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The Letter of the Collège de France

N°5 Academic year 2009–2010



COLLÈGE
DE FRANCE
— 1530 —





Teaching research in the making

The Collège de France was created in 1530 by François I

The Collège's motto is "Docet omnia": the vocation to teach everything

The lectures are open to anyone, there are no registration fees, no diplomas are awarded

The program is changed each year



Dissemination of knowledge

- Lectures, seminars, guest lecturers from abroad, international and multidisciplinary conferences: attended by 120,000 people annually

- Publications: abstracts of work under way (*Yearbook*), Inaugural lectures, reopening symposiums and guest professors' lectures, DVDs

Website in French and English (www.college-de-france.fr)
(4,500 visits/day), Podcasts (3,350,000 downloads/month), audio and video retransmissions



- Lectures broadcast by France-Culture
(800,000 listeners/month)



57 chairs

- 52 Chairs + 5 Chairs renewed annually (Artistic Creation, Information Technology and Digital Sciences, Knowledge against Poverty, Sustainable Development–Environment, Energy and Society, Technological Innovation Liliane Bettencourt)



- Promoting the emergence of new disciplines

- Multidisciplinary approach to cutting-edge research

- Creation of a new Chair in the scientific domain of every nominated professor (Mathematics, Physics and Chemistry, Biology and Medicine, Philosophy, Sociology, Economics, Archaeology, History, Study of the great civilizations, Linguistics and Literature)



International relations

- Lectures and conferences delivered abroad

- The professors may deliver some of their lectures abroad
(Agreements with: Germany, Belgium, Brazil, Canada, China, USA, Israel, Lebanon, Singapore, Sweden, Switzerland, Czech Republic)



- Foreign professors invited

- Program of reception of post-doctoral researchers from abroad

Research at the Collège de France and training through research

- 4 institutes (Institute of Biology, Institute of the Contemporary World, Institute of Oriental Studies, Institute of Literary Studies)



- Center for Interdisciplinary Research in Biology—C.I.R.B.

- more than 300 researchers

- 148 PhD students and post-doctoral students

- 315 engineers, technicians and administrative staff

- 7 research teams hosted

- Affiliated organizations: Collège de France, CNRS, INSERM, Universities, EPHE, EHESS, Pasteur Institute

The Collège de France libraries

A heritage of rare books and some of the best specialized libraries in Europe



Open to a public of outside specialists

- General library: 120,000 books

- Social anthropology library: 28,000 books

- Libraries of the Oriental Studies Institute: Egyptology, Ancient Near East, Byzantium, Arab, Turkish and Islamic Studies, Far East (India, Tibet, China, Korea, Japan): 500,000 books

Budget

- Operating budget: 14.8 M€

- State grant: 6.7 M€

- Own income: 1.7 M€

- Institutional contracts: 6.4 M€

- Total payroll: 15.1 M€

Sponsorship

- Collège de France Foundation

- Collège de France Hugot Foundation

Relations with the business world

- Contracts with industry

- Budé Committee, corporate managers club

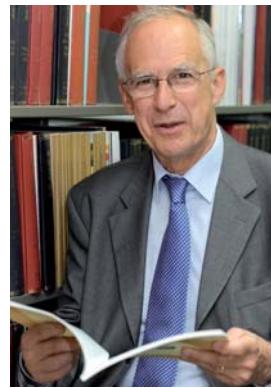
"What the Collège de France is expected to bring to its audiences is not established knowledge, but the idea of free research."

(Ce que le Collège de France, depuis sa fondation, est chargé de donner à ses auditeurs, ce ne sont pas des vérités acquises, c'est l'idée d'une recherche libre.)

Maurice Merleau-Ponty

Editorial

by Pierre Corvol
Administrator
of the Collège de France
Professor,
chair of Experimental Medicine



A new audience for the Collège de France

Whether our elders like it or not, the Collège de France's motto, *Docet Omnia*, is incomplete. *Docet Omnes Omnia* would be more accurate: it teaches everything to everyone. No registration, no constraint: whoever wishes to attend a lecture, symposium or seminar at the Collège de France can do so unconditionally, freely and at no charge. This custom is so rare that both in France and abroad it tends to surprise even our fellow academics. The Collège is neither limited to an academic syllabus, nor delivers qualifications, nor requires its audiences to undergo any test of the knowledge acquired through its teaching. This has been so since 1530, at least in principle, since we are not entirely sure of where and under what conditions the first royal lecturers taught. It seems that the earliest audiences were students, scholars from the Latin Quarter and the Montagne Sainte Geneviève, a campus before the term existed. At the Collège they sought knowledge not dispensed by the universities.

Often, when I am presenting the Collège de France and its teaching missions, people ask me what types of audiences attend the lectures. Who comes to the Collège's lectures, what is their level of education, their regularity, their assiduity? What is their motivation? What do they derive from the lectures? Until now there were as many answers to these questions as chairs at the Collège, for each of the professors had some idea of his or her audiences. However, no overall answer could be given because no study had been carried out on the subject. Some of the more highly specialized lectures were faithfully attended by small numbers of the initiated. In contrast, well-to-do crowds thronged to Bergson's lectures, for example, and photos of the time show people clinging to the windows, avidly listening to the master's words. Today, video recordings of the most well-attended lectures are broadcast live in several lecture halls.

We can assume that the question of their audiences was of little concern to the Collège professors in the

past and is hardly more of one today. Rightly so, and there is nothing about that that should offend those audiences. As the Collège de France emphasizes, its lectures are above all the fruit of personal work: the demanding, concentrated and intellectual result of each Professor's own research. That is what sets it apart: it is anything but a media exercise. The audiences present in its lecture halls witness the elaboration of an intellectual product, the development of arguments structuring a theory, the disclosure of new discoveries and their interpretation. Very often the lectures lead to the publication of scientific articles or books. The audiences are thus both necessary and contingent: on the one hand they are the indispensable and privileged witnesses of a thought process taking shape and being expressed in vivo before them; on the other, the nature and composition of the audience is of no relevance to the lecture itself.

One has to bear in mind, however, that this knowledge is ultimately intended for the public, and that the public shows a strong demand for knowledge in all scientific disciplines. To teach everyone, the Collège and its lecture halls would be hopelessly insufficient, but the Internet has broadened them to the scale of our planet. And the audiences have followed suit. Statistics on visits to the Collège's website and its multimedia platforms (Daily Motion, iTunes U) have revealed the existence of virtual audiences outnumbering the ones on campus.

To find out who these audiences are and what they hope to get out of the Collège's lectures, we ran a survey on the attendees of Collège de France lectures in early 2010. In parallel, a survey was also run on the Collège's online audiences, in 2009 and in 2010. The results are presented in detail by Henri Leridon in the present issue (p. 57). To sum up those of the survey carried out at the Collège, a profile of the average attendee can be drawn: man or woman, aged over 55, living in or around Paris (Île de France), with

a high cultural level, usually unemployed or retired, and who say they attend the lectures for their personal interest. Over half of them say they attend at least two lecture series. The picture is however not quite as clear-cut when it comes to the hard sciences: mathematics, physics and the natural sciences. This public is younger and includes far more students and researchers.

The profile of the average respondent to the Web questionnaire differs considerably from the one above. Most are men, they live in Ile de France (51%), elsewhere in France (35%) or abroad (14%), and the majority are in the 25–34 age-group and are students, teachers or researchers. They follow the lectures for their own interest (63%), for their studies or for professional reasons (37%). Fewer of them have or had positions at a senior managerial level (46%) than in the audiences who attend lectures at the Collège (70%).

These surveys, which were short and therefore partial and imperfect, nevertheless had the merit of producing an outline of the Collège de France's virtual audiences for the first time, and of enabling us to compare them to its traditional audiences who attend lectures on campus. This calls for several comments:

1. First, by making its lectures available on its website, the Collège de France has met an expectation. In less than three years, large new audiences have discovered the institution, subscribed to its podcasts, and started to use the published versions of its lectures (in text, audio and video format) for their personal interest or for learning, teaching and research purposes. The Collège's teaching is no longer reserved only for a few fortunate inhabitants of Paris and surrounding areas, as we wrote in the editorial of the *Lettre du Collège de France* in June 2006; it is now accessible to all.

2. The Collège's new online audiences are younger and are mostly students or employed. In addition there are the PhD students who are hosted by the Collège for their research, essentially in the mathematical, physical and natural sciences (320 students in 2010). These young people will in turn impart the knowledge that they acquired at the Collège.

3. The answers to the survey questionnaires as well as free comments show that Internet users are loyal and are satisfied with the Collège's lectures on the Web, as are the audiences that attend lectures on campus.

4. The diversity of the Collège's offer in terms of content and educational media is a valuable asset that should be preserved. The survey shows that all types of media interest Internet users and that we should not favour any particular one. In this spirit, the Collège is

currently putting online the texts of certain lectures, as well as other types of content: inaugural lectures, the Collège de France yearly report, the Letter of the Collège de France, and other text documents (notably on the site revues.org).

5. The survey revealed that 14% of the Internet users do not live in France. This is a strong encouragement to make the Collège known beyond our borders, both in French-speaking countries and beyond. The next step would therefore be to have certain lectures and seminars translated into English so that they can be disseminated throughout the world. In this way the Collège will actively contribute to promoting French science and culture internationally.

6. The surveys on the Collège's different audiences enabled us obtain the first overview on the subject in 2010. It would be useful to carry out such surveys regularly so that we can see how these audiences evolve over time, and evaluate the services that we deliver.

The digital dissemination of knowledge has multiplied the Collège de France's audiences by a factor of 10 to 100. The public concerned corresponds precisely to the target that the Collège wanted to attain: those listeners whose presence is "virtual" yet very real, and who want to acquire more in-depth knowledge in various research fields.

The survey on Internet users is an encouragement to perpetuate and amplify this approach, by maintaining the same high standards of teaching which make the Collège's lectures so valuable and interesting, both online and on campus. For the Collège's aim is not only to teach everyone, but also to give them the best. ■

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SELECTED
PAPERS

OPENING OF THE CHAIR OF INFORMATION TECHNOLOGY AND DIGITAL SCIENCES



On 10 November 2009 the Collège de France and the French national institute for research in computer science and control (INRIA, Institut national de recherche en informatique et automatique) presented the press with their objectives in creating a chair devoted to computer and digital science.

From left to right : Professors Pierre-Louis Lions, Gérard Berry, Pierre Corvol and Mr Michel Cosnard

The importance of computer science in our society is unquestionable. Our world is becoming increasingly digital; that is obvious. Not a day goes by that each of us does not use a device or service attesting to that, whether in our private or professional lives. We live in a world of computers or, more precisely, electronic circuits. Apart from our personal or office computer, we are surrounded by machines that are part of this big family: household appliances, cars, aeroplanes, mobile phones, etc., are all related to our computers. All have electronic chips that function on the basis of software to perform a series of predefined tasks.

To the long list of objects with integrated computer programs, we naturally have to add the increasing number of services from which we benefit. After the introduction of the personal computer in the 1980s, the appearance of the Internet in the mid-90s triggered the most visible upheaval by enabling hundreds of millions of machines to be connected. This constantly expanding networking has been attended by a digitization of data and of products that are potentially transferable on Internet. Data and medium are now inseparable and, as such, have revolutionized certain sectors like the record industry.

These are examples from our daily lives, which reflect profound change in our society, for while we 'consume digital', including our entertainment, we also 'produce digital' and even

'think digital'. Very few objects and complex procedures today are not the product of computer-aided design.

Apart from digital engineering, digital modelling, simulation and visualization have transformed practically all scientific domains. The digital sciences are at the heart of most of the challenges requiring interdisciplinary answers today.

The implications of the digital revolution are huge, from both an economic and a societal point of view. In France, first the announcement in early April 2008 of a plan to develop the digital economy, with a view to ranking France among the leading 'digital nations' by 2012, and then, more recently, the controversy around the drafting of the HADOPI law, are emblematic of the phenomenon. These two events highlight the economic weight associated with digital technologies, on the one hand, and with evolving uses and the need to regulate that evolution, on the other. An estimated 28% of global research and development is devoted to information and communication science and technologies (ICST). Whether the aim is to create value with the leading firms or to regulate new uses related to new technologies, in order to ensure their acceptance, the same condition applies: the need to understand the bases of computing and to identify the principles governing this digital world in which we live. Ignorance spawns the impossibility of creating, as well as dependence or even fear and mistrust of an unfamiliar world.

From this point of view, explaining the digitization of the world and giving our fellow citizens the keys needed to further their understanding of this new society become fully meaningful. It is essential if they are to make sense of the environment in which they live, to accept it and to become actors in their own right and even creators. I am convinced that the 'digital divide' is more than simply a question of equipment; it is also a matter of thought patterns, of a divide in the capacity to adopt a different way of grasping the world.

By creating a chair for Computer and Digital Science at the Collège de France, we are moving a step closer to acknowledging computer science as a discipline in its own right, and are thus highlighting the importance of devoting more attention to it in the academic world. It is no longer legitimate to have to wait to specialize in one's post-school education to receive an explanation of the foundations of computing. This teaching should be imparted to people from a younger age. Starting this year, the mathematics programme in the first year of senior high school (*lycée*) in France will include one of the key concepts in computing: algorithms. This is a first step, which I salute, but we need to go further in the same direction. ■

Mr Michel Cosnard
CEO of INRIA

INAUGURAL LECTURES

CHAIR: INFORMATION TECHNOLOGY AND DIGITAL SCIENCES

ACADEMIC YEAR 2009–2010



Gérard BERRY

gave his inaugural lecture on
19 November 2009.

His course entitled “To think, model and control calculation”
began on 25 November 2009.

Extracts from the inaugural lecture:

The current digital revolution is rooted in automatic computation on digitally encoded information. Since it deals with information instead of matter and energy, it is more comparable to the ancient revolutions of writing and printing than to the more recent industrial revolution. These former revolutions were comprehensible by everybody since they all had a directly visible material impact. Being mostly invisible, the digital revolution is much less comprehensible to the public. In particular, the underlying notions of information digitization and automatic computation remain either unknown or mysterious to most people. Who realizes that printing a document, giving a phone call, or piloting an airplane are now based on the well-ordered execution of billions or trillions of elementary computations, the very same for such different applications? Who knows that mastering automatic computation is fundamentally difficult and requires verifying in great details that the aforementioned myriads of elementary computations fully and faithfully implement their designer's intention?

In this year at Collège de France, I will concentrate on automatic computation as an object of scientific and technical reflection. I will describe the different principles at work, how they differentiate from each other, how to make them cooperate, and why it is necessary to recursively compute on computations to make systems reliable. The basic principles are of a theoretical nature: abstract machines, programming concepts and languages, verification logics, etc. I will

take great care in linking these principles to their practical impacts. In the digital industries as elsewhere, pragmatics reign, and engineers are often reluctant to change their methods unless they are obliged to by project failures or costs escalations. Thus, the use of the advanced notions presented in the course remains quite slow in many places. However, it is becoming indispensable because of a sharp increase of the cost of bugs and security problems, itself due to the explosion of the number, variety, and criticality of applications in a context where machines and networks become more and more complex.

Informatics-based applications must become more reliable. This requires modeling and mastering the core notion of automatic computation, object of this course. But this is clearly not sufficient. One must also master many other subjects, ranging from theoretical algorithmics to practical software engineering. Indeed, many important recent innovations are due to the better design of programming languages through data structures, modules, objects, aspects, etc. These will not be considered here, since they change the architecture and writing of programs without deeply changing what concerns us here, the way they compute at run-time.

Why did we mention several computation principles and models, while all computers look alike and seem to differ only by their brand, their speed, and their cost? Because we need to distinguish between two highly different levels: the human level, where we think about computation with our slow, semi-rigorous, but intuitive brains, and the execution level, performed by computers that are superfast and superexact but totally deprived of intuition. Mastering the path between these two opposite ends is difficult and requires understanding the variety of conceptual and technical models we present here. ■



The inaugural lecture is available from Editions Fayard. The video is available on the Collège de France website.

CHAIR: TECHNOLOGICAL INNOVATION LILIANE BETTENCOURT

ACADEMIC YEAR 2009–2010



Patrick COUVREUR

delivered his inaugural lecture on 21 January 2010.

His lecture series entitled “Nanomedicines” started on 25 January 2010.

Extracts from the inaugural lecture:

Nanotechnologies have appeared and the world of the infinitely small has revolutionized the way of administering medicine. Because they are on a nanometric scale ($1\text{nm} = 10^{-9}\text{m}$), nanotechnologies are not simply miniaturized larger objects; they have properties found only on a scale of that size. Medicines are no exception. Until the early 1970s it was considered impossible to administer pharmaceutical suspensions (dispersion of solid particles in a liquid) by intravenous means, due to the obvious risks of embolism. Today, the conception of nanoparticles suspensions containing medicines (“nanomedicines”) has made it possible to increase the therapeutic index of many components (improvement of the activity, reduction of toxicity) by directing them selectively towards the diseased tissues and cells (“drug targeting”). The shift in size from tens of microns to tens or hundreds of nanometres has thus been a significant technological and medical breakthrough.

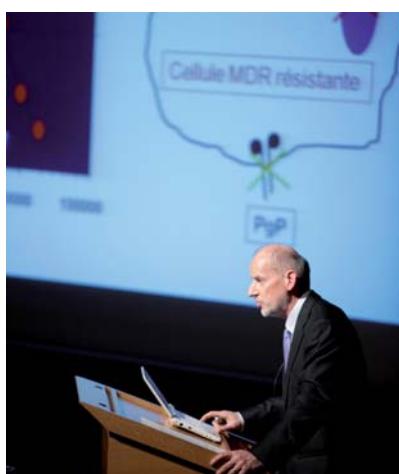
In this inaugural lecture I wish to show that the concepts of physico-chemistry, the development of new materials (synthesis of new polymers and new lipids, for example), and better knowledge of biological targets enable us to conceive of sub-micronic systems of administration endowed with numerous functions and properties; in short, to develop ‘intelligent’ nanotechnologies which can contribute to diversifying our therapeutic arsenal in the treatment of severe diseases.

Applied to drug targeting, these nanotechnologies have a diameter midway between that of viruses and bacteria, thus resembling natural particles. It is moreover possible to create

‘intelligent’ nanotechnologies, for we now have a wide variety of materials and *biomaterials that can be implemented cleverly*.

[...] The core of nanocarriers makes it possible to encapsulate biologically active molecules in order to make them ‘invisible’ to detoxification mechanisms such as those employed by cancer cells to resist to chemotherapy. The resistance mechanisms developed by these cells can indeed result in the expression of efflux proteins (PgP, MRP, etc.) which expel medicines from the cell. This so-called ‘multidrug resistance’ (MDR) neutralizes most classical chemotherapeutic treatments. We had the idea of trying to circumvent this resistance mechanism by encapsulating doxorubicin (an anti-cancer intercalating agent of DNA) in nanoparticles prepared from a biodegradable polymer, polyalkylcyanoacrylate. In this form, the efflux proteins can no longer recognize the doxorubicin and the cancer cells become sensitive to it again. This concept has been applied to the experimental treatment of resistant hepatocarcinoma because these nanoparticles, like all colloids, are recognized by the liver (via Kupffer cells) after intravenous administration. The company BIOALLIANCE has been developing this technology and a multicentric trial of Phase II/III is currently underway.

[...] The core of nanotechnologies also allows for the encapsulation of fragile molecules. ‘Biomimetic’ or stemming from biotechnologies, macromolecules like DNA, siRNA or antisense oligonucleotides, peptides and proteins offer significant therapeutic prospects. They may be the basis of tomorrow’s therapeutic techniques (non-viral gene therapy, inhibition of oncogenes or viral genes, targeted therapeutics using antibodies, etc.), but because they are fragile, they need to be encapsulated into nanocarriers. ■



The inaugural lecture is available from Editions Fayard. The video is available on the Collège de France website.

CHAIR: PHYSICS OF CONDENSED MATTER



Antoine GEORGES

gave his inaugural lesson on 8 October 2009.

His lecture series entitled “From supra-conductor oxides to cold atoms: matter with strong quantum correlations” started on 5 May 2010.

Extracts from the inaugural lecture (translated transcription):

Since the Collège de France is a locus of knowledge production, where the professors teach their own original research, I would prefer this talk not to seem too much like a lecture .

I would therefore like you to listen to me as though you were listening to someone recounting their travels: a journey starting out from the extraordinary diversity of organized forms of matter on a macroscopic scale, to its most minute components on an atomic scale.

[...] This journey starts in awe before the diversity of material that nature presents us with or that chemists and physicists are able to create. The carbon atom, with its six electrons around a core, is one of the simplest of all atoms but also one of the

most essential elements of the living world. When a large number of these atoms combine, they can form crystal structures: the three-dimensional architecture of diamonds or structures consisting of bi-dimensional layers of graphite. What an amazing difference there is between the physical properties of these two structures, even though both consist of the same element: on the one hand, the diamond, transparent, extremely hard and providing good electrical isolation; on the other, graphite, a black, flaky, layered composite that is used in crayons and is almost metallic. Carbon can form even more remarkable structures, recently discovered or synthesized. The large molecules, for example, called Buckminsterfullerenes in homage to the architect Buckminsterfuller, the inventor of

geodesic domes, can consist of up to 60 carbon molecules and have the form of a football. These carbon nanotubes, small, very narrow and long tubes—their diameter is only a few nanometers, that is, a millionth of a millimetre—are obtained when a single sheet of carbon atoms rolls itself up. Five years ago, Geim and Novoselov isolated a sheet of this kind, formed by a single layer of carbon atoms organized like a network of hexagonal cells. This is graphene, the subject of abundant research today.

And all these examples are of materials formed by just one type of atom! What an immense playing field lies before us if we consider the countless possibilities of combining the elements on Mendeleev’s periodic table. One example is an oxide composed of four different atoms—copper, oxygen, lanthanum and strontium—which can occupy the same sites . It has the remarkable property of becoming a supra-conductor above a certain temperature, which means that it can convey an electric current without any resistance or dissipation. Another example is cobalt oxide, in which small alkaline lithium ions circulate between sheets of cobalt oxide atoms, and which is essential to the batteries of our mobile phones and laptop computers.

There is not only perfect crystal—that structure which in a sense is more like matter as it should be than matter as it is. The organized matter that nature presents us with or that is born in the laboratories of chemists adopts extraordinarily diverse forms: gels, mousses, liquid crystals, and many more. [...] As the term solid state physics proved to be too limited to encompass all these forms, condensed matter physics is the term that took prevalence in the 1970s to denote the field of physics that studies the structure and properties of the organized forms of matter. I chose to keep this title for the chair, to show my interest in this extraordinary variety of forms. ■



The inaugural lecture is available from Editions Fayard. The video is available on the Collège de France website.

CHAIR: ARTISTIC CREATION

ACADEMIC YEAR 2009–2010



Founder of the
Théâtre de l'Aquarium and the
company
l'Inattendu.
Director of the
Théâtre National de Toulouse
1998–2007.



The inaugural lecture will be available from Editions Fayard. The video is available on the Collège de France website.

Jacques NICHET

delivered his inaugural lecture on 11 March 2010.

His lecture series entitled “Theatre does not exist” started on 18 March 2010.

Presentation of the series:

Over the past four decades we have witnessed numerous singular metamorphoses of theatre, which have shaken and boldly overturned the traditions of the dramatic arts. What explains such changes? What are the different ways in which these unforeseen forms, these unknown visions, have been invented? Luca Ronconi, Ariane Mnouchkine, Peter Schumann, Robert Wilson, François Tanguy, Tadeusz Kantor, Denis Marleau, Valère Novarina, Pina Bausch and many others wrenched me from my usual self with my certainties, filled me with enthusiasm, shook, moved and astounded me, sometimes irritated me. It is hardly surprising that in the midst of so many divergent models, the public sometimes feels lost. What is it seeing? Is this still theatre? Sometimes a play triggers controversy amongst both the public and critics: while some criticize the director in the name of murdered art, others acclaim him/her in the name of revived art.

Over a century ago, Zola advised the artists caught in the controversies of the day: ‘Every time someone wants to confine you to a code by saying: this is theatre, this is not theatre, reply outright: theatre [as such] does not exist. There are theatres and I’m looking for mine’.

This type of approach does indeed spawn only singular, dissimilar, temporary forms. And Zola firmly emphasizes: ‘There is no absolute, ever, in any art whatsoever! If there is theatre, a fashion has created it today and a fashion will destroy it tomorrow!’

Zola’s claims have never been as relevant as they are today. In response to the

disruptions and fragmentation of a world that is defying our references, plays are proliferating and becoming increasingly differentiated. They endeavour to echo our painful impressions of disorientation and uncertainty. The artists, each in their own way, try to react through different practices, alliances and modes of production.

We witnessed large numbers of unusual creations that sought to mark their difference from the productions of the established institutions.

By asserting their originality, these experiments have shown other ways of inventing theatre.

My greatest pleasure would be to relive the shock of a surprise, the upsurge of emotion like the first time, the evening when we saw *Orlando Furioso* by Luca Ronconi, 1789–1793 by Ariane Mnouchkine and the Théâtre du Soleil, *A Man says Goodbye to his Mother* and *Fire* by Peter Schumann and the *Bread and Puppet Theatre*, *Deafman Glance* by Robert Wilson, *Dead Class* by Tadeusz Kantor, *The Blind* de Maeterlinck in the phantasmagoria of Denis Marleau, *The Unknown Act* by Valère Novarina, and *Café Müller* and *Barbe-Bleue* by Pina Bausch. Forty years ago all these shows were unimaginable, but ‘if you can imagine it, you can do it’ said the sculptor Calder. All it took was an artist to imagine it one day. ■

CHAIR: KNOWLEDGE AGAINST POVERTY

ACADEMIC YEAR 2009–2010



Peter PIOT

delivered his inaugural lecture on 7 January 2010.

His lecture series entitled “The Aids epidemic and the globalization of risks” started on 5 February 2010.

Extracts from his inaugural lecture:

A virus that was totally unknown less than 30 years ago has overturned schemas on progress in health and socio-economic development in many countries, especially in sub-Saharan Africa. In three decades, some sixty million people have been infected by the HIV—the human immunodeficiency virus—of which some twenty-five million have died so far. These tens of millions of people were linked to one another via sexual relations, exposure to contaminated blood products or needles, or because their mother was infected with the HIV. Genetic and epidemiological studies have moreover shown that everything probably started with only one person and a single virus. All this highlights another side of globalization—and a new dimension of the concept of blood relatives!

[...] The Aids epidemic has pursued its global expansion for three decades. Today, 33.4 million people are living with the HIV; in 2008, 2.7 million new infections were contracted and there were two million deaths. Who could have predicted the worst pandemic in modern history since the Spanish Flu when, in June 1981, the Weekly Morbidity Mortality Report of the Atlanta Center for Disease Control published a short article on a syndrome of unknown origin, characterized by a rare form of pneumonia caused by *pneumocystis carinii* in five black homosexual men in the United States?

This is a classical dilemma in public health: when a few cases of a new disease are detected, will these cases remain isolated or are they the beginning of an epidemic? The experiences of Aids, SARS and bovine spongiform encephalopathy, in particular, introduced the precautionary principle into public health. Its most recent application

was the campaign against the H1N1 flu. We can legitimately wonder how many millions of infections by the HIV and how many deaths could have been avoided, had health authorities and policy-makers applied this precautionary principle on a global scale from the beginning of the Aids epidemic, and implemented all the means deployed in recent years.

