# IAP - Institut d'astrophysique de Paris

Rapport Hcéres

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

Department for the evaluation
of research units

# AERES report on unit:

## Institut d'Astrophysique de Paris

## IAP

# Under the supervision of the following institutions:

## Centre National de la Recherche Scientifique

## Université Paris 6 - Pierre et Marie Curie

January 2013

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

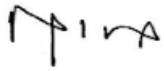
Research Units Department

President of AERES

**Didier Houssin**

Research Units Department

*Department Head*



**Pierre Glaudes**

The president of AERES "signs[...], the evaluation reports, [...]countersigned for each evaluation department by the relevant head of department (Article 9, paragraph 3, of french decree n°2006-1334 dated 3 november 2006, revised).

# Grading

Once the visits for the 2012-2013 evaluation campaign had been completed, the chairpersons of the expert committees, who met per disciplinary group, proceeded to attribute a score to the research units in their group (and, when necessary, for these units' in-house teams).
This score (A+, A, B, C) concerned each of the six criteria defined by the AERES.
NN (not-scored) attached to a criteria indicate that this one was not applicable to the particular case of this research unit or this team.

Criterion 1 - C1 : Scientific outputs and quality ;
Criterion 2 - C2 : Academic reputation and appeal ;
Criterion 3 - C3 : Interactions with the social, economic and cultural environment ;
Criterion 4 - C4 : Organisation and life of the institution (or of the team) ;
Criterion 5 - C5 : Involvement in training through research ;
Criterion 6 - C6 : Strategy and five-year plan.

With respect to this score, the research unit concerned by this report received the following grades:

- Grading table of the unit: INSTITUT D'ASTROPHYSIQUE DE PARIS

| C1 | C2 | C3 | C4 | C5 | C6 |
|---|---|---|---|---|---|
| A+ | A+ | A+ | NN | A+ | A+ |

# Evaluation report

| | |
|---|---|
| Unit name: | Institut d'Astrophysique de Paris |
| Unit acronym: | IAP |
| Label requested: | UMR and OSU (Observatoire des Sciences de l'Univers) |
| Present no.: | UMR 7095, UI 934 |
| Name of Director (2012-2013): | Mr Laurent VIGROUX |
| Name of Project Leader (2014-2018): | To be nominated mid 2013 |

# Expert committee members

**Chair:**

Ms Anne-Marie LAGRANGE, IPAG, Université de Grenoble

**Experts:**

Ms Catherine BOISSON, LUTH, Observatoire Paris (representing the CoNRS)

Ms Muriel GARGAUD, L3AB, Université de Bordeaux (representing the CNU)

Mr Artie HATZES, Observatoire de Thuringe, Germany

Mr Jean ILIOPOULOS, ENS Paris

Mr Viatcheslav MUKHANOV, Center for Theoretical Physics, München, Germany

Mr John PEACOCK, Institute for Astronomy, Université d'Edimburgh, Scotland

Mr Alejandra RECIO-BLANCO, OCA (representing the CNAP)

Ms Licia VERDE, Institute of Cosmological Sciences, Université Barcelone, Spain

**Scientific delegate representing the AERES:**

Mr Michel BLANC

## Representatives of the unit's supervising institutions and bodies:

Mr Paul INDELICATO, Vice-président recherche, UPMC

Mr Denis MOURARD, Directeur Scientifique Adjoint, CNRS/INSU

Mr Nicolas TREPS, Directoire de la Recherche, UPMC

# 1 • Introduction

## History and geographical location of the unit

1938 – 2000 UPR 341 CNRS, Institut d'Astrophysique de Paris

2000 – 2013 UMR 7095, Institut d'Astrophysique de Paris

2005 – 2013 UI 934, UPMC, Observatoire Institut d'Astrophysique de Paris, Paris 6

Address : 98bis Boulevard Arago, 75014 Paris

## Management team

Dir. Mr Laurent VIGROUX; Deputy Dir.: Mr Jacques COLIN; Head of administration: Ms V. BONA.

## AERES nomenclature

ST3, ST2

## Unit workforce

| **Unit workforce** | **Number as at 30/06/2012**[1] | **Number as at 01/01/2014**[2] | 2014-2018 **Number of project producers**[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 20 | 20 | 20 |
| **N2**: Permanent researchers from Institutions and similar positions | 35 | 35 | 35 |
| **N3**: Other permanent staff (without research duties) | 29 | 30 | 5 |
| **N4**: Other professors (Emeritus Professor, on-contract Professor, etc.) | 3 | 3 | 3 |
| **N5**: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.) | 41 | 45 | 45 |
| **N6**: Other contractual staff (without research duties) | 11 | 11 | 0 |
| **TOTAL N1 to N6** | 139 | 144 | 108 |

| Percentage of producers | ***75 %*** |
|---|---|

| Unit workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 20 | |
| Theses defended | 33 | |
| Postdoctoral students having spent at least 12 months in the unit* | 12 | |
| Number of Research Supervisor Qualifications (HDR) taken | 12 | |
| Qualified research supervisors (with an HDR) or similar positions | 35 | 35 |

# 2 • Assessment of the unit

## Strengths and opportunities

IAP gathers many talented researchers and technical staff. Both the Institute and its individual staff are very highly recognized at an international level. Most researchers and developments are devoted with success to extragalactic science and cosmology, but IAP is also recognized in other fields such as (not an exhaustive list) extrasolar planets, high energy astrophysics, and theoretical physics.

The Institute has been traditionally and successfully involved in theory and (heavy) numerical simulations, as well as observational work. Over the past few years, IAP has become strongly involved in the data analysis/archiving of large ground or space projects; this evolution represents an additional asset as it increases the synergy between projects and more theoretical/analysis work.

The rate of publications is high (about 300 papers in refereed journals per year), and the level of citations is also very high. Several high-impact, high-visibility results have been obtained, and precious legacy data have been released thanks to a strong involvement in survey data processing.

IAP attracts many associates, visitors, post-docs from abroad, which is a sign of its international visibility and attractiveness.

It is also quite successful in being awarded highly competitive grants at the national (ANR projects, Labex, Chaires d'excellences) and international levels (ERC, ITN, etc…). One highly visible example is the recently funded IAP-led Excellence Centre for Cosmology and High Energy Physics, Institut Lagrange de Paris (ILP), which will gather the efforts of a wide community in the Paris area over the next 10 years. This Centre will undoubtedly be a major asset for the IAP in the years to come, in terms of scientific developments and the ability to attract additional students, post-docs, and senior collaborators.

IAP is also involved at a high level in academic teaching, especially at Masters & Doctorate levels, and attracts very good PhD students. Finally, it has a very steady and strong outreach policy.

The projects of the scientific teams and for the Institute as a whole over the next 5 years are both ambitious and solid, including the participation in/leading of major initiatives (ILP) or projects (Euclid). They will ensure that IAP remains at the forefront of astronomy in a number of important domains.

## Weaknesses and threats

An important number of highly recognized scientists are now working as emeritus or are about to retire. Also, several younger scientists are leaving or will be shortly leaving IAP. Hence, some unique expertise will be lost for the Institute, and sometimes whole scientific domains will disappear. Even though this naturally happens in any Institute's life, it may require thematic or structural evolutions to be handled carefully in the forthcoming years.

Also, the number of technical and administrative staff has significantly decreased to a level that may jeopardize both the capability to maintain the Institute involvement in key projects, and the proper running of a large Institute which hosts a growing numbers of people (post-docs) and manages a growing number of contracts. Noticeably, the large decrease in ITA staff (Ingeneers, technicians and Administrative personnel) cannot be fully compensated by temporary staff, for administrative reasons (lengths of the contracts are smaller that the length of the projects) and practical ones (inefficiency of the hiring & training processes). The Committee emphasizes the need to maintain a proper balance between permanent & temporary staff.

