

bois-marie

INSTITUT DES HAUTES ÉTUDES SCIENTIFIQUES

editorial

The Institute is about to embark on a new chapter, as Jean-Pierre Bourguignon, Director since 1994 is about to retire. To lead IHÉS is first and foremost to lead its scientific activity, and in particular to maintain a balance in the different disciplines that interact there: mathematics, theoretical physics and now biology. The international conference “*Stem cells and regeneration – mathematical formalization*” was proof once again of the rich interdisciplinarity, which remains one of IHÉS’ core values.

More recently, fundamental research undertaken at the Institute related to certain challenges linked to high technology. The “*Mathematical Models of the Analysis of Sound*” workshop, organised in the framework of the Schlumberger Chair thus attracted a mix of participants, both engineers and researchers. Preserving the capacity of initiative taking and scientific independence requires full commitment from a director to guarantee the Institute’s financial resources. Even though it has managed to maintain the support of French and other public institutions, its fundraising in two campaigns has enabled IHÉS to progress towards autonomy. Today, almost 20% of the Institute’s budget comes from endowment funds, thanks to the

support of donors who have made significant contributions, whilst in no way impinging on its scientific freedom.

Building on these gains, the Institute can look to the future and the challenge-gift, which multiplies donations by two until 2016 – up to 5 million euros – provides development efforts with continued momentum. The launch of the India Fund deepens the Institute’s relationship with Asia, as initiated by the Chern Fund (for China) and the Japan Fund.

Reaching out to other countries is natural for IHÉS and represents just one of the ways in which the Institute contributes to French scientific activity. This is evidenced once again in its involvement in the celebration of the centenary of Henri Poincaré’s passing or by certain activities in the Laboratoire Mathématique Hadamard.

During the nineteen years he has spent at IHÉS, Jean-Pierre Bourguignon has championed the Institute’s original model, introduced by its founder Léon Motchane, whilst grasping opportunities to open it to new intellectual horizons.

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scientific events

rencontre autour des Publications mathématiques de l'IHÉS

This third meeting, organised by Claire Voisin (CNRS-CMLS), editor-in-chief of *Les Publications Mathématiques de l'IHÉS* took place at IHÉS on 20 January 2013.

Dynamical Systems and Nonequilibrium Statistical Mechanics

This seminar, organised by David Ruelle (IHÉS) and Hans H. Rugh (Univ. Paris-Sud) with the help of Viviane Baladi (Univ. of Copenhagen), which was held from December 2012 to March 2013 enabled participants, over the seven sessions, to share updates on developments in this very active research area.



Viviane Baladi

Schlumberger Workshop on Mathematical Models of Sound Analysis



This workshop was organised on 14 and 15 June 2012 by Stéphane Mallat, holder of the Schlumberger Chair for Mathematical Sciences at IHÉS, together with Daniel Pressnitzer, Alain de Cheveigné (ENS Paris) and Shihab Shamma (Maryland Univ.). It brought together international experts in areas as diverse as learning, signal processing, psychophysics, audio physiology and various fields of mathematics. Participants were both academics and industrialists. The event which took place in the context of the Chair was co-financed with CNRS.

Stem Cells and Regeneration – Mathematical Formalisation

This one-week international conference, which was held from 24 to 29 June 2013, was the second in a series initiated at IHÉS in January 2010 on the topic of pattern formation in morphogenesis. Its objective was once again to create an interdisciplinary space in which embryologists, geneticists and molecular biologists interacted with mathematicians and computer scientists. The Organizing Committee comprised Vincenzo Capasso (Univ. di Milano), Mikhail Gromov (IHÉS), Annick Harel-Bellan and Nadya Morozova, both from the Institute of Biology and Technology Saclay and the CNRS.



Eric Davidson

This conference enabled participants to discuss one of the most intriguing and unsolved problems – how the formation of the geometrical shape of the living organism and its parts (tissues and organs) is regulated. To this end, the workshop structure had a special framework, designed for the improvement of intercommunication between leading scientists from different disciplines. For example, the participants of the workshop were invited not only as speakers but also as invited discussants, with the main aim of contributing to the discussions.

The “conference part” of the workshop comprised 20 plenary talks during which the leading biologists in the field of stem cells biology, regeneration and pattern formation showed the biological problems together with the necessary biological background and raised unsolved questions. Some of the plenary talks were delivered by mathematicians, working on the mathematical modelling of pattern formation.