[...] It has been in the field of access to treatment that progress has been the most spectacular. At the end of 2008, four million people in low- and medium-income countries benefited from antiretroviral treatment. Although this accounts for only 42% of the needs, a lot of ground has been covered: in the year 2000, fewer than 200,000 people were receiving antiretroviral treatment in developing countries. The majority were in Brazil, the first developing country to offer free care to HIV-infected people. [...] When it comes to prevention, progress has been less spectacular, even though many countries have experienced a drop in the number of new HIV infections. Globally, for each new patient put under treatment, almost three new HIV infections occur somewhere in the world, as though we were constantly losing the race against the virus.

[...] Once again, ‘scientific evidence’ does not automatically mean ‘acceptance’ and ‘action’. A great deal of science is lost in translation. We have found this in many sectors of health. For instance, the international convention on tobacco control was approved by the member states of the WHO more than fifty years after the correlation between tobacco smoking and lung cancer was proved by Doll and Hill. This failure to act has resulted and continues to result in millions of deaths. To eliminate poverty, the world probably needs the application of science even more than it needs knowledge against poverty! ■



The inaugural lecture is available from Editions Fayard. The video is available on the Collège de France website.

CHAIR: SUSTAINABLE DEVELOPMENT - ENVIRONMENT, ENERGY AND SOCIETY

ACADEMIC YEAR 2009–2010



Nicholas STERN

delivered his inaugural lecture on 4 february 2010.

His lecture series entitled “manage climate change, promote growth, development and equity” started on 5 February 2010.

Extracts from his inaugural lecture:

The world, the planet, is at a crossroads. If we fail to act strongly now to reduce emissions of greenhouse gases, if we continue with the pattern of high-carbon growth of the last century, we incur grave risks of a catastrophic destruction of the physical geography of the planet. The implications would likely be the re-drawing of where people could live and how they could live their lives: thus we risk movements of population on a massive scale, with the probable consequence of severe, extended and global conflict. Inaction is the most pernicious of policies. But it is all too easy a path in a world dominated by the politics of the short term, narrow self-interest and a suspicion of others.

There is another, and very attractive route. If we act together as a world, strongly, collaboratively, creatively, justly, we can create a new era of low-carbon growth and development. It will be more energy-efficient, more energy-secure, more equitable, safer, quieter, cleaner and more bio-diverse. We can create a new definition of, criteria for, and approach to development that will be far more attractive than what has gone before. Further, the transition to low-carbon growth could be the most dynamic and innovative period in world history. On the other hand, high-carbon growth will kill itself: first on high prices for hydro-carbons and second, and more fundamentally, on the very hostile physical environment it would create.

The choice is ours and it is urgent. We can identify the scale of action necessary—the topic of the next section—the areas of action and the necessary technologies. We understand the basic economic policies to encourage the reduction of emissions—the

topic of section 2. The challenge now is creating the political will. We saw in Copenhagen in December 2009 just how difficult that can be. We will not create, or deserve to create, the necessary political will and collaboration, unless we recognise that there are two defining problems of this century: managing climate change and overcoming world poverty. We will succeed or fail on these two together. Creating an international agreement will be the topic of section 3. The sequence of these sections reflects the structure of the course.

Analysis and the making of policy on climate change must start with an examination of the consequences of various forms of action and indeed of inaction. The problem starts with the actions of people in their daily lives and their consequences influence directly the capability of people to live their lives. The chain of causation is the following. Step 1: through their activities, in production and consumption, people cause the emissions of greenhouse gases. The emissions have, for much of the last century or more, been above the level that the planet can absorb via ‘the carbon cycle’. Step 2: the flows therefore result in an increase in the stock or concentrations of greenhouse gases in the atmosphere. Step 3: the increased concentrations of greenhouse gases in the atmosphere imply that more heat radiating from the earth is trapped in the atmosphere and temperature rises. The magnitude of the increase is shaped by the ‘climate sensitivity’. This is global warming. Step 4: global warming causes climate change. This manifests itself in large measure through water in some shape or form: storms and hurricanes; floods and inundations; droughts and desertification; sea-level rise and changing flows and courses of rivers. Step 5: these climate changes have an impact on peoples’ lives and livelihoods to which they will have to adapt in some way or another. In many cases, the impacts will re-define where people can live and thus adaptation, for many, will involve dislocation and migration. ■

The chair receives support from TOTAL.



The inaugural lecture is available from Editions Fayard. The video is available on the Collège de France website.

NEWS OF THE CHAIRS

CLIMATE AND OCEAN EVOLUTION



Professor Édouard Bard

Tahiti's sea level and corals

About a study published in the journal *Science* on 5 March 2010

We are currently studying in detail the variations of the sea level during the last deglaciation which led to a massive rise in global sea levels of about 120 meters. During this period, many other climatic and oceanographic parameters underwent consequential change: a global warming of around 5°C, a rise of approximately 40% in the levels of greenhouse gases (carbon dioxide and methane) in the atmosphere, a fall in wind speeds, a reorganisation of ocean currents, etc.

Our new study focuses on the core of this period (from 14,000 to 9,000 years ago), using the uranium-thorium dating technique on many fossilised corals from Tahiti's barrier reef. During those five millennia the sea level rose by more than 50 m, that is, the equivalent of all of Antarctica's ice today pouring into the ocean. The average pace of rising sea levels was approximately one centimetre every year, which is three times more than is currently measured by satellite.

With an unprecedented number of samples, we have been able to demonstrate that this rate of increase is correlated with global climatic phenomena, notably the succession of warm and cold phases. In particular, we observe a slowing down in the rise of sea-levels during the Younger Dryas cold event and a subsequent acceleration during the Holocene warm period.

These studies have many implications for several domains of climatology, geophysics and other disciplines. The exact chronology of the core of the deglaciation is essential in order to estimate the phase shift between the climate forcing and the variations of the global average temperature and sea level. It is also crucial for estimating the dates at which coastal areas and certain important basins were submerged: creation of the

Bering Strait and of the straits of the Sea of Japan, immersion of the Black Sea and of the Persian Gulf (and the legends associated with the Flood), the closing of the Cosquer cave, etc.

Several authors have established semi-empirical relations between the sea level rise and the global temperature for different time scales ranging from the last century to several millennia. This kind of statistical relation was even used to reassess the IPCC (Intergovernmental Panel on Climate Change) projections for the next centuries. There is however some scientific debate concerning the uncertainties of this kind of approach. Our finding of a correlation between the sea level and temperatures will be used in that context and in real models simulating icecaps.

Our data on Tahiti's sea level will also be integrated into numerical models simulating the glacio-hydro-isostatic postglacial readjustment, which alters the shape of the earth. An ice sheet several kilometres thick creates a depression of the earth's crust of about a kilometre, which leads to movements of mass on a large scale and even to a variation in the moment of inertia of our planet and as such in the length of day. These variations produce a similar effect to that of an ice skater spinning and spreading his or her arms out or drawing them back in.

This geophysical aspect is also crucial for correcting the recent data provided by tide gauges and by altimetry and gravimetry satellites. The parameters of these models are adjusted to correspond to long time series of sea level, notably what we are producing by dating corals. Studies reaching until the middle of the deglaciation are very rare (half a dozen in the world) and the Tahiti record is the only one for the Pacific. ■



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INTELLECTUAL HISTORY OF CHINA



Professor Anne Cheng

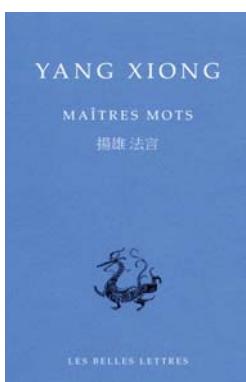
A new Chinese “Budé” collection enters the Belles Lettres

The “Bibliothèque chinoise” (Chinese Library), inaugurated by the Belles Lettres in March 2010, was born from a long-standing dream, that of creating a Chinese equivalent to the famous “Budé” collection of Greek and Latin texts. It was also the result of the meeting that took place in 2007 between two representatives of the Belles Lettres publishing house, its director Caroline Noirot and its coordinator Marie-José d’Hoop, and two sinologists, Anne Cheng who holds the chair of Intellectual history of China at the Collège de France and Marc Kalinowski who teaches ancient and medieval Chinese cultural history at the École Pratique des Hautes Études.

The prime ambition of the “Bibliothèque chinoise” is to bring forward in scholarly French translations a wide range of texts written in classical Chinese in every field of the arts and sciences without any restriction (be it philosophy, history, literature, poetry, political and military treatises, but also medicine, astronomy, mathematics, etc.). The texts will be selected both for their stylistic quality and for their impact on the Chinese cultural world, thus offering the non-specialized readership a direct access to the most representative works of that vast written literature, ranging from the times of Confucius in the 6th–5th centuries B.C. down to the modern era in the early 20th century.

The collection will not be limited to Chinese texts, but will be open to other cultural areas such as Korea, Japan or Vietnam, that have made use of classical Chinese as a language common to literati elites, just as European scholars have used Latin as a *lingua franca* from the Middle Ages down to the Enlightenment period.

Following the model of the Greek and Latin “Budé”, the texts will be presented in a bilingual edition, with the Chinese original facing its French translation, preceded by a detailed introduction and assorted with a substantial critical apparatus (explanatory and philological footnotes, chronologies, glossaries, indexes), not with the aim of showing off pedantic erudition, but of guiding and facilitating the task of the reader.



The two first books of the collection.

This project has already elicited an enthusiastic response from numerous colleagues of all generations, from the masters who trained us to the young researchers who will replace us. It will draw on every competence available and make accessible to the wider audience the wealth and diversity not only of Far Eastern sources, but also of the disciplinary methods enacted to approach them in the French-speaking context (let us not forget that modern European sinology was born with the creation in 1814 of a chair in Chinese and Tartar-Manchu at the Collège de France).

The first two titles of the collection are representative of the Han dynasty which lasted four centuries (from the 2nd century B.C. to the 2nd century A.D.) and established the institutions of the first centralized empire together with the *pax sinica*, parallel to the *pax romana* at the other end of the Eurasian continent. Rendered in Jean Levi’s translation, the *Debate on salt and iron* (*Yantielun*) vividly records the discussions held at the imperial court in 81 BC on state monopolies and the art of rulership. As to the *Fayan* (*Masterly words*) written by the great thinker Yang Xiong (53 BC–18 AD) and translated by Béatrice L’Haridon, it is conceived as a brilliant pastiche of Confucius’s *Analects*. It is worth noting that these two titles were first presented to the public at the Fondation Hugot and benefited from a subsidy granted by the Collège de France which thus manifests its support to an undertaking so obviously faithful to its motto *Docet omnia*: it endeavours to introduce the sources in classical Chinese into the humanities, thereby making them accessible to both students and open-minded spirits and, eventually, extracting them from their supposedly irreducible “otherness”. ■



ANTHROPOLOGY OF NATURE



Professor Philippe Descola

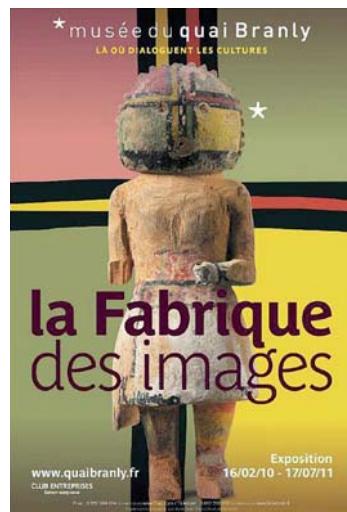
The Making of Images Exhibition at the Musée du quai Branly 16 February 2010 - 11 July 2011 Philippe Descola, curator of the exhibition

The purpose of this exhibition is to present what is not directly apparent in an image, that is, the effects that the creators wished to convey to their intended audience. In some cases, these effects are perceptible through the ages and despite cultural diversity: as long as what they represent is recognisable, images that are either extremely old or come from afar can awaken in us desire, fear, disgust, pity, amusement or even, quite simply, curiosity. Most often these effects are overlooked, however, as the conventions guiding their representation are unfamiliar to the 21st century museum-goer whose perception has been shaped, mostly, by the traditions of Western art.

The hypothesis underlying this exhibition is that the representation of such effects relates to four major figurative strategies. These correspond to four ways of rendering evident in these images a particular set of qualities associated with the objects of the world. Traditionally known as ‘ontologies’, these specific sets of qualities serve the purpose of identifying different groups of beings distinguished from one another by differences in their common characteristics. However, not all cultures have the same ontology. For example, sheep, cars or transgenic soya beans are not legal entities in Europe and in the United States (they are not represented in parliament, do not have any inalienable rights, cannot be taken to court, etc.) because they are considered to be utterly different from human beings. On the other hand, in other regions of the world it is considered normal to ask of a hunted animal not to seek revenge (Amazonia) or to whip a mountain to punish it for its misbehaviour (Mongolia).

There are four main ontologies in the world, so four different ways of perceiving the continuity and discontinuity that exist between things.

In our own ontology—the naturalist ontology that has prevailed in the West since the classical era—humans are distinguished from all other beings and things because they are believed to be the only ones to have



an interiority (a mind, soul and subjectivity), even though they share with non-humans certain material characteristics (the physical-chemical processes of their bodies).

In the tradition of animist ontology (in the Amazon, the northern parts of North America, certain parts of South-east Asia and of Melanesia), the opposite is true: many animals, plants and objects are thought to have an interior depth similar to that of human beings, while differences between one another arise from differences in the physical form.

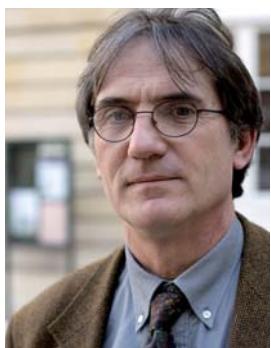
In the totemic ontology (found amongst Australian Aborigines for example), certain humans and non-humans within a particular class share the same physical and moral qualities that arise from a prototype, while still differing from other similar classes.

Finally, in analogist ontologies, all the inhabitants of the world—and this includes their elementary components—are said to be different from one another, which explains why we seek corresponding links between them (China, Europe during the Renaissance, western Africa, the Andes, Mesoamerica, etc.). The aim of this exhibition is to convey how each of these four ontologies is able to represent, in other words to highlight and activate in these images, the kinds of entities that they focus on in the world, the relations that these entities establish between one another, and the properties that are associated with them. ■



Acrylic painting
“Dream of the two Men”
© Musée du quai Branly,
photo Thierry Ollivier, Michel Urtado.

CHEMISTRY OF BIOLOGICAL PROCESSES

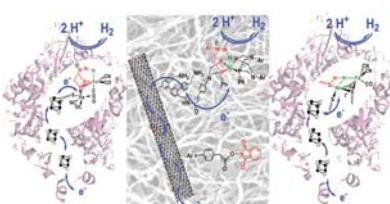


Professor Marc Fontecave

Bioinspired chemistry and nanosciences: towards new catalysts for production and oxidation of hydrogen

There is no doubt that the most abundant renewable energy source, far superior to the potential contributions of wind energy, geothermal energy or hydroelectric power, is solar energy. A way to exploit this energy is to convert it into chemical energy, to store it in the form of a chemical fuel, hydrogen for example. Hydrogen is a very attractive alternative to oil, because of the large amount of energy it releases during its oxidation (fuel cells) and because the only by-product of this oxidation is water.

The conversion of solar energy into fuel is in fact carried out wonderfully by the living world, which continuously uses the sun to transform water and carbon dioxide into molecules with a high energy value, found in biomass. Certain living organisms, like micro-algae or cyanobacteria, even have the capacity to carry out simple water photolysis. They use solar energy to transform water into oxygen and hydrogen. Because water does not absorb the sun's photons and because the processes used in this photolysis are complex multi-electronic processes, microorganisms achieve this amazing feat thanks to the incredibly sophisticated and efficient enzymatic systems they possess for collecting these photons, converting the light absorption into chemical energy and catalysing the electron transfer reactions, namely the photosystem for the oxidation of water into oxygen and the hydrogenases for the reduction of water into hydrogen. What is remarkable is that these systems use abundant metals like manganese, nickel and iron for catalysis while today water electrolysis devices or fuel cells function exclusively with noble metals, like platinum, which are expensive and not very abundant in the earth's crust. We often forget to point out that a hydrogen economy has no future if we do not resolve these major catalysis issues.



In the centre a nickel complex, grafted at the surface of a carbon nanotube, reproduces some characteristics of Ni-Fe (left) and Fe-Fe (right) hydrogenases and catalyses the proton-hydrogen interconversion, like platinum.

These enzymes are, for the chemists, a fascinating source of inspiration and it is within our reach to "copy" them and invent new catalysts displaying some of the remarkable structural and functional properties of the enzyme active sites. This unique approach is called bio-inspired chemistry. It has been developed with great success in the Laboratoire de Chimie et biologie des métaux (CEA-CNRS-Université J. Fourier, CEA Grenoble), in collaboration with a group of the Laboratoire de Chimie des surfaces et interfaces (CEA Saclay) and a group of the Laboratoire d'Innovation pour les technologies des énergies nouvelles et les nanomatériaux (CEA Grenoble). By combining the bioinspired chemistry approach and nanosciences, we were able to design an original material capable, in electrochemical devices, to catalyze, like platinum, both the production of hydrogen from water (for use in electrolyzers) and its oxidation (for use in fuel cells). This material is based on a small nickel complex, sharing some structural characteristics with the active site of hydrogenases, which has been grafted on carbon nanotubes, selected for their great potential bonding surface and for their remarkable electrical conductivity. Adsorbed on an electrode, these functionalized nanotubes are very stable and efficient catalysts, working without overpotential, in acidic medium, and thus compatible with the proton exchange membrane technology extensively used in fuel cells. Even though the achieved current densities are still too small, but improvable, this type of electrode material might open new possibilities for the development of the future hydrogen economy. ■

Professor Marc Fontecave, Vincent Artero

Référence: *From hydrogenases to noblemetal-free catalytic nanomaterial for H₂ production and uptake*, Le Goff A., Artero V., Jousselme B., Tran P. D., Guillet N., Métayé R., Fihri A., Palacin S., Fontecave M., (2009), *Science*, 326, p. 1384–1387.

NATIONAL ANTIQUITIES



Professor Christian Goudineau

Post mortem

Funeral rites in Lugdunum,
An exhibition at the Gallo-Roman Museum
in Lyon

27 November 2009–30 May 2010

Professor Christian Goudineau, high
commissioner for the exhibition.

Professor Christian Goudineau has been given responsibility for planning an exhibition organized at the Lyon-Fourvière Gallo-Roman museum and entitled "Funeral Rites in Lugdunum". It was accompanied by a book, a visitor's booklet and several audio-visual documents.

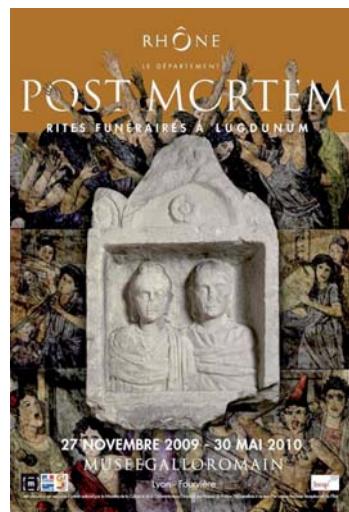
Not only has the city of Lyon, thanks to the persistent efforts of scholars and antiquarians, preserved many remarkable monuments, such as mausoleums, steles, and large inscribed altars, but in the last twenty years, before major urban development work could be authorized, a number of archeological digs were set up, and they have brought to light thousands of tombs of the Roman period. It was therefore possible to present the results of recent research together with older discoveries.

Thanks to a lavish use of space and resources, seldom found in an archeological museum, we have opted for a reconstitution of the complete procedure



The funeral pyre, with the deceased and the offerings.
In the background, reproduction of a mausoleum.

Next to the pyre, a table for the frugal banquet which accompanies the cremation.
In the background, on the left, an oven.



The book published for the exhibition.

from death to burial. The deceased belonged to the Roman colony's high society. He was an important merchant and a member of the municipal government. In the atrium of his house we have staged the funeral wake, with the ceremonial couch, lights, floral decoration and relatives in attendance. Then a series of life-size panels painted by Jean-Claude Golvin, research director at the CNRS, picture the procession which accompanies the hearse to the necropolis.

Coming after jugglers, mime artists, musicians, professional mourning women, the hearse was followed by the

family, the local officials, the “clients” and associates.

The funeral pyre stood at the entrance to the necropolis. It was adorned with drapes, flowers, all sorts of offerings, especially of food, and beside it was a table set for the banquet, with an oven to warm up or cook some of the food. After that display, the visitor sees what is left of the pyre after the fire has gone out. He is told how the remains of the bones and the burnt-out offerings are now sorted and transferred to a lead, glass or ceramic urn which will be placed in the definitive tomb and again surrounded by new offerings. The form of that tomb will depend on the social standing of the deceased: on top of it would be a simple mark, an altar, an inscribed stele which may weigh several tons, and possibly a sumptuous mausoleum.

It has been our intention that the visitor would feel he is walking through a necropolis of the second century A. D. Cremation is practically the only rite. Burial is only for new-born babies and for a few families observing their own time-honoured tradition. The number of burials will increase gradually from the end of the second century, to become the most frequent rite in the third century.

This is not due to Christianity, but because, from the time of Antoninus, the imperial family spread this new fashion. Some remarkable finds include tombs with shelves for placing offerings, burial places for dogs and conduits for libations to the dead, which prove that ceremonies in memory of the dead were taking place regularly.

The last section of the exhibition presents the scientific evidence which supports the reconstructions, together with some exceptional finds such as those of Martres-de-Veyre, near Clermont-Ferrand, with a coffin in perfect condition, the hair and the clothes of a dead woman.

Audio-visual presentations explain the archeological methods, the anthropological analyses and the study of the material. A documentary film presents the practice of cremation in India today and another summarises all the data. Sarah Rey, research fellow seconded to the department, has collected the most relevant texts about funeral rites in classical antiquity. ■

Picture credits: gallo-romain museum, Lyon-Fourvière.



Infant buried in a vase.



Funeral altar bearing a greeting to the passer-by in Greek on the top belt-course: "Hail and good health".



Offerings placed in the tomb: a representation of Venus in white clay.



Funeral furnishings (personal belongings): golden *bulla*, ring and pendant, wooden comb and shoes.

GUEST LECTURERS

Arthur GOLDHAMMER

Professor at Harvard University (United States)
invited by the Assembly of the Professors
on the proposition of Professor Pierre Rosanvallon.
He gave in May 2010 one lecture entitled:
Democracy in American: conditions and conflicts in Tocqueville.



Our starting point is a reflection on two Tocquievillian phrases that are easy to translate but come up against cultural obstacles to their full understanding: the ‘equality of conditions’ and ‘the greatest number’ which, for Tocqueville, sometimes meant ‘the majority’ but sometimes also ‘the people’ as opposed to ‘the elite’. Here we catch Tocqueville red-handed: he freely uses ‘these abstract terms which abound in democratic languages, and which are used on every occasion without attaching them to any particular fact, enlarge and obscure the thoughts they are intended to convey; they render the mode of speech more succinct and the idea contained in it less clear’.

The translator is fully aware that the apparent simplicity of these expressions can indeed ‘blur thinking’. In fact, they are the source of what we take to be a blind spot in Tocqueville’s thinking. The problem is however that these expressions are actually less abstract than they seem to be. They are linked to particular facts, but surreptitiously, so to speak, and unknown to Tocqueville himself. Moreover, these particular facts concern non-democratic societies. This confusion in Tocqueville’s mind prevented him from seeing in democratic society what he clearly discerned in the society of orders that preceded it, i.e. the roots of social discord and the use that power made of it.

The institutions and orders of the Ancien Régime served as a foundation for an edifice of ambitions, desires and rivalries that spawned discord in many respects. Tocqueville endeavoured to analyse the mechanisms of this discord in detail and to explain how the royal powers used it. But when he turned to democratic society, he saw nothing but an undifferentiated mass: ‘the greatest numbers’ was nothing but ‘dust’, as he put it. It was consequently difficult for him to reflect on real political conflict or even to grant an appropriate place to those parties that were becoming both its symbols and its agents.

This shortcoming in Tocqueville’s sociology of democracy is found in other thinkers of the ‘egalitarian liberal’ tradition, notably American philosopher John Rawls. It therefore seems that the blind spot of liberal political philosophy is the origin both of social discord and of the power that takes advantage of it. Finally, a concrete example from US history shows us that the real root of social discord in democracy is not the contradiction between equality in principle and actual inequality, which is impregnable, but rather the appearance of what we call the feeling of inequity within a balance that may have seemed temporarily equitable. But this feeling is neither stable nor objective. It depends on norms which evolve over time, and we see how the introduction of new norms

of equity becomes the main driver of democratic political life. ■

Thierry MEYNARD

Associate Professor at the Sun Yat-Sen University (Canton, China)
invited by the Assembly of the Professors
on the proposition of Professor Anne Cheng.
He gave in February 2010 one lecture entitled:
Confucius Sinarum Philosophus,
The first translation of the *Analects* in Europe.



The publication in Paris of *Confucius, Philosopher of the Chinese* (*Confucius Sinarum Philosophus*, 1687) marked the beginning of European sinology. This work, which may truly be called an encyclopedia of Chinese thought, was the result of one hundred years of collective efforts by Jesuit missionaries in China. Notably, it presented the *Analects* of Confucius, translated into Latin and presented with commentaries from the Song and Ming dynasties, in Europe for the first time. The book spread the name of Confucius, a Latin transliteration of Master Kong, throughout Europe. It subsequently had a great influence on intellectuals such as Pierre Bayle, Malebranche, Leibniz, and Voltaire, imposing upon them the image of a philosophical China—an image which remained until the beginning of the nineteenth century.

First, we examined earlier translations of Confucian texts into Western languages, such as the *Sapientia Sinica* (1662) and the *Sinarum Scientia Politico-moralis* (1668–1669). These translations were initially used as manuals for teaching language and culture, then as documentary evidence in support of the missionary policy of inculcation. The decision to provide literal, word for word, translations allowed Jesuits to remain close to the original meaning of the texts, even if there were, at times, some inflections in those meanings.

We then examined the editorial decision to present the classical text

together with its interlinear commentaries in the *Sinarum Philosophus*. We showed that this method of combining a classical text with its commentaries was supported by a long hermeneutical tradition in China. We asked how this method was different from the way in which the Classics were read in Europe, and what kind of relationship it may have produced with the text.

Moving from form to content, we analyzed the image of Confucius as found in the translation, and compared it with that found in the classical text and its Chinese commentaries. In particular, we raised the following question: is the presentation of Confucius as a philosopher grounded in the classical text, or is it a pure construction, deprived of any basis? At the same time, Confucius is qualified as holy (*sanctus*) in the translation. How may we understand the meaning of this denomination, related both to the Chinese interpretative tradition and to Christian dogma?

Continuing our comparison of the Latin translation with the Chinese texts, we then investigated its presentation of certain core Confucian ideas. For example, the cardinal virtue of *Ren* is essentially described from the perspective of its Neo-Confucian universalistic interpretation, suggesting a correspondence with Christian charity. Similarly, the interpretation of the notion of will, central to the Confucian project of moral transformation, suggests strong similarities with the theme, both Stoic and Christian, of victory over the self.

Finally, the conception of political power found in the translation, even if rooted in the imperial order of the Ming dynasty, can also be read according to the political ideals of the Jesuits. In the three areas of morality, transformation of the self and politics, this translation of the *Analects* shows Confucius to be a potent and emblematic figure, who enabled a dialogue between Neo-Confucianism and Classical European thought to take place. This was the first attempt to provide this dialogue with a philosophical foundation, and was made possible by the identification of the Neo-Confucian *li* (or principle of coherence) with the European *ratio*. ■

Lawrence WARD

Professor at British Columbia University (Vancouver, Canada)
invited by the Assembly of the Professors
on the proposition of Profs Alain Berthoz and Stanislas Dehaene.
He gave in May 2010 four lectures entitled:
Cognition, attention, and consciousness: Synchrony in mind.



