Laboratoire des systèmes perceptifs

Rapport Hcéres

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

Department for the evaluation of research units

AERES report on unit:

Laboratoire des Systèmes Perceptifs

LSP

Under the supervision of the following institutions and research bodies:

École Normale Supérieure

Centre National de la Recherche Scientifique

October 2012

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

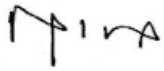
Research Units Department

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 and was given along with an overall assessment. 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 and its in-house teams received the overall assessment and the following grades:

- Grading table of the unit: Laboratoire des Systèmes Perceptifs

C1	C2	C3	C4	C5	C6
A+	A+	A+	A+	A+	A+

- Grading table of the team: Vision

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

- Grading table of the team: Audition

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

Evaluation report

Unit name:	Laboratoire des Systèmes Perceptifs
Unit acronym:	LSP
Label requested:	UMR
Present no.:	
Name of Director (2012-2013):	Unit to be created
Name of Project Leader (2014-2018):	Mr Pascal MAMASSIAN

Expert committee members

Chair:	Mr Edouard GENTAZ, University of Geneva, Switzerland
Experts:	Mr Paul AVAN, University of Auvergne
	Mr Pascal BARONE, University Paul Sabatier (representative of the CoNRS)
	Mr George MICHAEL, University of Lyon 2 (representative of the CNU)
	Mr Andrew SMITH, University of London, Uk

Scientific delegate representing the AERES:

Ms Annie VINTER

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

Mr Yves GULDNER *(École Normale Supérieure)*

Mr Bernard POULAIN *(CNRS INSB)*

1 • Introduction

History and geographical location of the unit :

The present structure, called "Laboratoire des Systèmes Perceptifs - LSP", is new. The LSP will be part of the "Institut d'Étude de la Cognition -IEC" (director: Mr Christian LORENZI) at the "École Normale Supérieure- ENS" and will be located on a single site at the ENS rue d'Ulm. The LSP is composed of two teams, "Audition" (leader: Mr Daniel PRESSNITZER, CNRS) and "Vision" (leader: Mr Jean LORENCEAU, CNRS). The Audition team is already a full structure of the IEC since 2005. The Vision team results from a proposal (submitted by Mr Pascal MAMASSIAN, CNRS) as a response to a call from the IEC LABEX in February 2012 to welcome new teams at the IEC and this proposal has been accepted by the IEC.

Management team:

Mr Pascal MAMASSIAN will be the director of the unit, Mr Jean LORENCEAU will be the leader of the Vision team and Mr Daniel PRESSNITZER will be the leader of the Audition Team.

AERES nomenclature :

SHS 4 – 2 Psychology

Unit workforce:

Unit workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions		2	2
N2: Permanent researchers from Institutions and similar positions		5	5
N3: Other permanent staff (without research duties)		2 (1,25)	
N4: Other professors (Emeritus Professor, on-contract Professor, etc.)		1	1
N5: Other researchers from Institutions (Emeritus Research Director, Postdoctoral students, visitors, etc.)			
N6: Other contractual staff (without research duties)			
TOTAL N1 to N6		**10 (9,25)**	**8**

Percentage of producers	***100 %***

Unit workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students		
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		9

2 • Assessment of the unit

Strengths and opportunities :

- The proposal for the creation of the unit is coming from very highly visible scientists at an international level, from both the vision and audition domains of research. This warrants that this unit will be one of the very top units in the field of visual and auditory perceptual sytems, among the best at an international level.
- The project presented by the unit is characterized by a high scientific coherence inside each team and between both teams, with a common scientific core identified in psychophysics, studied with multidisciplinary and multiscales approaches (e.g., psychophysiology, modelling).
- The unit is proposed by very dynamic and strongly connected members.
- The scientific benefit of putting the two teams together appears very high. The auditory team can take advantage of intellectual concepts coming from the vision team and vice-versa. Units of this kind are very rare in France or in other countries.
- The members already work together and have proven that they can collaborate harmoniously, which means that the team should not have teething problems.
- This new structure will have an excellent and significant impact on the cognitive field of the ENS, with regard to the elaboration of multidisciplinary knowledge. Indeed, the unit will be a natural attractor for emergent interdisciplinary research associating separate departments like physiology, maths, or philosophy.
- The project is oriented both toward fundamental and applied research and will have impact at both the economic level (industrial partners) and societal level (health). This combined approach is very rare in France in this domain.
- The members of the unit participate in different training programs of high quality, coherent with their research.
- Both teams are very successful in raising funding, from national, european and international funding organisations.

Weaknesses and threats :

Only risk is space for working. Indeed, the current space is limited for the moment at the ENS for the lab, but there seems to be some possibility of expansion within next years, as the ENS institution has assured the commitee.

Recommendations :

The committee would advise the ENS supervising institution to try to provide the unit with a professor or assistant professor position for the vision team, which they are lacking for the moment. The committee would also advise the ENS institution to provide to the unit (in particular to the vision team) the minimum necessary working space (at least 150 square meters) in the very immediate future.