The “discussion part” allowed several modes of communications:

- 10 scheduled “discussion sessions” dedicated to the hot problems in stem cells and regenerative biology, with the possibility of these being continued over the entire workshop in case of interest;
- work within small “working groups” generated according to specific questions raised by biologists or mathematicians;
- a poster session.

Some of the key topics explored included: mechanisms of regeneration and determination of pattern formation; mathematical models of cancer and normal stem cells; the comparison of totipotency and regeneration ability in plants versus animals, the problem of mathematical formalisation of the phenomena of cell differentiation; models of gene regulatory networks; the role of stem cells in aging; chaos and stochasticity in cell behaviour and fate decision; models of stem cell defects in neurodevelopment; the role of epigenetic factors in stem cell fate decision.



Nadya Morozova

centenary of the passing of Henri Poincaré

The passing of Henri Poincaré was celebrated in 2012. IHÉS took part in the events organised on that occasion by the Institut Henri Poincaré.

The organising committee and the scientific committee in charge of the celebration had prepared a number of events for the general public and presentations by scientists:

- Travelling exhibition: *Henri Poincaré – the mathematician and philosopher*;
- Remembrance ceremony at Henri Poincaré's tomb in Montparnasse cemetery;
- *Science and Society* conference cycle organised in Nancy by the Institut Henri Cartan, Fédération Charles Hermite and IUT Nancy Charlemagne;
- *Soirées Poincaré* at École polytechnique;

- *Ten Hours with Henri Poincaré* – a day for the general public in the Grand Amphithéâtre of La Sorbonne in Paris;
- Three *Mathematic Park* seminars took place at the Institut Henri Poincaré;
- *International Scientific Conference* at the Institut Henri Poincaré;
- *Poincaré – 1912-2012*, the 21st *Poincaré Seminar*, closed the celebrations at the Institut Henri Poincaré.



Exhibition at the 5^e arrondissement Town Hall in Paris

launch of the LMH

The launch of the “Labex Mathématique Hadamard” (LMH), organised by the Fondation mathématique Jacques Hadamard (FMJH) took place on 11 February 2013 at IHÉS.

The LMH, which was created as part of a government initiative officially came into being on 1 March 2012 and is to operate for 96 months until 31 December 2019. Its objective is to help consolidate the mathematics infrastructure in the Southern



Hans-Henrik Rugh, director of FMJH

Paris area, whilst developing scientific excellence. It comes under the tutelage of the FMJH, itself one of the foundations in the Paris-Saclay grouping (“fondation de coopération scientifique de Paris-Saclay”).

Its scope includes mathematics departments from the FMJH founding and associated members (Université Paris-Sud LMO lab, École polytechnique CMLS and CMAP labs, IHÉS, Université Versailles-Saint-Quentin LMV lab) together with certain teams located in Saclay (IPhT, Télécom-ParisTech, ENSTA-ParisTech). All mathematics fields of study are represented, especially with activities linked to doctoral programmes. These, being placed at the interface with other science and engineering disciplines, make them a pivotal activity of the LMH.

Amplitudes and Periods

In December 2012, Alexander Goncharov (Yale Univ.), Gregory Korchemsky (IPhT/CEA), Marcus Spradlin (Brown Univ.), Pierre Vanhove (IPhT/CEA & IHÉS) and Anastasia Volovich (Brown Univ.) organised an international meeting on advanced computational methods for scattering amplitudes in Yang-Mills theories and quantum gravity using techniques from algebraic geometry.

Fête parisienne in « Computation, Inference and Optimization »

This event was organised by Francis Bach (INRIA-ENS Paris) and Michael Jordan (FSM, Berkeley) as part of the Schlumberger Chair for Mathematical Sciences at IHÉS. The theme was around certain problems arising from the analysis of large amounts of data (“big data”) and to learning.

Moduli Spaces and Macromolecules

The objective of this conference, organised by Jørgen E. Andersen (Aarhus Univ.), Mikhail Gromov (IHÉS) and Robert C. Penner (Aarhus Univ. and Caltech) from 14 to 18 May 2013 was to share and present the latest research in the application of techniques from moduli spaces to structural biology and from computer science to RNA and proteins.

Paris-Pékin-Tokyo Arithmetic Geometry Seminar

This video-seminar, organised jointly for the second year running by the Institut des Hautes Études Scientifiques, the Morningside Center of Mathematics, Chinese Academy of Sciences and the Department of Mathematical Sciences of the University of Tokyo took place on a regular basis all year long.