1. Neural synchronization and cognition

Arguably the preeminent task of cognitive neuroscience is to explain how the brain implements cognitive processes such as perception, attention, memory, decision-making, and consciousness. It is becoming commonplace to propose that such cognitive processes are implemented through the activity of networks of functionally specialized brain regions, forming and dissolving on a time scale of tens to hundreds of milliseconds. In this first lecture I will review some of the current knowledge about one mechanism that is likely to be deeply involved in forming and dissolving these networks, and in the communication within them: neural synchronization. Neural synchronization refers to the idea that oscillations of activity, within a particular narrow band of frequencies, of one group of neurons can become transiently phase-locked with that in another group of neurons. Such transient phase locking can play a number of roles, including facilitating communication of information between the neural groups and even performing computational functions. Modulations of theta (4–7 Hz), alpha (8–15 Hz), and gamma (30–50 Hz) synchronization in the EEG and MEG, both within and between brain regions, have all been shown to be associated with cognitive function, including perception, memory, attention, and consciousness. I will review a few of the most important of these results, and then discuss in detail one such

result from my own laboratory involving detection of changes in the ongoing stimulus environment.

2. Neural synchronization and attention

The brain networks involved in orienting spatial attention have been elucidated to some extent. Just how these networks accomplish orienting, however, is still under investigation. It is proposed that neural synchronization plays an important role in the organization and function of these networks. I will describe some recent results from my laboratory that begin to describe the temporal dynamics within the dorsal network of brain regions that orients voluntary attention. Presentation of a cue as to where in space a target stimulus will occur begins a cascade of processes that involves synchronization of frontal and parietal regions with each other, and of parietal regions with sensory cortex, as well as changes in synchronization within those areas. Several of these changes happen regardless of target modality except for the substitution of the relevant sensory region. In particular, in visual orienting, a lateralized increase in synchronization in the gamma band occurs transiently around 250–300 ms after cue onset, and an increase in alpha band synchronization begins around that time and continues until target onset. Moreover, local alpha-band synchronization increases in occipital cortex ipsilateral to the target location and decreases contralateral to it, indicating that local and long-distance synchronization play

different, complementary, roles in this task. Finally, I will present preliminary evidence from auditory attention orienting that theta synchronization maintains orienting networks whereas gamma synchronization indexes communication within them, based on within- and across-frequency coupling analyses.

3. Neural synchronization and consciousness

Consciousness has been proposed to emerge from functionally integrated large-scale ensembles of gamma-synchronous neural populations that form and dissolve at a frequency in the theta band. I will discuss the proposal that discrete moments of perceptual experience are implemented by transient gamma-band synchronization of relevant cortical regions, and that disintegration and reintegration of these assemblies is time-locked to ongoing theta oscillations. In support of this hypothesis I will provide evidence that (1) perceptual switching during binocular rivalry is time-locked to gamma-band synchronizations that recur at a theta rate, indicating that the onset of new conscious percepts coincides with the emergence of a new gamma-synchronous assembly that is locked to an ongoing theta rhythm; (2) localization of the generators of these gamma rhythms reveals recurrent prefrontal and parietal sources; (3) theta modulation of gamma-band synchronization is observed

between and within the activated brain regions. These results suggest that ongoing theta-modulated-gamma synchronization mechanisms periodically reintegrate a large-scale prefrontal-parietal network critical for perceptual experience. Moreover, activation and network inclusion of inferior temporal cortex and motor cortex uniquely occurs on the cycle immediately preceding a response signaling perceptual switching. This suggests that the essential prefrontal-parietal oscillatory network is expanded to include additional cortical regions relevant to tasks and perceptions furnishing consciousness at that moment, in this case image processing and response initiation.

4. The role of the thalamus in human consciousness

Currently human consciousness is considered to arise from activity in the neocortex or in thalamocortical loops. A compelling case can be made, however, that some subcortical areas, in particular the diencephalon, are also critical. I will describe a theory in which phenomenal consciousness depends on synchronous neural activity in the dorsal thalamus, a major component of the diencephalon. The theory of the thalamic dynamic core depends on four empirical pillars: anatomy and physiology of the brain, particularly of the dorsal thalamus and associated cortical areas; brain lesion and anesthetic studies; studies of neural synchronization, particularly in binocular rivalry; and results from the experimental psychology of cognition, in particular that we experience results of cortical computations and not the processes that produce them. The four empirical pillars support the idea that the neocortex computes potential contents of consciousness, and competitive laterally-inhibitory

activity in the nucleus reticularis of the thalamus selects some of these potential contents to include in a thalamic dynamic core of synchronous (and thus integrated) neural activity that gives rise to phenomenal experience of those contents. Destruction of the thalamus thus abolishes conscious experience itself, whereas destruction of a particular cortical area abolishes only the experience of contents computed by that area. The implications of this theory, and others that implicate critical roles for subcortical areas of the brain in consciousness, for the concept of brain death are significant. In particular, the theory agrees with positions such as that of Shewmon that absence of cortex or cortical activity does not mean absence of consciousness. If permanent lack of consciousness is a criterion for “death,” then both neocortex and diencephalon must be shown to be non-functional for the criterion to be satisfied. ■

PRIZES AND DISTINCTIONS



IAN HACKING HOLBERG PRIZE AWARD 2009

His Royal Highness the Princess Mette-Marit presents the Holberg Prize 2009 to Professor Ian Hacking (Bergen, Norvège)
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Ian Hacking, holder of the chair of Philosophy and History of Scientific Concepts at the Collège de France (2000–2006), was awarded the Ludwig Holberg Memorial Prize in Bergen, Norway, on 25 November. There are three parts to the Holberg prizes. The Holberg Prize School Project is a research competition for pupils in upper secondary schools. The Nils Klim Prize is awarded to young Nordic researchers under 35 years within the academic fields of the Holberg Prize. The Holberg International Memorial Prize is awarded annually for outstanding scholarly work in the fields of the arts and humanities, social sciences, law and theology. The prize amount is NOK 4.5 million.

Words of acceptance Holberg Prize Awards Ceremony, 25th November 2009 Ian Hacking

Your Royal Highness, Officers of the Ludwig Holberg Memorial Fund, and Guests:

It has been the custom in past years for the winner of the Holberg Prize to express, in a few words, thanks and respectful comments on the Prize, the organizers, and Baron Holberg. This year I have been asked for a slightly longer talk on some theme of current work and/or scientific research.

But I cannot omit the thanks. I would like to speak for the entire triad of

prizes. The most important is the most junior: the research competition for senior students in secondary schools. Those who have competed, and the three who have won, are the future. It was a brilliant idea to include young people in the structure of the Holberg Prize. Next most important is the Nils Klim prize for young Nordic researchers. These are the nearer future. Such a prize can make a real contribution to the winner, both financially and in terms of international recognition. The least important is the senior award, for no matter how active we old men and women continue to be, we have done most of our life's work.

I am of course grateful for the largesse, but sad too. I got a serious 15 minutes of fame which I would not have had without a large cash award. I best liked the headline in the conservative London newspaper, *The Daily Telegraph*, “Canadian Philosopher wins 500,000 Euros and Buys New Sheets.” It is a shame that there cannot be extended public recognition for a humanist unless there is a lot of money involved. Money is not to be despised, however. Like many other winners of large prizes, my wife and I will give quite a lot of it away. We were struck that our own choice of beneficiaries, aside from contributions to educational institutions, is remarkably similar to those listed for the *Crown Prince and Crown Princess's Humanitarian Fund*.

Now for a theme of current research. The best three-sentence summary of my life, intellectual and other, is ‘I am curious’, not meaning, but not altogether excluding, the sense of the famous 1967/8 Swedish soft porn films *I am Curious (Yellow)* and *I am Curious (Blue)*. My curiosity gets me into a lot of trouble, not the least of which is that I follow up more different types of topic than I have time and energy to devote to them.

The Holberg Symposium yesterday was about social questions, and in particular, my ideas about making up people and the ‘looping effects’ of classification. But the issue I find most pressing right now is curiosity about curiosity itself.

There is a wonderful children’s story, called *ME!*, by the American Marxist novelist, William Saroyan. In the beginning, there was only one word, ‘me’, and people went around saying ‘me me me’ and nothing else. But then they discovered ‘you’. If there could be two, there could be more, ‘yes’ and ‘no’, ‘green’ and ‘blue’. And then, Saroyan tells us, people started finding out. On the last page of this beautiful book: ‘They are still finding out.’ Yes we are.

The fable teaches this: We had to find out how to find out. That is a series of cultural discoveries in historical time. But it is not only the history of civilizations. People had to have various sorts of latent abilities that

they learned how to use. Finding out how to find out is an intricate interplay between innate faculties and human history. It has had more impact on our planet than anything else we have done.

We have found out how to do innumerable things, how to sculpt the human body in marble, how to paint it in oils, and we are finding out how to modify its genome. We not only find out how to do, but also what is true. We have found out endless facts in love and, alas, in war, but it is finding out in the sciences that has made our species dominant. Perhaps too dominant. A philosophical anthropology of the sciences is an inquiry into those aspects of human nature that have changed the face of the earth and all that dwells thereon.

All finding out is particular, but there are a few broad lines to draw. I call them styles of scientific thinking. I adapted the label from an Australian historian of the sciences, the late Alistair Crombie. I turn his historical anthropology of scientific reason into a philosophical anthropology

Crombie distinguished some six fundamentally different methods of argument that have evolved in what he called ‘The European Tradition’, but which have become part of the human heritage, and whose epicenter today might well be the brand new metropolis of Shenzhen in the south of China, adjacent to Hong Kong. Or is it Bangalore in India? But the originating cultural history of what we call the sciences evolved in the Mediterranean and then in Europe.

The first style to flourish, as Kant well saw, was mathematics. He had a magical passage in the second edition of his *Critique of Pure Reason*, where he speaks of a *revolution*: ‘A new light flashed upon the mind of the first man (be he Thales or some other) who demonstrated the properties of the isosceles triangle.’ Of course it is not a single man but a tiny community, and

we would now say Eudoxus rather than Thales, but in the course of about eighty years a small group of eccentrics discovered mathematical demonstration, an entirely new way to find out. And we have gone on finding out: Proof ideas and techniques of proof continue to be an evolving part of social history.

Crombie’s next two styles of scientific thinking are, using his labels, (1) hypothetical modelling of the world, an ancient technique that crystallized with Galileo, and (2) experimental exploration, even more antique and universal. The really decisive conceptual step, which enabled the so-called scientific revolution to take off in 17th century Europe, was the merging of both into the laboratory style. Once again, Kant spoke of ‘the sudden outcome of an intellectual revolution’. He singled out Galileo on the one hand and Torricelli on the other. Theory and exploration had to combine in order to change the world. I use Robert Boyle and his Air Pump as an emblem of a new crystallization into the laboratory style. At its core is the building of apparatus not only to probe the world but also to create new phenomena. Crombie has three more styles, of which I shall mention only the fourth, the taxonomic style, found in all cultures, but crystallizing in the work of Linnaeus.

It is the philosophical twists that intrigue me. I start with an erudite version of popular history of the sciences, but canonical historical events get new meanings. There must also be a cognitive side to the story, although at the moment it is more *a priori* than empirical. One school of cognitive science uses a modular approach. It holds, for example, that there is a universal structure to the ways in which human beings the world over classify living things. The taxonomic style of thinking builds on that. In truth I am not much of a modularist, but one can see each style of thinking as deploying a specific group of human abilities that have to

be uncovered and cultivated. When ‘a new light flashed’ on Thales, Eudoxus, and their colleagues, something in the human mind clicked, the realization of a potential already there. Within a very few years there was a prodigious upwelling of geometrical creativity. The Israeli historian of mathematics, Reviel Netz, has made a marvellous start on that ‘cognitive history’, as he calls it. But let us not overemphasize cognition. The laboratory style demands not only cognitive skills of modelling and exploration, but also finding out how to do things with the human body, hands and eye. It is an embodied art.

A more purely philosophical twist has to do with truth itself. The styles of thinking are not ways of finding out truths that are just there, waiting to be discovered. The styles are self-authenticating, in that they generate new criteria for what is true. This is not some kind of relativism; it is an explanation of where our sense of objectivity comes from. It may sound like wild historicism, but it is close to the verification principle of the Vienna Circle positivists.

I shall stop there, at a tantalizing beginning. We are now in the heartland of philosophy. We are in Kant-land, yes, but I see it as the home of the philosopher of the modern epoch who had the greatest curiosity, namely Leibniz. He is my role model, curious about everything, including curiosity itself. I am encouraged by the Holberg prize to carry on with these reflections on scientific reason, and perhaps to bring them to fruition in the nearish future. So once again, I express my thanks. ■

Ian Hacking’s last *cours*, in 2005, about scientific reason (2006) is available online at www.college-de-france.fr



SERGE HAROCHE CNRS GOLD METAL 2009

quantum laws and for demonstrating quantum logic operations that held promise for quantum information processing.

Serge Haroche started to do research in 1965, when atomic physics and quantum optics were undergoing profound change following the discovery of lasers and the development of new methods of manipulating atoms by means of light. He is a pioneer in the field of quantum optics, observing atom-light interaction at the most basic level. His research enabled him to isolate an atom in a cavity with almost ideally reflective walls, and to force it to interact with an elementary field consisting of a few photons at the most.

phases at the same time. The researchers have monitored the temporal evolution of this field and have been able to observe the disappearance of the quantum superposition state, which rapidly turned into a state described by the laws of classical physics. By experimentally studying this phenomenon called ‘decoherence’, they have furthered understanding of why macroscopic systems can generally be understood with classical concepts, even though they are made up of particles which, on microscopic scales, obey the counter-intuitive laws of quantum theory.

Apart from these fundamental implications, these manipulations of photons and atoms are used to create prototypes which demonstrate general methods of information storage and quantum calculation. Whereas in normal computers and communication circuits, information is coded in electrical or light signals in the form of classical ‘bits’ with two mutually-exclusive values, 0 and 1, quantum information proposes the use of ‘quantum bits’ or ‘qubits’ carried by quantum systems that can exist in a superposition of 0 and 1 states. The principle of superposition thus considerably enhances the possibilities of calculation and communication. Theoreticians have shown that machines making use of such qubits would be able to perform certain calculations far more swiftly than current computers. They would also make it impossible to violate the privacy of information transfers, in contrast with current methods based on classical cryptographic protocols, which have not proved to be absolutely secure. Serge Haroche’s cavity quantum electrodynamics experiments are making a major contribution to the development of this new physics. ■

(source: CNRS)



Serge Haroche, Loïc de La Mornay (journalist) and Arnold Migus (Director of the CNRS) at the ceremony for the presentation of the Gold Medal at the Sorbonne, 16 December 2009.

Serge Haroche is a specialist in atomic physics and quantum optics. In the 1970s–80s, after completing his PhD on dressed atoms under the supervision of Claude Cohen-Tannoudji (1967–71), he developed new laser spectroscopy methods based on his research on quantum beats and superradiance. His interest then turned to Rydberg atoms, giant atomic states sensitive to microwaves and therefore suited to fundamental research on matter-radiation interaction. He showed that these atoms, coupled with superconducting cavities containing a few photons, were ideal systems for testing basic

Serge Haroche’s work made it possible to study and demonstrate experimentally a number of postulates in quantum mechanics that defy intuition. His results contributed to explaining the difference in behaviour between the quantum world and the classical macroscopic world. His experiments also made it possible to study the history of a single photon in an electromagnetic cavity by ‘seeing’ it several hundred times, and have shown its sudden and unpredictable disappearance in what is called a quantum jump. For the first time it was shown that it is not necessary to destroy a single photon in order to observe it.

Serge Haroche and his team illustrated the ‘Schrödinger’s cat’ paradox, which refers to a thought experiment in which a macroscopic system placed in contact with a single atom is put in a superposition of two classically different states. In the experiment carried out by the ENS team, an atom prepared in two superposed energy states is coupled in a cavity to a microwave field containing several photons. Under the effect of this coupling, the field is put into a state of quantum superposition, acquiring two

DARWIN'S BICENTENARY

COLLÈGE DE FRANCE AUTUMN SYMPOSIUM

15 AND 16 OCTOBER 2009

Variations on a human theme

Alain Prochiantz

2009 can unquestionably be called Darwin Year since we celebrated both the 200th anniversary of the naturalist's birth and the 150th anniversary of the publication of *On the Origin of Species*. To some extent, this has contributed to eclipsing another great evolutionist, Jean-Baptiste Lamarck, who published *La Philosophie zoologique* in the year of Darwin's birth. Lamarck ended his life blind; his daughter would lead him to the amphitheatre where he gave lectures to a few loyal followers, including Etienne Geoffroy Saint-Hilaire. He was called Lamarck the Red by Napoleon and by the English Tories who had little interest in importing the French Revolution and the latest decapitation technologies. We wish to take this opportunity to salute a scholar who is never far away when we talk about evolution and whose work is gradually being rediscovered through the new importance granted to epigenetics.

In spite of its sometimes pompous—or jingoistic—aspects, which may bring a smile to some faces, the celebration of great men reminds us above all that *homo sapiens* is attached to his history. If I'm not mistaken—and the ethologists will correct me here if I am—other animals do not have this type of cultural practice; not even chimpanzees, who are our closest cousins, or so the ethologists say. Had I chosen to present a paper at the opening symposium, it would probably have been to deflate the myth of a 1.23% difference between the genomes of *homo sapiens* and those of *pan troglodytes* (or *paniscus*), and to point out that while the chimpanzee is indeed the human being's closest cousin, saying that humans are 98.77% chimpanzee (or 80% mouse) is meaningless.

This unique nature of *sapiens*, this attachment to a history or histories, to cultures, is particularly relevant when we talk of Darwin. He constantly humiliated *sapiens* by reminding him of his humble origins, and questioned the strangeness of a species which might have inherited mental faculties—and therefore also psychological and moral ones—from its evolving history, but which had pushed them to such an extreme that it could be referred to as a tragic animal. It was biological hominization, an evolving process, that led to the cultural possibilities of humanization.

The symposium left little room for 'pure' biology. After so many gatherings of various kinds devoted to the event, it seemed there was nothing left to add. Yet, despite its limitations, that small space did make it possible to give an idea of the current state of a theory which is itself evolving. The least one can expect from a living theory is that it evolves; even if that indicates a degree of imperfection, or rather incompleteness, which serves as an angle of attack for the creationists who, on the contrary, have a perfect theory—or so they think. Dogmas don't evolve; they are dead and—often—deadly. Moreover, the creationists have reason to hate Darwin, an atheist scholar for whom evolution had neither an end nor a goal, and for whom the great book of nature was not written by a divine being in mathematical terms. The history of this departure from a Galilean conception of nature remains to be written; just as its effects on the very nature of science is still to be analysed. But that is another issue; perhaps the topic of a future symposium.

Stimulated by the diversity of the fields of knowledge present at the Collège de



Professor Alain Prochiantz

France, we have given pride of place to the question of man—or rather, of humans, Françoise Héritier would say, correcting me. In this respect we have followed Darwin, whose *The Descent of Man* is a long series of thoughts not only on the evolution of humans but also on humans as social animals. This reflection encompasses hominization, our evolving history, and humanization as a construction of societies and of the evidently contingent rules that govern our ways of living together. It is moreover interesting to note that Darwinism itself was influenced by the social question—Malthus—and influenced it—social Darwinism. Humanization is also the invention of cultures that enable us to recount histories and to endeavour to give meaning to, or find meaning in, the fleeting moment that any organic life is.

And even if our mortal destiny is ensured (dare I say) at an individual level, and perhaps even at the level of the species or of all life on earth, there was a firm intention in the opening symposium not to overlook the future evolution of human beings. Some talk of post-human; I prefer simply talking of a technical evolution, because even if *sapiens* are still evolving biologically, they are animals whose destiny is above all technical-tools being the extension not only of their arms but also, above all, of their brains. Without

tools, which may also be our future downfall, our few thousand African ancestors would not have close to seven billion descendants now, occupying virtually the entire surface of the earth, not to mention the moon. In this respect, the post-human seems essentially human.

Indeed, tools are the extension of our brains, exceptional human brains that have reached a point of organic development bearing no comparison with that of our chimpanzee relatives. By opening the field of human cultures—of which techniques are

part—this cerebral hominization projected *homo sapiens* outside of nature (I dare not mention a clearing). The Darwin Bicentenary symposium was therefore an opportunity to explore this highly topical subject of the future of humans, that is, the future of human cultures in all their dimensions, through all the fields of knowledge, both present and yet to be invented.

By looking back at those two days of talks, it seems obvious that the speakers played the game, that we learned a great deal, and that

questions were raised which enabled us to further reflect on the subject. This letter to commemorate the commemoration is above all a note of gratitude extended to all those who, during those two days, shared their knowledge with us and enabled us to learn and to discuss their subjects. I also wish to thank the attentive and cultured audiences. Everyone is now looking forward to reading the various contributions which will be published in a collective volume. Such is our custom. ■

The acts of this colloquium are published under the title *Darwin: 200 ans*, Paris, Odile Jacob, 2010. Below is a summary of Professor Delmas-Marty's conference (published in the newspaper *Liberation*, 19 November, 2009), followed by a summary of Professor Jean-Pierre Changeux's conference.

Hominization and Humanization

Mireille Delmas-Marty

While biological evolution is the result of transformations creating a single human species (hominization), social and cultural evolution, which occurred later, is the result of cultural diversification and the emergence of a normativity proper to each human group (humanization). The tension between these two processes, which are studied separately, is not obvious because they share neither the same timescale (millions of years for the former and thousands of years for the latter) nor the same values (survival of the species/promotion of each human being's dignity).

But Darwin himself noted that the social and moral faculties limited the effect of natural selection on human beings. And we are entering a phase in which scientific knowledge enables us to change reproductive methods and/or the characteristics of the human species—even to manufacture hybrids, whether human/animal or human/machine. By diversifying the human species, humanization may therefore end up modifying the course of hominization. Paradoxically, the process of universalizing ethical norms made it clear that a convention was necessary to recall that cultural diversity

is part of the common heritage of humanity (UNESCO, 2005), as if humanization tended to eliminate differences and unify cultures.

It is therefore necessary to link the two processes. Jean-Pierre Changeux explained that epigenetic variability (which is particularly strong in humans) fosters creativity, and thus humanization; and Stanislas Dehaene showed how “neuronal recycling,” which prolongs hominization, contributes to culture and thus to humanization. Law contributes to making this link in several ways.

Law Reveals Tensions

The right to life clearly benefits the species, and thus hominization: the prohibition on killing seems quasi-universal (as are its exceptions, such as war or self-defense). There is disagreement as to the death penalty, however, and more broadly on life's beginning and end (abortion and euthanasia). Hannah Arendt emphasized that birth and death “are not natural occurrences, properly speaking”: human life seems limited by a beginning and an end, while nature, non-human life, follows a cyclical movement with no birth or death as these words are generally understood. If the forms of the right to life have



Professor Mireille Delmas-Marty

varied with the history of peoples, it's because they are part of humanization.

Unlike the right to life, the right to equal dignity, which underlies the prohibitions of slavery and of torture and inhuman or degrading treatment, is clearly tied to the process of humanization. But it also reveals tensions, for example when one justifies torture by the need to save lives. And when the Penal Code qualifies reproductive human cloning as a crime against “the human species,” rather than “humanity,” it separates hominization from humanization, and thus risks increasing tensions.

Disruptive Law

Law is especially disruptive when it is directly related to the dehumanization

of a human being, as when it legitimates slavery or bases certain forms of criminality on the continuity between animals and humans: Lombroso cited Darwin to support his argument that certain criminals were incomplete human beings. And the eugenics movement legitimated not only the sterilization of criminals in both Europe and the United States, but also the Nazi policies of castration and extermination. The 21st century is not devoid of monsters either: from terrorists labeled “unlawful combatants” to sexual perverts and other perpetrators of serious crimes, the concern is no longer to simply punish the guilty, but to eliminate dangerous “monsters,” who are thus dehumanized.

But disruption might also be caused by likening all or part of the non-human world to humans. Under the combined influence of scientific discoveries (namely the small genetic difference between man and chimpanzees) and technological innovations, ecological movements have become more radicalized, as illustrated by the 1978

declaration on animal rights qualifying any act “compromising the survival of a wild species and any decision leading to such an act” as “genocide.” Such excesses show that to regulate, law must transform tensions into interactions.

Law as Regulator

For law to act as a regulator, each pair’s relationship must be rebuilt. The “human/inhuman” relationship is central to human rights’ texts and biomedicine, which requires respect for both the human being as a member of the human species, and the right to equal dignity. This should lead to unifying crimes against humanity and crimes against the human species. Indeed, if, “as part of a widespread or systematic attack directed against any civilian population, with knowledge of the attack” (International Criminal Court Statute, art. 7), “dehumanization” produced new groups through biological changes (such as eugenics, cloning, or crossing species) on a timescale completely different from

that of human evolution, it would increase the danger of discriminatory treatment, and therefore of dehumanization. Such practices would also undermine the principle of indeterminateness characteristic of both our biological species and our ethic of responsibility.

Rebuilding the “human/non-human” relationship without any anthropomorphism requires a concept such as that of “duty” (as enshrined in the 2005 French constitutional charter on the environment), which institutes a non-reciprocal relationship with nature or animals, as well as with future generations. In this way, ethical evolution would attain a certain degree of universalization. Law would then have to reconcile such universalization with the cultural diversity that enabled our slow humanization, as incomplete as it may be. ■



Professor Jean-Pierre Changeux

Introductory talk Jean-Pierre Changeux

Darwin was born 200 years ago but his ideas are as alive and ubiquitous as ever; to the extent that they have become part and parcel of our definition of life.

In his seminal book, *On the Origin of Species*, Darwin proposed a theory of evolution which he applied to hominization, that is, the origin of the *Homo sapiens* species. Then, in *The Descent of Man*, he extended his reflection to humanization, that is, the origins of humanity, focusing on “man’s mental faculties” and comparing them to those of “inferior animals”, to the community of certain instincts, and so on. Merely listing the topics covered in the book shows the extent of Darwin’s thinking on the human brain and its capacities.

I will therefore limit my introductory comments to the human brain and to a fundamental concept of Darwin’s thinking: the notion of variation. The word is everywhere in *The Origin of Species*. Darwin wrote that “species had not been independently created, but had descended, like varieties, from other species”. He devoted the first chapter of his book to the study of

“variation under domestication and under nature”. While Darwin saw natural selection as an essential mechanism leading to the divergence of characteristics, variation is an equally important aspect of his theory. In my opinion variation is the driving force of evolution.

Variability comes in at least three forms. The first is genetic variability. In recent decades our knowledge on the genome of living beings has increased considerably. We now have a detailed picture of the tree of life, magnificently illustrating Darwin’s thinking, with the profusion and diversification of genomes. To the tree-shaped and hierarchical view of the evolution of genomes, contemporary science adds horizontal gene transfers. The representation of the evolution of the species in the living world has thus changed from Darwin’s original tree to a complex network of genetic interactions.