3 • Detailed assessments

Assessment of scientific quality and outputs:

The research programs of the vision team have strong academic impact since a number of articles have been published in very high scientific journals. This team publishes in high quality scientific journals (e.g., *Journal of Vision*, *Vision Research*, *NeuroImage*, *Neuropsychologia*) and, in some instances, in journals that benefit from an excellent impact (e.g., PNAS, Current Biology).

Regarding the audition team, its reputation is very high and it comes from their publications on three levels of investigations (from psychophysics itself to electrophysiology to signal processing). A strong point of all the past and planned research rests on its large potential for clinical applications. It is important to highlight that the audition team will develop a new and strong electrophysiological axis to explore auditory processing and its disorders. The impact of already published work along similar lines has been highly satisfactory, with several papers published in top generalist journals, *Nature Neuroscience* and *Neuron*, in excellent broadband journals such as *Journal of Neuroscience*, and in the best specialty journals in the field of hearing, e.g., *JASA* and *JARO*.

All together, the 5 researchers (5 ETP, i.e. full time research position) and 2 assistant professors (1 ETP) of the unit (total of 6 ETP) have published 127 articles in journals with good to excellent international visibility, that is more than 4 articles per year per ETP. Noting that most part of this production is published in the best international scientific journals, this illustrates clearly the high scientific quality of this new research unit. It is also remarkable that this excellent production is homogeneous across the members of the unit, all of them being highly productive.

Assessment of the unit's academic reputation and appeal:

Both teams benefited from a strong academic attractiveness. They obtained a large number of grants across the world (national, european and international) since 2007. The vision team obtained 8 national or european grants (e.g., from the ANR, from the Royal Society of London) and has developed important european partnerships (EC ITN “CODDE”, with 9 European academic and industrial partners, EC ITN “PRISM”, with 8 European academic and industrial partners). The audition team also obtained various grants since 2007, either national (e.g., 4 from the ANR, 2 from the CNRS, 4 industrial research grants), European (e.g., EC 6th Framework Program FET−Open "Sound to Sense", EU FP7 “Dual-Pro”, Royal Society International Joint Project “Speech perception in noise”) or international, non-european (e.g., from the Air Force Office of Scientific Research, Intelligence Advanced Research Projects Agency, Defence Advanced Research Projects Agency, Haut Conseil franco-israelien de science et technologie). Furthermore, one junior member of the team has received an ERC grant (Starting Grant "SPIKEHEAR") and two seniors members have recently obtained an advanced ERC grant (“The Adaptive Auditory Mind (ADAM)”), thanks to which an international leader in the field will participate in the unit for the coming 5 years.

Both teams contribute actively to several regional, national and international networks. With regard to international networks, the director of the unit has been on the Board of Directors of the Vision Sciences Society (2007-2012) and the president (2010-2011) of this society, which is the largest international community in Vision Sciences. One of the main missions of this society is to organize an annual meeting in Florida (about 1500 presentations). One member of the audition team is the local coordinator for the ENS of the French-Israeli Laboratory in Neuroscience, and another member of this team is a founding member of the “Audiological Research Cores in Europe” consortium, and sits on the steering committee of this network, which groups together 8 European research centres focusing on the investigation of diagnosis and rehabilitation of cochlear hearing loss. Finally, the leader of the audition team is a founding faculty and local coordinator for the ENS of an EU-North America exchange teaching program, Erasmus Mundus Auditory Cognitive Neuroscience network.

With regard to national networks, the leader of the Vision Team is the director of the Relais d’Information sur les Sciences de la Cognition (RISC), which is a CNRS Research Services Unit. One of the main missions of this structure is to facilitate the sharing of resources in Cognitive Sciences across all laboratories in France. The director of the unit is the founder and director of the CNRS Group of Research in Vision (GDR Vision). One of the main missions of the GDR-vision is to bring together the French community of vision scientists by organizing annual conferences, workshops, and summer schools.

A member of the audition team is the founder and past director of the GDR in Clinical and Experimental Audiology. The GDR was intended to foster interactions between fundamental research on auditory perception and health professionals in audiology labs, hospitals, and industry. The audition team is still an active member of this national network. He has also been involved in the RTRS ("réseau thématique de recherche et de soins") "Voir et Entendre" as a member of the steering committee and as a sub-project leader. A psychophysical evaluation tool for speech in noise intelligibility has been distributed to a number of French hospitals. Note that one of the research engineers of the unit is regularly involved in the organization of the "Journées Nationales de l'Audition", a general-audience event, aimed at increasing awareness around hearing-impairment in general.

Several members of the research unit obtained different awards since 2009 (e.g., the David Marr Medal, elected fellows of the Acoustical Society of America), and one member is currently a IUF junior member.

