers and similar positions	3	3
N3: Other permanent staff (without research duties)	6	6
N4: Other professors (PREM, ECC, etc.)		
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)	1	2
N6: Other contractual staff (without research duties)		1
TOTAL N1 to N6	13	15

Team workforce	Number as at 30/06/2013	Number as at 01/01/2015
Doctoral students	1	
Theses defended *	3	
Postdoctoral students having spent at least 12 months in the team *	1	
Number of Research Supervisor Qualifications (HDR) taken *		
Qualified research supervisors (with an HDR) or similar positions	3	3

* since 1st january 2008



• Detailed assessments

Assessment of scientific quality and outputs

The DYSCOL team investigates the Dynamics and Structure of Lipid Bodies in plants. They joined IJPB from Paris-Grignon in 2010. The team is a merge of three previous groups (Oleosomes/Protein structure/seed allergens, the latter being closed now). The main goal is to identify the proteins associated with lipid bodies (LB) during seed development and germination, and increase the knowledge on their roles and functions in LB overall biological dynamic. The group used both yeast and plants (*A. thaliana*, *B. napus*) as model system, to study these different aspects. Basic research and more applied biotechnology approaches are undertaken. The group has realised six major advances:

1) The understanding of sequential deposition of the major proteins of LB in plants, namely oleosins, caleosins and steroleosins, assessed through gene expression pattern, proteomics analysis, and protein immunodetection (e.g. *J Plant Physiol* 2011);

2) The discovery of the likely involvement of vesicular trafficking-related proteins (Rab proteins) as regulators of LB dynamics (not yet published);

3) The secondary structure of oleosin in LB was determined for the first time, and an original model for their structure in their natural half-membrane environment was proposed in which the hydrophobic regions adopts a beta fold (*Biochem Biophys Acta*, 2011);

4) The team evidenced that oleosins in Arabidopsis seeds are post-translationally modified by K48 or K63ubiquitination;

5) Evidence for a link between lipid accumulation and storage carbohydrates fluxes by an original FT-IR spectroscopy (*PlosOne* 2013). The team evidenced that a redirection of carbon fluxes occurs when endogenous gene inactivation or over expression of seed LB proteins is manipulated (*Appl Micro Biotech* 2008, *FEMS Yeast Res* 2009);

6) Allergenicity of industrial wheat proteins was due to multi-epitope entities of high molecular weight derived from a rearrangement of gluten peptides of protein hydrolysates (*J Agric Food Chem* 2010).

The team produced 37 articles (e.g. *Plant Physiol*; *Proteomics*; *BiochimBiophysActa*; *FEMS Yeast Res*; *J Agric Food Chem* with a mean IF=3.6); 5 reviews (IF=6.6); 3 book chapters; 4 communications with proceedings, 5 oral communications without proceedings, 8 poster communications; 1 patent; 2 vulgarisation articles).

In relation to its large size, the scientific production can be considered as very good. The group should try to publish in higher profile journals to achieve international competitive work.

Assessment of the team's academic reputation and appeal

In mid 2013, the group contains one master, one PhD, and one post-doc as non-permanent staff which testifies to its appeal. In addition, the group coordinates one ANR project, three INRA projects and one project with private oil companies (ONIDOL). They also participate to several other projects as collaborators. The team's reputation and appeal is thus very good.

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

The team has several industrial contracts with INRA-ONIDOL "Study of bacterial production of lipids" and collaborates with INRA-Transfert "Biotechnological improvement of oil content and seed pressability of *B. napus* and *A. thaliana*, ArcoPress" and INRA-Stallergène "Structural study of plant allergen". One patent on a yeast strain able to over-accumulate lipids has been deposited in 2008. This level of interaction with the social, economic and cultural environment can be considered excellent despite that the near future in terms industrial-related funding seems not secured.



Assessment of the team's organisation and life

The team is expert in Lipid bodies structure and protein biochemistry. It has developed methods to analyze protein composition, dynamic, structure and biological role and that are very useful for the scientific and industrial community.