Will this progress in the knowledge on genomes enable us to lift the veil shrouding ‘human nature’? We do indeed know what all the molecules composing the human body and especially the brain are, but is that enough? At this stage we are still far off the mark. The human genome and those of other related mammals have been sequenced in their entirety, but whereas we know the number and identity of all the genes, the relationship between genomes and cerebral phenotypes remains an enigma. From the fly to the mouse, the number of genes increases with the number of neurons; yet we find the same number of genes in mice as in humans, and the sequencing of these genes is very similar. What is the genetic origin of the differences, especially in the size and complexity of the brain, which appeared during the evolution of mammals, from the mouse to the human being? This paradox, that molecular biologists still have to solve, is particularly difficult to understand, for the evolution is still very recent: only a few million years separate us from the ancestors that we share with chimpanzees. Shifting from a linear structure, that of genomes, to a three-dimensional structure, like that of the brain, involves a series of intermediate steps. That is where evolution can be grasped, for the jump in complexity is probably linked to the non-linearity of the processes involved. Genetic modifications are likely to have interacted with one another and created a combinatory network, with a resulting ‘connectivity’ at the level of the genome. Thus, small genetic variations can entail substantial morphological ones. That is why seemingly insignificant variations such as genetic duplications can explain the non-linear character of the shift

between genomic connectivity and cerebral connectivity.

Variability is at work not only in genetic evolution but also during development. The mass of the adult brain is roughly five times larger than that of a neonate, and connectional development continues throughout the first fifteen years of life. This epigenetic dimension is decisive in explaining the connectional variability resulting from this long period of development in conditions of profound interaction with the environment. It leads to a new paradox for the neurobiologist: how to reconcile this connectional variability with the constancy of the function?

Once again, we see the importance of the application of Darwinian thinking, for instance in understanding certain brain pathologies. Several recent theories establish a link between serious neuropsychiatric diseases and epigenetic developmental abnormalities. A recent explanation for schizophrenia posits a disturbance in the epigenetic selection of synapses during development.

In this respect Darwinian thinking enables us to further our understanding of humanization. In humans, the phase of connectional evolution is a period of extended development and constant learning where the child is in close interaction with his or her physical, social and cultural environment. This is probably decisive in the prodigious development of culture in the human species and in the shift from hominization to humanization. Epigenetic variability and the multiplicity of sensitive periods contributed to creating stable imprints of cultural evolution in the developing

brain, much like the acquisition of writing, for example.

Finally, the last level of variability that I wish to mention is that of the brain’s spontaneous activity, starting with the embryonic period and contributing eventually to the development of the brain itself. It is the source of the diversity of our actions on the world, of our creativity. This time, the variability of individuals’ behaviours and of their relations with others takes on a social dimension.

Thus, to the genetic variability taking place at the level of the evolution of the species, is added, at the ontogenetic level, connectional and epigenetic variability and then, at yet another level, the variability of the brain’s spontaneous activity which participates in the dynamics of thinking and continues in social and cultural interactions. At this level we find the establishment of extra-cerebral memories using writing, works of art and, more recently, electronic computers which have paved the way to immense possibilities for processing information.

This stroll through the evolving history of the human brain and its multiple levels is an invitation to give up the ‘instructive’ model of the brain - proceeding by input-output—for a generalized Darwinian schema—by variation and selection. We therefore opt for a projective style of cerebral functioning. This model accounts better for the Darwinian evolutions embedded in our brain, which are on-going and contribute to the exceptional dynamic of humanization, with an evolving opening onto the future, and no apparent limits! ■



THE DAYS OF JEAN DAUSSET

Symposium organized by the chair of Experimental Medicine
Professor Pierre Corvol
8–9 January 2010

Jean Dausset left us in June 2009. Holder of the chair of Experimental Medicine at the Collège de France from 1977 to 1987, he was not only a great researcher but also an outstanding teacher. To provide us with a glimpse of the man and his work, I have drawn on texts produced at the Collège de France, which have not all been published: the presentation of the chair by François Jacob; Jean Dausset's inaugural lecture at the Collège de France; and his closing lecture in 1987.

Jean Dausset was the author of one of the most important discoveries in immunology—the HLA system. Everything started with a finding in 1952, as he observed the agglutination of white globules in the presence of a polytransfused donor's serum, he had the idea that it could be caused by antibodies in the serum. In 1958 he demonstrated the existence of a leukocyte group, like the blood groups carried by red globules. He posited that there were groups of tissue that in a sense marked an individual's biological identity. Thus, between 1952 and 1958 the HLA system was born.

In 1976 François Jacob nominated Jean Dausset to the chair of Experimental Medicine at the Assembly of Professors, pointing out that 'all of his observations open an immense domain for immunology and pathology. Far beyond the leukocyte groups originally studied, the HLA system of histocompatibility is a functional unit of prime importance. It is the real command centre of the body's defence system both against attacks from the outside and to maintain the body's integrity.' He

emphasized the marker's precision and the extraordinary diversity that it allowed for: 'apart from identical twins, no two individuals can be the same'. Today, advances in epigenetics are showing that even in the case of identical twins, there are differences.

In the inaugural lecture of his chair, Jean Dausset pointed out that the study of the HLA complex had not yet yielded all its secrets. He hoped 'that the increasingly precise knowledge of the inner workings of the immune response will make it possible to control that response at will, including both its positive side, immunization, and its negative side, tolerance'.

One of his experiments with skin grafts on healthy volunteers to demonstrate humans' histocompatibility was a superb case of clinical investigation of extreme simplicity, elegance and fecundity. It was a starting point that made it possible to envisage the use of phenotyping and then of the HLA genotyping to guarantee successful grafts. Jean Dausset subsequently played an essential part in France Transplant and the search for compatible donors for grafts. The applications were numerous. One of those that he strongly promoted was the use of the HLA genotype to monitor populations, their migration, their isolation, their merging, and so on. The seeds of all these developments were in his inaugural lecture in 1977.

Jean Dausset was a builder. In 1984 he created the Centre d'Etude du Polymorphisme Humain (now the Jean Dausset Foundation). He had the intuition of the importance of this polymorphism to characterize individuals' uniqueness and thus to promote predictive medicine. This led to the creation of the human genetic map. In this respect his work was both crucial and fruitful: from 2,000 human polymorphisms



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known in 1992, countless thousands more have now been identified.

From 1955 to 1958 Jean Dausset conducted the reform of the CHU (university hospitals), loyal to the ideas of Claude Bernard who in 1865 had written: 'medicine does not end in hospitals, as is often believed, but merely begins there.' In fact, Bernard explained, 'In leaving the hospital, a physician, jealous of the title in its scientific sense, must go into his laboratory; and there, by experiments on animals, he will seek to account for what he has observed in his patients'. This was an inspiration for the reform achieved by Jean Dausset, which was seen as a model of well-designed and implemented cooperation between government administration, scientists, doctors and politicians.

In 1976 François Jacob had emphasized the qualities of this prolific researcher gifted with immense curiosity for the most diverse aspects of research. He noted that he was 'one of the rare men capable of putting formidable problems of medicine in biological terms'. Indeed, as early as 1975, in his brochure at the Collège de France, Jean Dausset had pointed out possible associations between HLA antigens and pathologies. Today the number of applications of

this principle is huge. In his inaugural lecture he indicated that, for the first time, medicine could be oriented from birth according to individuals' genetic predispositions. This opened up the perspective of personalized preventive medicine that would be more effective and less expensive. He said that he expected to see an attack on, and even a reduction of, 'one of the soundest and least shakeable bastions of injustice among men: that of innate inequality in the face of disease'.



Minutes of the morning session
on cellular immunology
HLA, self and non-self: a systemic perspective
Philippe Kourilsky

The discovery of the HLA system—and of H-2, its equivalent in mice—has had immense repercussions for immunology. Several were mentioned during a first session on cellular immunology, chaired by M. Sasportes (Paris). The genes responsible for coding the main histocompatibility antigens are highly polymorphic. We now have knowledge of several thousand alleles of genes responsible for coding "classical" class I and II antigens. Since each human being possesses three genes of each class, usually different in the two chromosomes, the millions of combinations obtained by assorting them provide what could effectively be seen as a personal identity card for each individual. This extreme polymorphism, now studied in detail with regard to gene sequences, is of prime importance for organ and bone marrow transplants. The presentations

Another sign of Jean Dausset's enlightened humanism, in his closing lecture in 1997, was his warning against the risks that 'knowledge about the workings of these genes that make people more susceptible to diseases' could entail. He foresaw two stumbling blocks: violation of individual and family privacy; and opening the door to random and abusive selection of genes, leading to a 'semblance of eugenics'. An optimist in spite of all, he called for approaches in which both science

were concerned with the underlying immunological reasons.

One relates to the primary function of histocompatibility antigens, which consists in presenting T cells with fragments of protein (peptides) stemming from both outside and inside the cell. The polymorphisms affecting these molecules have a deep impact on the range of peptides they present, and distinguish each individual's immune system from all others. Using state of the art technology, M. Bonneville (Nantes) was able to study, with unmatched precision, the impact of the HLA phenotype on the range of T cells at the level of several individual peptides and of the few T cells that recognize them.

In the case of transplants, the complex and powerful reactions that occur when the graft carries an HLA that is different from that of the receiver most often lead to a rejection of the graft, or else cause the graft to attack the host.

It is now understood that these reactions involve not only T cells but also NK cells (natural killers). A. Bensoussan (Créteil) shed light on this important development by carrying out an in-depth analysis of one of their receptors, CD160.

The HLA gene family includes not only genes responsible for coding the main histocompatibility antigens, but

and ethics were present, and expressed his hopes regarding genetic engineering: 'any new knowledge is a liberation, any ignorance is a limitation, for one should not confuse knowledge, which is peculiar to and the pride of humankind, with its beneficial or dangerous use'. ■

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also many other genes, which are often far less polymorphic. One of them in particular, HLA-G, is studied because, as E. Carosella (CEA Paris) has shown, it encodes several molecules with suppressive properties. These genes play a key part in a wide range of important situations such as pregnancy, successful transplants, and the immunological rejection of tumours.

The immune system of some individuals carrying mutations can be faulty, especially if these mutations affect the expression of certain histocompatibility antigens. The correction of these often fatal deficiencies is theoretically possible through gene therapy. A. Fisher (Necker, Paris) has shown that this approach can yield outstanding results, and that it now seems possible to control the negative side effects which had caused its clinical trials to be temporarily put on hold.

The role of the HLA is so central to the immune system that it is useful to seek to grasp it from a systemic perspective. In view of this, P. Kourilsky (Collège de France) has pointed to the issues intrinsic to complex systems. He has insisted on concepts such as robustness and quality control, which have seldom been used in immunology until now. These could have a role to play in many pathologies, especially those linked to auto-immune disorders. ■

Homage to Jean Dausset

Laurent Degos

Head of the Haute Autorité de Santé

In 1952, while looking for an explanation for the lack of white blood cells in certain patients, Jean Dausset had the idea of mixing their white blood cells with serum from a person who had received blood transfusions. To his great surprise he saw, with his naked eye, agglutinated cells on the glass slide. This was the initial experiment that was to lead to the Nobel Prize.

Jean Dausset was always drawn to medical research. Intuitive and perceptive, on occasion it was difficult for him to get his views across but time proved him right. He was opinionated and afraid of no-one. There was no administrative or financial obstacle that he could not overcome. He was passionate and able to communicate his passion. He was very unaffected and inspired respect. He had an uncommon aura of nobility which was apparent on first meeting him. He was enthusiastic about any original or creative idea. However, anyone speaking to him had to weigh their words and keep to the point, and not express utopian or outrageous views. Although he did not want there to be any barriers between himself and others, everyone would watch their words or their attitude. He was as demanding of himself as he was of those around him.

Before informing me in July 2007 that he was moving permanently to the Balearic Islands, Jean Dausset handed me a red spiral-bound notebook. On the first page he had written the four areas in which he had made his main discoveries: transplantation, predictive medicine, immune response and anthropology. These

words, so rich in meaning, both for knowledge and for patient care, inspired the two-day scientific conference for which we are gathered here.

Jean Dausset chaired the international immunology conference in 1980, receiving the Nobel Prize the same year. Professor at the Paris-Denis Diderot university, head of department at the Hôpital

Saint-Louis, director of National Institute of Health and Medical Research (INSERM) unit U 93, he was appointed professor at the Collège de France in 1978, while retaining a laboratory at the Hôpital Saint Louis. Elected to the Academy of Sciences and the Academy of Medicine, in 1984 he founded the Human Polymorphism Study Centre (CEPH). That same year he was appointed president of the Universal Movement For Scientific Responsibility (MURS). These functions reveal the many facets of his personality.

Jean Dausset was able to combine the spirit of discovery and genius. Discovering the hidden secrets of nature was his passion. No serum reacted the same as any other. He adopted a researcher's approach and a visionary's reasoning: by giving a patient a transfusion of blood from a single donor and repeating this principle, he obtained serums which agglutinated only 50% of the series of white blood cells from his blood donors, whom he called his white cell panel. He succeeded in determining the first leucocyte group called MAC—the initials of the three donors in the panel whose blood was not agglutinated by serums (HLA-A2 in the current nomenclature). He liked to cut up and rearrange the columns and rows of tables showing the reactions between serums and white blood cells, hoping to find order, an order which would be called the leucocyte group.

This colloquium has revealed the extraordinary advance which the discovery of molecules of the human major histocompatibility complex represented. In 1975, in his review article, Jean Dausset wrote: "the HLA complex [...] governs the three stages in the allogeneic response: recognition, immunisation and destruction. It is however probable that the mechanism involved in allograft rejection also acts as a defence against somatic mutations, or indeed tumoral or viral antigens". This seemed very strange then. Time has since shown him to be right.

Jean Dausset had a passion for discovery and creation. An expert in modern painting, he ran a gallery in the Rue du Dragon, near Saint Germain des Prés, the

artistic and literary centre where the surrealists used to meet. His spirit of discovery and creativity inspired his efforts to build bridges between discoveries and applications for patient care. He looked for means of bridging the gap between molecules and genes, but also between genes and applications beneficial to patients, such as trans-plantation or detecting susceptibility to disease.

To demonstrate the link between leucocyte groups and transplant rejection, he called on the assistance of volunteer donors and the American surgeon Felix Rappaport. The Czechoslovak Pavol Yvanyi and his wife Dagmar assisted him in the first description of this complex which they called Hu-1. Since 1964, international workshops have been held every two years, in Durham then in Leyden, Turin, Los Angeles, etc.

Jean Dausset worked with the great doctors of his era: Jean Hamburger on kidney transplantation, Jean Bernard on bone marrow transplants. Organ or tissue transplantation was at the heart of scientific advances in the xxth century, for the good of patients. He founded France Transplant and France Transplant Greffe de moelle [bone marrow transplant]—the main activities of which are now undertaken by the French Transplant Establishment which became the Biomedicine Agency.

After discovering leucocyte groups, he set about looking for links between the presence of a group and susceptibility to a disease. HLA groups provided a basis for recognizing susceptibility to diseases such as diabetes, multiple sclerosis, narcolepsy or Crohn's disease: the best known is ankylosing spondylitis, for which the presence of allele HLA B27 has become a diagnostic test. Why do these links between leucocyte group and susceptibility to disease exist? The question has not been answered, but it prompted Jean Dausset to introduce the concept of "predictive medicine" which has developed greatly since then. The terms used are prediction, personalised prevention and personalised treatment—right through to pharmacogenetics: the Haute Autorité de santé has recently been



asking that an HLA B5701 test be performed before an anti-AIDS drug is prescribed, to avoid adverse effects. Tomorrow, prevention or personalised diagnosis will be on offer.

The discovery of HLA polymorphism applied to anthropology was the reason for the international workshop held at Evian in 1972. Jean Dausset summed up its findings in this sentence, which in 2009 was engraved on the walls of the courtyard at the Hôpital Saint Louis: "every person is unique".

A discoverer and a genius, Jean Dausset was also a man who showed commitment, enterprise and responsibility. After the American landing in North Africa, he joined the French army as a volunteer and took part in the Tunisian campaign. Following his work in transfusions and intensive care during the war, liberation saw him posted to the blood transfusion centre at the Hôpital Saint-Antoine. He carried out exsanguination transfusions, i.e. blood exchanges, for women with septicaemia after an abortion. With his teams of voluntary donors, he carried out these arm to arm exchanges of blood (up to 15 litres) using many donors, one after the other, for the same patient. These women, facing death from septicaemia and consequent renal failure, left the hospital cured.

Jean Dausset managed to recruit hundreds of volunteer donors. In 1962, he launched the Royan appeal for railway workers, then press campaigns calling on families to get involved in his scientific adventure. Thus, every morning, about ten donors gave blood for our experiments. These were mainly railway workers, whose blood provided the white blood cell panel which was used to reveal the complex secrets of leucocyte groups. He also called upon family members when performing skin grafts. At his office, his desk became an operating table and Felix Rappaport went back and forth between New York and Paris. The loyalty of his donors—of blood, plasma and skin ("la bande à Dausset")—never waivered. His friendship with them was so deep that

he even asked them to accompany him to Stockholm to collect his Nobel prize.

The reform of the university hospitals was another ambitious project into which Jean Dausset threw himself with the help of his "young team" and with the support and unfailing friendship of Professor Robert Debré. He is also the prime mover behind the research building which became the University Institute of Haematology. At that time, he was a member of the private office of René Billières, minister for national education and social affairs, who consulted him after reading, in *Le Figaro* on 8 March 1957, an article entitled "A moving appeal from Professor Jean Bernard: cancer and leukaemia can be conquered". Since social conflicts led him to fear attacks in the National Assembly the next day, the minister asked for a rapid response to this appeal. Seizing his opportunity, Jean Dausset urged Jean Bernard to ask for at least a two-storey building. He ultimately sent the minister a proposal for four storeys. The building got built.

In 1984 he founded the Human Polymorphism Study Centre, with assistance from an unexpected source. In the post-war years, when he was running his art gallery in the Rue du Dragon, he gave advice on buying paintings to Mme Anavi, a collector. 35 years later, she recognized him on television receiving the Nobel prize and bequeathed him some paintings for his research work.

Jean Dausset continued, with Daniel Cohen, his research into human polymorphism. It led to the description of the first maps of the human genome. Calling upon many laboratories all over the world, he demonstrated the effectiveness of large-scale collaboration, while making the tools and results available to all. He was a great entrepreneur who enjoyed the dedicated support of Robert Debré, Jean Bernard, Jean Hamburger and René Billières, and of donors and sponsors.

Discovery, application and entrepreneurship are activities for which there is one requirement, that of responsibility, in the sense of accountability, being answerable, but

also in the sense of *response ability*, the ability to respond, to answer for what one does, particularly as a scientist, and being answerable to society and to policymakers. That was one of his great concerns. He chaired the MURS from 1984 to 2001. He opposed the sale of human organs and the patenting of human genes, and advocated the defence of human rights. He also drew attention to the scarcity of freshwater resources, organising two colloquiums with MURS in 1987 and 1996. He chaired the Academy of Water from 1995.

Dedicated, entrepreneurial and responsible: that is how his collaborators knew him. His door was always open and we would come and show him our latest results, talk to him about our ideas or the projects we were planning. He would encourage us, and criticism was always constructive. He would often invite eminent foreign researchers to give talks in his office with a blackboard and chalk as their only aids. We would listen, sitting anywhere we could. It was a simple and rich life. The annual meeting of donors which we used to organise was a family celebration. We would present our discoveries of the past year, dressed in our impeccable white coats. He was one of us, and we were at one with him in this adventure.

Everything had a cause, all was reason for Jean Dausset. A fervent disciple of Claude Bernard from whom he inherited the chair of experimental medicine at the Collège de France, he did however say, at the end of his inaugural lecture: "if there is a biochemical cause for every action, every thought, if all behaviour is a necessary consequence of the genetic make-up on which all past experience has been imprinted, must we conclude that the free agent of which humans are so proud does not exist? We must remain in doubt until the hypothesis has been tested because it is probably impossible to know". He leaves us with that question and that doubt.

Jean Dausset has departed this world. He leaves behind the memory of his life so that we can continue his work. ■

RATIONALITY, TRUTH AND DEMOCRACY: BERTRAND RUSSELL, GEORGE ORWELL, NOAM CHOMSKY

Symposium organized by the chair of Philosophy of Language and Knowledge (Professor Jacques Bouveresse)
28 May 2010

Videos of the papers can be consulted and downloaded at www.college-de-france.fr (Professor Bouveresse's page, under *audio/video*)

The full proceedings of the symposium has been published in the journal *Agone* n° 44 (October 2010).

Excerpt of the talk by Professor Jacques Bouveresse on “Bertrand Russell, science, democracy and the pursuit of truth”.

“In ‘Free thought and official propaganda’, a talk delivered in 1922, Russell argued: ‘The methods of increasing the degree of truth in our beliefs are well known; they consist in hearing all sides, trying to ascertain all the relevant facts, controlling our own bias by discussion with people who have the opposite bias, and cultivating a readiness to discard any hypothesis which has proved inadequate. These methods are practiced in science, and have built the body of scientific knowledge. [...] In science, where alone something approximating to genuine knowledge is to be found, men’s attitude is tentative and full of doubt. In religion and politics, on the contrary, though there is as yet nothing approaching scientific knowledge,

everybody considers it *de rigueur* to have a dogmatic opinion, to be backed up by inflicting starvation, prison, and war, and to be carefully guarded from argumentative competition with any different opinion. If only men could be brought into a tentatively agnostic frame of mind about these matters, nine-tenths of the evils of the modern world would be cured.¹

The solidarity that exists between science and democracy is reflected in the fact that the principle of free research, after being experimented in the treatment of scientific questions, is likely to spread naturally to that of political questions. [...] ‘The habit of basing opinions on reason, when it has been acquired in the scientific sphere, is apt to spread to the sphere of practical politics. Why should a man enjoy exceptional power or wealth because he is the son of his father? Why should white men have privileges denied to those with other complexions? Why should women be subject to men? As soon as these questions are allowed to come into the light of day and examined in a rational spirit, it becomes very difficult to resist the claims of justice, which demands an equal distribution of ultimate political powers among all adults, with the exception of those who are insane or criminal. It is, therefore, natural that the progress of science and the progress toward democracy have gone hand in hand.’² Russell believed that, when questions of this nature were posed clearly and

addressed rationally, the answer could but appear to be more or less obvious. It was therefore essential, for those seeking at all costs to maintain the status quo, to ensure that things were not expressed or envisaged in a rational spirit. One of the secrets of the success of totalitarian systems, he argued, lay in the way in which they successfully persuaded a large number or even a majority of people that the most basic divergences of opinion had a source causing them to defy all reason, so that their rational discussion was futile and derisory. On this point, Hannah Arendt made the following comment: ‘[The Nazis] presented disagreements as invariably originating in deep natural, social, or psychological sources beyond the control of the individual and therefore beyond the power of reason. This would have been a shortcoming only if they had sincerely entered into competition with other parties; it was not if they were sure of dealing with people who had reason to be equally hostile to all parties.’³ For a convinced rationalist like Russell, the danger—that could soon prove to be fatal—arose when, in a community that was still democratic in principle, one allowed the generalization of the feeling and soon the certainty that major disagreements and conflicts could and had to be treated in a way which, to be serious and effective, had to start by excluding as completely as possible all reason and rational argumentation.” ■

1. Bertrand Russell, *Sceptical Essays* (1935), Allen & Unwin, 1960, p. 106.

2. Bertrand Russell, *Fact and Fiction* (1961), Routledge, 1994, p. 105.

3. Hannah Arendt, *The Origins of Totalitarianism*, Cleveland: The World Publishing Company, 1958, p 312.





Excerpt from the talk by Jean-Jacques Rosat (lecturer at the Collège de France) entitled: “Russell, Orwell, Chomsky: a family of thought and action (From liberalism to anti-authoritarian socialism)”

“Russell argued that ‘Political and social institutions are to be judged by the good or harm that they do to individuals. Do they encourage creativeness rather than possessiveness? Do they embody or promote a spirit of reverence between human beings? Do they preserve self-respect?’¹

It is noteworthy that this typically liberal profession of faith opened a text that soon proved to be a manifesto for an anarchizing socialism. This was in 1916. From the outbreak of the First World War, Russell battled for peace with the energy of despair, and fought for the right to conscientious objection—a struggle that soon landed him in jail for six months. That was where he became aware that, in an industrialized world where there was a prevailing force leading to the concentration of economic and state power that deprived individuals of control over their own existence, the liberal values underpinning his education and in which he still believed could be promoted only within the politico-economic

framework of an anti-authoritarian socialism. In 1920 he declared: ‘I am one of those who, as a result of the war, have passed over from Liberalism to Socialism, not because I have ceased to admire many of the Liberal ideals, but because I see little scope for them, except after a complete transformation of the economic structure of society.’²

This rapid evolution in Russell’s thinking highlights the thread linking the original liberal mentality to anti-authoritarian socialism, and it is this link that Noam Chomsky has constantly stressed. ‘Contrary to the contemporary version of it, classical liberalism [...] focused on the right of people to control their own work, and the need for free creative work under your own control—for human freedom and creativity. So to a classical liberal, wage labor under capitalism would have been considered totally immoral, because it frustrates the fundamental need of people to control their own work: you’re a slave to someone else. [...] In fact, there are no two points of view more antithetical than classical liberalism and capitalism [...]. If you take the basic classical liberal principles and apply them to the modern period, I think you actually come pretty close to the principles that animated revolutionary Barcelona in the late 1930s—to what’s called ‘anarcho-syndicalism’. [...] I think that’s about as high a level as humans have yet achieved in trying to realize their libertarian principles, which in my view are the right ones.’³

The description of revolutionary Barcelona that Orwell discovered in December 1936 is one of the most poignant pages of *Homage to Catalonia*. This experience, and even more so the one he lived for several months on the Aragonese front

mongst the POUM militia, was obviously one of equality—an equality understood not as an end in itself, a uniformization of individuals, but as the condition for real freedom and fraternity. ‘Many of the normal motives of civilized life—snobbishness, money-grubbing, fear of the boss, etc.—had simply ceased to exist. The ordinary class-division of society had disappeared [...] there was no one there except the peasants and ourselves, and no one owned anyone else as his master.’⁴ This experience was so decisive for Orwell because it mirrored his conviction that the various forms of top-down socialism, driven by intellectuals—be it Fabian technocratic reformism or the Leninist vanguard—could never lead but to a change of masters. He believed that authentic socialism was bottom-up, based on the experience of ordinary people and on the values of common decency.” ■

1. Bertrand Russell, *Political Ideals* (1917), chap 1).

2. “Socialism and Liberal Ideals” (May–June 1920), *Collected Papers*, 15, p.144.

3. Noam Chomsky, *Understanding power* (2003), London: Vintage, pp. 216, 221, 222.

4. George Orwell, *Homage to Catalonia* (1989), London: Penguin Books (First edition 1938, Secker & Warburg, London).

Excerpt from the talk by Noam Chomsky (Professor at MIT) entitled : “*Power-hunger tempered by self-deception*”.

“The doctrines of economic rationalism that dominated mainstream discourse in the advanced societies for a generation have shaped policy, though selectively: one recipe for the weak, a sharply different one for the powerful, much as in the past. It seems not unfair to say that their dominance does not reflect either rationality or commitment to truth, but rather service to privilege and power. The consequences are unmistakeable. In the US, for example, during these years the financial institutions that were the main beneficiaries of the doctrines as well as their most fervent advocates have vastly expanded their power, with a comparable impact on political life. Meanwhile, for the majority of the population real wages have stagnated and family incomes have been sustained by higher working hours, debt, and asset inflation, with regular collapse of the bubbles. While very rich by comparative standards, the US is taking on some of the structural characteristics of the former colonies, which typically have sectors of enormous wealth and privilege amidst a sea of misery and suffering.