Clearly, the international visibility in the academic world of both teams is very high. Several members of the vision team sit on editorial boards of scientific journals such as *PLoS ONE, Psychological Science, Journal of Vision, Perception, Frontiers in Perception Science*, *ISRN Biomathematics*. The audition team is a founding member of the LabEx Institut d'Étude de la Cognition. It is also part of the IdEx Paris-Science-Lettres (PSL). Several members of the audition team sit on editorial boards such as *Proceedings of the Royal Society B*, *Springer Series in Computational Neuroscience*, *TINS*. Members of the audition team participated in the organization of 6 international workshops at the ENS (New Ideas in Hearing; Mathematical models of sound analysis; Auditory features; Perceptual bistability; NTT Japan-ENS; Hebrew university-ENS). Finally, members of this research unit have produced expertise reports for: ANR (France); European Research Council (EU); National Science Foundation (USA); AFOSR (US); ESPRC (UK); MRC (UK); Royal National Institute for Deaf People (UK); Royal Society (UK); Wellcome Trust (UK); Israel Science Foundation; Fonds Québécois de la Recherche Nature et Technologies (Canada); U. San-Diego (USA); U. of Tampere (Finland); U. of Pompeu Fabra (Spain); Catholic University of Leuven (Belgium); U. of Cambridge (UK), U.of Minneapolis (USA).

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

Other major beneficiaries of the research developed by the members of this unit are clinicians (e.g., audiologists, speech therapists, ophthalmologists), general public societies ("Association pour la promotion et le développement du langage parlé complete [French sign language]", Journée nationale de l'audition), and industrials (hearing aid and cochlear implant companies, optometry companies, audiovisual companies).

The vision team has initiated and directs the GDR-vision (CNRS GDR 3045), a virtual structure uniting about 200 researchers working in visual perception from academia and industry in France. This team entertains close links with the industry by having for instance 2 PhDs financed by a CIFRE grant (one with Technicolor, the other with Orange Labs).

They are part of the steering committee of the recently-created DEFI-SENS program, an ambitious "challenge" set by the CNRS to stimulate new ideas for the alleviation of sensory deficits.

Finally, their works are often visible to the general public thanks to the coordination of and participation in scientific events (Fête de la Science, Forum des Sciences Cognitives, Journée Nationale de l'Audition). A part of these works is also sometimes disseminated in the general media in France (Agence France Presse, France 2, France 3, M6, Le Monde, Sciences & Vie, Sciences et Avenir, …) and abroad (Wall Street Journal, Der Spiegel, BBC, ABC News, Associated Press, Daily Telegraph, …).

Assessment of the unit's organisation and life:

The present unit is a new research unit. Therefore, these aspects regarding how the scientific life inside the unit is organized cannot be analyzed.

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

The primary beneficiaries of the research are other researchers and students. The team members are committed to present their work to a variety of workshops and conferences before submitting this work for publication. They are particularly pleased to see that some of their work has been at the origin of related research projects in France and in foreign Universities (in particular Cambridge University, UK; University College London, UK; University of Giessen, Germany; Hebrew University, Israel; University of Washington at Seattle, USA; MIT, USA; Beijing Institute of Otolaryngology, China; NTT, Japan; University of Sydney, Australia).

The vision team is heavily involved in the Cogmaster, a master programme between the École Normale Supérieure, the Université Paris Descartes and the EHESS. They are members of both the scientific committee and the pedagogic committee. One of them is also the co-ordinator of the Psychology strand of this master (the largest of the 5 strands). They have trained 9 PhD students and 12 masters in the last five years. They take part in several summer schools, either by organising them (annual CNRS Thematic School in Colour; Summer School on Consciousness and Action) or lecturing therein (e.g. FENS-IBRO European Neuroscience School Programme). One of the members of the unit is also part of the steering committee of the Graduate Doctoral School (ED261, Cognition, Comportements, Conduites Humaines) to which the unit LPS will belong. They have been part of an EC-funded ITN (CODDE) and have been invited to a new one (PRISM). Finally, in collaboration with the RISC, they are developing an Internet platform for on-line experiments (partnership with the ENS Cogmaster and with other researchers).

The team members are all actively involved in teaching and scientific training. They all teach in the Master de Sciences Cognitives of ENS/EHESS/Paris Descartes, for which they coordinate a teaching unit on auditory perception. They will also continue to coordinate teaching units in other universities (e.g. University of Paris 6) or on different topics (computational neuroscience at the ENS), to diversify the profile of students engaged in their research topics. Thus, they will offer training opportunities (Master, PhD, engineering degrees) for a range of fields covering psychophysics, computational neuroscience, modelling, animal behaviour, neurophysiology. As one of the founding members of the training network Erasmus Mundus (EU / Northern America) on Auditory Cognitive Neuroscience, they expect further international exchanges with Canada and the US.