An afternoon in honour of Victor Kac

Organised by Thibault Damour, IHÉS permanent professor, this event celebrated on 13 May 2013 the work of Victor Kac. A frequent visitor at IHÉS, he stayed for a longer period during 2012/2013 during a sabbatical year.

An afternoon of scientific conferences around the impact of his work in mathematics and physics was followed by a recital by renowned pianist Mûza Rubackyté, who honoured us with her performance to close the celebration.





Maxim Kontsevich

2012 was a year rich in awards for Maxim Kontsevich. He had hardly received the Shaw Prize in May that news reached him he had also been awarded the new Fundamental Physics Prize.

Maxim Kontsevich, Fundamental Physics Prize

Maxim Kontsevich is one of the nine winners of this generously endowed prize, set up by Yuri Milner. He received the award *“for numerous contributions which have taken the fruitful interaction between modern theoretical physics and mathematics to new heights, including the development of homological mirror symmetry, and the study of wall-crossing phenomena”*.

Prize award regulations stipulate that the first nine laureates form the selection committee for the prize in subsequent years. Maxim Kontsevich therefore contributed to the decision to honour Alexander Polyakov with the 2013 prize.

a visit by the Minister

Ms Geneviève Fioraso, French Minister for Higher Education and Research honoured with her presence an event organised jointly IHÉS and Université Paris-Sud to celebrate the prestigious awards made to two professors from these institutions.

Nalini Anantharaman, professor, Université Paris-Sud, 2012 Prix Henri Poincaré winner and Maxim Kontsevich, permanent professor, IHÉS, 2012 Shaw Prize and 2012 Fundamental Physics Prize winner, were

both honoured on that occasion. The event was held at IHÉS, with Nalini Anantharaman interacting with the audience by videoconference, as she was visiting the Institute for Advanced Study. The Minister drew attention to the flourishing French mathematical school and she was also pleased to note that a male and a female mathematician were both rewarded for their work.



Jean-Pierre Bourguignon, David Ros, Geneviève Fioraso, Maud Olivier, Thibault Damour



Jean-Pierre Serre, Pierre Deligne, Mikhail Gromov

Pierre Deligne, 2013 Abel Prize

Chance had it that Pierre Deligne was giving a series of lectures at IHÉS as part of *“A Course in Arithmetics and Algebraic Geometry”*, when he received a phone call from Norway. He was being informed that he had been awarded the prestigious mathematical award that is the Abel Prize *“for seminal contributions to algebraic geometry and for their transformative impact on number theory, representation theory, and related fields”*.

Pierre Deligne, at the *Institute for Advanced Study* since 1994, is a former permanent professor at IHÉS. His presence at the Institute therefore provided an ideal opportunity to celebrate the award of this prize, in the presence of His Excellency Tarald Brautaset, Norwegian Ambassador in France and also of Jean-Pierre Serre, first Abel Prize winner in 2003 and Mikhail Gromov, who was also an Abel Prize winner, in 2009.



recently arrived Francis Brown

Francis Brown became a CNRS long-term visitor at IHÉS from 1 September 2012. He is a senior researcher, and until that date, was affiliated to the Institut de mathématiques de Jussieu in Paris.

Francis Brown has dual French and British nationality (British father and French mother). He studied at the University of Cambridge and then at ENS in Paris. He prepared his doctoral thesis under the supervision of Pierre Cartier in 2006, then worked at the Max Planck Institute in Bonn and the Mittag-Leffler Institute in Stockholm, as part of the EPDI programme. He joined CNRS in 2007. He obtained the **CNRS bronze medal** in 2012. That same year, he was awarded the **Élie Cartan Prize by the Académie des Sciences de Paris** for “his proof of two conjectures relating to multiple zeta values”.

Francis Brown’s work lies at the crossroads between algebraic geometry and arithmetic. He works in particular on periods of motives, which were invented by Euler nearly 300 years ago and which appear in many areas of mathematics and modern physics, especially particle physics and quantum field theory. Amongst his contributions are: the resolution of the Goncharov-Manin conjecture on moduli spaces of curves, Hoffman’s conjecture on multiple zeta values, and the Deligne-Ihara conjecture on mixed Tate motives over \mathbf{Z} .

Part of Francis Brown’s work relates to problems arising from quantum field theory, and especially the cosmic Galois group programme, which was initiated by many people connected to IHÉS, including D. Kreimer, P. Cartier, A. Connes, M. Kontsevich. This is a programme that seeks to reinterpret the theory of renormalisation



Pierre Vanhove

Pierre Vanhove is a theoretical physicist working on string theory, supergravity theories and field theory. He is a long-term CEA visitor at IHÉS.