To turn to the title of these remarks, can we say that these consequences are the outcome of power hunger and self-deception? In the terms that are current today, can we blame ‘greedy bankers’ who are guilty of ‘irrational exuberance,’ the famous phrase of the most lauded economist of the past

generation before the crash, Alan Greenspan, in a rare moment of departure from orthodoxy? That does not seem fair. When bankers are ‘greedy,’ they are pursuing their institutional commitment, which is to maximize profits—in Anglo-American corporate law, a legal responsibility. If some reject this commitment, they will be removed and others will take their place. ‘Power hunger’ is an institutional feature of a competitive system. Furthermore, the exuberance of the necessarily greedy bankers was not irrational. The bigger banks knew that they were taking no serious risk with transactions that might well fail, because they could rely on an implicit government insurance policy, called ‘too big to fail.’ Its very existence gives them substantial benefits as compared to rivals. And they regularly cash in when necessary. Under Reagan, for example, one of the larger banks, Continental Illinois, was rescued by a taxpayer bailout. Also under Reagan, the predecessor of the huge firm Citigroup was rescued from disaster by the IMF—the ‘credit community’s enforcer,’ as it was described accurately by its US executive director, returning to its traditional role today. As pointed out by Martin Wolf of the *Financial Times*, probably the most respected economic correspondent today, the current bailout ‘is overtly a rescue of Greece, but covertly a bailout of banks.’

The same has been true during the current financial crisis in the United States: the big banks were not only rescued by taxpayers, but ended up more profitable and larger than

before, preparing for the next and probably worse crisis. The bankers can hardly be faulted for doing just what they should do under the rules of the game.

After the current financial crisis erupted, a consensus developed among economists that it is foolhardy to ignore systemic risk—that is, the threat to the whole system if some transaction fails. But that is hardly a new insight. An elementary feature of markets is that transactions ignore externalities—effects on others. For financial transactions, that means ignoring systemic risk. It has long been understood that the practice is hazardous, and there have been occasional warnings within the profession. This market inefficiency alone makes financial crash a highly likely contingency, and the risk is amplified by the perverse incentives that follow from the influence of private power over the political system, among them the ‘too big to fail’ government insurance policy, but others as well.” ■



MANAGING CLIMATE CHANGE

This colloquium was organized jointly by the ‘Sustainable Development—Environment, Energy and Society’ chair, held by Nicholas Stern in the 2009–2010 academic year, and the ‘Economic Theory and Social Organization’ chair held by Roger Guesnerie.
7–8 June 2010

The symposium focused on the economics of climate change and brought together speakers and “discussants” who are internationally reknowned for their contributions on the subject.

The first day was devoted to the economics of the long run. It referred to the debate on the cost-benefit analysis of climate policies, which has intensified over the past ten years and was revived by the publication of the Stern Report, in particular. The costs of climate policies are effective in the short and medium term, whereas their benefits, that is, the damage that they avoid, are manifested in the medium-long, the long and even the very long term. But the discount rates applied in traditional cost-benefit analysis to transform the future values of benefits into present values (in technical terms, to “discount” them) so that they can be compared to costs (also “discounted”), crush the future. There are good reasons for this to be so, but these reasons, which could be seen as a form of “economic reason”, seem to contradict ecological intuition which focuses on sustainability and the long-term preservation of the environment. The papers delivered during the first day were primarily on the economic relevance of climate policies and, more generally, on the reconciliation of

the economic logic and the sustainable development logic.

Some of the key figures in the above-mentioned debate were present. In his talk, Harvard University professor Martin Weitzman again emphasized the distribution of the probability of damage. This distribution has what economists call ‘thick tails’, which means that the density of the probability of extreme damage, seen as a function of the amount of such damage, decreases ‘slowly’. As the title of his paper indicates, from this point of view the targets of Greenhouse Gas (GHG) concentrations must be seen as a sort of “insurance against catastrophic climate damages”. This argument, in which the avoidance of catastrophe is crucial, was challenged by William Nordhaus, professor at Yale University. In his paper entitled ‘Economic policy in the face of severe tail events’, Professor Nordhaus, one of the most rigorous advocates of the traditional theses, considered the problems of statistical estimates and issues of measurement of economic losses. His talk was discussed by Partha Sen, professor at the Dehli School of Economics, while Professor Weitzman’s paper was commented on by Nicholas Stern.

The questioning of traditional economic logic with regard to discount rates is thus based on the ‘extreme’ uncertainty that is indisputably present in climate change. A change in the earth’s mean temperature of over five degrees plunges us into the unknown, the probabilistic description of which echoes the first two papers. There are other channels through which the



Professor Roger Guesnerie

economic problematic is grasped, which also relate to uncertainty but in a different way. ‘Ecological intuition versus economic reason’, the title of Roger Guesnerie’s paper,¹ is about the rules of an ‘ecological’ economic evaluation of an ‘irreversible damage to the environment’. The text derives a ‘precautionary principle’ that clarifies the generally imprecise—to say the least—notion of ‘acceptable economic cost’. The conclusions are clearly established in a world reduced to four parameters briefly describing: the productive capacity; the trade-off determining desired timeless growth; ecological ‘sensitivity? and, finally, the ‘ethical’ dimension of the inter-generational trade-off. The discussion of the latter dimension, that is, the ethical dimension of the problem, was considered in greater depth by Professor Cameron Hepburn of Oxford University, who put the entire debate of the discount rate back into this perspective by emphasizing the compatibility as well as the differences with traditional economic approaches. Roger Guesnerie’s paper was commented on by Professor James Mirrlees from Cambridge University, winner of the Nobel Prize for Economics in 1996.

1. Based on a paper co-authored with O. Guéant and J.M. Lasry.

Reverting to uncertainty, another direction for potentially fruitful confrontation between traditional calculation and calculation that stresses the ecological logic more, suggests the relevance of the concept of ‘ambiguity’. There is ambiguity, in the technical sense, when hesitation on the uncertainty of a particular situation challenges the construction of subjective probability and thus affects the transposition, in the analysis, of the risky choices of the probabilistic logic expressed in traditional criteria. The earlier work of Christian Gollier,² professor at the Toulouse School of Economics, on risky timeless choices, is set in the ‘Bayesian’ tradition of using expected utility. In the paper that he delivered at the symposium, Professor Gollier analyzed the effects of the introduction of ambiguity into the analysis of the ‘socially effective discount rate’, and showed that the biases introduced are not systematic.

The contribution of Thomas Sterner³ from Gothenburg University considered ‘climate policy, prudence and the role of technological innovation’. In a sense, his talk was equally relevant to the main theme of the first day and that of the second day, where the focus was on issues pertaining



Professor James Mirrlees

to innovation. Professor Sterner emphasized the relative merits of emission reduction and research-development, depending on the characteristics of the technologies and the uncertainty weighing on their results. His paper was discussed by Antoine d’Autume, professor at Paris I University and the Paris School of Economics.

The other papers delivered on the first day were mainly selected from proposals in response to a call put out by the French Economics Association (*Association française de sciences économiques*). All of them highlighted the time dimension of environmental problems. Michel de Lara from the University of Paris Est examined the issue of the ‘Risk and sustainability: is viability that far from optimality?’. Charles Figuières from the French national agronomic research institute (INRA) confronted the regular interpretation of the Rawlsian view (that of philosopher John Rawls) of inter-generational equity, with a so-called ‘mixed’ criterion of inter-temporal social choice (with reference to both Bentham and Rawls). Fabien Prieur from the University of Savoie and his co-authors discussed ‘the optimal control of pollution under uncertainty and irreversibility’, while Jean-Charles Hourcade from the International Centre for Research on the Environment and Development examined the ‘determinants of the social cost of carbon: public economic principles in a controversial future.’⁴

On the second day the focus shifted to innovation and the stimulation of innovation for climate policy, with issues of risk, uncertainty and international cooperation either directly present or in the background.

In the morning Nicholas Stern provided a systematic analysis of the questions raised by growth with a low level of carbon consumption. First he considered innovation and technical change, with a historical perspective on the current problem. He then examined the redefinition of appropriate public policies and finally discussed the multiple facets of the political economy (as opposed to the economy *stricto sensu*) of a global agreement.



Professor Nicholas Stern

The following contribution, by Alberta University professor Ujjayant Chakravort, was entitled: ‘Can nuclear power supply clean energy in the long run? A model with endogenous substitution of resources.’⁵ In several contrasting scenarios, this model simulates the proportion of nuclear energy in the energy mix on the 2100 timeline. The results were discussed by Professor Pierre Noel Giraud from the École des Mines de Paris.

The paper delivered by Harvard University professor Philippe Aghion was on ‘Climate change and the role of directed innovation.’⁶ It was based on a model of endogenous innovation in which incentives to invest either in ‘clean’ technologies or else in ‘dirty’

2. Paper co-authored with Johannes Gierlinger.

3. Co-authored with Carolyn Fischer.

4. The supporting papers were by the following authors: i) for the first paper, Michel de Lara, Vincent Martinet and Luc Doyen; ii) for the second paper, Charles Figuières, Ngo Van Long and Mabel Tidball; iii) for the third paper, Alain Ayong Le Kama and Aude Pommeret, and Fabien Prieur; iv) for the fourth paper, Jean-Charles Hourcade, Patrice Dumas and Baptiste Perrissin Fabert.

5. Paper by Ujjayant Chakravorty, Bertrand Magne and Michel Moreaux.

6 Co-authored with Daron Acemoglu, Leonardo Burzyn and David Hemous.

ones was affected by the form and intensity of climate policy. Alex Bowen of the London School of Economics commented on the model and the qualitative results derived from it.

The afternoon's papers focused not only on innovation but also on issues of institutions and negotiations that Nicholas Stern's talk had introduced.



Professor Thomas Schelling

The talk by Maryland University professor Thomas Schelling, winner of the Nobel Prize for Economics, emphasized the new institutions required for international climate cooperation, and related issues of governance. Based on historical precedents (Marshall Plan, Bretton-Woods), he highlighted the necessity to provide developing countries with substantial, efficiently organized aid. This paper was discussed by another specialist on the subject, Professor Henry Tulkens from the Catholic University of Louvain.

Jean Tirole, professor at the Toulouse School of Economics, discussed 'regional initiatives' and the 'cost of delaying climate change agreements'. His model emphasized what can be called the ratchet effects affecting climate negotiations when, paradoxically, the good environmental performance of the first period weakens the position for negotiating in the second period. His

presentation was commented on by Jean-Pierre Ponssard, senior researcher at the École Polytechnique.

The last paper was by Humberto Llavador,⁷ professor at the Universitat Pompeu Fabra, who placed the two days' discussions in a general perspective. His presentation of a 'dynamic analysis of human welfare on a warming planet' was commented on by Jean Philippe Nicolaï (Collège de France, chair of Economic Theory and Social Organization).

Finally, in addition to the scientific papers, a round table on climate policy issues was held on the second day after the morning's talks. Presided by Roger Guesnerie, this round table made it possible to compare the views of Nicholas Stern, Thomas Sterner, Jean Tirole and Henry Tulkens.

To conclude, the organizers wish to thank those who contributed to facilitating the two days, especially the chairpersons (excluding speakers), Guy Laroque (INSEE) and Olivier Godard (École Polytechnique).

With the exception of the round table, the symposium was scientific and the papers were technical. Despite its high level of specialization, the two-day event was attended by a large audience that was clearly familiar with the topics discussed. ■

The Sustainable Development—Environment, Energy and Society chair receives support from TOTAL.

⁷ Co-authored with John Roemer and Joaquim Silvestre.

THE TRAGEDY OF THE HAITI EARTHQUAKE

Professor Xavier le Pichon
Chair of Geodynamics 1986–2008



On January 12 2010, at 4:53 p.m., the E/W Enriquillo fault started to yield at a depth of 13 km, 25 km SSW of Port-au-Prince. The rupture propagated toward the West during 35 seconds along a distance of about 50 km without ever reaching the surface. But most of the mechanical energy was dissipated during the first ten seconds with a fault displacement that reached a maximum of 4 m. The northern lip of the fault moved to the West with respect to the southern lip. This is what specialists call a strike-slip fault. Although the resulting earthquake was a great earthquake with a magnitude of 7, it was not a very great earthquake. For example the energy was 900 times less than the energy dissipated during the 2004 Sumatra earthquake. Many greater earthquakes have occurred in modern times. Yet with about 300 000 human fatalities, the Haiti earthquake appears to have been the deadliest. Why? As is often said: earthquakes do not kill... but human buildings do. Haiti is the extreme illustration of problems coming from anarchic development without any consideration for the environment.

But let us go back to the tectonic context of this land that became home for the Haitian people. Haiti is located on the E/W northern border of the Caribbean plate. North of the border, the American plate moves to the West at a velocity of 20 mm/yr. This border is not linear. It is rather a 200 km wide border zone, sometime called the Gonave plate, limited by two main great faults, the Septentrional fault to the North and the Enriquillo fault to the South. The total 20 mm/yr strike-slip motion is distributed between these two faults, about 10 mm/yr on each. Actually it is difficult to exactly define how the motion is partitioned because of the complex elastic interactions between the two faults. But, in a first approximation, each fault takes about half of the motion. These two faults are the main elements of the structural framework of the island of Hispaniola, Haiti corresponding to the western portion of the island. However the tectonic system is actually even more complex, as the Septentrional fault veers to the SE within the island and as, consequently, the Gonave plate tapers eastward, the eastern corner being

located NW of the island of Puerto Rico. Further East, the plate boundary is unique and follows the Puerto Rico trench. The eastward junction of the two boundaries produces compressive deformation within the central portion of Hispaniola, within NW/SE mountains which form the core of the island. It is this deformation that has created the present morphology of the island.

Thus there are three main sources of large earthquakes in Haiti, the Septentrional fault to the N and NE of the island, the Enriquillo fault to the SW and the mountains in the central portion. This is verified by the distribution of historical seismicity, although it is poorly localized, except for the relatively recent triple 1946 earthquake. Specialists have identified ten earthquakes that appear to have reached or exceeded magnitude 7 since the xvith century, that is one about every fifty years. Three of them could be along the southern fault, four along the northern one, and three would have resulted from shortening in the central mountains. The last earthquakes that destroyed Port-au-Prince date from 1751 and 1770. The town had just been founded by the French and Louis XV had chosen it as the capital. Following the destructions of the earthquakes, it was forbidden to build there with anything except wood, which was quite reasonable. It is thus clear that no part of Haiti can escape destructive earthquakes. Actually specialists had announced in 2008 that the Enriquillo fault could be affected by a 7.2 earthquake at any time and that the Septentrional fault could similarly be struck by a 7.5 earthquake, still pending.

But, what could have been done by the government of the 9 millions inhabitants of Haiti, a country where the density of the population exceeds 325/km², 80% of which live below the level of poverty, to prevent this disaster? Of course, technically, it is possible to build in such a way that the danger of earthquakes is minimized for the population. But with the desperate context of struggle for survival in this country, it was probably illusory to expect a real politic of mitigation of the destructive effects of earthquakes. One only has

to consider the failure of the reforestation program in spite of the enormous cost of the generalized deforestation that cannot be stopped in Haiti. Yet the dramatic effects of this deforestation are experimented repeatedly during the yearly cyclones! It seems to me that this tragedy is an illustration of the challenges that our society must confront to come out of the crisis in which our humanity appears to progressively get submerged. How can we facilitate a reasonable implantation of the population within an environment under control when the context is one of extreme poverty? In this somber outlook, the hope comes from the remarkable qualities that have been manifested by

the Haitian people during this tragedy and from the surge of international solidarity that it triggered. ■

Xavier Le Pichon, Emeritus Professor

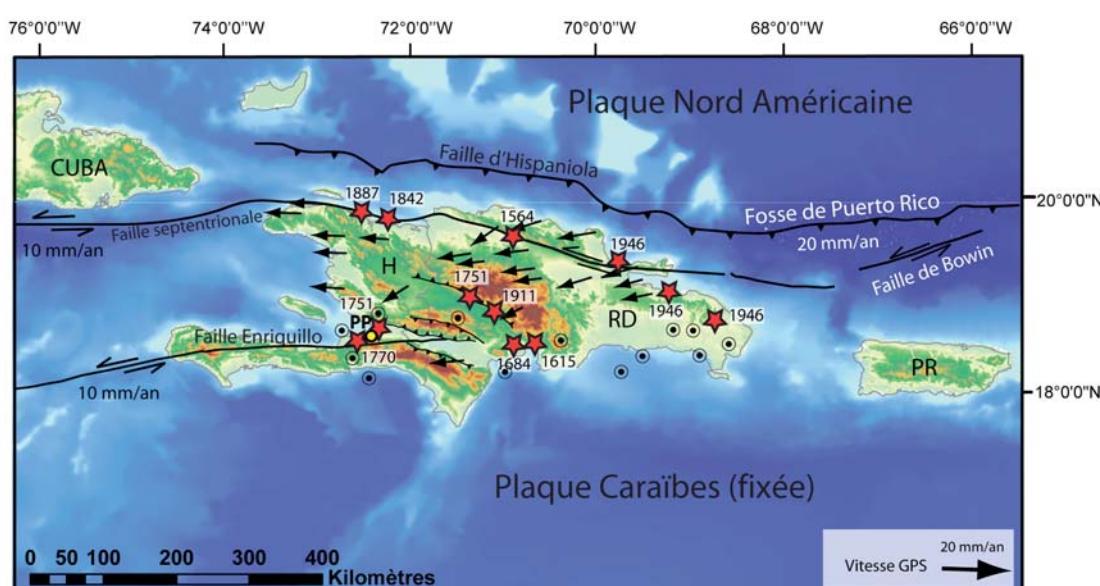
of the Collège de France

*with the collaboration of Claude Rangin, Tiphaine Zitter
and Agnès Crespy of the Egérie team of Collège de France*

More informations: the best source is the website of Eric Calais, professor at Purdue University:
<http://web.ics.purdue.edu/~ecalais/haiti/>



The rupture of the January 12 2010 earthquake of Haiti. The yellow star marks the localization of the epicenter and the red dots those of the main aftershocks, after the USGS. The wide band identifies the probable zone of rupture.



Tectonic context of the January 12 earthquake. The probable locations of the main historical earthquakes are identified by a red star. The year of the earthquake is next. The yellow point marks the location of Port-au-Prince. The black arrows are the GPS velocity vectors with respect to the Caribbean plate. Les circles with a black dot in the center indicate where the velocity vectors are small with respect to the errors of measurement. These points are located on the southern portion of Hispaniola and consequently belong to the Caribbean plate.

PR: Puerto Rico

RD: Dominican Republic

H: Haiti

Data from Éric Calais.

Jean Dausset 1916–2009

Chair of Experimental Medicine
1977–1987

by Philippe Kourilsky



Jean Dausset passed away on 6 June 2009, at the age of 93. He held the chair of Experimental Medicine from 1977 to 1987, and is to thank for one of the most important discoveries in the history of immunology: that of the HLA system. In 1952, he observed that the combination of a patient's white blood cells with another donor's serum triggered an agglutination effect. From this he deduced that anti-white blood cell antibodies existed in the patient's body, and showed that these were the result of the many blood transfusions that the patient had undergone. The existence of blood groups for red blood cells was already known; Dausset showed that the same went for white blood cells, but with groups of a different nature, that were far more complex. Years of work and the study of blood samples from large numbers of patients and volunteer donors were necessary. In 1958, he identified the first leukocyte group, speculated on its genetic origin and emphasized its probable importance for organ transplants. The HLA system was born, with multiple implications: firstly medical ones, for transplants. It also had immunological implications: thousands of researchers in the world—myself included—set out to isolate genes, to determine the molecular origins of transplantation antigens, and to understand the cellular reactions associated with the HLA. It had anthropological implications: the HLA can be used as a marker of individuals and therefore of the migration and mixing of human populations. Lastly, it had genetic implications, since the polymorphism of the HLA opened the way for the analysis of other

polymorphisms in human beings. This is what led Jean Dausset, in 1984, to create the *Centre d'études des polymorphismes humains* (CEPH—Centre for the study of human polymorphisms), transformed into the *Fondation Jean Dausset* in 1993, where the first detailed genetic mapping of human beings was developed—a prelude to sequencing the human genome. In 1980, along with Baruj Benacerraf and George D. Snell, Jean Dausset received the Nobel Prize in Physiology and Medicine which honoured, along with many other distinctions, his discovery of the HLA.

This is the story that one finds in the textbooks. Yet scientists often provide a formal reconstruction of the history of science that is very different from the actual story, which they struggle to tell. Their reconstruction sometimes provides a regrettable approximation of the lived reality. In the case of Jean Dausset, it is simply erroneous.

Born in Toulouse in 1916, he studied medicine, but was interrupted by the war in 1939. Although drafted into the army, in 1940 he was able to get back to Paris to prepare for an internship, which he obtained in 1941. In the following year, after reading a small poster displayed at the Saint-Louis hospital, he enrolled and left for North Africa. Starting off as an ambulance driver, he then became a blood transfuser and resuscitator. He found himself confronted with a constant stream of wounded patients who, in difficult and uncertain conditions, needed reanimation,

operations, and transfusions. A transfuser he remained: once back in Paris in 1945, he was appointed to the Centre for blood transfusion at the Saint-Antoine hospital. In 1961 he joined the *Centre Hayem* at the Saint-Louis hospital, alongside Jean Bernard.

To transfuse, blood is needed. Human beings are needed to give blood to other human beings. Transfusion is the expression of a human bond, of which Jean Dausset became an promoter. He expressed it in all his activities; not only scientific and medical, but also social and societal ones. For instance, he expressed it in his taste for art: in 1946 he opened a bookshop in Paris, rue du Dragon in the 6th arrondissement, that later became an avant-garde gallery frequented by André Breton and many others. Fernand Léger, Yves Tanguy, Pierre Alechinsky, etc., exhibited their work there. He also expressed it in his desire to serve the community: from 1955 to 1958, Jean Dausset was a member of the cabinet of the Minister of Education, where he defended and planned the "Debré" reforms of medical studies and of the university-hospital system, which allowed for full-time work in hospitals and for medical research to flourish. The importance of the human bond was also evidenced in his commitment to promoting responsibility among scientists: from 1984 to 2001, he chaired the Universal Movement for Scientific Responsibility (MURS). Finally, we witness it in his research activities: in fact

this is the lens through which his scientific and medical work should be seen, since they were largely underpinned by this human bond.

Jean Dausset would probably not have been able to carry out his work and to make his important discoveries, had he not had access to patients, of course, but also blood donors and later organ donors. He respected donors, and donors respected him. At the Nobel Prize ceremony he chose to be accompanied by two of them. He received, but was driven by the desire to give back, not only through individual medical activity but also by organizing the pooling of knowledge and resources to benefit the community. The international conference and workshops on the HLA bear witness to this, as well as the creation of *France-Transplant* in 1969 and of *France-Greffe de Moelle* in 1987. A particularly noteworthy application for this sharing culture was found in a strictly scientific sector from which it had previously been virtually absent. The creation of the CEPH in 1984 was made possible thanks to the sale of a collection of paintings donated by a woman who had recognized him on television. Jean Dausset used them in the simplest and best way there was. He started to gather blood samples from 61 large donor families. Their DNA was extracted, preserved and analysed, and many genetic polymorphisms were mapped: close to 200 as early as 1992—several million today. His ties with the *Association française contre la myopathie* (AFM—French Muscular Dystrophy Association) and the creation of the *Généthon* in 1991 brilliantly magnified this effort that led to the growing precision of human genome mapping and made its sequencing possible. France thus opened the way to organized sharing in biological experimentation, and Jean Dausset can be considered as one of the founders of human molecular genetics.

We will no longer see the slender, slightly hunched silhouette of Jean Dausset, nor his warm gaze, full of humour and even mischief. He has been honoured in many ways, many times. But beyond the official story, let us remember his humanity. Jean Dausset was certainly a great scientist, but he was also and perhaps first and foremost a human being, a great human being, whose science was great because it was human. ■

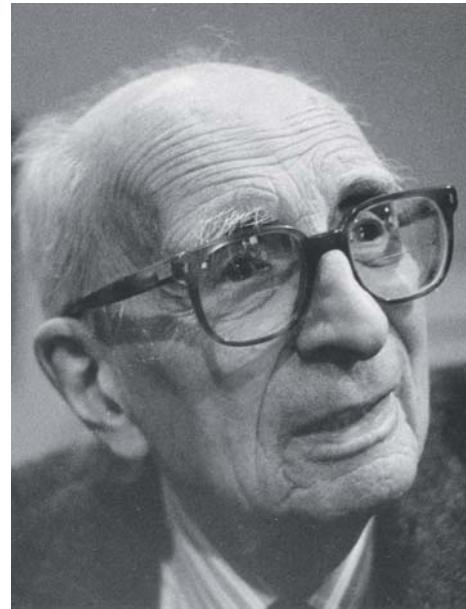
Professor Philippe Kourilsky
Chair of Molecular Immunology



Claude Lévi-Strauss 1908–2009

Chair of Social Anthropology 1959–1982

by Philippe Descola



Claude Lévi-Strauss died on 30 October 2009, a few days before his 101st birthday. He was born on 28 November 1908 into a family where the arts were cultivated: painting, which was his father's profession; music, in which his great-grandfather, composer and conductor Isaac Strauss had won renown; and literature, at which he tried his hand at a very early age. A good student, but a dabbler, he studied both philosophy and law but devoted much of his energy to activism in the SFIO,¹ of which he saw himself at one stage becoming the official theoretician. Fortunately for science, fate decided otherwise. After his *agrégation*,² in philosophy and a brief period in secondary education, of which he retained a gloomy memory, Claude Lévi-Strauss' life changed direction in the autumn of 1934 when Célestin Bouglé suggested he join the French university mission at São Paulo University to lecture in sociology. There he discovered a country that he would be particularly fond of for the rest of his life. Above all, he discovered ethnology in the field, for which he had developed a taste by reading Robert Lowie, and which he was able to practice during university holidays. His first mission was in 1935–1936 to study the Caduveo and Bororo in the Mato Grosso do Sul. This was followed by an eight-month mission during which, mandated by the Musée de l'Homme that Paul Rivet had just founded, he resided first among the Nambikwara of the north of the Mato Grosso and then with the Tupi-Monde and the Tupi-Kawahib on the Bolivian border.

In this respect, allow me a few words on Claude Lévi-Strauss the ethnographer, so often overlooked. He

himself acknowledged his lack of patience needed for the painstaking work that the collection of ethnographic data required. Taking him literally, many commentators saw him exclusively as an armchair anthropologist. Yet his complementary thesis on the Nambikwara, as well as many articles that he wrote on various aspects of the life of the populations among which he sojourned, clearly show that nothing about them remained foreign to him, from the symbolism of the colours of their fletchings and the Bororos' penile sheaths, to those features of the Nambikwara language that were comparable to Chibcha. Moreover, most of his analyses of the institutions of these people, with whom he actually spent relatively little time, were amply confirmed by the ethnographers who, 40 or 50 years later, studied them in far greater depth. Finally, there is no doubt that his experience with the American Indians, by enabling him to witness the functioning of institutions—albeit undermined—that had previously seemed to him to exist in books only, contributed to imprinting in him a philosophy of social life that never left him. Hence, the importance of the mutual dependence that Bororo moieties fostered, where all the important acts in an individual's life, from birth rites to funeral rites, were accomplished by the members of the other moiety, could but consolidate in him the idea that reciprocity was the basis of any society. And it was certainly also his fondness for the Nambikwara, that static and crystalline island beaten by the waves of an unkind historical future, that fed the idea of the so-called 'cold' societies which desperately tried to freeze events to prevent their effects from snowballing out of control.