Assessment of the five-year plan and strategy:

The creation of a new research unit could be seen as a daunting enterprise. Fortunately, the team has already some experience in building new structures from previous moves (e.g. one of them moved from Glasgow to Paris, another one moved from Maryland to Paris, others moved from Paris Descartes University to the ENS, from the IRCAM to the ENS, from Gif-sur-Yvette to the center of Paris). Thanks to generous previous funding, they already own most of the equipment necessary to start working immediately. In addition, experimental space has been identified at the École Normale Supérieure (see next section). In summary, they do not foresee any material problem to build their new unit.

Members of the unit already have strong links with the applied and fundamental research communities, and new links will also be created. At the local level, they will initiate a partnership with the Biology Department of the ENS that will focus on auditory and audio-visual cortical coding and they have already started to collaborate with the Department of Informatics of the ENS on projects related to scene analysis. In addition, they will contribute to the training within the future School of Engineering of PSL. Within Paris, they intend to continue their participation to two RTRA to be in direct link with the other laboratories in the field. At the national level, they were the founders of the two GDR in audition and in vision, and they are active members of the RTRS “Voir & Entendre”. They are intending to continue playing an important role in these structures. They are fortunate to have a large number of collaborations at the national and international levels and they intend to consolidate these partnerships (ERC Synergy, University of Cambridge, UK; UCL, UK) and initiate new ones in 2013 (e.g. ANR French-German, University of Giessen, Germany).

Most members of the unit have a long history of collaboration with the industrial world **(**Pertech, Technicolor, Orange, Starkey, Neurelec, Advanced Bionics) and participated to translational projects. In parallel, they intend to reinforce their links with clinical teams within hospitals, including the “service clinique neurologique Pitié-Salpêtrière” in Paris, and the Robert Debré Hospital in Reims.

The laboratory will be strongly committed to the link between research and higher education. Most team members are already giving lectures, primarily in the Cogmaster (Masters in Cognitive Sciences, ENS/EHESS/Université Paris Descartes). They will complement their teaching repertoire by introducing a new graduate seminar on sensory processes at the École Normale Supérieure. They also intend to generalize the practice of sending their PhD students abroad for short and mid-term visits to learn new research skills. The newly created *PhD program* (Frontiers in Cognition) from the IEC will offer future PhD students 3-year doctoral grants and teaching assistantship. Finally, the team will also contribute to several summer schools, including the PSL summer school in cognitive science in Paris, the European Summer School in Visual Neuroscience (in Rauischholzhausen, Germany), and the National Science Foundation neuromorphic workshop (in Telluride, USA).

Obviously, the main concern for the immediate future of this new research unit is its successful implementation at the École Normale Supérieure. The team has tried to anticipate all major issues and does not expect any problem. Members of the vision team intend to pursue a well-rewarded policy of research grant applications to national and international institutions.

They have several ANR grants running ("Dynamic MEG mapping", "Eye-Writing", "Visual Confidence", "Predictive Adaptation"). They are also building new links with the Institut de la Vision where blind patients are starting to receive retinal implants and need to be evaluated for their newly acquired visual perception. Finally, they are negotiating a partnership with the "Palais de la Découverte" to eventually renovate their permanent exhibit on visual perception

In short, the project presented by this unit is exciting and highly promising. With no doubt, this new lab will soon become one of the top international leading places in research in vision and audition. A more detailed analysis of the project of each team is presented below.

4 • Team-by-team analysis

Team 1 : Vision team

Name of team leader: Mr Jean LORENCEAU

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
N1: Permanent professors and similar positions			
N2: Permanent EPST or EPIC researchers and similar positions		3	3
N3: Other permanent staff (without research duties)		1 (0,62)	
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 (3,62)**	**3**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students		
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		4

• Detailed assessments

The genesis of the vision team comes from a proposal (submitted by the director of the unit) as a response to a call from the IEC LABEX in February 2012 to welcome new teams at the IEC. The Vision project has been selected by the steering committee of the IEC and then evaluated by the international Scientific Advisory Committee of the IEC. This team is composed of four members coming from as many institutions.

Assessment of scientific quality and outputs:

The vision team carries out research on three main themes: predictive coding, fluctuant perceptions and visual segmentation/integration. There is already a flourishing scientific literature on these topics, yet the team uses *novel* and *original* methods of analysis (e.g., reverse correlation, evaluation of visual confidence) and new techniques (i.e., display for volitional control over smooth-pursuit eye movements) in order to address specific questions of central importance for fundamental and applied research. This promises major advances in the field since the members of the team have already produced and disseminated research of the highest quality using these methods. The three themes are distinctive but all three are strong and there are no obvious weak points in the research plan.

The proposal shows strong evidence of an ability to adapt methods to meet new challenges, whether based on the team's own innovations or in response to developments in other labs. The past work of the vision team shows a high level of competence, suggesting that the promise shown in the proposal will be fulfilled, Excellent links with other vision research groups are in place, ensuring that the team's advances will be built on state-of-the-art knowledge and methods.