After studying at ENS in Paris, he prepared his PhD thesis at École polytechnique under the supervision of Constantin Bachas. He continued working with Michael B. Green at the University of Cambridge DAMTP. He was recruited as CEA engineer at the Institut de physique théorique at CEA-Saclay in 2000. He was then a fellow in the theoretical physics division of CERN for two years. Since 2008, he has been working at both IPhT at CEA-Saclay and at IHÉS, where he is a long-term CEA visitor. Pierre Vanhove’s work has been recognised with the award of the École polytechnique thesis prize and recently, the **Académie des Sciences de Paris Mergier-Bourdeix Grand Prize**. In addition to his research work, he also gives general conferences in various French high schools.



Schematic view of the relationship between string theory and particle physics and between cosmology and mathematical physics.

in physics with Grothendieck’s motivic Galois theory. This enables perturbative quantum field theory to be studied from the point of view of algebraic geometry.

The fundamental properties of quantum gravitation lies at the heart of his research programme.

Einstein’s formulation of general relativity as a geometric theory describing the dynamics of space-time made it difficult to reconcile it with quantum mechanics, where Heisenberg’s uncertainty principle makes it impossible to determine geometric points. Whereas gauge theories have developed into a quantum field theory formalism that has been wonderfully confirmed by precision experimentations in subatomic physics and high-energy accelerators, gravitation seemed to be left by the wayside of these developments. From the late XXth and early XXIst centuries, cosmology entered into an age of precision, providing crucial and ever more precise information on the structure and the dynamics of the observable universe. An important consequence of these observations is that gravitation theory as formulated by Einstein is no longer enough and extensions must be envisaged. A certain number of extensions have been suggested, some arising from theoretical considerations such as the introduction of additional dimensions, supersymmetry as a new local symmetry and various forms of massive gravity; other extensions were developed to try and reply to various questions resulting from observations such as the presence of dark matter.

Even if we have no direct indication of quantum gravity effects, working in a framework in which gravity, like other fundamental forces, is quantified remains a reasonable hypothesis. In order to offer answers to these questions, Pierre Vanhove uses the formalism of string theory to develop new quantum computational methods for quantum gravity in order to build, justify and constrain modified gravity phenomenological models and especially, in supergravity models, to understand the role of supersymmetry.

Jean-Pierre Bourguignon interviewed

Jean-Pierre Bourguignon, École polytechnique graduate and PhD in mathematics from Université Paris VII, was Director of IHÉS from 1994. A CNRS Research Director, he was also a part-time professor at École polytechnique until May 2012 and a member of the scientific councils of various foreign institutions.

His term as Director came to an end on 1 September 2013 and his departure provides an opportunity to look back on his time at IHÉS.

What will you remember of your 19 years spent heading IHÉS?

An international fundamental research centre such as IHÉS is by definition a one-of-a-kind institution, therefore quite a fragile one. Its *raison d'être* is to stimulate interaction among scientists from different countries, backgrounds and disciplines around a core of exceptionally high calibre researchers. In order to operate this type of organisation successfully, the key element is the quality of all the people who work there and their professionalism, which means constantly working out the best match between competencies and tasks. This can only be achieved with vigilance and by anticipating emerging needs. On the science front, considerable efforts have been deployed to broaden contacts with various scientific communities, especially in Asian countries, where development is unprecedented in its speed and support from policy makers. At the same time, the Institute must be convincing about the relevance and value of its operating model within an already complex, not to say fragmented, national and international science infrastructure, where research is increasingly constrained with short-term projects and pnickety checking procedures. To be able to take risks, which is crucial, the Institute needs freedom and its activity needs to be judged over the long term.

If you could make one wish for the Institute's development, what would it be?

My wish would be for the Institute to preserve its uniqueness, which rests on taking scientific risks, its international dimension and a subtle balance between research carried out over long periods of time by permanent professors and opening up to the very different issues brought by invited researchers. As one of the sources of its fragility is linked to the scarcity of funding streams, there is a financial aspect to the wish. It would be nice to have this potential threat removed; the search for sponsors embarked upon by IHÉS over the past few years is developing on a more global scale, with more results, with the same scrupulous attention to keeping the Institute's total independence as regards its scientific choices. Again, the Institute's international nature plays a key role.

Extract of the interview published in the magazine Le Buressois in September 2012, on the occasion of the 50th anniversary of the Institute's establishment in Bures-sur-Yvette.