1. Precursor of the current Socialist Party. [Transl.]

2. State competitive examination to qualify for teaching posts at high-school and university level. [Transl.]

Claude Lévi-Strauss returned to France on the eve of the war, in which he participated as a liaison officer, but was struck after armistice by the anti-Semitic laws of the Vichy regime and managed to leave the country for the United States. There he taught at the New School for Social Research in New York. He joined the Free French Forces, was assigned to the French scientific mission to the US, and founded the École Libre des Hautes Études de New York where he was appointed general secretary. It was during this period in the US that Claude Lévi-Strauss became a full-fledged anthropologist. The discipline was more established and older there than in France. A network of Chairs, institutions and journals inspired him and, above all, a long tradition of fieldwork had produced an extraordinarily rich documentation on the Indians of North America, on which he drew for many of his subsequent studies. It was also in New York that Claude Lévi-Strauss discovered the systematic study of kinship, a field that until then had been neglected in France and to which he devoted all his efforts for several years. Finally, New York was where he met another refugee, Roman Jakobson, who initiated him into linguistics and became his friend. This was the rich melting pot that spawned structural anthropology, less a new stream in an established science than a new knowledge method, forged in the treatment of problems peculiar to a discipline.

From a very early stage Claude Lévi-Strauss was convinced that social science was built not on the basis of manifest reality but by elucidating the subconscious order where the rational correspondence between the properties of thought and those of the world are revealed. In structural phonology he discovered an ideal model to apply his intuition, and in the abundant ethnographic literature that he studied in New York, the material to substantiate it. This model had four noteworthy characteristics: it focused not on conscious phenomena but rather on the subconscious infrastructure; it analysed not terms but relations between them; it sought to show that these relations formed a system; and it aimed to discover general laws. During this period Lévi-Strauss posited that, combined, these four approaches could contribute to illuminating problems of kinship because of the formal analogy that it revealed between phonemes and the terms used to denote relatives. Both are elements whose meaning stems from their combination into systems, themselves products of the subconscious functioning of the mind, and whose recurrence in many places of the world suggests that they comply with universal laws.

Les Structures élémentaires de la parenté, the thesis for his PhD obtained after his return to France in 1948, was a masterly variation on this initial intuition,

immediately saluted in the world as a revolution in the way of addressing kinship phenomena. In it, Lévi-Strauss rejected the point of view of the sociology of kinship groups and that of their conjectural historical reconstruction, replacing it with a general theory of the alliance of marriage which, in turn, elucidated the nature and functioning of the social units at play in kinship and situated them in a broader set. He also established the generality of the rules ordering systems of matrimonial exchange based on the structures of the mind. He saw this as the only logical base for confirming the hypothesis of the unity of humans in the diversity of their cultural productions.

Appointed by Lucien Febvre in 1948 to the new 6th Section of the École Pratique des Hautes Études, then nominated in 1949 as Research Director to the 5th Section of the same institution, Claude Lévi-Strauss gradually turned away from sociological studies to devote himself to the study of the various manifestations of 'savage' thinking, an ideal way to understand the functioning of the mind. The systems of classification, myths and ritual operations of societies without writing relate to the qualities of the objects of the world and the connections that can be made between them. Their study is therefore an ideal way of highlighting mental operations that do not differ fundamentally from those of scientific thinking, even if the phenomena to which they apply and the knowledge that they produce may make them seem very distant. Practised first on sensitive categories, savage thinking uncovers and orders the remarkable characters of natural objects to convert them into signs of their hidden properties. To be sure, these signs are still partially submerged in the images from which they draw their existence, but they do nevertheless have a sufficient degree of autonomy compared to their referents to be able to be used, within their limited category, for purposes other than those for which they were initially intended. The logic of the sensible is thus an 'intellectual bricolage' exploiting a small repertoire of permutating relations within a set that forms a system. Hence, structural analysis aims not only to elucidate the logic at play in mythical thinking, but also, through the study of 'the thinking of savages', to illuminate the part of 'the savage mind' that each of us still has left over from before the great rational domestication.

In 1959 Claude Lévi-Strauss was elected Professor at the Collège de France, after two unsuccessful applications and thanks to the decisive support of Maurice Merleau-Ponty. Although the title of his chair was 'Social Anthropology', most of his research and teaching was devoted to mythical thinking, leading to the publication from 1964 to 1971 of the four volumes

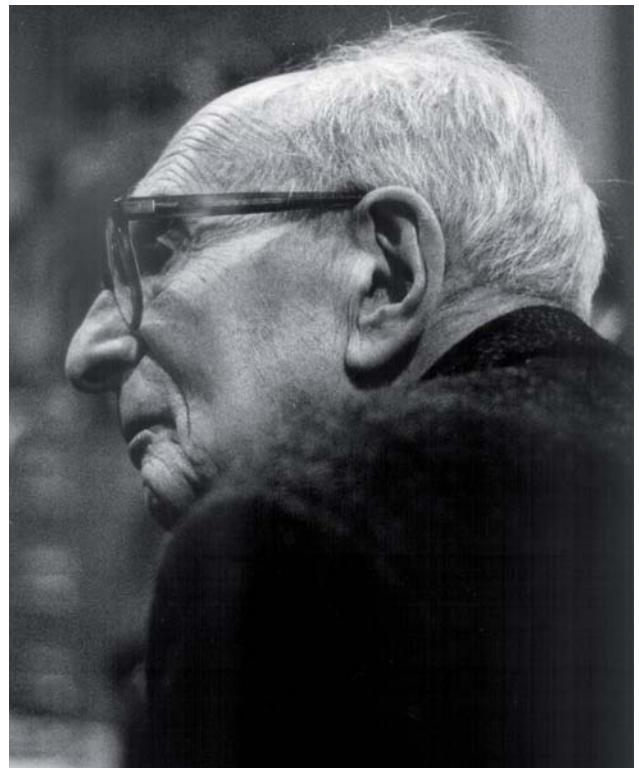
of *Mythologiques*. Claude Lévi-Strauss argued that myths, more so than other products of savage thinking, were the fruit of a creative liberty freed from the constraints of the real. Shedding light on the laws of their functioning should therefore make it possible to further our understanding of a mind that takes itself as an object, without talking subjects being aware of how it does so. Taken separately, each myth is indeed an unreasonable story, without true signification apart from the moral lesson that those recounting it sometimes feel entitled to infer from it. Meaning proceeds not from the content of a favoured myth, but from the resonance of thousands of myths which, over and above the apparent diversity of their content and the distance between the peoples that invented them, weave a constantly-changing logical web around the world. The multiple combinations of these myths define the closed field of the operations of the human mind. Hence, the structural analysis of myths cannot claim to be exhaustive. Advancing in pace with the associations of a syntagmatic chain starting from a randomly chosen reference myth, it can aspire only to carve out of this immense web fragmented matrices of signification that a different path might have disregarded.

Claude Lévi-Strauss' abundant scientific work should not make us forget the importance of his moral thinking. Constantly denouncing the concurrent impoverishment of the diversity of cultures and natural species, he always saw anthropology as a tool for criticizing prejudices, notably racial ones, as well as a means for implementing a 'generalized' humanism. By that he meant a humanism no longer limited, as in the Renaissance, to Western societies only, but one that took into account the experience and knowledge of all human societies, both past and present. Far from leading to an improbable global civilization that abolished singularities, this type of humanism would, on the contrary, take into account the fact that with regard to aesthetics and spirituality, any true creation requires both individuals and cultures to draw on their particularisms in order to contrast them better with other values. The question of aesthetics is a theme running throughout Claude Lévi-Strauss' thinking. Not only did he consider forms of artistic expression—or ones perceived as such—of non-Western societies both as a challenge to the rationality of the West and a legitimate subject of anthropological knowledge, he also fed his work with in-depth reflection on the role of music and art as mediations between the sensible and the intelligible, which made it a crucial contribution to aesthetic theory.

3. *Structural Anthropology*.

In 1963, with the publication of *Anthropologie structurale* in English,³ Susan Sontag published an article on Claude Lévi-Strauss entitled 'A Hero of our Time'. Above all, she was commending *Tristes Tropiques*, comparing it to Montaigne's *Essais* and admiring the lucid heroism of this observer of humans, whose pessimism never led him to discouragement. Yet we can say that Claude Lévi-Strauss was heroic in another sense too, when he took the risk of building that which, in many respects, was a new science, and when, through his own practice, he set for it such a high standard of requirement and intellectual virtuosity that he was never sure of being followed or even understood. The future will tell whether his work—in my opinion the most significant of the 20th century in its field—will continue for a long time to act as a catalyst, as it has done in the past decades. The hundred or so books devoted to him seem to indicate that this will be so. ■

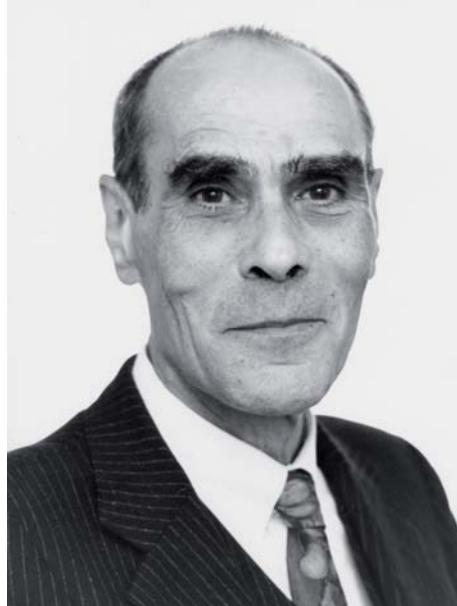
Professor Philippe Descola
Chair of Anthropology of Nature



Jean Yoyotte 1927–2009

Chair of Egyptology 1991–1997

by Nicolas Grimal



Jean Yoyotte passed away on 1 July last year. He was born on 4 August 1927 in Lyon, into a family from Martinique. His father was a chemical engineer with a senior position in the company Rhône-Poulenc, which soon led him to settle in Paris. Thus, in 1932, at the age of five, Jean Yoyotte became a Parisian, and remained so until his death. To be more exact, he became a citizen of the 5th arrondissement and, even more precisely, of the Montagne Sainte-Geneviève, for he studied at the Lycée Henri IV and his life ended in his flat in the Rue Monge. Yet behind this limited topography lay the vast horizons of Jean Yoyotte's career, fed by the prestigious institutions that he frequented in that area.

His studies at Henri IV left Jean Yoyotte with two valuable assets: an insatiable curiosity, and a deep friendship with Serge Sauneron that developed in their youth through their discovery, together, of the pharaoh's Egypt. This friendship lasted until the tragic death of Serge Sauneron in 1976 at the age of 49, when he was head of the Institut Français d'Archéologie Orientale and the leader in his field. The *loisirs dirigés* made compulsory in 1936 by the Léon Blum government had the unexpected effect of binding the members of the 'Egyptian club' founded by the two friends' art teacher. They were joined by Gérard Godron who ended his career as professor of Egyptology at Paul Valéry University. All three gradually migrated from the Montagne Sainte-Geneviève to the École du Louvre and the École Pratique des Hautes Études. Jean Yoyotte followed the classes of the masters of those days: Jean Sainte Fare Garnot, Jacques-Jean Clère, Michel Malinine, Jacques Vandier, Gustave Lefebvre, and Georges Posener, of whom he became a disciple.

After obtaining his *baccalaureat* in 1945, Jean Yoyotte studied for a bachelor's degree in history and in 1948 joined the CNRS as a trainee. He was assigned to the chair of Pierre Montet at the Collège de France. Both were to change his life: the Collège, which he never really left, even though he regularly crossed the Rue Saint Jacques to the other pole of his career, the École Pratique des Hautes Études; and Pierre Montet, from whom he inherited his fascination with Tanis and of whom he was to be one of the successors at the Collège.

Jean Yoyotte studied at the École Pratique des Hautes Études (4th Section) in 1951 and in the following year obtained a *diplôme d'études supérieures* in history. In 1953 this enabled him to join the Institut Français d'Archéologie Orientale in Cairo as a scientific member. He remained in Egypt until 1957. Those were not easy times in a country that was challenging the foundations of its society, but Jean Yoyotte managed to travel extensively, often with Bernard Bothmer who remained a friend throughout his life. He visited the sites to which he would later devote many studies: Heliopolis, Kom Abou Billou, Saft el-Henna, Abusir Bana, el-Kom el-Kebir, Samanoud, Mendes, Tell Rozan, Tell Abu Yasin, Horbeit, etc. Jean Yoyotte was fascinated above all by the sites of the delta, to which he devoted most of his research. On the basis of this first experience in the field, compared with the historical sources, he wrote an article in 1961 that was to be one of his main works: 'Les principautés du delta au temps de l'anarchie libyenne'. In this article he organized the complex documentation of that period, providing a new synthesis that was to serve as a basis for subsequent work on the same subject, primarily that of Farouk Gomaa and Kenneth A. Kitchen. The geography of the delta and, more particularly, its religious geography

were to be the main theme of his teaching at the École Pratique des Hautes Études from 1964, when he succeeded Jean Sainte-Fare Garnot who passed away prematurely and who had been his director at the Institut Français d'Archéologie Oriental for four years. Since his return from Egypt he had revived his ties with the Collège and rediscovered the library of the Cabinet Champollion where he had formerly been a librarian for a short while.

In 1964 Jean Yoyotte took up the post of project manager at Tanis, where the archaeological work had been interrupted in 1956. There he conducted ten campaigns, until 1984, and carried out painstaking work recording and classifying, both in the field and on the archives of the Montet mission. He ordered a systematic review of the site and explored major sectors: the temple of Khonsu, the area of the Sacred Lake, the south of the temple of Mout and, of course, the necropolis, one of Pierre Montet's main discoveries during the Second World War.

At the same time, as part of the Centre de Documentation d'Histoire des Religions, he created and ran the Vladimir Golenischeff Centre, which currently still has the core scientific documentation of the Montet archives and which further enriched Jean Yoyotte's personal library.

A fine result of this patient collation and fieldwork was the exhibition on the treasures of Tanis, which opened in 1987 at the Grand Palais in Paris and then moved on to the Centre de la Vieille Charité in Marseille, before an international tour. In 1984 Philippe Brissaud took over as director of this site of immense potential, as the discovery of the Sacred Lake at Mout in that year evidenced.

Jean Yoyotte was elected professor at the Collège de France on 30 June 1991. He lectured there from 1992 up to his retirement in 1997, essentially on late Egypt, thus moving ever closer to the Greek period and the role that the great cities of the delta played in it, namely Naucratis and, more recently, Heracleon-Thonis. His interest in the Greek presence dated back to his Egyptian years when he helped Father du Bourguet draw up an epigraphic inventory of Deir el-Medina and Abydos. During that project he had started to record Carian and Cypriot graffiti. Jean Yoyotte's Greek studies occupied the rest of his life, much of the time with the scientific collaboration of Olivier Masson and then, in recent years, with André Bernand.

For a quarter century at the École Pratique des Hautes Études, and then for six years at the Collège de France, Jean Yoyotte imparted rich and varied learning,

contributing to the education of generations of Egyptologists, both French and of other nationalities. For my generation, his classes, along with those of Jean Leclant, Georges Posener, Jacques-Jean Clère and Paul Barguet, were the main source of our training. His teaching ranged from Egyptian grammar to the various aspects of religion, through geography, priesthood, and funereal literature. We followed the virtuosity of the Master who readily studied original or unknown texts with us.

Jean Yoyotte's scientific work reflects his constantly aroused curiosity. Historian above all, he was also a geographer and a philologist. His studies encompass a wide range of subjects, including toponymy, royalty, the prosopography of private individuals, anthroponomy, institutions, economics, society, the pantheon and religious conceptions. Each study was an opportunity for a dense and enriching framing from a new perspective. The scope of this short article does not enable me to list his abundant and varied scientific production. I simply wish to mention that all of his studies, even those devoted to what seemed like a detail before he examined them, still are and will always be unavoidable sources for researchers.

The general public is acquainted with Jean Yoyotte through his collective books. The most famous is probably *Le Dictionnaire de la civilisation égyptienne*, edited by Georges Posener and Serge Sauneron. Published in 1959, it was repeatedly reprinted and a new revised edition is forthcoming. Jean Yoyotte also contributed to *L'Encyclopédie de la Pléiade*, with three articles on Egyptian history, art and mentalities. In 1968 he furthermore published *Les Trésors des pharaons* and, more recently, in 2005, with Pascal Vernus, a *Bestiaire des pharaons*.

As fate would have it, the major volume on Darius' Palace at Susa, edited by Jean Perrot, was published just last week, and Chapter 3 is by Jean Yoyotte: the final publication of the Egyptian statues of Darius, discovered in 1973. This chapter is characterized not only by the erudition and precision of the historian, but also by the vision and the sharp intelligence of the great scholar who has left us. ■

Professor Nicolas Grimal
Chair of Pharaonic Civilization: Archaeology, Philology, History

Léon BRILLOUIN FROM WAVES TO INFORMATION

by Rémy Mosseri



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Léon Brillouin (1889–1969) taught physics theory at the Collège de France from 1932 to 1948. Additionally, he was heir to a great scientific legacy that strengthened his attachment to this prestigious institution, for he followed in the footsteps of both his grandfather, Eleuthère Mascart, chair of Experimental Physics from 1872 to 1908 (succeeded by Paul Langevin), and his father, Marcel Brillouin, chair of Physics Theory and Mathematics from 1900 to 1931.

As the surname Brillouin was already associated with many breakthroughs in physics, the young Léon also had to find a place for himself—and succeeded brilliantly in doing so. The work of this scientist, at the summit of French physics theory between the two World Wars, both witnessing and taking part in the quantum revolution and covering a vast range of subjects, illustrates a significant part of modern physics. In this article we consider one of the main themes underlying his scientific career, from the physics of undulatory phenomena to information theory in the immediate post-WWII years.

The young Léon first worked on waves as early as 1913, during a year spent training in Munich under the already famous physicist Arnold Sommerfeld, after graduating from the École Normale Supérieure. His research there won him renown, particularly his prediction of the existence of a precursor signal—which since then has borne his name—that precedes electromagnetic waves propagated in a dispersive environment. Back in France he started to work on his thesis, with the project of building a solid state equation somewhat similar, for matter, to the famous relationship between pressure, volume and temperature in gasses. But this difficult work, which led him to clarify the notion of “radiation pressure”, was soon interrupted by the outbreak of the war in 1914. Léon Brillouin was assigned to the Laboratoire Central de Radio-télégraphie under the authority of the (future) General Ferrié. In that context he investigated undulatory problems from a more concrete angle, through antennae studies, radio-piloting and

scrambling, which earned him the Legion of Honour.

After the war he resumed his research on solids. By analysing the interaction between an incidental light wave and vibration waves in a solid, he made his most original discovery: the prediction—which preceded its experimental verification by nearly ten years—of a subtle coupling between the two types of wave, and the fact that this produced an exchange of energy and thus of wavelength for the light escaping from the solid.

The Brillouin effect was to traverse the century, triggering increased interest from the 1960s when lasers became common features in laboratories and made it possible to amplify measurements. Even today, it is still an essential tool for highly accurate analysis of the elastic properties of solids.

With the advent of quantum mechanics in the 1920s, Léon Brillouin contributed to various aspects of the new theory, including magnetism, where the “Brillouin functions” enhanced the classical “Langevin function”. In parallel he also developed a famous method of approximation known by the names of Brillouin, Wentzel and Kramers.

It was likewise in the field of wave propagation that Léon Brillouin signed another famous study. He was seeking to describe the behaviour of the wave, that is now associated with any material particle, and in particular with the electron, when it interacts with the periodic arrangements of atoms in crystals. Brillouin worked in so-called “reciprocal” space, where a vector represents a wave filling the entire space of the crystal. He showed how to divide this space into planes forming a set of “Brillouin zones”, thus making it possible to unambiguously identify all the waves, the planes themselves corresponding to those waves whose propagation is impossible in the crystal. This work paved the way to modern solid state physics and in particular to understanding the differences between isolating and conducting materials.

At that stage, in 1930, Léon Brillouin was the first physics professor of the brand new Institut Henri Poincaré, from which he resigned two years later to join the Collège de France. He was at the height of his scientific career and his reputation stretched way beyond the French community. The effect that he had predicted several years earlier had clearly been observed in liquids and solids—an achievement that he hoped would be recognized by the Nobel jury but never was.

His research in the 1930s at the Collège primarily concerned what is known as the quantum N-body problem, and is too technical to summarize here. But he also opened his seminars to concrete problems (such as acoustics) and pluridisciplinary ones, and started to develop a growing taste for epistemological questions.

As the spectre of global conflict loomed once again, political decisions were taken concerning radio broadcasting, with a view to creating a powerful and effective tool. In July 1939 Léon Brillouin was appointed head of radio broadcasting, with the prime objective of reducing France's technological backwardness in comparison with Germany, and above all equipping the country with powerful short-wave transmitters, which it lacked. During France's disastrous defeat of May-June 1940 he gave the order to destroy all the transmitters before they fell into enemy hands. He then joined the complex operation headed by biologist Louis Rapkine, which enabled tens of scientists to leave France for the United States during the first two years of the war. This was how Léon Brillouin arrived in New York in May 1941. He became a member of the Free French Forces and rapidly sought to participate in the US war effort, rightly believing that his recent research on magnetron theory would interest the engineers feverishly developing the

radars that would contribute so much to the Allies' supremacy. His participation was officially recognized by the US authorities, albeit at a late stage.

After the Liberation his return to France turned out to be somewhat complicated. Did he feel that there was little enthusiasm to have him back in Paris, or did he want to remain in the US because he sensed the tremendous scientific interest of the first generation of computers that he saw being developed at Harvard? He postponed his return, content to make short visits to resume his lectures at the Collège de France where he was eagerly awaited, especially by those who, cut off from scientific progress under the occupation, aspired to rapidly catching up. But the Collège rules prohibited this intermittent presence, and Léon Brillouin finally chose to remain in the United States and even to adopt US nationality in 1949. He already had a place of choice among the American scientific elite, sanctioned by his election to the National Academy of Sciences in 1953.

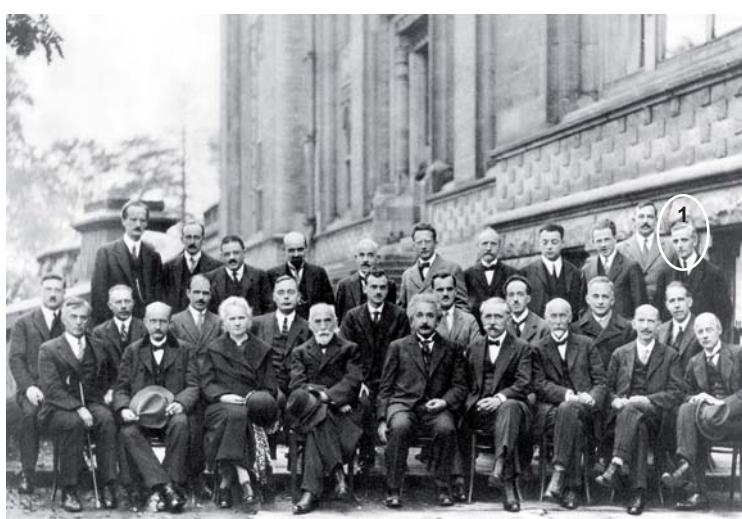
In the immediate post-WWII years he developed a passion for the new Information theory spawned by the work of Shannon and Weaver. His book *Science and Theory of Information* made Léon Brillouin one of the main vehicles of the success of this theory. In it he tackled the old problem of Maxwell's demon which continued to undermine the bases of thermodynamics, and even thought that he had solved it, concluding that "the demon is old now and it is time to retire it". But his argumentation, apparently very sound, was nevertheless refuted some thirty years later by Charles Bennett.

It is difficult not to conclude that by returning to France, Brillouin would surely have made a valuable contribution on the country's scientific scene. Merely listing some of his last centres of interest, such as non-linear physics and biophysics, unambiguously places him in the flow of science in the making. In certain respects, he even seems to have been a visionary. And there seems little doubt that his passion for the philosophy of science would have led him to involve himself more forcefully in France (as he was already doing from the United States) in debates at the frontiers and interfaces between disciplines. That is an area where, even more so than within the various fields, the migration of concepts requires a scholarly combination of openness and rigour—qualities that Léon Brillouin embodied so well. ■

Rémy Mosseri

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Fifth Solvay International Conference on Electrons and Photons, Brussels, October 1927.

1. Léon Brillouin

© Benjamin Couprie, International Solvay Institutes for Physics and Chemistry

Further reading:

Rémy Mosseri,

Léon Brillouin, à la croisée des ondes,

Éditions Belin, Paris 1999.

INSTITUTIONAL NEWS

THE GENERAL LIBRARY OF THE COLLÈGE DE FRANCE

by Marie-Renée Cazabon
Curator

Library and Archive Services

The libraries of the Collège de France, including the specialized collections on the Near East, the Far East, Byzantium and Egyptology, are amongst the richest and most beautiful libraries in Europe. Their core components, the General Library and the Archives, have now been moved back to the Marcelin-Berthelot campus. Two thousand square metres of space have been entirely renovated and are now ready to receive French and foreign researchers in the best possible conditions (access to the network, large catalogues and databases, and eventually remote consultation of digitized volumes).

This is all coordinated by the Library and Archive Services, the purpose of which is to:

- Ensure coordination with all Collège de France libraries, including:
 - expert advice in library science, standardization and unification of professional procedures, including in the domain of archives;
 - centralization of the acquisition, subscription and binding markets;
 - centralization of inter-library loans (ILL), and pooling of resources;
 - development of partnerships with libraries from outside the Collège de France.
- Connect all these libraries through a single computerized management system: ALEPH. This is an integrated library management system (ILMS) funded through patronage, which

will unite all the different catalogues of the specialized libraries and of the General Library in a single catalogue. It will moreover be enhanced with current tools for networked research of online documents, using the library portal.

- Join the national dynamic in this domain: for instance, the General Library of the Collège de France and the specialized libraries currently take part in the main unifying higher education projects, SUDOC (système universitaire de documentation—university library system), and will eventually participate in CALAMES (catalogue en ligne des archives et des manuscrits de l'enseignement supérieur—online catalogue for higher education archives and manuscripts).
- Host researchers: the new space will allow for researchers to be hosted far more comfortably and for three essential functions to be developed:
 - memory function: collecting, identifying, preserving and disseminating publications by and about the professors and their teachings, and about the history of the Collège de France, regardless of the format;
 - interdisciplinary function: updating and making available work tools of interest to several Chairs or several groups of Chairs;
 - external function: extending the use of its resources beyond its own teams (hosting foreign researchers or researchers from partner institutions, searching for and providing material using the ILL system, accessing external resources using the library portal).

Collaboration and partnerships

With both scientific and economic objectives in mind, the specialized libraries and the General Library of the Collège de France have developed ties, confirmed in some cases by agreements, with various partners: the Bibliothèque Universitaire des Langues et Civilisations (BULAC—university library of languages and civilizations); the École Normale Supérieure, rue d'Ulm; the Institut National des Langues et Civilisations

Orientales (INALCO—national institute of oriental languages and civilizations); the Bibliothèque Inter-universitaire de Médecine (BIUM—inter-university medical library); the Institut Mémoire de l'édition Contemporaine (IMEC—institute for the memory of contemporary publishing); the Institut de Recherche et d'Histoire des Textes (IRHT—institute for textual research and history) of the CNRS.



The computerization of the libraries

Thanks to patronages, particularly that of Mr Michel David-Weill, the library service has developed and implemented a common tool for all the libraries: a single catalogue allowing access from anywhere to all of the bibliographical descriptions of the collections available in the various libraries of the Collège de France. The different catalogues of the libraries have been uploaded to an integrated library management system (ILMS) known as ALEPH. Apart from the possibility of searching for the description of a publication as in any catalogue, the numerous resources offered by this system make it a very powerful reference tool.

ALEPH is used in a large number of higher education libraries in France. It applies the most recent library science and computing standards, as well as the essential functionalities required of a catalogue. ALEPH moreover includes the Unicode standard which allows for the original language and edition of publications to be catalogued. It of course also offers the possibility of networking and exchanging data with the SUDOC (collective catalogue of the higher education and research libraries).