Without any doubt, the research programs of the vision team have strong academic impact since a number of articles have been published in prestigious scientific journals (e.g., PNAS, Current Biology). The originality of the research conducted is intriguing and stimulating for researchers worldwide. The team is on an upward trajectory, the most prestigious articles referenced in the "Demande de création" document being very recent. Articles published several years ago are frequently cited and impact is likely to accelerate in the future.

The number of national (e.g., LPNCog Paris, INRIA Sophia Antipolis, CerCo Toulouse, INT Marseille…) and international (e.g., University of Sidney, Bernstein CCN Berlin, Vanderbilt University USA, University of Manchester…) collaborations that led to a publication, European partnerships (EC ITN CODDE 2008-2012, EC ITN PRISM 2012-2012), and the fact that the team welcomes several international post-doctoral and doctoral students and visiting scientists is very compelling and shows that the Vision Team is open at both the national and international levels. It is likely that this will remain the case in the future and indeed it should increase as a result of the inclusion of a new member, who has worked extensively in USA and UK and has very strong international links.

Members of the vision team have published 60 publications in peer-reviewed journals between 2007 and 2012. Not too surprisingly, a large number of these papers appeared in specialized journals in perception (*Vision Research*, *Journal of Vision*). Studies that addressed issues in neurosciences were published in the corresponding journals (*NeuroImage, Visual Neuroscience, Brain Research*), as were studies addressing clinical issues (*Neuropsychologia, Brain and Cognition*), or computational models (*PLoS Computational Biology*). Finally, the team has also been successful in targeting high-impact journals (*PNAS*, *Current Biology*).

Assessment of the unit's academic reputation and appeal:

The members of the team are involved in several recent national (e.g., DGA-MRIS 2008-2012, MRC 2009-2012, ANR Blanc 2011-2014) and European (EC ITN CODDE 2008-2012, EC ITN PRISM 2012-2012) projects, and they direct 7 of them (e.g., EC ITN PRISM 2012-2012, ANR 2009-2013, MRC 2009-2012).

Several activities of the team in important national research networks should be underlined (e.g., the RISC). The leader is an experienced researcher who is known internationally. He is well placed to provide leadership to the team and to facilitate the establishment of national and international contacts by younger members of the team.

The team follows a coherent strategy since the member recently recruited from overseas already has a worldwide reputation, and the current and planned visiting scientists are known for their expertise in the visual domain.

One of the team members received the 2012 David Marr Medal in recognition of the excellence of his work.

The members of the vision team are members of the editorial board of several international journals (e.g., *Psychological Science*, *PLoS ONE*, *Journal of Vision, Perception & i-Perception*), of which all are good journals and some have an excellent reputation (e.g., *Psychological Science*).

The most important international society for vision research is the Vision Sciences Society (VSS), which was presided over by one of the members of the team (2010-2011). The members of the team participate in and organize national and international scientific meetings, conferences and workshops (e.g., VSS, GDR-Vision Forum, French-British Conference on Visual Perception).

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

The methods of investigation used or developed by the team (e.g., smooth pursuit eye-movements) brought clearly new knowledge about the visual system, and their simplicity and originality promise to open new perspectives in research.

There is no evident coupling of the team with particular professional teaching programs, except for some teaching in the domain of orthoptics and optic physiology. However, the links between the team and professionals is visible through the GDR-Vision network, a virtual structure created by the team that allows communication between more than 200 academics and professionals. Furthermore, some students received a CIFRE doctoral funding (Orange R&D, Technicolor), which is a clear sign of the close relationship with applied research.

Some publications were co-authored with health partners, and the research contributes to exhibits with artists.

Assessment of the five-year plan and strategy:

The projects proposed by the vision team have many original aspects. The work on predictive coding is consistent with advanced contemporary thinking about sensory processing and projects are proposed that will apply this framework to specific aspects of visual processing (adaptation, smooth eye movements) in a way that is highly original. In addition, predictive coding is an approach that is of equal relevance to all sense systems, so it provides an excellent opportunity for cross-fertilization of ideas with the auditory team. This work shows a willingness to take risks when necessary in order to achieve major progress. The work on fluctuant perception and on form/motion binding is grounded in more conventional theoretical approaches but again shows strong originality. The work on visual confidence is particularly interesting and original – the possible relation between perceptual confidence and learning could have far-reaching implications for learning more generally, including auditory learning. Opportunities for visual-auditory comparisons are plentiful throughout the work proposed and this is a key strength of the proposal.

The project has several distinct parts involving different experiments but there is heavy overlap both in the underlying philosophy and in the personnel involved, such that they form a coherent overall package.

A viable strategy is in place for developing the field in important ways. This involves reliance on the combined strengths of several individuals and the use of a variety of experimental techniques.

The work is primarily basic research but the needs of non-academic beneficiaries are kept in mind. Good links with commercial and other non-academic organizations are in place.

At present, some devices designed/produced by the team are used in hospitals and medical centers in a fundamental short-term perspective and in a clinical long-term perspective.