Assessment of the team's involvement in training through research

Over the period, the team has trained three post-doc (mostly funded by ANR), 7 masters and 3 PhD students. Half of the group delivers teaching, mainly at AgroParisTech, and organizes visits for 1st year students (quality, oleaginous resources), and projects for 2nd year students. This defines an excellent involvement in training through research.

Assessment of the strategy and the five-year plan

The team will focus on the study of structure/function relationship of LB proteins to understand dynamic and lipid storage in yeasts and seeds. Three objectives are listed: 1/ the involvement of vesicular trafficking rab proteins and LB dynamic and ubiquitination of Oleosine during germination; 2/ determine the topology of oleosins in LB by X-rays generated by SYNCHROTRON Soleil; 3/ In the frame of an ANR, the structural study of DGAT, limiting enzymes of the oil accumulation, as well as a collaborative work inside IJPB on the structural determination of PPR proteins (RNA recognition) are also undertaken. Overall the research plan appears outstanding.

In the frame of the ALICE project which defines a priority for the INRA department, four teams of IJPB (DYSCOL, SEDEV, SIREN, LPH) gather to study the Optimisation of grain filling for green chemistry with *Arabidopsis thaliana* as model plant by quantitative genetic, functional genomic and proteomic approaches in relation to Nitrogen fertilisation. This consortium has been very successful in terms of publications in high ranked journals.

Conclusion

▪ Strengths and opportunities:

The group is recognized in the field of lipid bodies. The approaches use multiple organisms (mostly yeast and plants) at different scale (amino acid residues to cell organelles). The use of multi-disciplinary approaches (SYNCHROTON SOLEIL, NMR, FTIR...) is a good strength to decipher structure of LB proteins. The synergy between the different parts of the team appears clearly. The team obtained several funding sources to perform their research. The project is getting wider considering role of OB, dynamics with other organelles, complexity of the protein and lipid composition.

▪ Weaknesses and threats:

In relation to its size, the scientific production is reasonable; the group should try to publish in higher profile journals to achieve international competitive work. The departure of two technicians will likely affect the productivity.

▪ Recommendations:

The recent increase in size and the closing of one theme (allergen) inside the group offer unique opportunities for future development. The project of the group is getting more and more multi-disciplinary, which is very good, the team should even further optimize its collaboration with other teams in and out IJPB to deal with all these aspects with high efficiency.



5 • Conduct of the visit

Visit dates:

Start: Wednesday, January 29th 2014 at 9h00

End: Friday, January 31st 2014 at 14h00

Visit site: INRA Centre de Versailles

Institution: IJPB

Address: Route de Saint Cyr, RD 10
78026 Versailles Cedex

Specific premises visited: Visit of IJPB platforms by the subcommittee 2 (Thursday, January 30th from 12h50 to 13h50)

Conduct or programme of visit:

The review committee visited the IJPB in Versailles from Wednesday, January 29th to Friday, January 31st, 2014. The program for the visit was organized by the two delegates of the AERES, Mr Steven BALL assisted by Mr Christophe ROBIN, the former committee president, Mr Francis-Henri WOLLMAN and the Directory board of the IJPB (Mr David BOUCHEZ (DU), Mr Herman HÖFTE (DUA, scientific director), Mr Philippe GUERCHE (DUA, human resources director) and Ms Magali NAWROCKI-SERIN (DUA, administrative director). Since the president of committee had to resign a few days before the visit, Mr Pere PUIGDOMENECH formerly vice-president was appointed to preside the committee assisted by two vice-presidents, Mr Jan TRAAAS and Ms Jacqueline GRIMA-PETTENATI. The organization of the visit was very satisfactory and all the presentations were of excellent quality. The visit started by an overview of the Research unit given by the Director, followed by a presentation of the IJPB scientific project for 2014-2019 given by the scientific director.