The General and Scientific Library

Located in new premises, Place Marcelin-Berthelot, the General and Scientific Library has a collection of some 120,000 publications (sciences of Antiquity, literature, history, history of art, various specialized collections, scientific publications) and a very wide range of scientific periodicals that can be accessed freely.

Its main aims are to preserve the publications of the Professors and some of their archives, as well as the written and audiovisual archives of the institution, to provide a bibliographical search tool, and to manage electronic resources. The reading hall has 58 seats and six carrels.

The Oriental libraries

The Oriental Institutes are situated at 52 rue du Cardinal-Lemoine, and count five libraries and research units (Institutes of Egyptology, of the Far East, of the Ancient Near East, of Byzantine Studies, and of Arabic, Turkish and Islamic Studies). Each institute is directly managed by a Professor, when there is one in the relevant discipline, assisted by a scientific committee that is representative of all researchers in the field. The committee members are

Users have access to an electronic resource portal organized and catalogued by the libraries of the Collège de France. The portal offers a complete display of the information sources offered by the institution's libraries.

For each item, users can choose the services offered by the libraries such as, for instance, access to the full text. A personal page with a basket, a list of favourite resources, automatic alert management and a history of searches is offered to any authenticated user.

For computer searches, users are offered a number of services and links that allow them, when consulting bibliographical references, to access complementary information systems. Another application concerns the management of digital collections. It includes functionalities specifically dedicated to the conservation of digital documents and to managing the registration of copyrights and digital material. This application offers the guarantee of long-term access to this material and uses technologies included in ALEPH to catalogue and index the data. ■

nominated for three years by the Assembly of Professors of the Collège de France upon recommendation by the Administrator of the Collège de France. Some institutes publish collections and have scientific archives which are open to researchers, except when research on the collections themselves is ongoing or planned. The institutes work closely with research teams that have access there to study and group meeting areas.

The Institutes of the Far East offer access to the very rich material of the library of the Société Asiatique (Asian Society), when these are not otherwise accessible due to a shortage of staff. The loan of books from the Société Asiatique and consultation of its archives is for members only.

The Social Anthropology Library

The Social Anthropology Library is one of the three reference libraries in the Paris area for anthropology. It works closely with the CNRS and the École des Hautes Études en Sciences Sociales (School of Advanced Studies in Social Science).



PARIS SCIENCE ET LETTRES - Quartier Latin

PARIS SCIENCE AND HUMANITIES—Latin Quarter



The grouping together of five institutions to form a campus of international renown, at the heart of the Latin Quarter, contributes to enhancing the visibility and appeal of French learning and research.

The aim of *Paris Sciences et Lettres - Quartier Latin* is to:

- ensure that the Latin Quarter remains an exceptional site of higher education and research, by coordinating investments in real estate and in literature and digital equipment;
- increase synergies and the pooling of teaching and research activities, by developing multidisciplinary activities and interfaces, and by working on common research projects;
- undertake strategic reflection on and adopt a common long-term approach to emerging themes;
- enhance France's international visibility and appeal by creating Chairs of excellence, organizing calls for proposals for post-doctoral researchers and young teams, and implementing systems for hosting researchers and supporting international mobility.

The Paris Science and Humanities group is made up of institutions which, for centuries, have consistently contributed to the advancement of French science and humanities: the École Normale Supérieure, the Collège de France, the Observatoire de Paris, the École Supérieure de Physique et de Chimie Industrielles de la ville de Paris-ParisTech, and the École Nationale Supérieure de Chimie de Paris-ParisTech. Together on the Montagne Sainte-Geneviève, these institutions form a continuum of higher education and research that covers all academic disciplines (from classical humanities to most innovative sciences).

This grouping is defined by a common commitment to achieving very high

quality research, based on a method of learning through research that is unique in our country.

Selection is in fact a founding rule, and top-level training and research are the sole objectives. These two values are essential to performing research and provide a sound guarantee of this group's ability to rank among the best research centres in France.

The motto of *Paris Sciences et Lettres*, “Let us share what makes us unique”, is fully meaningful here.

The ambition of *Paris Sciences et Lettres* is to create, on the Montagne Sainte-Geneviève and in the surrounding area, an urban campus promoting the free movement of students and researchers. Prestigious Chairs, research units, and the hosting of international researchers, post-doctoral researchers and students will be shared on this campus, which will be concretely embedded in the urban fabric through “researchers’

journeys”, as illustrated on the map below.

Paris Sciences et Lettres will also have a policy of social and societal openness, especially through the dissemination of knowledge via a digital campus accessible to all.

Within the framework of Operation Campus, *Paris Sciences et Lettres* has applied for the financial support essential to achieve its objectives. The legal status of Foundation for Scientific Cooperation was chosen to ensure tight-knit, reactive and collegial governance that will respect the identity of each institution. The statutes have been registered at the Ministry of Higher Education and Research. The Foundation is governed by a scientific steering committee and a 16-member board of governors chaired by a distinguished scientific personality, a select steering committee, and a general delegate for its management. ■



WHO ARE THE AUDIENCES OF THE COLLÈGE DE FRANCE'S LECTURES?

Since its creation in 1530, 691 professors have taught at the Collège de France, and 42 have held Annual Chairs. We know their names, their specialties, their age when they were first appointed to the chair, the period of time for which they taught, etc (1). But what of the people who attended their lectures? One of the Collège's fundamental rules being freedom of access to all teaching, without any prior registration nor examinations, no information is available on this population. We

know only from memory and by observing the entry into the lectures, that certain lecture halls are sometimes overflowing, forcing us to turn down certain attendees or to offer them the possibility of following a video broadcast in another room. In order to know a little more—and to our knowledge, for the first time—a survey was undertaken at the beginning of 2010, focused on the people who attended the lectures delivered during the observation period.

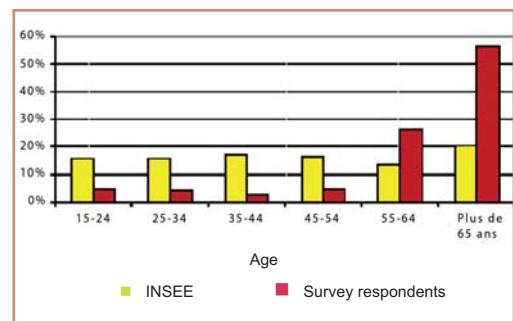
This survey was designed to supplement another one on a new audience category: users of the audio and video recordings that have been available for the past three years on the Collège's website. Our findings show that this population differs noticeably from the one present in the lecture halls, and substantially increases overall audience figures. The following is a comparative presentation of some of the results of both surveys.

Audiences on campus and online: two very different populations

The fact that lectures at the Collège de France are held in the centre of Paris, during regular teaching hours (therefore competing with professional or study-related activities) and do not lead to any formal qualification, strongly determines *the profile of those who attend*. A total of 95% live in Île-de-France (i.e. Paris and surrounding areas), 83% are aged 55 or over, and 72% are either unemployed or retired. This clearly

does not correspond to the characteristics of the whole of the French population (over the age of 15), as the attached graph shows with regard to age distribution, for example. This difference is however smaller in the case of people attending lectures in the mathematical, physical or natural sciences, where 43% are 55 or older, and 48% are unemployed or retired.

Distribution by age of the respondents to the survey on audiences at the Collège, compared to the distribution in the French population aged 15 and over (INSEE, 2006).



The survey at the Collège de France took place from mid-January to mid-February 2010, on all the individuals who attended one of the 26 courses delivered during that period (out of a total of 47 in 2009–2010). By indirect calculation we estimate the participation rate at roughly 75%, which means that the 1,973 questionnaires returned are representative of the audiences who attend lectures at the Collège.

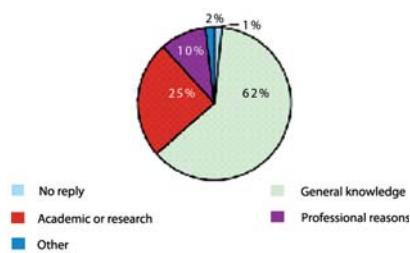
The online survey was carried out in two main waves of three weeks each, in June 2009 and February 2010 (to cover two different periods in the year). A total of 9,533 exploitable answers were received. Compared to the total number of visits to the website during those same periods, this figure corresponds to a response rate of about 6%,

which is acceptable for a survey of this kind (the real rate is moreover higher, since the same person may log on several times but answer only once). It is however impossible to know whether the individuals who agreed to participate in the survey differ from the overall profile of the population concerned as regards its specific characteristics, behaviours and degree of satisfaction.

The survey was carried out by the Cultural Affairs Division of the Collège de France, under the supervision of Professor Henri Leridon, chair of Sustainable Development-Environment, Energy & Society, and Research Director Emeritus at the INED (Institut national d'études démographiques).

Within this category, 18% of the listeners are students or researchers (41% in SMPN lectures - Physical, Mathematical and Natural Sciences, and 9% in SHS - Humanities and Social Sciences), and the great majority said that they attended these lectures primarily for their own interest and culture (89%). Men and women are equally represented. The cultural level is high: nearly 70% belong to the category of "senior management or higher professionals", against 10% in the whole of the French population.

Reasons given by the web site users



Roughly two thirds of the survey respondents use the website for their personal interest, and the remaining 35% visit it either for professional purposes (10%) or for research (25%).

Those who took part in the online study are not affected by the geographical constraint. However, the majority (51%) still do live in Île-de-

France, while 35% live elsewhere in France and 14% abroad. This majority of inhabitants of Île-de-France within the French audience has two explanations. First, the Île-de-France region is home to a high proportion of students, teachers and researchers (it accounts for 40% of researchers in the country). Second, because the Collège de France is located in Paris, it is not nearly as well-known in other regions where, before online access to lectures, it was almost impossible to take advantage of its teaching (with the noteworthy exception of broadcasts on the radio station France Culture, and a few lectures scheduled every year in other cities). The relatively high proportions of respondents in the provinces and especially abroad are therefore by no means insignificant. In the latter case the problem of language is an additional obstacle.

Another difference compared to audiences on campus in Paris is the age distribution in the Web audiences. The 55 and over age group accounts for only a third, which corresponds to the general population, while the rest of the distribution differs from the French population as a whole only in so far as there is a smaller proportion of

people in the 15–24 age-group (which is hardly surprising) and a larger proportion in the 25–34 age-group. The latter finding can be ascribed to the interest shown by students, teachers and researchers. Here this group accounts for 43% of the total, against 18% of the audiences of lectures on campus, and unemployed/retired persons account for only 23%, against 72% (see Table below).

Within this population, which is more representative of what can be considered as the Collège's natural "target", 25% of respondents said that they listened to lectures as part of their study, research or teaching activities. Note that 66% of these audiences are men (2).

Finally, social bias is less marked in Web audiences: 46% are in the senior management/higher professional category, against 70% of the audiences at the Collège. Note also that the online questionnaire did not contain questions on the type of lecture listened to (by discipline).

Occupational situation of respondents to the survey on campus
(by disciplinary field) and the online survey.

Sector affiliation	Amphitheater survey			Internet survey
	SHS Humanities and Social Sciences	SMPN Physics, Mathematics and Natural Science	Together	
Education, Research	5%	29%	11%	25%
Student	4%	12%	7%	18%
No occupation, retired	81%	48%	72%	23%
Other (working)	10%	11%	10%	34%

Some findings on Web audiences' practices

Although the online offer is fairly recent, a large proportion of the audiences are already regular listeners: 20% of the respondents first visited the website at least three years previously, and 33% first visited it between one and three years previously. Just under 23% said they visited the website at least once a week, and 32% at least once a month. In contrast, another part of the population is either new (one quarter first visited the site less than three months earlier) or occasional (34% log on no more than once or twice every quarter).

It is noteworthy that Web audiences are interested in all types of media: 44% said they download texts, 43% download audio files, and 33% download video files (multiple answers are of course possible). These proportions reflect roughly those of the various types of

document available online. On average, each Internet user had downloaded 5 documents over the previous 12 months. "Heavy users" (at least 15 files downloaded per year) account for 14% of all those who downloaded at least once. The main mode of listening is on computer (80%), either online or after downloading the file. Mobile devices follow, at 17%. This medium is preferred by younger audiences: 23% in the under-35 age group. Few Internet users (19%) said they use podcasts, which would enable them to download audio or video files in a format that can be used on a mobile device. In contrast, a majority of heavy users subscribe to podcasts (54%).

There are some points in common between these two types of audience of Collège de France lectures (on campus and distance). In the latter

category, 18% heard about this possibility when they attended lectures at the Collège, and the same proportion by listening to lectures broadcast on the radio station France Culture (30% of listeners in the provinces). Moreover, 33% of the respondents who attended lectures on campus said they also listened to lectures on the website, 15% said they also listened to audio podcasts, and 13% to video recordings. Within that category, 22% also listened to lectures broadcast on France Culture.

Finally, on the whole the respondents said they were very satisfied with the content of the lectures and with the technical conditions of access to material on the website.

To conclude

The online offer has substantially increased the size and composition of the population that can benefit from Collège de France lectures. New beneficiaries are on the whole much younger and usually visit the

website for teaching or research purposes. An obvious obstacle to better international dissemination is language: for the moment only a minority of lectures and seminars are available in English. It would

certainly make a significant difference to the Collège de France's renown and reputation if this offer could be expanded. ■

Professor Henri Leridon

Main motivation for listening to the lectures, of respondents to the survey on campus
(according to disciplinary field) and respondents to the online survey

	Amphitheater survey*			Web survey
	SHS	SMPN	Together	
Education, students, research	8%	38%	16%	25%
General knowledge	95%	71%	89%	63%

* (possible double quotes)

SHS = Humanities and Social Sciences

SMPN = Physics, Mathematics and Natural Science

1. A demographic analysis will be presented in a later issue of the *Letter*.

2. We also made comparisons with the entire French population who has Internet access. In 2008, 61% of French households had Internet access at home (58% of whom had a high-speed connection). We found that the proportion of individuals aged 55 and over is lower in the population of Internet users (17% against 33% in our survey), and that women are in the minority.

FACTS AND DATA

COLLÈGE DE FRANCE ORGANIZATION CHART

Administrator of the Collège de France: Pierre CORVOL

The Administrator is a Collège de France professor elected by his/her colleagues to direct the institution for 3 years.

Professors of the Collège de France

I – MATHEMATICAL, PHYSICAL AND NATURAL SCIENCES

Mathematics

- Analysis and Geometry — Alain CONNES
- Partial Differential Equations and Applications — Pierre-Louis LIONS
- Differential Equations and Dynamical Systems — Jean-Christophe Yoccoz
- Number Theory — Don ZAGIER

Physics

- Mesoscopic Physics — Michel DEVORET
- Physics of Condensed Matter — Antoine GEORGES
- Quantum Physics — Serge HAROCHE
- Observational Astrophysics — Antoine LABEYRIE
- Elementary Particles, Gravitation and Cosmology — Gabriele VENEZIANO

Natural sciences

- Biology and Genetics of Development — Spyros ARTAVANIS-TSAKONAS
- Climate and Ocean Evolution — Édouard BARD
- Human Paleontology — Michel BRUNET
- Experimental Medicine — Pierre CORVOL
- Experimental Cognitive Psychology — Stanislas DEHAENE
- Chemistry of biological processes — Marc FONTECAVE
- Molecular Immunology — Philippe KOURILSKY
- Human Genetics — Jean-Louis MANDEL
- Genetics and Cellular Physiology — Christine PETIT
- Morphogenetic Processes — Alain PROCHIANTZ
- Microbiology and infectious diseases — Philippe SANSONETTI

II – HUMAN AND SOCIAL SCIENCES

Historical, Philological, Archaeological Sciences

- History and Civilization of the Achaemenid World and of the Empire of Alexander — Pierre BRIANT
- Intellectual History of China — Anne CHENG
- Modern and Contemporary French Literature: History, Criticism, Theory — Antoine COMPAGNON
- Assyriology — Jean-Marie DURAND
- History of India and Greater India — Gérard FUSSMAN
- Pharaonic Civilization: Archaeology, Philology, History — Nicolas GRIMAL
- Indo-Iranian Languages and Religions — Jean KELLENS
- Epigraphy and History of the Ancient Greek Cities — Denis KNOEPFLER
- Modern Literatures of Neo-Latin Europe — Carlo OSSOLA
- History of European Medieval and Modern Art — Roland RECHT
- The Hebrew Bible and/in its contexts — Thomas RÖMER
- Religion, Institutions and Society in Ancient Rome — John SCHEID
- Turkish and Ottoman History — Gilles VEINSTEIN
- History of Modern China — Pierre-Etienne WILL
- Literatures of Medieval France — Michel ZINK

Philosophy, sociology

- Writings and cultures in modern Europe — Roger CHARTIER
- Comparative Legal Studies and Internationalization of Law — Mireille DELMAS-MARTY
- Anthropology of Nature — Philippe DESCOLA
- Rationality and Social Science — Jon ELSTER
- Economic Theory and Social Organization — Roger GUESNERIE

- Contemporary Arab History — Henry LAURENS
- Modern and Contemporary History of Politics — Pierre ROSANVALLON

III – ANNUAL CHAIRS 2010–2011

- Information Technology and Digital Sciences — Martin ABADI
- Artistic Creation — Anselm KIEFER
- Knowledge against Poverty — Ismail SERAGELDIN
- Sustainable Development—Environment, Energy and Society — Jean-Marie TARASCON
- Technological Innovation Liliane Bettencourt — Elias ZERHOUNI

Emeritus Professors of the Collège de France

- Anatole ABRAGAM — Nuclear Magnetism
- Maurice AGULHON — Contemporary French History
- Etienne-Emile BAULIEU — Bases and Principles of Human Reproduction
- Alain BERTHOZ — Physiology of Perception and Action
- Georges BLIN — Modern French Literature
- Yves BONNEFOY — Comparative Studies of the Poetic Function
- Pierre BOULEZ — Invention, Technique and Language in Music
- Jacques BOUVERESSE — Philosophy of Language and Knowledge
- Pierre CHAMBON — Molecular Genetics
- Jean-Pierre CHANGEUX — Cellular Communication
- Claude COHEN-TANNOUDJI — Atomic and Molecular Physics
- Yves COPPENS — Palaeontology and Prehistory
- François-Xavier COQUIN — Modern and Contemporary Russian History
- Gilbert DAGRON — Byzantine History and Civilization
- Jean DELUMEAU — History of Religious Mentalities
- Michael EDWARDS — Literary Creation in English
- Anne FAGOT-LARGEAULT — Philosophy of Life Science
- Marcel FROISSART — Corpuscular Physics
- Marc FUMAROLI — Rhetoric and Society in 16th and 17th century Europe
- Jacques GERNET — Social and Intellectual History of China
- Jacques GLOWINSKI — Neuropharmacology
- Christian GOUDINEAU — National Antiquities
- Gilles Gaston GRANGER — Comparative Epistemology
- François GROS — Cellular Biochemistry
- Jean GUILAINE — European Civilizations in the Neolithic and the Bronze Age
- Ian HACKING — Philosophy and History of Scientific Concepts
- Claude HAGÈGE — Linguistic Theory
- Françoise HÉRITIER — Comparative Studies of African Societies
- François JACOB — Cellular Genetics
- Pierre JOLIOT — Cellular Bioenergetics
- Yves LAPORTE — Neurophysiology
- Jean LECLANT — Egyptology
- Nicole LE DOUARIN — Molecular and Cellular Embryology
- Jean-Marie LEHN — Chemistry of Molecular Interactions
- Xavier LE PICHON — Geodynamics
- Georges LE RIDER — Economic and Monetary History of the Hellenistic Orient
- Emmanuel LE ROY LADURIE — History of Modern Civilization
- Jacques LIVAGE — Chemistry of Condensed Matter
- Edmond MALINVAUD — Economic Analysis
- André MIQUEL — Classical Arabic Language and Literature
- Philippe NOZIÈRES — Statistical Physics
- Jean-Claude PECKER — Theoretical Astrophysics
- Armand de RICQLÈS — Historical Biology and Evolutionism
- Daniel ROCHE — French History in the Age of the Enlightenment

- Jacqueline de ROMILLY — Greece and the Development of Moral and Political Thinking
- Jean-Pierre SERRE — Algebra and Geometry
- Michel TARDIEU — History of Syncretisms in Late Antiquity
- Javier TEIXIDOR — Semitic Antiquities
- Jacques THUILLIER — History of Artistic Creation in France
- Jacques TITS — Group Theory
- Pierre TOUBERT — Occidental History
- Paul-Marie VEYNE — History of Rome
- Nathan WACHTEL — History and Anthropology of Meso- and South American Societies
- Harald WEINRICH — Romance Languages and Literatures

LECTURES GIVEN BY THE PROFESSORS ABROAD

AUSTRALIA

- University of Melbourne
 - Stanislas DEHAENE (Chair of Experimental Cognitive Psychology)
The Global Neuronal Workspace Model of Conscious Processing (2 lectures and seminars)

BELGIUM

- Free University of Brussels
 - Pierre ROSANVALLON (Chair of Modern and Contemporary History of Politics)
Democratic equality: History and theory.
 - Serge HAROCHE (Chair of Quantum Physics)
Non-destructive photon measurement: New insights (4 lectures)

CANADA

- University of Montreal
 - Jean-Marie LEHN (Chair of Chemistry of Molecular Interactions)
From Supramolecular Chemistry towards Adaptative Chemistry (4 lectures)

CHAD

- University of N'Djamena
 - Michel BRUNET (Chair of Human Paleontology)
Origin of the Hominids: Abel and Toumaï, two brilliant confirmations of Darwin's prediction (1871)

CZECH REPUBLIC

- Academy of Sciences, Institute of Physiology
 - Alain BERTHOZ (Chair of Physiology of Perception and Action)
Plasticity and vicariance: The brain as an emulator.
- Charles University, Prague
 - Antoine COMPAGNON (Chair of Modern and Contemporary French Literature: History, Criticism, Theory)
The Future of the French Culture

DENMARK

- University of Copenhagen
 - Alain BERTHOZ (Chair of Physiology of Perception and Action)
Plasticity and vicariance: The brain as an emulator.

GERMANY

- University of Bonn (Ernst Robert Curtius chair)Germany
 - Jacques BOUVERESSE (Chair of Philosophy of Language and Knowledge)
Literature, knowledge and moral philosophy
- Bauhaus-University Weimar
 - Alain BERTHOZ (Chair of Physiology of Perception and Action)
Plasticity and vicariance: The brain as an emulator.

INDIA

- Indian Academy of Sciences, Bangalore
 - Marc FONTECAVE (Chair of Chemistry of Biological Processes)
Biological Chemistry: Enzymes and Metalloenzymes (3 lectures and seminars)
- National Centre for Biological Sciences, Bangalore
 - Spyros ARTAVANIS-TSAKONAS (Chair of Developmental Biology and Genetics)
Tracing Biological thought from Aristotle to the Genome (3 lectures)

ITALY

- University of Macerata
 - Anne Cheng (Chair of Intellectual History of China)
Reception of some European ideas in modern China: the category of philosophy.
Reception of some European ideas in modern China: the concept of freedom.

MEXICO

- Universidad Nacional Autónoma de México
 - Philippe DESCOLA (Chair of Anthropology of Nature)
Cosmología y ontología: un enfoque antropológico. (4 lectures)

SWEDEN

- Uppsala University
 - Jean-Marie LEHN (Chair of Chemistry of Molecular Interactions)
From Supramolecular Chemistry towards Adaptive Chemistry (4 lectures)
- Stockholm Brain Institute, Karolinska Institute
 - Alain BERTHOZ (Chair of Physiology of Perception and Action)
Plasticity and vicariance: The brain as an emulator.

SWITZERLAND

- École polytechnique fédérale de Lausanne - University of Lausanne
 - Alain PROCHIANTZ (Chair of Morphogenetic Processes)
Transduction proteins (9 seminars)

TAIWAN

- French School of the Far East, Taipei
 - Anne Cheng (Chair of Intellectual History of China)
Contemporary debates on the relationships between ethics and politics in reference to The Great Learning—Daxue Confucian studies in France: an overview

UNITED KINGDOM

- University of Edinburgh
 - Jean-Marie LEHN (Chair of Chemistry of Molecular Interactions)
From Supramolecular Chemistry towards Adaptive Chemistry (4 lectures)

UNITED STATES

- University of Chicago
 - Thomas RÖMER (Chair of The Hebrew Bible and/in its Contexts)
Israel's First History (3 lectures)
Current Research on the Pentateuch (3 seminars)
- Yale University, New Haven
 - Michel DEVORET (Chair of Mesoscopic Physics)
Introduction to Mesoscopic Physics (3 lectures)

LECTURES AND LECTURE SERIES BY FOREIGN PROFESSORS INVITED BY THE ASSEMBLY OF THE PROFESSORS

I. State chairs reserved for foreign scholars

- Eliezer RABINOVICI, Professor, Racah Institute of Physics, Jérusalem (Israel), Oct. 2009
 - 1–2. Black Holes, String Theory and Phases of Gravity
 - 3. Black Holes, String Theory and Gravitational Singularities
 - 4. Black Holes, String Theory and Information Aspects.
- Stephen MANN, Professor, University of Bristol (Great Britain), Oct. 2009
 - Biomineralization. Principles and Concepts in Bioinorganic Materials Chemistry
 - 1. Biominerals—Types and Functions
 - 2. General Principles and Chemical Control
 - 3. Matrix-mediated Biomineralization
 - 4. Morphogenesis an Biomineral Tectonics.
- Tamar FLASH, Professor, Weizmann Institute of Sciences, Rehovot (Israel), Oct. 2009
 - Neural Control of Movement: Principles and Models
 - 1. Human Trajectory Planning: Historical Perspectives and Current Research Directions
 - 2. From Motion Plans to Motor Execution
 - 3. On the Contruction and Perception of Complex Movements
 - 4. Motor Learning and Adaptation of Motor Actions.
- Jack SASSON, Professor, Vanderbilt University (USA), Oct.–Nov. 2009
 - Extraits d'un commentaire au livre des juges : quatre lectures sur l'art et les techniques narratologiques bibliques :
 - 1. Fragments et cohérence : le livre des juges à la lumière des documents mésopotamiens ;
 - 2. Otniel et Ehud : l'analyse générique de leurs récits ;
 - 3. Les deux mères de Sisera et le poème didactique de Déborah ;
 - 4. Jephthé : portrait d'un héros manqué.
- Christian LETZ, Professor, University of Tübingen (Germany), Nov. 2009
 - 1. Le grand Hymne athribite des noms de la déesse Répit
 - 2. Le défilé des dieux des provinces à Dendara, Philae et Athribis
 - 3. La décoration du temple de kom Ombo et la fonction de ses divers éléments.
- Mark GARRISON, Professor, University of San-Antonio (USA), Nov. 2009
 - New Light on Persepolis: The Glyptic Imagery from the persepolis Fortification and Treasury Archives
 - 1. Seals and Archives at Persepolis: an introduction
 - 2. Glyptic Imagery as Social Identity: The Seals of Zissawis
 - 3. The Religious Landscape at Persepolis: New Glyptic Evidence for the So-Called « Fire Altars »
 - 4. Glyptic imagery and Ideology: The Emergence of a Visual Language of Empire at Persepolis.
- Isabelle PERETZ, Professor, University of Montreal (Canada), Nov.–Dec. 2009
 - Cognitive Neuroscience of music.
- Roger HEACOCK, Professor, Birzeit University (Palestine), Nov. 2009
 - La Palestine, un kaleidoscope disciplinaire
 - 1. Palestine et histoire : le temps perdu
 - 2. Palestine et espace : le territoire éclaté
 - 3. Palestine et identité : la société résistante
 - 4. Palestine et discours : la perspective implosée.