The vision team has a strong history of collaboration with other researchers including numerous international collaborations. Its members are among the leading vision researchers in France and have a high profile both in France and abroad.

The members of the team, and particularly the director of the unit, are politically aware and are adept at exploiting the prevailing circumstances to best scientific advantage.

The research projects described constitute a coherent plan for the next five years and are likely to lead to a sustainable research programme that yields further advances beyond that time-frame. The team is closely aware of developments in the field and will be able to modify their scientific plans in response to advances made in other laboratories.

Conclusion:

In conclusion, the vision team presents a very strong scientific plan that appears viable and feasible in all respects. The team members, being among the leaders in their field in France, have an ability and track record that gives strong reasons for optimism that their success will continue into the future. Their record of funding is excellent, as is their engagement with the international research community. Non-academic beneficiaries are in place. The proposed integration with the auditory group should lead to many new scientific opportunities. There are no significant weaknesses in the plan.

Team 2 : Audition team

Name of team leader: Mr Daniel PRESSNITZER

Workforce

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014	2014-2018 Number of project producers
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)		1 (0,62)	
N4: Other professors (PREM, ECC, etc.)		1	1
N5: Other EPST or EPIC researchers (DREM, Postdoctoral students, visitors, etc.)			
N6: Other contractual staff (without research duties)			
TOTAL N1 to N6		**6 (5,62)**	**5**

Team workforce	Number as at 30/06/2012	Number as at 01/01/2014
Doctoral students		
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		5

• Detailed assessments

The audition team has existed almost in the same form as in the present project for several years. It has received the support of a renowned auditory physiologist who moved to Paris from Maryland (USA) one year ago. Through the previous organization of the team, the choice of cutting-edge topics and their personal output, the team members have acquired a broad, international standing in the field of psychoacoustics. The submitted project builds on the reputation of the team and on the opportunities provided by the opening of two new avenues of research, one based upon a new methodology, cortical electrophysiology in the behaving ferret, and the other one in relation to the coming of the vision team.

Assessment of scientific quality and outputs:

The reputation of the audition team comes from their publications on three levels of investigations, all grounded in psychophysics yet addressed with the help of a broad range of complementary methods (from psychophysics itself to electrophysiology to signal processing, domains where each team member is considered an excellent specialist). The projects for the next five years aim to address several newly formulated questions. The first project investigates the part played by temporal cues in the auditory nerve, once time modulated signals have been processed by the cochlea, and explores how cues missing at lower levels may be reconstructed at higher levels. The second project, which pertains to neural plasticity, examines higher-level effects: those of memory and context on sound recognition. The last project is to develop computational models and tools for signal processing.

A strong point of all the past and planned research rests on its large potential for clinical applications, notably to explain why some patients perform better than others once fitted with hearing aids, and to produce guidelines and tools for improved hearing aids. On the one hand, hearing impairment preserves some auditory cues and destroys or distorts others, depending on its pathogenesis. On the other hand, some types of hearing aids are unable to transmit certain auditory cues or utilize algorithms that may inadvertently distort some important auditory cues: besides its evident and timely fundamental interest, the planned research is targeted in such a way as to improve rather directly the outcome of clinical intervention in hearing-impaired patients (several millions in France).

It can be safely expected that from the planned research, original propositions will keep being generated, for improving diagnostic tests of hearing-impaired patients, and for better coding algorithms in hearing aid processors. This is what happened during the past term of five years, and the projected topics are likely to remain as productive as their past version was. It is important to highlight that the audition team will develop a new and strong electrophysiological axis to explore auditory processing and its disorders. First, human EEG recording will be promoted based on technological advances developed by a member of the team. Second, electrophysiological recordings in behaving ferret will be introduced in the unit, directed by one member of international renown.

The impact of already published work along similar lines has been highly satisfactory, with several papers published in top generalist journals, *Nature Neuroscience* and *Neuron*; excellent broadband journals such as *Journal of Neuroscience*; and the best specialty journals in the field of hearing, e.g., *JASA* and *JARO*. The H indexes of the audition team researchers testify to their impact, that is, from 32 for the most senior team member to between 14 and 20 for the younger ones.

This team will start its new five-year period with two European Research Council grants running, together with three ANR grants. It has shown the ability to attract, for at least five years, an expert professor from the USA. As a founding member of a Labex structure, its strength wi**ll** become even larger. This guarantees that the visibility of the planned team at home and abroad will remain large, as is already illustrated by the sizeable number of invited conferences secured by the team members during the past period.

Assessment of the unit's academic reputation and appeal:

The ability of the audition team to attract the attention of the scientific community, to recruit good students and to find them good positions after they leave the team will be ensured, as it was previously the case, by the position of leader of this team in a number of national networks. In the past, the team leader chaired the GDR CNRS GRAEC. At present, the team is involved in "DEFI-Sens" at the CNRS.