Due to the large size of the IJPB (26 different teams organized in 5 departments), the committee was split into two subcommittees that attended parallel sessions for the scientific presentations of the teams, presentations which were open to the whole unit. The work was divided between the sub-committees as follows: Sub-committee 1 attended to the presentations of 14 teams belonging to three departments: DEG, "Dynamics and expression of the genome"; PAVE, "Plant Cell Wall function and utilization" and RG, "Reproduction and Seeds". Subcommittee 2 attended to the presentations of 12 teams that belong to two departments: APE, "Adaptation of Plants to Environment" and MSM "Morphogenesis, Signaling, Modeling". A strict time schedule was maintained in which all team leaders gave a 20 min presentation followed by 10 min questions. At the end of the presentations of one Department, the review subcommittees discussed the relative merits of each team in a closed meeting. At the end of the on-site visit the evaluation of all teams was re-discussed between the two sub-committees.

The committee considers that the division in two sub-committees was justified by the large size of the unit, but wishes to underline that it was, as a result, much more difficult to obtain homogeneous evaluations. In addition and in general, there was not enough time for a detailed discussion amongst panel members. This made the overall evaluation process more difficult.

A presentation of the Plant Observatory, which encompasses 7 platforms, was given by the coordinating scientist to the whole committee but only sub-committee 2 visited some of the IJPB platforms. Meetings were also organized to allow exchanges between the committee members and the different categories of the IJPB staff: Technicians & Engineers, PhD students & Post-Docs, Researchers & group leaders. The last meeting of the on site visit was with the management team. The evaluation committee also met with INRA division heads representatives Ms Monique AXELOS (Head of the INRA CEPIA « Science and Process, Engineering of Agricultural products » division), Ms Carole CARANTA (head of the INRA BAP « Plant biology and breeding » division), Mr Thomas GOJJON (Deputy head BAP division, in charge of partnership), Mr Frédéric GAYMARD (Deputy head BAP division), Mr Thierry DORÉ (Professor and representative of AgroParisTech and doctoral school ABIES) and Ms Mariane DELARUE (Prof and representative of the SdV Doctoral School).



The precise schedule of the visit was as follows:

Wednesday, January 29th

09h00-09h15	Welcome of Evaluation Committee members and presentation of evaluation procedures
09h15-10h15	General presentation of the IJPB
10h15-10h45	IJPB scientific project 2014-2019

• **Concurrent Sessions**

Subcommittee 1 [DEG, PAVE & RG Departments]

Ms Jacqueline GRIMA PETTINATI (Vice President), Mr Avi LEVY, Ms Leonie BENTSINK, Ms Marie BAUCHER, Mr Wim SOPPE, Mr Olivier MATTHIEU, Mr Sébastien MONGRAND, Mr Denis POMPON, Mr Olivier LEPRINCE.

AERES Delegate in charge of SC 1: Mr Steven BALL.

20 minute presentation/10 minute discussion

11h00-11h30	Primary Cell Wall
11h30-12h00	Secondary Cell Wall
12h00-12h30	Lignocellulosic Biopolymers: from Cell Wall Assemblies to Synthons for Green Chemistry
12h30-13h00	Biomass Quality and Interactions with Drought
13h00-15h00	SC1 Meeting
15h00-15h30	Homeostasis Lipid-Protein in Seed
15h30-16h00	Development and Seed Quality
16h00-16h30	Dynamics and Structure of Lipid Bodies
16h50-17h50	SC1 Meeting
17h50-18h20	Organelles and Reproduction
18h20-18h50	Germination Physiology
18h50-19h30	SC1 Meeting

Subcommittee 2 [APE & MSM Departments]

Mr Pere PUIGDOMENECH (President), Mr Jan TRAAS (Vice-President), Ms Françoise MONEGER, Mr Nicolaus VON WIREN, Mr Laurent NUSSAUME, Mr Christophe MAUREL, Mr Teva VERNOUX, Mr David WENDEHENNE, Mr Tony PRIDMORE.

AERES Delegate in charge of SC 2: Mr Christophe ROBIN.