Finally, the level of recurrent funding has dramatically decreased over the years, to an unacceptable level in 2012. While the level of funding of projects is very good, this cannot substitute for the recurrent funds that are needed for the proper functioning of the Institute. This decrease of recurrent funding is particularly difficult to handle as the Institute has to deal with its own infrastructure costs.

## Recommendations

IAP has presented an ambitious and coherent 5-year plan. IAP wishes to keep a strong involvement in its activities of excellence and to take a significant role in the forthcoming Euclid project. Meanwhile, IAP faces a past and continuing challenge in the form of retirements and departures of high skilled staff, and the involvement of key researchers in the management of large projects. For these reasons, IAP has to think about the best way to handle this evolution, while staying as bright or becoming even brighter; and the funding agencies have to follow these changes. There are several aspects that are addressed below.

**Evolution of research domains:**

- While the 5-yr plan proposes to continue the long lasting and highly visible activities in cosmology, extragalactic science, and theoretical physics, IAP understandably wishes to keep activities in other domains (extrasolar planets, high energy astrophysics). Keeping IAP as a leading Institute requires – at least partly - compensation for the departures of researchers through academic permanent positions (CNRS, CNAP, UPMC) in the coming years. The Committee feels that it is crucial to keep a "critical mass" in each of the domains that IAP wishes to maintain/develop.

- During the next term, the Committee felt that some team reorganization could make sense. While the committee understood that the contours of the extragalactic and cosmology teams could/had to be loose because of the large number of people involved and the necessary overlaps, the existence of two small extra-solar planet teams (whose contours will strongly overlap in the next term) does not seem a priori a configuration that ensures the best visibility. The committee encourages IAP to investigate other possible configurations compatible with the researcher's needs, and insuring the best scientific outputs in this domain.

- The Committee also recommends the IAP management and the staff to continue their valuable efforts to "integrate" as much as possible the science funded by individual grants within the laboratory life.

**IAP and large projects:**

- IAP's role in Terapix is expected to last until 2015; its role in Planck data processing will ramp down after 2015, and in the longer term, IAP aims at being part of the ground segment of Euclid. The Committee understands this as a long-term investment in wide field astronomy projects which fully justifies the hiring of permanent scientists (Service d'Observation 2, or SO2 "Instrumentation of large ground and space observatories" of CNAP and INSU) and technical staff.

- As far as CNAP hiring is concerned, IAP is encouraged to clearly explicit its contribution to SO2 (clarifying for the CNAP committee between "tâches de services" and "personal research"), and the CNAP committee is encouraged to take into account the IAP's needs in terms of SO2 for a hiring, hopefully in the close future.

- The Committee agrees with the IAP staff that a prompt feedback should be given by INSU to the teams proposing "SO2 labellisation". This is necessary in particular to avoid a long-term commitment of CNAP staff in projects that are finally not selected for SO2 stamping.

- Funding agencies (including CNES) should agree with IAP and commit on a pluri-annual roadmap for technical human resources, considering both permanent and temporary staff, and taking into account the past and forthcoming leaves. The hiring of permanent technical staff is mandatory to ensure the sustainability of know-how on long-term projects and avoid time loss. For the near future, the need for 2 "permanent" engineers within a two-year time scale is identified.

- Finally, the visiting committee considers that, depending on the profile of the next IAP Director, a leader of the technical "project" group should be identified.

**Budget:**

- As mentioned, the recurrent budget has decreased to a dramatically low level, where the recurrent needs and infrastructure costs are not adequately covered. Also, with the present respective levels of recurrent and project fundings, there is a clear risk that the laboratory could loose control of its scientific priorities. The Committee therefore recommends the re-establishment of a decent level of recurrent funding. In addition, for all contracts (including the ANR ones) funding should be made available to the laboratory to ensure a proper administrative support for the projects.

- Discussions with funding agencies over human resources and budgets require well identified interfaces. The interface with UPMC derived from the OSU status seems to have been questioned during recent months. The Committee feels that it is critical to recover rapidly an interface mechanism with UMPC at the right level, either through a direct link between IAP as an OSU and the University (OSU status), or via a commonly agreed formal way that ensures a good and stable representation of IAP at the UFR level.

**Laboratory life:**

- The Committee was favourably impressed by the general working conditions in the laboratory. However, we think these could still be improved with the following recommendations:

- Consolidate the administration/support technical staff. The body of technical staff dedicated to the support (e.g. computer support, technical support) and the numbers of administrative staff have both seriously decreased over the years, while the needs have increased in particular because of the increased numbers of grants to manage, number of post-docs, etc. The situation has reached a level that could compromise the quality of work in the lab, despite the efforts of the staff present on site. The Committee recommends the hiring of at least one permanent staff for "support"/administration, and that a way should be found to provide additional secretarial support to assist the numerous projects (possibly through the merging of funding from different grants).

- The similar contours of IAP as an OSU (Observatory) and as an UMR (Laboratory) certainly simplify many aspects of the scientific politics. The three different councils associated with OSU and UMR have to work properly, without redundancy. The Committee felt that under the present conditions, a good compromise had been found in the sharing of responsibilities between the "Conseil de Laboratoire" and the " Conseil Scientifique de l'OSU". The Committee encourages the Director to maintain the present good level of discussions with the different Councils, and to make sure that the "Conseil de Laboratoire" will have the opportunity to provide inputs when setting up the process of search for the next Director, and participate to the discussion at the right level.

- Working conditions could also be improved thanks to an increased human resources effort from the funding bodies in terms of management of careers and jobs opportunities. Also, teaching opportunities for post-docs would be very welcome.

Finally, as a very attractive place, IAP hosts many students and post-docs coming from abroad. Efforts have been made in recent years to integrate them better in the life of the Institute (most of the seminars are now in English for instance, following the last Visiting Committee recommendations). The Committee suggests that IAP considers additional efforts to help them in their working life (e.g. for instance intranet information, or part of it, in English; cookbook for new comers in English).

# 3 • Detailed assessments

## Assessment of scientific quality and outputs

IAP has been a leading Institute in astronomy in France for many years, and has remained so for the 2007-2012 period. A large fraction of research effort is devoted to extragalactic studies plus gravitation & cosmology, but studies of the interstellar medium, stellar physics, extrasolar planets and high energy astrophysics, nucleosynthesis are also pursued at IAP.

The global scientific production is very high (~ 300 publications/yr), in highly challenging and diverse domains, from Early Universe to extrasolar planets. Noticeably, the number of publications, already very good, has significantly increased in the last decade. Several original contributions to astrophysics and theoretical physics have been obtained, demonstrating a highly creative scientific life. During the visit, selected scientific highlights were presented, which illustrated very well the outstanding quality of the work done in the Institute.

Some of the IAP research staff have also become involved in the production of precious legacy catalogues (e.g. QSO) or in instrumental projects important for a large community (e.g. Sophie at T193 OHP).

In the late 1990s, IAP became involved in the data processing and archiving of MegaCam at CFHT (Terapix). This involvement has continued (including WIRCAM) during the period 2007-2012 and has been a real success that the Visiting Committee wishes to acknowledge. IAP also became strongly involved in the Planck ground segment. Some data have already provided several results on foreground astronomical objects, and cosmological data will be soon released, as well as the first associated results. Recently, IAP became involved in Euclid, and now includes the Euclid Consortium Lead Scientist in its staff members.

## Assessment of the unit's academic reputation and appeal

IAP enjoys a well-deserved reputation at the national and international levels. It attracts several highly respected researchers from abroad every year as invited guests, as well as several students for long or short terms stays, and post-docs (~ 70% of the post-docs come from abroad).

Several IAP members are members of European or international committees, which points also to a solid international reputation.