The audition team is involved in numerous national and international networks. First, a member of the group was the founder of the CNRS GDR which succeeded in putting together a large range of scientists, clinicians and private companies working on clinical audiology. Second, a member of the audition group is also at the head of the Labex IEC (Institut d'Étude de la Cognition) which conveys an exciting dynamic of the Cognition at the École Normale Supérieure.

As mentioned previously, the quality of the outputs from this team group is high and they have a considerable number of publications in top-ranking journals. Some members of the group belong to the editorial boards of high-quality journals in diverse topics from computational neuroscience (*Frontiers in Neuroinformatics*) to review journals (*Trends in Cognitive Sciences*). The audition group organized or co-organized 17 international meetings with the participation of high-level scientists in audition.

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

In the past, and likely in the future as the same spirit will drive the work of the audition team, user-friendly diagnostic methods have been developed and disseminated in the framework of multicentre research projects involving several otolaryngology departments of French University hospitals. The goal of these methods is to categorize patients and identify those in whom hearing aid fitting will be more difficult. Once validated, they will most likely lead to more accurate guidelines for clinically grounded choices of the parameters of sound-processing algorithms in hearing aids.

Long-lasting applied-research programs with hearing aid companies, who employ former PhD students funded by CIFRE programs, ensure that collaborative works between the laboratory and companies will continue. The expertise of the audition group in acoustic research is highly recognized as some members of the team have being involved in consulting for private companies in audio-technology.

Assessment of the five-year plan and strategy:

The project is original in that it addresses poorly understood mechanisms of analysis of complex auditory messages, from low-level cues directly at the output of the cochlea, to higher-level analyses involving memory and context, calling for fast neural plasticity. Among the latter mechanisms, many are likely not specific of the auditory modality. The fact that a vision team will join the planned unit, and that its members are already skilled in tackling similar questions, will allow the two teams to interact even more closely that they already did in the past. It is noteworthy that one member of the audition team steers a vision project in collaboration with the future head of the planned unit. Another team member who performs microelectrode measurements in the auditory cortex of awake, behaving ferrets already uses combined audiovisual conditioning protocols that can easily be extended to evaluating deeper interactions between auditory and visual processing.

The feasibility of the audition project is enhanced (thus more ambitious), rather than threatened, by the fact that even more approaches will be combined, exploiting the diversity of techniques mastered by each team member without losing track of the psychophysics-grounded coherence: microelectrode-based electrophysiology, behavioral analyses, psychophysics, signal processing (e.g., denoising).

As a general rule, one should not try to predict too accurately how novel fundamental insights gained through the planned approach will be transferred to industrial applications and notably (but not only) in the domain of sensory handicap. Here the long-lasting partnership already established with companies ensures that this transfer will continue to exist and to occur smoothly and efficiently. One strong point of this partnership up until now has been that the creativity of the scientific partner has obviously never been constrained by any marketing or advertising goal.

Fruitful academic partnerships with other audition teams and with a few clinical departments selected on the basis of their research activity, in France and in the world, are planned to continue along the same lines and with the same partners as previously developed. In addition, ongoing projects on sound memory offer the possibility to develop new clinical research on dyslexic patients.

The SWOT analysis pinpoints as threats the lack of space and the difficulty to obtain permanent positions. At present, the third threat, funding, is less pressing as the success of this team to secure large grants from many origins (including ANR grants, at the national level, and ERC grants from abroad) is, to say the least, remarkable. Thus, even though the termination of the large ERC grants, in 5 years from now, might theoretically threaten some projects as the ERC funded non permanent positions will have to be put to an end, one can safely bet that the team will be able to raise new grants in the continuity of their already intensive fund-raising activity.

Of note, important construction work has started in the hosting building, that will soon allow more sound-proof booths to be installed and reasonably large space to be allocated to the vision team next to the audition one. Regarding positions, an efficient tenured engineer already member of the previous audition team will share his time between the vision and audition team in the new planning. He already designed tools for the vision team in the past. Although this technical help is minimum and unlikely to be expanded, it is fortunate that on the other hand, most PhD students of both teams come from the Cogmaster, where the curriculum includes a strong training program in signal processing and computer science allowing students to be largely autonomous in technically driving their own project.

Conclusion:

The project of the audition team is highly original, highly feasible and potentially ground breaking. Its strong multidisciplinary approach, both at the scale level (from single neurons to psychophysics) and at the methodological level from animals studies to human psychophysics, from neuronal computation to technological development, makes it a highly innovative venture. The presence of the visual team will favor transfers in modality-specific theoretical approaches that will enrich the already outstanding quality of the audition group, and enhance its already acknowledged momentum.

This team has spent the last few years expanding their experience and know-how, while always sticking to a coherent core of psychophysics-grounded paradigms. Its project elaborates on this successful approach thus presents hardly any risk: it is likely that the efforts of the team members will be rewarded.

5 • Appendix: Conduct of the visit

Visit date:

Start:Tuesday,16 october 2012 at 9.30 am

End: Tuesday, 16 october 2012 at 6 pm.

