

FINAL RESUME ON THE RESEARCH UNIT:
Institute of Theoretical Physics (IPhT)

UNDER THE SUPERVISION OF THE
FOLLOWING INSTITUTIONS AND
RESEARCH BODIES:

Commissariat à l'énergie atomique et aux
énergies alternatives - CEA

Centre National de la Recherche Scientifique -
CNRS

EVALUATION CAMPAIGN 2018-2019
GROUP E

Report published on April, 23 2019



In the name of Hcéres¹:

Michel Cosnard, President

In the name of the experts committee²:

Leticia Cugliandolo, Chair of the committee

Under the decree No.2014-1365 dated 14 November 2014,

¹ The president of Hcéres "countersigns the evaluation reports set up by the experts committees and signed by their chairman." (Article 8, paragraph 5);

² The evaluation reports "are signed by the chairman of the experts committee". (Article 11, paragraph 2).

Tables in this document were filled with data provided by laboratories and supervising bodies in the unit's application and in the Excel files "Données du contrat en cours" and "Données du prochain contrat".

UNIT PRESENTATION

Unit name:	Institute of Theoretical Physics
Unit acronym:	IPhT
Requested label:	UMR
Application type:	Renewal
Current number:	3681
Head of the unit (2018-2019):	Mr François DAVID
Project leader (2020-2024):	Mr François DAVID
Number of teams and/or themes:	3 themes

EXPERTS COMMITTEE MEMBERS

Chair:	Ms Leticia CUGLIANDOLO, Sorbonne Université, Paris
Experts:	Mr Freddy BOUCHET, CNRS, Lyon (representative of CoNRS) Mr Fawzi BOUDJEMA, CNRS, Annecy-le-Vieux Mr Julien LESGOURGUES, RWTH Aachen University, Germany Mr Jean Michel MAILLET, CNRS, Lyon Mr Frédéric MILA, École polytechnique fédérale de Lausanne, Switzerland Mr Julien SERREAU, Université Paris Diderot (representative of CNU) Ms Régine SOMMER, CNRS, Strasbourg (supporting personnel) Mr Erik VERLINDE, University of Amsterdam, The Netherlands

HCÉRES REPRESENTATIVE

Mr Yannis KARYOTAKIS

REPRESENTATIVES OF SUPERVISING INSTITUTIONS AND BODIES

Mr Philippe CHOMAZ, CEA

Mr Philippe LECHEMINANT, CNRS

INTRODUCTION

HISTORY AND GEOGRAPHICAL LOCATION OF THE UNIT

The Institut de Physique Théorique (IPhT) is a research institute of the Direction de la recherche fondamentale (DRF) of the Commissariat à l'énergie atomique et aux énergies alternatives (CEA), and of the Institut de physique (INP) of the Centre national de la recherche scientifique (CNRS, UMR 3681). It is part of the Paris-Saclay CEA centre, and is located in the campus of Orme des Merisiers. It is also part of the Université Paris-Saclay project. It is situated on the Plateau de Saclay, 20km south of Paris. It is since long recognized as one of the top theoretical physics research institute in Europe.

IPhT as it stands was founded in 1963, as the "Service de physique théorique", from the pre-existing "Équipe de physique théorique" It was then located in the Saclay main site. In 1968, SPhT moved to its present buildings at Orme des Merisiers. In 2008, it gained the denomination of Institute within the DSM (Département des Sciences de la Matière) and in 2017, the status of Department in the new formed DRF. The Saclay theory group was instrumental in the renaissance of theoretical physics in France. Quickly, SPhT/IPhT has gained and maintained over the decades a worldwide recognition for its many fundamental contributions to theoretical physics. Its long tradition of excellence and its early reliance on external and impartial scientific evaluations allowed the Institute to adapt to the many evolutions of theoretical physics from a purely scientific viewpoint, but also to the many changes in the management of science, in France and abroad. Its size in term of number of permanent scientists is now relatively stable, with a rough proportion of 2/3 of CEA researchers and 1/3 of CNRS researchers. In the early years, the number of students and postdoctoral researchers was quite low (note that CEA had then higher funding for students, postdocs and visitors than more academic institutions). Since the 80's the number of students is much higher and the number of postdocs and long-term visitors has increased enormously. They represent now about 60% of the researchers of the institute. They are mostly funded by external sources and grants. One should not forget the senior researchers with CEA and CNRS "emeritus" status, or members of the "Amis de la science" association (IPhT was probably the first unit in CEA to install such a program).