IAP staff members are particularly successful in being selected for prestigious grants (ANR, Labex, ERC, ITN, etc.), and have received several prestigious national and international awards during the 2007-2012 period. IAP is also leading the newly selected Labex « Institut Lagrange de Paris », which gathers several local Institutes with different and complementary competences, and proposes highly ambitious objectives in cosmology and extragalactic science. It is also associated with the Observatoire de Paris-led ESEP labex dedicated to the exploration of planet atmospheres.

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

IAP has maintained a vigorous outreach program in recent years, notably an important effort towards schools from Ile-de-France, as well as the very much appreciated monthly IAP seminars open to the general public, a participation in the "fête de la science" each year, and an exhibit in a metro station in Paris. IAP also participates at high level (coordination) in the international, EC-funded educational "hands on Universe" project, which aims at bringing interactive astronomy in classrooms.

## Assessment of the unit's organisation and life

IAP scientific life is structured around 6 teams. The largest ones are devoted to extragalactic work, cosmology, theoretical physics, high energy astrophysics. The contours between these teams are sometimes not so clear and there are overlaps between the teams. This is felt by the Committee to be unavoidable given the number of people involved and the scientific subjects. The Visiting Committee was puzzled that even though exoplanet research involves probably the fewest scientists at IAP, the topic is covered by two teams. Furthermore, exoplanetary atmospheres seem to be studied in both teams. Currently, Team 1 works 100% on exoplanets. If the stellar physics group (Team 2) manpower continues to decrease, the group will soon be also working 100% on exoplanets, albeit with a very small number of permanent scientists. IAP would then be in the odd position of having its smallest research group divided in two teams doing the same science. Having two exoplanet teams may work internally at IAP, but an outsider could be confused by this. In the event that stellar physics would one day be no longer present in Team 2, the IAP should decide how to better structure the exoplanet teams, either assembled in one team or with more clearly delineated research areas if it prefers to maintain two teams.

Over recent years, the increase of individual project funding over recurrent funding has been a major change for French laboratories. As seen above, IAP researchers have been quite successful in being awarded such funding. While the Committee recognizes that a very low ratio of recurrent budget versus individual project budgets represents a risk for the Institute (see below), it applaudes the decision to develop joint research programmes between individually funded research actions (e.g. ICAP with a "Chaire d'excellence" and an ERC) that can better promote the scientific life of the Institute.

The Visiting Committee finds, after discussion with all parties (ITA, teams, students, post-docs), that the working conditions are good. The scientific life is highly dynamic, with seminars at IAP level plus seminars within some teams, and one "journée des thèses" each year. A very well attended international conference is also organized yearly.

Students also organize their own seminars , and they participate in a self-organized conference at the Ile-de-France level. Of course, there is room for improvement (see Recommendations).

The only - yet major - difficulty is certainly the lack of human resources, given the decrease of staff members (researchers and technical & administrative staff) and the low recurrent budget from funding agencies. Such a situation should be reversed rapidly to avoid drastic strategic choices and/or decreased IAP Institute attractiveness, which would be deeply unfortunate for science and for the quality of working life at IAP. For « ITAs » (Ingineers and Technicians) in particular, staffing has decreased to a level such that the projects are at risk as well as the running of the Institute.

## Assessment of the unit's involvement in training through research

IAP is involved in teaching at "Licence" and Master Levels, through courses (physics, mathematics). Some researchers have taken important responsibilities in teaching/management of these courses. IAP also participates in the definition and contents of new courses.

IAP staff is also a highly active participant in the "Ecoles Doctorales" ED127 (Astropysics) and ED 107 (Theoretical physics). They participate intensively in the practical formation to Astronomy at various levels.

IAP has been hosting several interns and students (among them, 30% from abroad).

## Assessment of the five-year plan and strategy

The five year plan of the Institute has been presented in a comprehensive manner. Globally, the projects are both coherent and ambitious. They rely on the wide expertise of permanent and temporary scientists, technical and administrative staff. They also benefit from the possible synergy between different approaches: observational, modelling and simulations, and theory.

Concerning the projects, a ramp down of Terapix activities until 2015 is scheduled. Planck activities will remain high for the next period. IAP now aims at a major participation in the ESA Euclid project (leadership of the Consortium, project office of ground segment, VIS imager data analysis). This is a natural development given IAP's past activities in large field astronomy and available technical and scientific expertise. It is also in coherence with the scientific domains studied in the Institute.

# 4 • Team-by-team analysis

**Team 1 :** Planètes Extrasolaires et Milieux Interstellaires

Name of team leader: Mr Roger FERLET

## Workforce

| Team workforce | Number as at 30/06/2012[1] | Number as at 01/01/2014[2] | 2014-2018 Number of project producers[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 1 | 0 | 0 |
| **N2**: Permanent EPST or EPIC researchers and similar positions | 3 | 3 | 3 |
| **N3**: Other permanent staff (without research duties) | 1 | 1 | 1 |
| **N4**: Other professors (PREM, ECC, etc.) | 0 | 0 | |
| **N5**: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.) | 3 | 2 | 2 |
| **N6**: Other contractual staff (without research duties) | | | |
| **TOTAL N1 to N6** | 8 | 6 | 6 |

| Team workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 2 | |
| Theses defended | 3 | |
| Postdoctoral students having spent at least 12 months in the unit | 3 | |
| Number of Research Supervisor Qualifications (HDR) taken | 2 | |
| Qualified research supervisors (with an HDR) or similar positions | 3 | 3 |

# • Detailed assessments

## Assessment of scientific quality and outputs

The extrasolar planet team is a first class research group whose work is internationally recognized. Although small in comparison to other IAP teams, the scientists are at the forefront of explanet research in many areas: radial velocity discovery of planets, the confirmation of transiting planets, measurements of the spin axis alignment of exoplanet orbits (Rossiter-McClaughlin effect), and the detection of exoplanetary atmospheres. The IAP team members are on many of the major papers, in the exoplanet field, which appeared in the past several years.

The extrasolar group involvement with the SOPHIE spectrograph on the 1.93 m telescope at « Observatoire de Haute Provence » has insured its technical success and has turned it into the most successful "radial velocity machine" second only to the HARPS spectrograph. Not only does SOPHIE continue to make important exoplanet discoveries, but it has become a workhorse in the confirmation of transits from the space mission CoRoT and the ground based Superwasp project. It now plays a major role in the confirmation of transits from the Kepler mission. This work will ensure that the team stays at the forefront of exoplanet research for the foreseeable future.

The unit is highly productive given its small size. In the period 2007-2011 it has produced, on average, about 5 articles per permanent staff scientist. This productivity is exceptional even by international standards. This work is highly cited and this group has one of the highest citation rates among IAP teams.

Although this team has only five permanent staff members, three of the team members have received prizes from the Academy of Sciences or CNRS.

The team is successful at getting observing time at highly competitive facilities. Foremost is the success of a large program of over 100 HST orbits to study exoplanet atmospheres.

The evaluation committee could not comment on the ISM aspect of this team as no work in this area was presented.

## Assessment of the unit's academic reputation and appeal

This research unit has a high academic and scientific reputation. Exoplanet research is a new and vibrant field that attracts some of the brightest students. The unit has already produced several high quality PhD theses which indicates that it has the academic reputation required to attract the best students.

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

The discovery of exoplanets has captured the imagination of the public. This is shown by the large number of articles in newspapers and on the internet, as well as by the numerous television documentaries on this subject. The team has been involved in many press releases on exoplanet discoveries as well as dedicated outreach activities, and this helps keeping IAP highly visible to the public

## Assessment of the unit's organisation and life

The group seems to work well together and is well organized. However, there does not seem to be a great deal of communication or interaction with the other exoplanet team at IAP.

## Assessment of the unit's involvement in training through research

The team has produced high quality PhD theses. One previous member of the team now has a highly prestigious post-doctoral position at Caltech. The exoplanet field is highly competitive and the fact that a PhD student from this group can obtain a top job speaks highly for the quality of the work done.