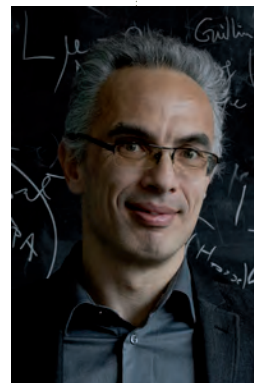
Speech by Jean-Pierre Bourguignon during the ceremony in his honour on 1 July 2013

the new Director

Emmanuel Ullmo became IHÉS Director on 1 September 2013. He is taking over from Jean-Pierre Bourguignon who held the post for 19 years.

A mathematician, his area of research is algebraic geometry and arithmetic. He studied at École Normale Supérieure de Cachan. He obtained his doctorate in 1992 at Université Paris-Sud. He alternated between posts in France and abroad, including 18 months at IMPA in Brazil, two years at Princeton University in the United States and six months at Tsing-Hua University in the People's Republic of China. He became a professor at Université Paris-Sud in 2001.

He was awarded the Académie des Sciences de Paris Élie Cartan prize in 2006. He was 2003–2008 Junior Member of Institut Universitaire de France. He is a member of the editorial board of *Inventiones Mathematicae* since 2006 and its co-Managing Editor since 2008.



Emmanuel Ullmo

international campaign

The international campaign in which IHÉS and Friends of IHES in the United States are engaged saw several highlights in 2012. The fantastic leverage resulting from the Simons Foundation's challenge gift continues to operate, with all donations made before the end of 2016 being matched by the foundation up to a maximum of five million euros.



The first gala dinner organised by Friends of IHES that took place on 12 November 2012 was a high point in the life of this organisation, dedicated to the promotion of IHÉS' work in the United States.

first Friends of IHES gala dinner in New York

To just say that it was success does not do justice to the warmth of the atmosphere, or to the real interest in finding out more about IHÉS' research activities that the guests demonstrated. Marilyn and Jim Simons were the guests of honour at this gala dinner, during which *Friends of IHES* expressed warm gratitude for their transformational support over many years.

The theme chosen, *Beauty and Mathematics*, gave a focal point to the evening's programme, which was shared by artists and mathematicians.

The dinner hosted by the French General Consulate was part of the Institute's efforts to promote it and raise funds. This was a successful first, so another gala event is being planned for 2013.

cocktail in honour of Dr Sackler and his wife Beverly

On 30 May 2013, Friends of IHES organised a cocktail in honour of Dr Raymond Sackler and his wife Beverly, to thank them for their loyal financial support.

With the concept of "space" chosen to frame the evening, this event brought together around forty guests who watched a film recording several scientists' and artists' conception of space and listened to the reading of a beautiful text on the topic, written by Elie Wiesel. Emmanuel Ullmo spoke of the future projects IHÉS will engage in with relation to Israel. Michael Douglas concluded the talks by presenting the work of *Friends of IHES*.



Jean-Pierre Bourguignon, Dr Raymond Sackler

Friends of IHÉS warmly thanks Mary and Luc Hardy for their kind hospitality at this event.

Funds dedicated to the support of Asian researchers

A meeting of the **Japan Fund** Support Committee took place on 15 May 2013, the Fund being close to its target of two million euros.

The **Chern Fund**, the objective of which is to contribute to the support of Chinese researchers invited to IHÉS, benefitted from renewed support from the S.S. Chern Foundation for Mathematical Research.

2013 saw the launch of fundraising for the **India Fund**, the financial target of which is to raise two million euros, proceeds from the fund allowing each year ten months of invited Indian researchers' work to be financed. Support from the Science Services of the French Embassy in Delhi was key to promote this development, especially during President François Hollande's state visit on 13 and 14 February 2013, which IHÉS was able to take part in.

Over half of a new significant contribution from Total to IHÉS' endowment funds have already been allocated to the India Fund. The other part has been allocated to the Chern Fund. We would like to thank Total for their longstanding support.

a new chairman for Friends of IHES

Another important event for *Friends of IHES, Inc.* in 2012 was the change in its governance, with Michael R. Douglas becoming Chairman of the Board.

We would like to thank his predecessor, Renaud Dutreil, for his commitment to the Institute since 2010. Michael R. Douglas, a theoretical physicist, Professor at the Simons Center for Geometry and Physics at Stony Brook University knows IHÉS well, having often been invited to undertake research visits there, especially when he was one of the holders of the Louis Michel Chair.



a point of view by ...