Institution:

ENS

Address :

26 rue d'Ulm, Paris

Conduct or programme of visit:

9h00 – 9h30	Welcome
9h30 – 10h10	Presentation of the project by the director
10h10 – 11h30	Presentation of the scientific projects by each team.
11h30 – 12h00	Visit of some experimental places
12h00 – 13h30	Lunch, then meeting with the supervising institutions
13h30 – 14h00	Meeting with PhD students and post-doctorants
14h00 - 14h30	Meeting with the administrative and technical staff
14h30 – 18h00	Meeting of the committee: first writing of the report

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

Mr Edouard GENTAZ was not able to join the committee for the visit. Mr Andy SMITH chaired the committee during the visit. Mr Edouard GENTAZ participated by phone during the afternoon, and then coordinated the writing of the report.

6 • Statistics by field: SHS on 10/06/2013

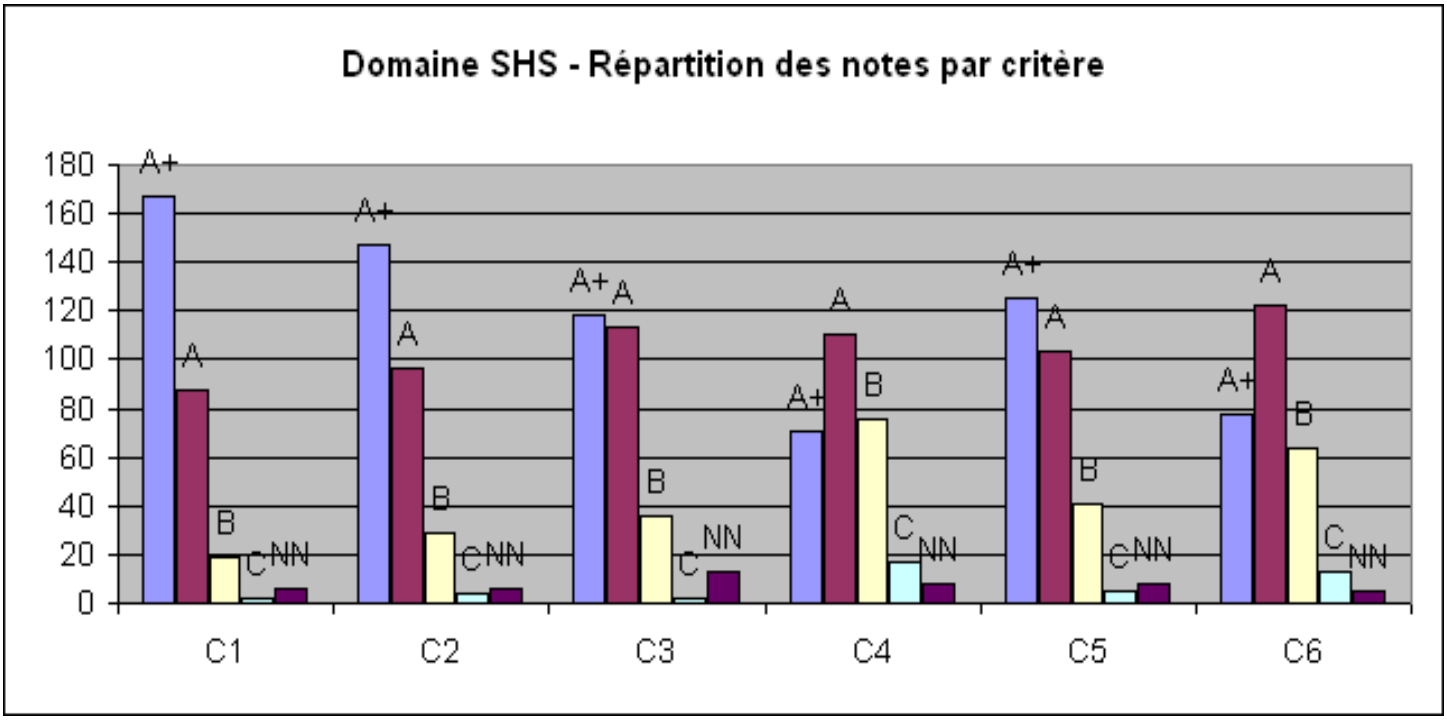
Grades

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+	167	147	118	71	125	78
A	88	96	113	110	103	122
B	19	29	36	76	41	64
C	2	4	2	17	5	13
Non Noté	6	6	13	8	8	5

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+	59%	52%	42%	25%	44%	28%
A	31%	34%	40%	39%	37%	43%
B	7%	10%	13%	27%	15%	23%
C	1%	1%	1%	6%	2%	5%
Non Noté	2%	2%	5%	3%	3%	2%

Histogram



7 • Supervising bodies' general comments

The director of the laboratory doesn't wish to make any comments on this report.