## Assessment of the five-year plan and strategy

The outlook had three main aspects:

- **Atmospheres of exoplanets**.

This consists mostly of ground-based observations using in-transit spectrosopy with the GTC 10m telescope and space-based facilities. Twenty nights have been allocated on the Gran Telescopio Canarias (GTC) and this is one of the few programs producing science with that telescope. A large program of over 100 orbits has been allocated on the Hubble Space Telescope (HST) to study the atmospheres of over ten exoplanets. This work will serve as an excellent basis for getting time on the future James Webb Space telescope (JWST).

- **Radial velocity measurements**

. The team is among the world leaders in radial velocity detection of planets and the team members will continue in this area. There are several excellent opportunities acknowledged by the team. Concerning instrument development, they are involved in HARPS-N, the radial velocity spectrograph which is a copy of the highly successful HARPS spectrograph that is in the northern hemisphere, and in the ESPRESSO spectrograph planned for the 8.2m VLT on Paranal. There are also considerable opportunities in ground-based support for space-based transit search such as TESS (NASA) or PLATO (ESA). A decision regarding the selection of these missions will be made in 2013. The team can also make a significant contribution in supplying candidates to the CHEOPS mission, a Swiss-led satellite to search for transits around known radial velocity planets. CHEOPS has already been selected as a small mission by ESA.

- **Radio-emission from extrasolar planets**

. LOFAR presents a tremendous opportunity for the detection of radio-emission from exoplanets, and the team acknowledges this. However, the team does not explain in detail what role they will have and whether they have started collaborations with the French team leading the efforts in using LOFAR to detect exoplanets.

The field of exoplanets is a rapidly developing area and the team's strategy is to continue on previous success and to reorientate their efforts as new discoveries are made. Their involvement in several projects should enable them to do so; however, they could have provided more details regarding collaboration, instrument development, etc… that would have expressed and illustrated more clearly their research goals.

## Conclusion

● Strengths and opportunities:

The strengths of the team are its expertise (radial velocities in particular and stellar spectroscopy in general), its involvement in many state-of-the-art instruments (SOPHIE, HARPS, HARPS-N, ESPRESSO, etc.) and the excellent quality of its overall research.

There are several excellent opportunities for this team that the members have grasped for the present and future of radial velocity studies and planet characterization with JWST and LOFAR. The team can bring significant contributions to these studies.

● Weaknesses and threats:

The team is small and, as any small research team, it can be adversely affected by the departure of essential members..

Although the team has 'Interstellar Medium' (ISM) in its title, the Visiting Committee did not get an oral presentation on results or plans in this field.

● Recommendations:

The Institute should make efforts to keep key people, or replace them with competent ones if needed.otherwise the team will loose its "critical mass".

The team mentions the use of LOFAR to study radio-emission from exoplanets. This is an exciting possiblity but there is no mention of what collaborations have been started in this area. Spectroscopy, which is the expertise of the team, is very far from radio science. The team should explore the idea of starting collaborations with radio astronomers working on LOFAR to establish what contribution the IAP can make in this area.

The title of the research team should be changed to reflect what it actually does, i. e. 100% exoplanet research, unless the hiring of ISM researchers is planned in the future.

**Team 2 :** Physique Stellaire et Planètes extrasolaires

Name of team leader: Mr Arnaud CASSAN

## Workforce

| Team workforce | Number as at 30/06/2012[1] | Number as at 01/01/2014[2] | 2014-2018 Number of project producers[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 1 | 1 | 1 |
| **N2**: Permanent EPST or EPIC researchers and similar positions | 5 | 5 | 5 |
| **N3**: Other permanent staff (without research duties) | 1 | 1 | 1 |
| **N4**: Other professors (PREM, ECC, etc.) | 0 | 0 | |
| **N5**: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.) | 3 | 2 | 2 |
| **N6**: Other contractual staff (without research duties) | | | |
| **TOTAL N1 to N6** | 10 | 9 | 9 |

| Team workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 2 | |
| Theses defended | 3 | |
| 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 | 3 |

# • Detailed assessments

## Assessment of scientific quality and outputs

This team has diverse research areas covering solar physics, protoplanetary disks, star formation, extrasolar planets, and solar system planets. In all these areas the work of this team is internationally recognized. It has produced 179 publications in refereed journals. With respect to microlensing the IAP group is among the world leaders in this field. The diversity of Team 2 also helps make a significant contribution towards a comprehensive understanding of star and planet formation.

An important aspect of this team (40%) is exoplanet research. In contrast to the work performed in this field by the Extrasolar Planets and ISM group, Team 2 focuses on the detection of exoplanets via microlensing and exoplanetary atmospheres. The microlensing group has a strong international collaborative component which is essential for detecting microlensing events.

## Assessment of the unit's academic reputation and appeal

The members of this team are well respected and recognized at an international level. In particular the exoplanet aspect is a strong attractor of students.

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

Exoplanet research is a topic with considerable public interest and that plays an important role in the public outreach programmes of the IAP. The team contributes significantly to outreach activities.

## Assessment of the unit's organisation and life

This group is quite diverse and it was not clear how the various sub-fields interact with each other. This is probably compounded by the loss of one senior person working on disks, and two senior scientists working on star formation are committed to administrative work (managing director of A&A and general secretary of the IAU). The exoplanet group works well within the team, but there was no obvious communication or collaboration with the other explanet team. We also see little synergy and interaction between the planetary and exoplanetary scientists within Team 2 and this would be an advantage.

## Assessment of the unit's involvement in training through research

Seven PhD students are currently in the team. For a group of approximately 10 permanent scientists, this is a good level.

## Assessment of the five-year plan and strategy

The outlook addressed four main areas:

- **Stellar Physics**: Contributions to the GAIA mission. GAIA is one of the most important astronomical space missions in this decade. There is a strong potential for IAP to play an important role in GAIA by providing stellar models and helping with GAIA-Alerts. The IAP's expertise in handling large databases can also be of value to the GAIA mission. It was not clear, however, that this contribution will involve getting more funding, or at what level personnel and resources are required.

- **Star Formation**: The outlook mentions the use of the new instrument SITELLE for global studies of H II regions, but it was not clear precisely what science case the IAP team wishes to pursue in this area.

- **Exoplanets**: The outlook focuses on: (1) continuing microlensing searches from the ground via the PLANET collaboration and the use of Euclid for microlensing detection of planets, and (2) atmospheric studies using the proposed ECHO satellite. If ECHO is selected and/or Euclid has a microlensing component then this would translate into great potential for the IAP.The detailed contributions of the IAP to Euclid and ECHO are not clear. Also, no alternative plan was identified in case ECHO and Euclid were not selected.

- **Solar System**: This consists of applying codes to exoplanet atmospheres and proposing an idea for a micro-satellite in response to the call for ideas issued by CNES at the end of 2012 making Lα emission. The idea sounds interesting and could be important for IAP, but few details were given.

## Conclusion

● Strengths and opportunities:

Overall, all sections of Team 2 are producing high quality science and the group has identified important projects in the future to participate in. The exoplanet part, focused on microlensing, is producing important and well-recognized results.

Having scientists working on solar system planets one one side and exoplanets on the other side is a great advantage, and a synergy between the two should be encouraged.

● Weaknesses and threats:

Although the "star formation and stellar physics" groups has produced very good science in the past, this part of the team is now decreasing in size: the group has lost a senior person working on disks and IAP has not been able to attract a suitable replacement; other senior members have considerable administrative duties. In stellar physics key scientists are near retirement. There is a danger that in a few years the "Stellar and Planetary Physics and Extrasolar Planets" will consist only of "Extrasolar Planets".

Euclid and ECHO are clearly important for the IAP, but the danger is that ECHO will not be selected and even though Euclid has been selected, it is not yet decided that it should have a microlensing component.