11h00-11h30	Variation and Abiotic Stress Tolerance
11h30-12h00	Arabidopsis Responses to Nitrogen Availability
12h00-12h30	Management of Nitrogen and Crops Productivity
12h30-14h30	SC2 Meeting
14h30-15h00	Signalisation and nutritional recycling
15h00-15h30	Phloem, Transport and Signaling
15h30-16h00	Nitrogen-Pathogen interactions



16h00-17h00	SC2 Meeting
17h20-17h50	Modeling and Digital Imaging
17h50-18h20	Transcription Factors and Architecture
18h20-18h50	Cell Differentiation and Polarity
18h50-19h50	SC2 Meeting

Thursday, January 30th

• Concurrent Sessions

Subcommittee 1 [DEG, PAVE & RG Departments]

09h00-09h30	Host-Retrotransposon Interactions
09h30-10h00	Epigenetics and Small RNAs
10h00-10h30	Epigenetic Natural Variation
10h50-11h50	SC1 Meeting
11h50-12h20	Meiosis and Recombination
12h20-12h50	Chromatin Dynamics and Gene Regulation
12h50-14h00	SC1 Meeting

Subcommittee 2 [APE & MSM Departments]

09h00-09h30	Branching Control in Plants
09h30-10h00	Spatial Control of Cell Division
10h00-10h30	Biology of the Cell and Plant Regeneration
10h50-11h50	SC 2 Meeting
12h50-14h00	Visit of IJPB Platforms
14h00-14h30	Presentation of the Plant Observatory
14h30-15h30	EC Meeting with Technicians & Engineers
15h30-16h00	EC Meeting with PhD students & Post-Docs
16h00-16h30	Coffee break
16h30-17h30	EC Meeting with Researchers & Group Leaders
18h00-20h00	EC Plenary Meeting 1

Friday, January 31st

09h00-09h30	EC Meeting with University and Agency representatives
09h30-10h00	EC Meeting with Doctoral School representatives (SdV & ABIES)
10h00-11h00	EC Meeting with IJPB Management team
11h00-14h00	EC Plenary Meeting 2



6 • Supervising bodies' general comments

UMR Institut Jean-Pierre Bourgin

Réf. : rapport d'évaluation AERES S2PUR150008288 - Institut Jean-Pierre Bourgin - 0753465J

Versailles, April 11th 2014

Response of the Institut Jean-Pierre Bourgin to its AERES evaluation report (January 2014)

To whom it may concern:

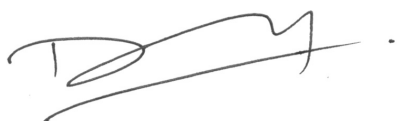
The research unit warmly thanks the AERES international Evaluation Committee for their very positive remarks on the scientific output and organization of the IJPB.

We especially note that, in terms of both scientific quality and academic visibility, ~75% of IJPB teams qualify as "Outstanding" or "Excellent", which is a strong recognition of efforts made by all IJPB personnels in recent years to promote scientific excellence at the highest international standards.

We also thank the evaluation committee for their useful and constructive remarks regarding not only the unit at large, its organization and strategy, but also the individual research groups. A point that may have been slightly overlooked during the evaluation process is the fairly recent creation of both the unit in its current configuration (2010), and the fact that some recently created research groups have initiated risky, exploratory approaches, hence it will require some time before they express their entire scientific potential.

In that respect, and considering that, after a few years of existence, the unit has now to optimize and stabilize its activity, we are fully aware that some points deserve a closer attention: e.g. cost optimization, increased interaction with industry, a better involvement in training, a more proactive participation in the public debate on plant biotechnology, which should be beneficial for facing the decrease in public funding and shortage of motivated students. The Committee's recommendations will provide a strong basis for further elaboration of our scientific and organizational strategy.

As to our wishes to increase our taskforce in computational modeling and quantitative approaches, as well as in bioinformatics, we hope the strong recommendations made by the Committee will strengthen the requests of the unit to get support from our funding institutions in terms of permanent and non-permanent positions in these fields.



David Bouchez

IJPB Director

With the agreement with the supervising institutions