MANAGEMENT TEAM

IPhT Director: Mr François DAVID;

IPhT Scientific deputy director: Mr François GÉLIS;

IPhT Administrative deputy director: Ms Anne ANGLES.

HCÉRES NOMENCLATURE

ST2 – Physique.

SCIENTIFIC DOMAIN

Mathematical physics, structure and models

- Physics and dynamics of quantum systems;
- Quantum field theory, conformal field theories, integrable systems, integrable gauge theories, topological recursion, two-dimensional random geometry, Liouville theory;
- String theories, black holes geometries, instabilities of de Sitter vacua, generalized geometry compactifications, dipole CFTs;
- Scattering amplitudes, supergravity and superstrings, post-Minkowskian corrections to GR, periods and modular forms.

Cosmology, particle and hadronic physics

- Nuclear matter at high temperature and density;
- Amplitudes for the LHC, jets substructure;
- Physics beyond the standard model, effective theories, BSM modelling, dark matter, matter-antimatter asymmetry;
- Cosmology and gravity, large-scale structures, modifies theories of gravity, gravitational waves.

Statistical and condensed matter physics

- Non-equilibrium physics, fluctuation theorems, dynamics and transport;

- Biophysics, DNA and RNA, aggregate of proteins;
- Spatial networks, science of cities;
- Disordered systems, glass transition, spin glasses;
- Phase transitions in computational systems and algorithms;
- Condensed matter theory, quantum phase transitions, graphene, high Tc superconductors, DMFT and extensions, out of equilibrium quantum systems, many-body localization.

UNIT WORKFORCE

	Unit workforce	
	Institute of Theoretical Physics	
Active staff	Number 30/06/2018	Number 01/01/2020
Full professors and similar positions		
Assistant professors and similar positions		
Full time research directors (Directeurs de recherche) and similar positions	7	7
Full time research associates (Chargés de recherche) and similar positions	7	7
Other scientists ("Conservateurs, cadres scientifiques des EPIC, fondations, industries, etc.")	33	33
High school teachers		
Supporting personnel (ITAs, BIATSSs and others, notably of EPICs)	8	8
Permanent staff	55	55
Non-permanent professors and associate professors, including emeritus		
Non-permanent full time scientists, including emeritus, post-docs	44	
PhD Students	18	
Non-permanent supporting personnel	17	
Non-permanent staff	61	
Total	116	55

GLOBAL ASSESSMENT OF THE UNIT

The Institut de Physique Théorique (IPhT) has a long tradition of excellence. Its scientific activity in the last five years was exceptional, at the highest international level. IPhT had an enormous impact, with more than a thousand scientific articles, several books edited, and the co-organisation of almost a hundred conferences and schools. Its members have been notably successful in obtaining prestigious research grants from the ERC and similar funding agencies. All this makes IPhT an outstanding theoretical physics laboratory at the World-wide scale.

The research groups in Mathematical Physics harbour world-leading experts in integrable systems, random geometries, string theory, conformal field theory and amplitude calculations in gauge theory and supergravity. IPhT has one of the largest High Energy Physics groups in Europe, and has contributed in a remarkable way to developments in the fields of Particle Physics, Astroparticle Physics and Cosmology. IPhT is a leading centre for rigorous studies of stochastic processes. Remarkable results on the theoretical description of glassy, disordered and quantum many body systems were obtained at IPhT. Members of IPhT contributed to the development of the statistical physics approach to theoretical computer science, networks and biophysical problems. The condensed matter group is small but has made very important contributions during this period.

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