● Recommendations:

The researchers in this unit need to decide what kind of team they want to be in the future. If they wish to continue in star formation and stellar physics, strong efforts should be made to hire new staff members working in these areas.

An important part of the outlook of the exoplanet members is Euclid and ECHO. If ECHO is not selected and Euclid does not do microlensing, the group needs to come up with an "alternative plan" on the direction that exoplanet research at IAP should take.

Finally, if the stellar physics group (Team 2) manpower continues to decrease,, the team will soon be working 100% on exoplanets, as Team 1, but with a smaller number of permanent scientists. IAP should decide how to better structure the exoplanet teams (see Section 2).

**Team 3 :** Origine et Evolution des Galaxies

Name of team leader: Ms Valérie DE LAPPARENT

## Workforce

| Team workforce | Number as at 30/06/2012[1] | Number as at 01/01/2014[2] | 2014-2018 Number of project producers[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 8 | 8 | 8 |
| **N2**: Permanent EPST or EPIC researchers and similar positions | 5 | 4 | 4 |
| **N3**: Other permanent staff (without research duties) | 1 | 1 | 1 |
| **N4**: Other professors (PREM, ECC, etc.) | 1 | 1 | 1 |
| **N5**: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.) | 2 | 3 | 3 |
| **N6**: Other contractual staff (without research duties) | | | |
| **TOTAL N1 to N6** | 17 | 17 | 17 |

| Team workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 4 | |
| Theses defended | 7 | |
| Postdoctoral students having spent at least 12 months in the unit | 8 | |
| Number of Research Supervisor Qualifications (HDR) taken | 1 | |
| Qualified research supervisors (with an HDR) or similar positions | 12 | 12 |

# • Detailed assessments

## Assessment of scientific quality and outputs

This group carries out research in a diverse range of topics. Much of this follows the tradition in studies of galaxy evolution and focuses on measuring star-formation rates, and how they vary between different types of galaxies. Modern tools for this purpose are used, particularly making use of data from Herschel, Spitzer and Galex. The most impressive work in this area concerns modelling of galaxy data, both spectral and imaging; the production of world-leading tools for these purposes within the IAP enables some high-quality science. The work on spectral modelling is especially impressive, and it is good to see that this work has been acknowledged by a major ERC grant. The SExtractor image analysis work gets more and more strength, and the AstroMatic initiative that makes this work more widely available is to be applauded. Overall, this group has produced 156 articles in refereed journals.

## Assessment of the unit's academic reputation and appeal

There is no doubt that if the IAP has a very good reputation internationally, its research on galaxy evolution is one of the main reasons for this. The modelling work mentioned in the previous section (the spectral synthesis models and SExtractor) has received a huge amount of use over decades, and it is clear that the world community firmly associates this work with the IAP. This represents a major asset for this Team.

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

The galaxy evolution group participates in the IAP outreach, in particular with the organisation of the monthly public conferences in collaboration with CERIMES and Canal-U, and with the formation of schools for students and postdocs (e.g. NEON).

## Assessment of the unit's organisation and life

The galaxy evolution group is quite diverse, and a reflection of this is that we did not gather a strong impression of coordinated research between sub-groups addressing common problems. . In most cases, the staff involved in this group appear to publish individually, collaborating with astronomers outside the IAP rather than with each other. However, the team offers the opportunity to share the research done by different members, in particular with regular internal (yet open to other teams) seminars.

## Assessment of the unit's involvement in training through research

During the most recent 5-years period, 6 PhDs were defended within the group. For a group with 14 permanent scientific members, the Committee felt that this number is in the low range. There is most likely much potential research that is being held back due to the lack of students. The newly-obtained ERC award in the team should help to improve this situation.

## Assessment of the five-year plan and strategy

The research outlook proposal emphasises in particular two elements: data from the GAIA satellite, and comparison with results from numerical simulations. In the former case, it is clear that GAIA should be a revolutionary experiment, but it was unclear exactly what the impact of GAIA on IAP research will be, especially as the main astrometric dataset will not be available until the end of the next 5-year review period. Regarding numerical simulations, this seems to be a strong point in general; a criticism of a good deal of the existing research is that it is relatively empirical and does not make a strong link with theory. Given the investment that the IAP has made in detailed simulation work relevant to galaxy formation, the Committee would have expected more cross-talk with teams developing such simulations. One might also have looked for plans for a connection with theory beyond the simulation group. Inter-group collaboration should be a strong priority.

## Conclusion

- Strengths and opportunities:

This team has great international visibility due to its tools for spectral and image modelling. These are widely used in the community and permit team members to join large external collaborations, thus producing additional science. A subset of the team performs well-visible work strongly relevant to GAIA, and this work is extremely well positioned to exploit the initial data release.

- Weaknesses and threats:

The research in the team covers a wide range of areas, so that the numbers of staff working on any given topic is low, and the scope for internal collaboration is restricted. The number of PhD students was regarded as rather low for the number of permanent staff. Funding for travel to conferences is well below a reasonable minimum (a common problem throughout the IAP, except for those staff who hold special grants).

- Recommendations:

The work on galaxy evolution should be tied more strongly to the effort on simulations of galaxy formation. Other related areas of common interest should be developed jointly with other teams: especially the impact of central black holes on star formation (with Team 4, high-energy astrophysics) and environmental influences on galaxy evolution (with Team 5, large-scale structure).

**Team 4 :** Cosmologie et Astrophysique des Hautes Energies

Name of team leader: Mr Frédéric DAIGNE

## Workforce

| Team workforce | Number as at 30/06/2012[1] | Number as at 01/01/2014[2] | 2014-2018 Number of project producers[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 4 | 4 | 4 |
| **N2**: Permanent EPST or EPIC researchers and similar positions | 3 | 3 | 3 |
| **N3**: Other permanent staff (without research duties) | 1 | 1 | 1 |
| **N4**: Other professors (PREM, ECC, etc.) | 1 | 1 | 1 |
| **N5**: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.) | 8 | 8 | 8 |
| **N6**: Other contractual staff (without research duties) | | | |
| **TOTAL N1 to N6** | 17 | 17 | 17 |

| Team workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 2 | |
| Theses defended | 6 | |
| Postdoctoral students having spent at least 12 months in the unit | 7 | |
| Number of Research Supervisor Qualifications (HDR) taken | 2 | |
| Qualified research supervisors (with an HDR) or similar positions | 5 | 5 |

# • Detailed assessments

## Assessment of scientific quality and outputs

It should be recognized that the COSMOH team has had a significant output of high quality work, well cited, in the past five years with some outstanding contributions. Their research, at the interface between high-energy astrophysics and cosmology, combines expertise on both theoretical modelling and observation with outstanding ground-based and space facilities. Their activities are focused on understanding the structure and evolution of energetic sources such as gamma-ray bursts and quasars, and the use of these sources as tracers of the cosmic history. Highlights of their recent activities include (far from exhaustive): the development of a complete and unique set of modelling tools to account for all emission phases observed in gamma-ray bursts; the modelling of the cosmic evolution of baryons from the first stars to the present Universe, implying new physics including limits on the variation of physical constants over cosmic time; the first detection of molecules at high redshift, in Damped Lyman-Systems.

## Assessment of the unit's academic reputation and appeal

The quality of their work is obviously recognized as they are invited to many international conferences. The team is attracting a large number of PhD students and postdocs. It has also recently attracted highly recognized senior scientists, through an ERC grant and a permanent position at CNRS. Team members are also quite successful in being awarded external funding (from ANR programs, CNES, PICS France-USA, etc.).

Some members of the group are involved in large projects such as the SDSS-III/BOSS survey of quasars and galaxies to constrain the nature of the dark energy, and the preparation of the franco-chinese satellite SVOM to observe GRBs.

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

The group is strongly active in the popularization of science, with a wide variety of implications. In particular, one member is coordinating, for IAP, the outreach activities towards schools, and IAP contribution to the "fête de la science". The team also participated in the AMA effort.