Léonard Todjihoundé

Léonard Todjihoundé is an associate professor of mathematics and physics at Porto Novo in Benin. His areas of research include global and harmonic analysis and also geometry methods in physics. He was invited to IHÉS for two months in 2012.

IHÉS, one of the leading international mathematical and theoretical physics research institutions in the world, reminds visitors of a sanctuary for scientists, who devote their lives in quasi religious fashion to fundamental research.

Its geographical location gives visitors the opportunity to take part in the programmes and scientific events in other prestigious institutions in the Paris region, such as Institut Henri Poincaré in Paris, École Polytechnique in Palaiseau, Université Pierre-et-Marie-Curie in Jussieu, Université Paris-Sud in Orsay, CNRS in Gif-sur-Yvette, Institut de Physique Théorique du CEA in Saclay, etc. Its professors include Fields Medal winners and scientists who have been honoured and rewarded for their work in mathematics and theoretical physics.

A visit to IHÉS, however brief, is always a very enriching experience in terms of broadening knowledge base, meeting and interacting with internationally recognised experts. Internal facilities (lunch on site, with everybody together, accommodation in the Ormaille residence, etc.) and the efficiency and helpfulness of administrative staff all contribute to a positive work environment for researchers at IHÉS.

As well as internal research projects, specific programmes enable a mix of scientists from different backgrounds and generations to be present at IHÉS. Africa, which really needs support to boost science, benefited from specific support with the Schlumberger Foundation. Thanks to this support, African researchers had been able to undertake research visits at IHÉS and many international conferences organised on the continent by African scientific institutions, such as the Institut de Mathématiques et Sciences Physiques, which is where I come from. Unfortunately, this special programme came to an end a while ago and, with this article, I would like to bring my wholehearted

support to IHÉS management in its efforts to set up a new special programme to support fundamental research in mathematics and theoretical physics.

Fundamental research in mathematics and theoretical physics is very insufficiently institutionalised in sub-Saharan Africa. It rests primarily on the individual scientific endeavours of academics who have kept links with Western universities and on a few under-resourced research centres. The scientific isolation of researchers, the paucity of international activities and events (conferences, workshops, scientific fora, etc.) and the absence of postdoctoral positions are some of the problems besetting fundamental research in sub-Saharan Africa. It should be noted, however, that many young African researchers are choosing to read mathematics and physics at university, which represents a tremendous potential for future fundamental research, provided this sector is better organised and funded.

forthcoming events in 2013

4-6 September, IHÉS

Freshers' welcome for Masters students from teaching institutions in the Fondation Hadamard

12 September, AXA Headquarters, Paris

Handover ceremony with J.-P. Bourguignon, IHÉS outgoing Director and E. Ullmo, incoming Director.

13 September, IHÉS

Scientific conference in honour of J.-P. Bourguignon organised by M. Gromov, O. Hijazi and E. Ullmo.

19 September, IHÉS

Seminar on experimental and theoretical aspects of gravity organised by T. Damour, C. Deffayet and P. Vanhove.

5 October, Simons Foundation, New York City

Day in honour of P. Deligne's work organised by Friends of IHÉS

8 October, London

Event organised by the IHÉS Support Committee in the UK with J. Garnier and G. Papanicolaou, holders of the Schlumberger Chair for Mathematical Sciences at IHÉS.

October 2013, every Thursday, IHÉS

A course in arithmetic and algebraic geometry organised by A. Abbès, C. Breuil and L. Lafforgue.

30 October-1 November, IHÉS

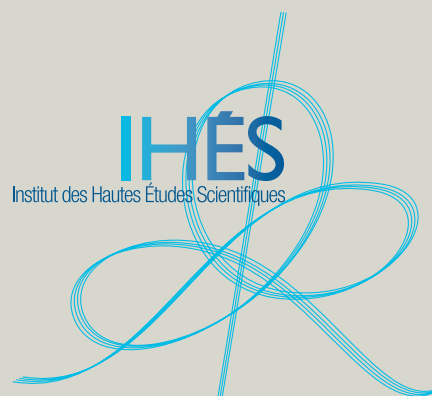
Conference in memory of Vadim Knizhnik, organised by A. Belavin, N. Nekrasov and S. Shatashvili.

18 November, New York City

Gala organised by *Friends of IHÉS*.

mid-December, IHÉS

Day conference in honour of Israel Gelfand, on the occasion of his centenary.



For further information: www.ihes.fr