## Assessment of the unit's organisation and life

The COSMOH team is composed of two rather distinct groups. The members of each sub-group collaborate among themselves and with other researchers from outside IAP, with large interdisciplinary interactions (nuclear, particle and fundamental physics).

The team has attracted outstanding researchers, but it was not clear in the presentation how deep are the direct interactions between these researchers and the team.

There is an explicit collaboration with the "Theoretical Physics" team, but one can only encourage the group on quasar surveys to be more closely involved with the "Large Scale Structures and Deep Universe" team.

## Assessment of the unit's involvement in training through research

The group has a strong involvement in the teaching of astrophysics from the undergraduate to Master and Doctoral levels, mainly at UPMC. One member is responsible of the Physics Faculty at UPMC (ED 127), and there is also a participation to the board of ED 517.

They have trained several PhD students (11 in the five-year period), and one of those has been recently appointed by CNRS and joined the team.

## Assessment of the five-year plan and strategy

The research outlook proposal is mainly along the lines of the present research. Given that the team is doing good quality science one can expect this to continue. The research plan emphasises many possible connections with other research groups within IAP, this is a positive extension of the current work that one can only encourage.

## Conclusion

● Strengths and opportunities:

Very efficient team, with highly recognized results.

● Weaknesses and threats:

No scientific weakness could be identified by the Committee. There is an effort to be done to promote more collaborations between the two components of the team and with other IAP teams, and this is what is planned, as said before, in the five-year project.

● Recommendations:

The Committee recommends more collaboration with other teams at IAP, such as Team 5.

**Team 5 :** Grandes structures et Univers profond

Name of team leader: Mr Christophe PICHON

## Workforce

| Team workforce | Number as at 30/06/2012[1] | Number as at 01/01/2014[2] | 2014-2018 Number of project producers[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 5 | 6 | 6 |
| **N2**: Permanent EPST or EPIC researchers and similar positions | 9 | 9 | 9 |
| **N3**: Other permanent staff (without research duties) | 2 | 2 | 2 |
| **N4**: Other professors (PREM, ECC, etc.) | 1 | 0 | 0 |
| **N5**: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.) | 2 | 2 | 2 |
| **N6**: Other contractual staff (without research duties) | | | |
| **TOTAL N1 to N6** | 19 | 19 | 19 |

| Team workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 10 | |
| Theses defended | 8 | |
| Postdoctoral students having spent at least 12 months in the unit | 12 | |
| Number of Research Supervisor Qualifications (HDR) taken | 3 | |
| Qualified research supervisors (with an HDR) or similar positions | 4 | 5 |

# • Detailed assessments

## Assessment of scientific quality and outputs

It is somewhat difficult to evaluate the science production of the team separately from its contributions to its main projects (Planck, Terapix, Euclid) which are themselves outstanding and at the cutting edge, but broadly collaborative and international. We will try to do so here, but it should be kept in mind that a significant part of the team resources (also in terms of time and energies) are expended on the specific projects.

This team is the largest of the IAP. The scientific production includes almost 400 publications for a total of 5000 citations (which is extremely high), and this is excluding the papers from the Planck project (which have a very high impact). The 4 publications/person/year output is high compared to the mean of the field. Overall the research carried out in the group is very good and sound, and some aspects of this research are particularly original and innovative.

IAP being one of the Planck data centres, the team is expected to release to the world and maintain the Planck database, which will be invaluable to the whole community. Similarly with the TERAPIX-CFHT-LS related data and results, the team is (will be) providing the community with extremely valuable products.

## Assessment of the unit's academic reputation and appeal

The team is highly involved at the international level in several respects: it attracts students and especially (good) post-docs internationally, it participates very actively to, and members are leaders of, large international collaborations (Planck, Euclid to name only two). The quality of group members is obviously recognized as some are extremely successful in attracting external funding (Labex, ANR etc.).

The group manages to attract and recruit the best and brightest scientists. Their participation in international conferences has been understandably slowed down lately (due to the Planck analysis crunch time) but will pick-up again in the second trimester of 2013 after the official release of the Planck Survey data.

Academic reputation and appeal is outstanding.

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

In particular, cosmology and large-scale structure being especially well-suited for outreach, this group has been actively involved in bringing science to the general public and to schools. The outreach activities are original and innovative.

## Assessment of the unit's organisation and life

A recent new hire and the influx of funds associated with it could have perturbed a previously achieved equilibrium. If this has happened it is not overly visible. There is an effort to coordinate the research of the different sub-groups which should be continued and fostered.

Collaboration and systematic cross-talk with Team 3 (Origin and Evolution of galaxies) should be strengthened, especially for the work on simulations and on connecting dark matter with observable galaxies. Moreover a more explicit connection with Team 6 (theoretical physics gravitation and cosmology) will probably benefit to both sides (for little extra cost).

## Assessment of the unit's involvement in training through research

Over the past 5 years, 8 PhD thesis were defended. This number is expected to increase quickly, as there are now 10 new students in the group.

## Assessment of the five-year plan and strategy

The five-year plan is not well outlined or detailed in the material presented.. Given the scientific interests and expertise of the team as of today, the team will continue with the scientific exploitation of data on the deep Universe (Planck), as well as data processing and analysis, using also numerical simulations. Planck data will be analyzed well beyond the day of the official final data release, and thus this work might carry on for a large part of the next 5 years. The preparation work for Euclid will continue and of course grow, but there will not be any Euclid data to analyze in the next 5 years, possibly leaving an important gap. Moreover, considering the involvement and investment in the Euclid mission, the Visiting Committee was surprised by the lack of an explicit strategy or mid-term planning involving the study of weak gravitational lensing.

## Conclusion

● Strengths and opportunities:

The team displays a critical mass, with expertise in key areas in cosmology, covering a broad range of subjects. It can count on world leaders in the field. The team is tackling key issues in cosmology, which in itself as a research area is passing through a very exciting time. The group has complementary strengths in data processing/analysis, theoretical modelling and simulation.

● Weaknesses and threats:

Coordination of strategy and priorities could be improved within the group.

The mid and long-term role of the group (and therefore IAP) as a world-leading wide-field astronomy centre might be jeopardized by a high-ratio of temporary staff members (CDDs)/permanent staff members (ITA): too many short term CDDs can render the group inefficient.

● Recommendations:

The comittee recommends the simulation sub-team to work closely with Team 3 (origin and evolution of galaxies). The comittee also encourages the establishment of a closer cross-talk with Team 6 (theoretical physics: gravitation and cosmology). The comittee finally recommends that the team takes the time to stand back and consider its mid- and long-term plans and strategy.

**Team 6 :** Physique Théorique: Gravitation et Cosmologie

Name of team leader: Mr Guillaume FAYE

## Workforce

| Team workforce | Number as at 30/06/2012[1] | Number as at 01/01/2014[2] | 2014-2018 Number of project producers[3] |
|---|---|---|---|
| **N1**: Permanent professors and similar positions | 1 | 0 | 0 |
| **N2**: Permanent EPST or EPIC researchers and similar positions | 8 | 10 | 10 |
| **N3**: Other permanent staff (without research duties) | 0 | 0 | 0 |
| **N4**: Other professors (PREM, ECC, etc.) | 0 | 0 | |
| **N5**: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.) | 0 | 0 | 0 |
| **N6**: Other contractual staff (without research duties) | | | |
| **TOTAL N1 to N6** | 9 | 10 | 10 |

| Team workforce | Number as at 30/06/2012 | Number as at 01/01/2014 |
|---|---|---|
| Doctoral students | 2 | |
| Theses defended | 7 | |
| Postdoctoral students having spent at least 12 months in the unit | 6 | |
| Number of Research Supervisor Qualifications (HDR) taken | 3 | |
| Qualified research supervisors (with an HDR) or similar positions | 6 | 6 |

# • Detailed assessments

## Assessment of scientific quality and outputs

This team has a rich scientific program covering many aspects of fundamental and computational gravity and cosmology. The team's results on the post-Newtonian expansions, gravity waves and theory of quantum cosmological perturbations are well-known and they constitute a technical "tour de force". Over the past five years the groups has published an impressive number of papers in a wide spectrum of topics from Astrophysics, Theories of Gravity, Cosmology and String Theory. Their results often require heavy computations, both analytical and numerical. They address important physical problems and the group has the physical expertise and the technical power to solve them.

## Assessment of the unit's academic reputation and appeal

The group is one of the best in Theoretical Gravitational Physics and Cosmology in France. It enjoys a well-deserved international reputation. Some team members are among the world reknown leading experts in General Relativity with important results on gravitational waves from binary sources. Others are well-known cosmologists, authors of the textbooks on cosmology with well-known important contributions to the theory of cosmological perturbations. Members of the group have been awarded two prestigious prizes: The Paul Langevin Prize of the French Physical Society, the highest Prize of Theoretical Physics in France, as well as a Prize for Young Physicists.

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

IAP as an Institution has developed a very important outreach activity bringing science to schools, students and the general public. Of course, Astronomy, Astrophysics and Cosmology are well-suited for such a purpose. Inside this collective effort, the team of theorists is very active.

## Assesment of the unit's organisation and life

The group seems to be well-organised with regular meetings and seminars. The members collaborate between themselves, but also with other theorists in France and abroad. The group has suffered from the recent decrease in travel budget, which is absolutely essential for the activity of theorists.

## Assessment of the unit's involvement in training through research

They have trained several PhD students (9 in the five-year period). Although the majority of the members are from CNRS, they participate in the teaching of Astronomy and Astrophysics, both at the undergraduate and at the graduate levels.

## Assessment of the five-year plan and strategy

A five-year plan does not seem very appropriate for theorists. In the immediate future, they plan to continue working on difficult problems in Cosmology and Astrophysics taking advantage of their theoretical and technical expertise.

## Conclusion

● Strengths and opportunities:

The team members cover together a great expertise in General Relativity, Quantum Field Theory, Astrophysics and Cosmology. They are able to tackle technically very difficult problems on a wide range of topics, from Classical General Relativity to Quantum Field Theory, Particle Physics and String Theory.

● Weaknesses and threats:

In the current times when funding depends almost exclusively on external sources, they should be more efficient in attracting and sharing resources.

● Recommendations:

A closer collaboration of pure theorists with the members of the teams more directly involved in observations could be beneficial to both parties.

The Committee encourages the team to search for additional budget, and an increase of their travel and guest budget is highly recommended.

## 4-b ● Theme-by-theme analysis

**Theme 1:** Planck Data processing Center

Manager's name: Mr François BOUCHET

### Workforce

| Theme workforce in Full Time Equivalents | As at 30/06/2012 | As at 01/01/2014 |
|---|---|---|
| FTE for permanent professors | 1,2 | 1,2 |
| FTE for permanent EPST or EPIC researchers | 2,7 | 2,7 |
| FTE of other permanent staff without research duties (IR, IE, PRAG, etc.) | 5,8 | 5,5 |
| FTE for other professors (PREM, ECC, etc.) | | |
| FTE for postdoctoral students having spent at least 12 months in the unit | 3 | |
| FTE for other EPST or EPIC researchers (DREM, etc.) excluding postdoctoral students | | |
| FTE for other contractual staff without research duties | 4 | 3 |
| FTE for doctoral students | 3 | |
| **TOTAL** | 19,7 | 12,4 |

## • Detailed assessments

Although the main cosmological results of Planck are still to become public (and are eagerly awaited by the entire cosmological community) the initial taste given by the "Planck preliminary results" series of papers are of high quality (and consequently already highly cited). IAP has played, and is playing, a pivotal role in Planck by being a data processing center (DPC). It is expected to continue to do so and produce top quality related science for the duration of the project and the time it takes to fully exploit the data.

### Conclusion

● Overall opinion of the theme:

Planck is THE main cosmology mission of the decade addressing the most important and fundamental questions in cosmology. The cosmological results are eagerly awaited by the entire cosmology (if not physic) community. It is expected to produce very high impact science.

● Strengths and opportunities:

The scientific exploitation of Planck data is expected to continue well after the initial public data release possibly for the most part of the next 5 years. The expertise developed for this project will be extremely valuable for other future large-scale projects should the IAP decide to continue in that direction.

● Weaknesses and threats:

The extension of the mission (which is undoubtedly good for science) has represented a perturbation in the previous plans (in terms of required years of manpower). Some last minute scrambling for resources (in terms of manpower) could probably have been avoided with a more careful advanced and coordinated planning or provisions for this scenario.

The heavy workload to honour the commitments of a Data Processing Center (DPC) may divert resources from the scientific exploitation of the data. If so, there is a risk for IAP that the scientific exploitation (and the glory that follows) will happen elsewhere, unless additional forces join (e.g. post-docs).

● Recommendations:

The comittee recommends that the group retains the expertise gained over the duration of the project if, in a relatively short timescale, this expertise could be useful for another project the IAP plans to be involved with. This requires careful and coordinated advanced planning.

The Visiting Committee recommends a search for additional human resources (e.g. post-docs) for Planck scientific exploitation, through e.g. the ILP or other channels.

**Theme 1:** TERAPIX-Euclid

Manager's name: TERAPIX: Mr Yannick MELLIER (then Mr Patrick HUDELOT, Research Engineer from January 2013).

## Workforce (Terapix/Euclid)

| Theme workforce in Full Time Equivalents | As at 30/06/2012 | As at 01/01/2014 |
|---|---|---|
| FTE for permanent professors | 0.8/1.3 | 0.5/1.3 |
| FTE for permanent EPST or EPIC researchers | | |
| FTE of other permanent staff without research duties (IR, IE, PRAG, etc.) | 1/1.3 | 1.5/3 |
| FTE for other professors (PREM, ECC, etc.) | | |
| FTE for postdoctoral students having spent at least 12 months in the unit | | |
| FTE for other EPST or EPIC researchers (DREM, etc.) excluding postdoctoral students | 1.9/1 | 1/3 |
| FTE for other contractual staff without research duties | | |
| FTE for doctoral students | | |
| **TOTAL** | 3,7/3,6 | 3/7.3 |

## • Detailed assessments

TERAPIX has been a successful operation that benefited to a wide community. IAP staff should be applauded for this success. The participation in the next large-field, cosmology dedicated space instrument, Euclid, is the natural next step, given the scientific (lensing) and "technical" expertise available in the Institute. In particular, IAP wishes to use its expertise to participate to the data analysis of the VIS imager.

The leading of this Consortium is done at IAP. This will obviously be a very heavy and important task as there are hundreds of scientists and dozens of Institutes members of the Euclid Consortium.

### Conclusion

● Overall opinion of the theme:

Euclid will be the major European space mission of the next decade as far as wide field astronomy is concerned. Its importance to cosmology is therefore unquestionable.

● Strengths and opportunities:

Euclid represents an excellent opportunity to exploit the scientific and technical expertise available in the domain at IAP. The scientific outputs can be very important and visible.

● Weaknesses and threats:

The involvment in the coordination of the Consortium will be a major workload for the leader. The Visiting Committee encourages IAP to take all necessary actions to ensure that the scientific activity regarding weak lensing is maintained within the Institute.

Also, the project will require technical human resources that have been estimated, but are not secured today. As mentioned earlier, there must be a minimum number of permanent staff to ensure a reasonable balance between permanent and temporary staff.

● Recommendations:

For a success of the IAP participation in Euclid, the agencies should commit to a mid-term plan for technical staff hiring (both permanent and temporary).

Also, the Committee encourages this team to accrete additional strengths in weak lensing.

# 5 • Appendix : Conduct of the visit

Visit dates :

| | |
|---|---|
| Start : | 09 january 2013, at 12:00 pm |
| End : | 11 january 2013, at 05:00 pm |

| | |
|---|---|
| Visit site : | IAP |
| Institution : | IAP |
| Address : | 98 bis Bd Arago; 75014 Paris |

## Conduct or programme of visit:

Briefly, the visit consisted in presentations given by the IAP directorates (open sessions). Highlights of the scientific results were also presented (open sessions). Each presentation was followed by discussions. Individual meetings were held with the management team, each team/project, grants holders, students & post-docs, technical staff, allowing direct exchanges. A discussion with funding agencies (CNRS, UPMC) was also held.

Brief discussions were asked with the IAP directorate when additional information was needed.

The Visiting Committee met in closed session prior to the Visit for presentation of the process and expected outcomes. Short closed discussions were held after the 9th and 10th sessions and a long closed-session was held during the afternoon of the 11th.

# 6 • Statistics by field: ST on 10/06/2013

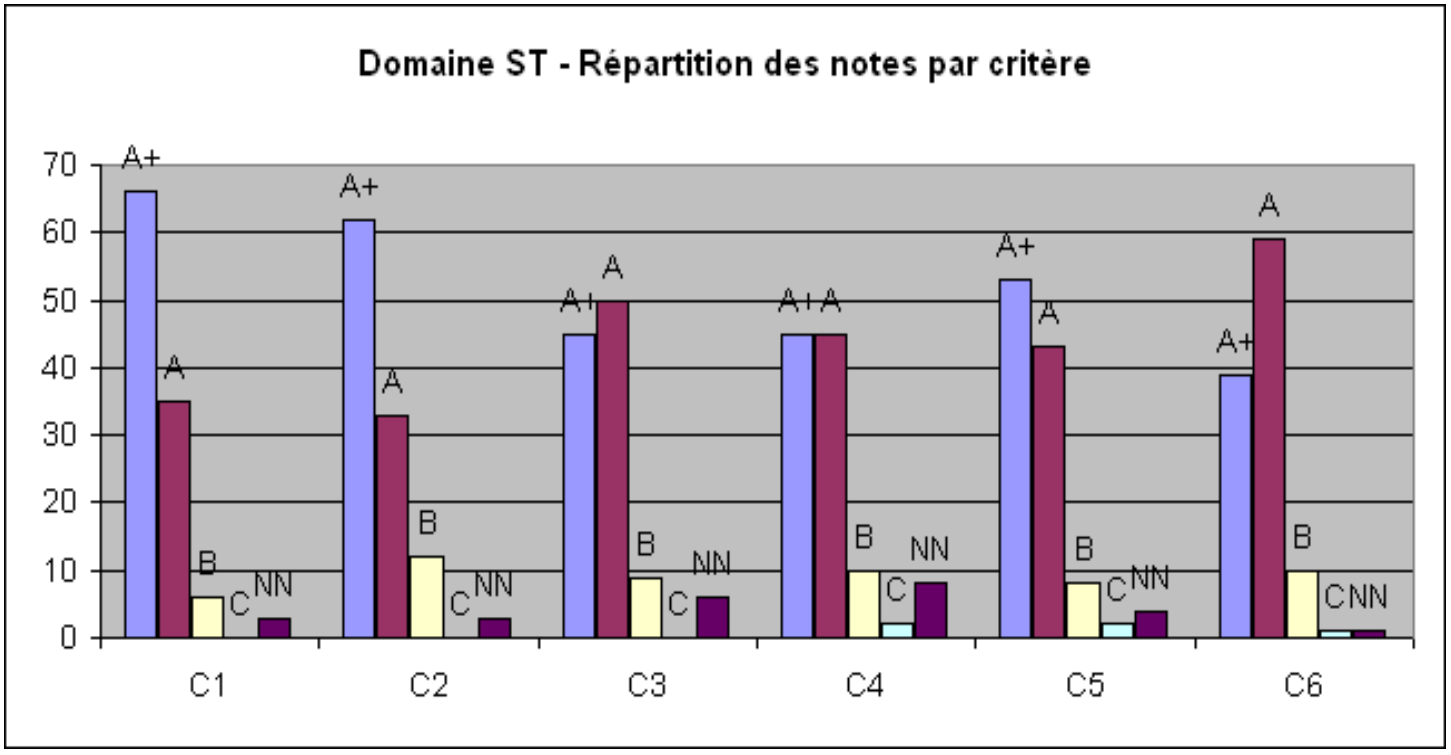
## Grades

| Critères | C1 Qualité scientifique et production | C2 Rayonnement et attractivité académiques | C3 Relations avec l'environnement social, économique et culturel | C4 Organisation et vie de l'entité | C5 Implication dans la formation par la recherche | C6 Stratégie et projet à cinq ans |
|---|---|---|---|---|---|---|
| A+ | 66 | 62 | 45 | 45 | 53 | 39 |
| A | 35 | 33 | 50 | 45 | 43 | 59 |
| B | 6 | 12 | 9 | 10 | 8 | 10 |
| C | 0 | 0 | 0 | 2 | 2 | 1 |
| Non Noté | 3 | 3 | 6 | 8 | 4 | 1 |

## Percentages

| Critères | C1 Qualité scientifique et production | C2 Rayonnement et attractivité académiques | C3 Relations avec l'environnement social, économique et culturel | C4 Organisation et vie de l'entité | C5 Implication dans la formation par la recherche | C6 Stratégie et projet à cinq ans |
|---|---|---|---|---|---|---|
| A+ | 60% | 56% | 41% | 41% | 48% | 35% |
| A | 32% | 30% | 45% | 41% | 39% | 54% |
| B | 5% | 11% | 8% | 9% | 7% | 9% |
| C | 0% | 0% | 0% | 2% | 2% | 1% |
| Non Noté | 3% | 3% | 5% | 7% | 4% | 1% |

## Histogram



# 7 • Supervising bodies' general comments

Paris le 25 04 2013

Le Président
Didier Houssin
Agence d'évaluation de la recherche
et de l'enseignement supérieur
20 rue Vivienne - 75002 PARIS

M. le Président,

Nous avons pris connaissance avec le plus grand intérêt de votre rapport concernant le projet de l'Institut d'astrophysique de Paris, porté par M. Vigroux. Nous tenons à remercier l'AERES et le comité pour l'efficacité et la qualité du travail d'analyse qui a été conduit.

Ce rapport a été transmis au directeur du laboratoire qui nous a fait part en retour de ses commentaires que vous trouverez ci-joint. Nous espérons que ces informations vous permettront de bien finaliser l'évaluation du laboratoire.

Restant à votre disposition pour de plus amples informations, je vous prie de croire, M. le Président, à l'expression de mes salutations respectueuses.

Le Vice -Président Recherche et Innovation

Paul Indelicato

Vice-présidence Recherche et Innovation
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# Commentaires à apporter sur le rapport AERES

## Institut d'Astrophysique de Paris

L'IAP a pris connaissance du rapport du Comité d'Evaluation mis en place par l'AERES. Le contenu et les recommandations de ce rapport n'appellent pas de remarques particulières de notre part. Ce rapport a été fait avec sérieux et compétence. Les recommandations du Comité seront étudiées avec soin en vue de leur mise en œuvre. Certaines de ces recommandations s'adressant aussi aux tutelles de l'IAP, le CNRS et l'UPMC, l'IAP souhaite pouvoir en discuter avec elles.

Le rapport du Comité a été écrit en anglais, ce qui en a gêné la compréhension par une partie du personnel maîtrisant mal l'anglais et ses subtilités, en plus de la question de principe sur l'utilisation du français. Le personnel de l'IAP aurait préféré recevoir une version en français.

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