- Lodovica BRAIDA, Professor, University of Milano (Italy), Nov.–Dec. 2009
 Pour une histoire de la culture écrite en Italie (xvi^e-xviii^e siècles)
 1. Les lettres en typographie. Inquiétudes religieuses et modèles linguistiques dans les manuels épistolaires du xvii^e siècle
 2. Les livres de lettres à l'Index. Censure et autocensure
 3. Les genres de large circulation. Textes, formes et usages des livres
 4. L'auteur absent. La réflexion sur la propriété littéraire au xviii^e siècle.
- Yoshihito NAKAMURA, Professor, Tokyo University (Japan), Nov.–Dec. 2009
 Challenges in Humanoid Robotics
 1. Toward Humanoid Robots Accumulating Human Behaviors;
 2. Toward Humanoid Robots Understanding Human Sensation
 3. Toward Humanoid Robots Communicating with Humans.
- Souleymane Bachir DIAGNE, Professor, Columbia University (USA), Dec. 2009–Jan. 2010
 1. Bergson et la pensée de L. S. Senghor
 2. L.S. Senghor et la philosophie du socialisme africain
 3. Bergson et la philosophie iqbalienne de l'*ijtihad*
 4. Leibniz, Bergson, iqbal et le *Fatum mahometanum*.
- Daniel HELLER ROAZEN, Professor, Princeton University (USA), Jan. 2010
 Harmonies et disharmonies du monde. Le son, le mètre et le nombre, de Pythagore à Nicole Oresme
 1. Dans la forge. L'invention de la consonance
 2. De l'arithmétique à l'art rythmique
 3. « Musique naturelle » et langues vulgaires
 4. Brisures du cosmos.
- Itzhak FRIED, Professor, University of California, Los Angeles (USA) and University of Tel-Aviv (Israel), Feb. 2010
 1. Matter and Memory: Stimulation and Recordings in the Human Temporal Lobe
 2. Matter and Memory: Single Neurons and Human Recollections
 3. Neuronal Mechanisms of Will and Action: Stimulation and Single Neuron Recordings in the Human Frontal Lobe
 4. Surgery of Epileptogenic and Functional Brain Networks: Plasticity and Functional Recovery.
- Jörg RÜPKE, Professor, University of Erfurt (Germany), Feb.–March 2010
 1. Les déviations religieuses : concepts romains et modernes
 2. Les superstitions : expériences religieuses interdites dans les temples
 3. Le discours normatif de l'Antiquité tardive
 4. L'individualisation religieuse dans le monde gréco-romain.
- Clifford ANDO, Professor, University of Chicago (USA), March 2010
 L'empire du droit.
- Detlev GANTEN, Professor, La Charité University Clinic, Berlin (Germany), Mar.–June 2010
 1. The New Concept of Evolutionary Medicine
 2. Evolutionary Medicine: What Can we Learn for the Prevention and Treatment of Disease?
 3. The Evolution of Cardiovascular Diseases: Practical Lessons Learned
 4. Evolutionary Medicine—the Evolution of Medicine and Education.
- John E. JACKSON, Professor, University of Berne (Switzerland), Mar.–Apr. 2010
 Paul Celan : contre-parole et absolu poétique
 1. La contre-parole
 2. Le principe dialogique
 3. La poétique de la « Strette »
 4. Le tournant des dernières années.

- Marc TESSIER-LAVIGNE, Executive Vice-President of Research and Chief Scientific officer of Genentech Inc., California (USA), Mar.–Apr. 2010
Development, Degeneration and Regeneration of Neuronal Circuits.
- Markus ANTONIETTI, Professor, University of Postdam (Germany), Director of the Max-Planck-Institute of Colloids and Interface, May 2010
 1. Materials Chemistry in the Energy and Raw Material Change
 2. Template Processes: Material Science Tool, Analysis of Self-Organization or Just Art
 3. Hydrothermal Carbonization: A « chimie douce » Towards Carbon Structures and Carbon-negative Product Styles
 4. Carbon Nitrides and Metal Nitrides: Towards Artificial Photosynthesis.
- Susan TAYLOR, Professor, University of California, San Diego (USA), May 2010
Camp-dependent Protein Kinase and the Regulation of Cell Signaling by Protein Phosphorylation
 1. Protein Kinase Structure and Function
 2. Allosteric Regulation of PKA by cAMP
 3. Assembly of Tetrameric Holoenzymes
 4. Signaling in Time and Space: Localizing PKA to Macromolecular Signaling Complexes.
- Lawrence WARD, Professor, University of British Columbia, Vancouver (Canada), May 2010
 1. Neural Synchronisation and Cognition
 2. Neural Synchronisation and Attention
 3. Neural Synchronisation and Consciousness
 4. Role of the thalamus in Human consciousness.
- Marianne BRONNER-FRASER, Professor, California Institute of Technology (USA), May 2010
 1. Gene Regulatory Network Underlying Neural Crest Formation
 2. Evolution of the neural crest From a gene regulatory perspective
 3. Ectodermal Placodes and their Contribution to the peripheral Nervous System
 4. Analysis of Cranofacial Developement using a Novel Gene/Protein trap Strategy.
- Peter STALLYBRASS, Professor, University of Pennsylvania (USA), May 2010
 1. Shakespeare's Desk
 2. Shakespeare n'a jamais écrit un livre
 3. Authorship, Attribution and Anonymity
 4. Montaigne, Shakespeare et le suicide.
- Oliver Jens SCHMITT, Professor, University of Vienna (Austria), May 2010
Entre Venise et les Turcs
 - I) Le miroir de la présence vénitienne en Méditerranée orientale : le cas de l'île de Korcula.
1. Le pouvoir ; 2. Les hommes et la terre ; 3. La mer.
 - II) Skanderbeg et le sultan : Anatomie d'une rébellion contre l'Empire ottoman.
- Douglas HOFSTADTER, Professor, Indiana University (USA), May–June 2010
La centralité de l'analogie dans le monde de l'esprit
 1. L'analogie au cœur de la cognition
 2. Les analogies extraordinaires d'Albert Einstein
 3. Le rôle omniprésent des analogies dans la traduction
 4. La place d'honneur de l'analogie dans la traduction de la poésie.
- Christopher BEARD, Carnegie Museum of Natural History, Pittsburgh (USA), May–June 2010
 1. Primate Origins: A New Synthesis Based on Data from the Fossil Record and Mammalian Genomics
 2. Global Warming in the Beginning of the « Age of Mammals »
 3. The Hunt for the Dawn Monkey: Unearthing the Origins of Monkey, Apes and Humans
 4. Burmese Days: Primate Paleontology in the union of Myanmar.

- Benjamin FOSTER, Professor, Yale University (USA), June 2010
 1. De la mer supérieure à la mer inférieure : l'avènement et la chute de l'empire d'Akkad
 2. Pays et peuples d'Akkad
 3. Les travaux et les jours akkadiens
 4. L'élu des dieux.

II. Others Invitations

- John NORTH, Professor, University College of London (Great Britain), Nov. 2009
Pompeius Festus et l'origine du dictionnaire latin.
- Betsy JOLAS, Honorary Professor, Conservatoire National Supérieur de Musique de Paris, Nov. 2009
Je chante ce que je dis ; je dis ce que je chante.
- Juan CALATRAVA, Director, School of Architecture of Granada (Spain), Nov.–Dec. 2009
Le Corbusier :
 1. « Il n'y a pas d'architectes seuls... » Le Corbusier et la synthèse des arts
 2. Le poème de l'Angle Droit.
- Hans Ulrich GUMBRECHT, Professor, Stanford University (USA), March 2010
 1. Peut-on éviter Heidegger ?
 2. Pourquoi on n'a pas oublié Heidegger.
- Guillemette BOLENS, Professor, University of Geneva (Switzerland), March 2010
Les gestes et la perception du mouvement dans l'art et la littérature.
- Andrée HAYUM, Professor, Fordham University (USA), March 2010
 1. L'idée de la Renaissance à l'aube du musée européen : les écoles primitives
 2. The Migration of the Renaissance Primitives and the Early Public Museum in the Anglo-American World.
- Antoine TOUZE, Assistant Professor, Paris 13 University, March–April 2010
Invariants, cohomologie et représentations fonctorielles des groupes algébriques.
- Oded LIPSCHITS, Professor, University of Tel Aviv (Israel), April 2010
How did the Babylonian Empire Rule in Judah? First Clues for Babylonian Administration in the « Empty Land ».
- Thomas LECUIT, Directeur de Recherche, CNRS, Institut de Biologie du développement de Marseille Luminy, CNRS/Université de la Méditerranée, May 2010
Contrôle génétique et contraintes physiques au cours de la morphogenèse.
- Laurent DUBOIS, Professor, Duke University, Durham, (USA), May 2010
Des lumières enchaînées : la révolution haïtienne et la pensée politique des esclaves.
- Arthur GOLDHAMMER, Professor, Harvard University (USA), May 2010
De la démocratie en américain : traduire Tocqueville.
- Martin HELLWIG, Professor, Max-Planck-Institute, Bonn (Germany), May 2010
Crise financière et réglementation bancaire.
- Noam CHOMSKY, Professor, Massachusetts Institute of Technology (USA), May 2010
Interpretation and understanding: language and beyond.
- Edward SLINGERLAND, Professor, Asian Centre, Vancouver (Canada), June 2010
Reverse Orientalism and the Figure of Confucius in the west.

- Stephen F. TEISER, Professor, Princeton University (USA), June 2010
Healing with merit: Buddhist Rituals of Curing in Medieval Chinese Liturgical Manuscripts
 - 1. Logic and Language
 - 2. Codicology and Sociology.
- Yordan PEEV, Professor, Sofia University (Bulgaria), June 2010
La porosité entre l'islam et le christianisme dans les Balkans. Le cas du crypto-christianisme.
- Leonard GUARENTE, Professor, Massachusetts Institute of Technology (USA), June 2010
Sirtuins, Aging and Disease.
- Sir Geoffrey LLOYD, Professor, Cambridge University (Great Britain), June 2010
 - 1. La fabrique des disciplines
 - 2. Pour un réexamen des sciences dans les sociétés anciennes : Grèce, Chine, Mésopotamie.
- Jayant NARLIKAR, Professor, University of Pune (India), June 2010
A Search for Micro-organisms in the Earth Atmosphere.
- Gregory SCHOPEN, Professor, University of Californie, Los Angeles (USA), June 2010
On Early Buddhist Monks and Nuns Protecting Children from Death and Demon for a Fee.

EVENTS AT THE COLLÈGE DE FRANCE 2009–2010

September

- Atoms, Cavities and Photons (Chair of Quantum Physics)
- The Sensual City (preparation for the Shanghai 2010 World Expo, Jacques Ferrier Architectures Agency)
- Translational Research in Alzheimer (France Alzheimer Association)
- Launching of the IbiSA NGS network (Génoscope and Institut de Génomique)

October

- Contemporary Lebanon (Lebanese Jurists Association)
- Rhetoric and Arts (International Society for the History of Rhetoric)
- Darwin's Bicentenary (Collège de France Autumn Symposium 2009)
- Grotowski, the stage, France, and Counterculture (UNESCO and Paris-Sorbonne 4 University)

November

- Launching of the event « À l'école des écrivains » (Ministry of National Education)
- Open days of the Collège de France Biology Institute
- The Republic of Letters in Turmoil (Chair of Modern and Contemporary French Literature: History, Criticism, Theory and Chair of Rhetoric and Society in 16th and 17th century Europe)

December

- Dante at the Collège de France (Chair of Modern Literatures of Neo-Latin Europe)
- The Technion takes up the Challenge of Growth through Innovation (Technion Israel Institute of Technology, Technion France Association)
- Humanoids 09, 9th International conference on humanoid robots (Chair of Physiology of Perception and Action)

January

- Jean Dausset Days (Chair of Experimental Medicine)

March

- French and Turks in the Ottoman Era. Five Centuries of Relationships (Chair of Turkish and Ottoman History)

April

- The Langages of Research in Human and Social Sciences (CNRS—Unité au service de la recherche des UMIFRE)

- Annual Colloquium of the Union rationaliste (Chair of History of India and Greater India)

May

- Billionaire Africa: Challenges and Opportunities of the African Metamorphosis (Agence française de développement)
- Five Years of Agence nationale de la recherche (ANR—National Research Agency)
- Rationality, Truth and Democracy: Bertrand Russell, George Orwell, Noam Chomsky (Chair of Philosophy of Language and Knowledge)

June

- Frontiers in Neuromorphic Computation (Unité de Neurosciences, CNRS)
- Managing Climate Change (Chair of Economic Theory and Social Organization and Chair of Sustainable Development - Environment, Energy and Society)
- Archéo-Nil 1990–2010, 20 Years of Predynastic Research (Archéo-Nil Society)
- *Le Monde-La Recherche* Forum (*Le Monde* Newspaper and *La Recherche* Magazine)
- Insights on Vertebrate Evolution: Topics and Issues (Chair of Historical Biology and Evolutionism)
- The Unexpected Anthology (Chair of Artistic Creation)
- Fault and Punishment (Chair of Assyriology and Chair of The Hebrew Bible and/in its contexts)
- Nanotechnology in Medicine (Multi-Organisms Thematic Institute (ITMO) and Chair of Technological Innovation Liliane Bettencourt)
- ITMO Neuroscience, Cognitive Science, Neurology and Psychiatry (CNRS)

July

- Body Development and Relations with Others (Chair of Physiology of Perception and Action and French Society of Child and Adolescent Psychiatry)
- String Phenomenology (Chair of Elementary Particles, Gravitation and Cosmology and École Polytechnique)

RESEARCH TEAMS HOSTED

The policy of hosting research teams was implemented on the basis of an Assembly vote dated 18 March 2001 to contribute towards the training of young research teams and to enhance the Collège's scientific potential. In some cases it was a temporary solution for teams directed by a professor about to retire.

Space permitting, these teams, which have to obtain the approval of their parent institution and to receive on-going funds from it, can be officially hosted by the Collège de France team for a four-year contract, renewable once.

They receive a € 10,000 annual grant and may obtain ATER and lecturing posts, on the same basis as the laboratories of the Chairs.

The final decision to host these teams is taken by the Assembly of Professors, after evaluation by a commission of professors.

Teams currently hosted:

- Lyne BANSAT-BOUDON
Institute for Indian Studies (EA 518)

- Catherine LLORENS-CORTES
Central neuropeptides and the regulation of body fluid homeostasis and cardiovascular functions (U 691)
- Jean-Michel DENIAU
The dynamics and physiopathology of neuron networks (U 667)
- Christian GIAUME
Junctional communication and interaction between neuronal and glial networks (U840)
- Claude RANGIN and Pierre HENRY
GERIE (Team Geodynamics of Exchange Research-Industry-Learning)
- TRAN VAN NHIEU Guy
Intercellular communication and bacterial infections (U971)
- MANACORDA Stefano
Law Team is part of the ARPE (Association de recherches pénale européennes) (UMR 8103 of comparative law - University Paris I)

UMR: Unité mixte de recherche
(Combined Research Unit)

U: Unité (Unit)

TEMPORARY POSITIONS AT THE COLLÈGE DE FRANCE 2010–2011 (*MAÎTRES DE CONFÉRENCES AND ATER*)

Temporary positions permit to receive yearly 29 Maîtres de conférences (Assistant Professors) and 38 ATER (Research Assistants and Post-Doctoral positions) in the chairs and research laboratories at the Collège de France.

French	45
Foreign	11
Nationals of the U.E.	11

THE COLLÈGE DE FRANCE INSTITUTES

The Collège de France has four Institutes: Biology; the Contemporary World; Literary Studies; and the Far East. These are informal structures with no official status from an administrative point of view. They group together Chairs and hosted teams.

The Institutes are created or closed on the initiative of the professors concerned, after a formal decision by the Assembly.

They promote and facilitate research by defining common projects and by pooling technical staff, equipment (technical facilities, libraries, etc.) and premises.

The modalities of these Institutes' organization may vary.

Institute of Biology

The Collège de France Institute of Biology, created in 1983 on a decision of the Assembly of Professors, includes the Collège's Professors of Biology (whether their laboratory is located at the Collège itself or elsewhere) and the teams hosted by the Collège. The incumbent President is Alain Prochiantz.

Chairs whose laboratories are located at the Institute of Biology:

- Pierre Corvol, Experimental Medicine (Inserm U833)
- Alain Prochiantz, Morphogenic Processes

Chairs whose laboratories are not located at the Collège de France:

- Spyros Artavanis-Tsakonas, Developmental Biology and Genetics
- Stanislas Dehaene, Experimental Cognitive Psychology (Inserm-CEA 562)
- Philippe Kourilsky, Molecular Immunology
- Jean-Louis Mandel, Human Genetics (Inserm U596)
- Christine Petit, Genetics and Cell Physiology (Inserm U587)

Hosted teams located within the Institute of Biology (they benefit from all the Institute's resources):

- Laurent Venance, Inserm U667, Dynamics and Pathophysiology of Neuronal Networks
- Catherine Llorens-Cortes, Inserm U691, Central neuropeptides and the regulation of body fluids
- Christian Giaume, Inserm U840, Junctional communication and interaction between neuronal and glial networks.
- Guy Tran Van Nhieu, INSERM U971, Intercellular communication and bacterial infections
- Sidney Wiener, CNRS UMR 7152, Physiology of Perception and Action

Professor Anne Fagot-Largeault (emeritus, chair of Philosophy of Life Science), and Professor Armand de Ricqlès (emeritus, chair of Historical Biology and Evolutionism), also participate in discussions concerning the Collège de France Institute of Biology.

The aim of the Institute is to promote the research being done within the Collège de France, via several actions defined by the professors of the Institute and applied by its Coordination Committee.

Shared resources:

- animal facilities: conventional and transgenic
- technical platforms: confocal imaging and electron microscopy, neural imaging
- equipment for studying behaviour in rodents
- document library

Institute of the Contemporary World

The Institute of the Contemporary World was created in 2005.

It groups together six Collège de France Chairs, five of which are located on the Ulm site and one on the Cardinal Lemoine site:

- Mireille Delmas-Marty, Comparative Legal Studies and Internationalization of Law
- Philippe Descola, Anthropology of Nature
- Jon Elster, Rationality and Social Sciences
- Roger Guesnerie, Economic Theory and Social Organization
- Henry Laurens, Contemporary Arab History
- Pierre Rosanvallon, Modern and Contemporary History of Politics

The Institute is coordinated by a professor on the basis of a two-year rotating system. Pierre Rosanvallon is the current coordinator.

The members of the Institute are participating in a multi-disciplinary study on globalization, focused on the following three dimensions: democracy, the rule of law, and the market.

Three key topics are addressed:

- Management of global collective (public) goods
- National sovereignty in question and the question of governance
- Towards a global political society: law and politics in the constitution of an international order.

Institute of Literary Studies

The Institute of Literary Studies combines the Collège de France Chairs devoted to literature studies and related subjects (history of art, history of books):

Professors:

- Roger Chartier, Writing and cultures in modern Europe
- Antoine Compagnon, Modern and contemporary literature: history, theory, critique
- Carlo Ossola, Modern literatures of neo-latin Europe
- Roland Recht, History of european medieval and modern art
- Michel Zink, Literatures of medieval France

Emeritus Professors:

- Yves Bonnefoy, History of the poetic function
- Michael Edwards, Literary creation in English
- Marc Fumaroli, Rhetoric and society in Europe (16th–17th centuries)
- Harald Weinrich, Romance languages and literatures.

Michel Zink is currently the Director of the Institute of Literary Studies.

Ms. Odile Bombarde, senior lecturer associated with the chair of Professor Michel Zink, coordinates the Institute's activities.

On the initiative of one or another of its professors, the Institute organizes colloquia devoted to topics for reflection common to the various comprising Chairs. Professors from the Institute as well as French and foreign researchers whom they wish to make partners in their work, participate in these meetings. They allow for a confrontation between fields of thought that are related—literary criticism, history of ideas, art history, poetic creation—but different, owing to the periods concerned or the approaches and methods used.

The Institute is closely associated to the works on the *History of the College de France*, a research and publication project under the responsibility of Professor Marc Fumaroli. The first volume was published in 2006.

The Collège de France's Oriental Institutes

The “Instituts d’Extrême-Orient” (IEO) are a federation of five Institutes devoted to Chinese, Indian, Japanese, Korean, and Tibetan studies respectively. Historically, the Institutes were

C.I.R.B.—Center for Interdisciplinary Research in Biology

The Center for Interdisciplinary Research in Biology (CIRB) is a novel Collège de France/CNRS/INSERM research structure located at the Collège de France in the Center of Paris. Nine teams from different horizons have recently founded this structure with the spirit to foster new collaborations within biological domains and across the usual disciplinary divide. In the long term the nine founding groups, specialized in the fields of infectious diseases, neurosciences and cardio-vascular research, will be rejoined by a similar number of new groups, primarily junior groups, including chemists, physicists and mathematicians with a strong interest for biological sciences. The new Center will benefit from being in the vicinity of several other laboratories and from an extraordinary rich intellectual milieu, with conferences that cover all aspects of knowledge. Outside of Collège de France, CIRB has developed strong interactions with high profile neighboring institutions, in particular the École Normale Supérieure and the Curie Institute. ■

The Nine Founding Teams

- Dynamics and Pathophysiology of Neuronal Networks
Group Leaders: Jean-Michel Deniau, Laurent Venance
- Molecular Control of Vascular Development
Group Leader: Anne Eichmann
- Role of Matrix Proteins in Hypoxia and Angiogenesis
Group Leader: Stéphane Germain
- Junctional Communication and Interactions between Glial and Neuronal Networks
Group Leader: Christian Giaume
- Cell Biology of Homeoproteins
Group Leader: Alain Joliot
- Central Neuropeptides in Cardiovascular and Hydric Regulation
Group Leader: Catherine Llorens-Cortes
- Early Development and Pathologies
Group Leader: Geneviève Nguyen
- Homeoprotein Function in Morphogenesis and Physiology
Group Leader: Alain Prochiantz
- Intercellular Communication and Microbial Infections
Group Leader: Guy Tran Van Nhieu

PUBLICATIONS 2009–2010

■ Books

The Collège de France has a partnership with the Éditions Fayard and the Éditions Odile Jacob for publishing the inaugural lectures of the professors, some lectures of invited professors and the proceedings of some of the Collège's colloquiums.

Éditions Fayard - Collection “Leçons inaugurales”(Inaugural lectures)

- Gérard BERRY, *Penser, modéliser et maîtriser le calcul informatique* (2009), n° 208.
- Patrick COUVREUR, *Les nanotechnologies peuvent-elles contribuer à traiter des maladies sévères* (2010), n° 211.
- Marc FONTECAVE, *Chimie des processus biologiques : une introduction* (2009), n° 207.
- Antoine GEORGES, *De l'atome au matériau. Les phénomènes quantiques collectifs* (2010), n° 209.
- Henri LERIDON, *De la croissance zéro au développement durable* (2009), n° 205.
- Peter PIOT, *L'épidémie du sida. Mondialisation des risques, transformations de la santé publique et développement* (2010), n° 210.
- Thomas RÖMER, *Les Cornes de Moïse. Faire entrer la Bible dans l'histoire* (2009), n° 206.
- Nicholas STERN, *Gérer les changements climatiques. Climat, croissance, développement et équité* (2010), n° 212.

Éditions Odile Jacob - symposia and conferences

- Stanislas DEHAENE et Christine PETIT (eds.), *Parole et musique. Aux origines du dialogue humain*, 2009.
- Pascal GRIENER, *La République de l'oeil. L'Expérience de l'art au siècle des Lumières*, 2010.
- Denis KNOEPFLER, *La patrie de Narcisse*, 2010.
- Pierre MAGISTRETTI et François ANSERMET (eds.), *Neurosciences et psychanalyse*, 2010.
- Alain PROCHIANTZ (ed.), *Darwin : 200 ans*, 2010.
- Michel ZINK (ed.), *Livres anciens, lectures vivantes*, 2010.

Yearbook

- *Cours et travaux du Collège de France. Résumés 2008–09. Annuaire 109^e année*.

■ OPEN EDITION/E-BOOKS

Since June 2010, 4 collections of the College de France have been published on Internet (open access):

- the Inaugural Lectures
- the Yearbook
- the Letter of the College de France
- the Conferences

The texts are published in partnership with the CLEO (Center for Open Electronic Publishing). They are available on the College de France website (http://www.college-de-france.fr/default/EN/all/pub_elec/index.htm) and on Revues.org (<http://www.revues.org>), a platform for journals in the humanities and social sciences run by the CLEO.

Most texts are in French, some are translated in English (e.g. the inaugural lecture of Nicholas Stern), and some will be published directly in English (e.g. the conference of Noam Chomsky).

Some of these texts are available as e-books on Apple Store and other platforms (inaugural lectures, *The Letter of the Collège de France*).

■ DVDs (Coproduction Collège de France / Docside / Éditions Montparnasse)

- Pierre BOULEZ, 2010.
- Pierre-Gilles de GENNES, 2010.
- François JACOB, 2010.
- Jacqueline de ROMILLY, 2010.

COLLÈGE DE FRANCE AUTUMN SYMPOSIUM 2010–2011

The globalization of research Competition, cooperation, restructuring

14–15 October 2010

The ‘campus plan’ and the creation of the PRES (centres for research and higher education), completing earlier reforms of the universities and the CNRS, triggered an unprecedented concentration of French research. The aim was to enable it to maintain its leading position in an environment of international competition that has now expanded to include the large emergent countries.

International competition is not the only driver of change. Basic research has undergone upheavals in the past ten years, leading to the creation of sufficiently large research centres to justify the purchase and very high operating costs of the increasingly sophisticated equipment required. All the disciplines are concerned, including the human and social sciences which have been completely transformed by the introduction of computing and electronic publications. Heavy equipment, the use of which is now standard practice in biology and medicine (genome sequencing, imagery, etc.), in physics (Large Hadron Collider in Geneva, etc.) and in astronomy (Hubble space telescope, etc.), is accessible only to those organizations able to finance it and to commit to using it intensively.

Finding adequate funds is therefore a necessity. It involves both national and international competition, as private and government grants go to the most renowned laboratories. There is nothing fundamentally new about this: research is the other side to discovery, and discovery demands that one be first. What has changed, apart from

the volume of the financial resources needed today, is the use of new evaluation criteria: controversial international classifications like those of the University of Shanghai; prizes, some of which, like the Nobel Prize, are granted years after the discoveries; quantified evaluations whose data and tools are challenged.

Competition demands secrecy until the result is sure. The same applies to patents and to contracts with private industry, which finance a large part of basic research. But being a researcher implies making one’s results known as generously and widely as possible. Science has no boundaries. All laboratories, including in the social and human sciences, have partnerships or fully-fledged members who are foreigners. Almost all of them use and contribute to developing tools that will be employed world-wide, large facilities or electronic databases. In these conditions, what does secrecy and international competition mean? How should the researcher behave? Is there no risk of misuse, ethically speaking?

These are the questions that the opening symposium in 2010 is intended to explore. The role played by the Collège de France yesterday and today in research and the teaching of research, along with the fact that we are ourselves confronted with these contradictions, affords us the possibility and the duty to do so. ■

The programme and lectures are available on
www.college-de-france.fr



Programme

Thursday 14 October 2010

- Opening by Pierre Corvol, Administrator of the Collège de France
- Introduction by Gérard Fussman, Professor at the Collège de France

2000–2010: Technical, institutional and behavioural upheavals

- The digital revolution in the sciences
Gérard Berry, Senior Researcher at INRIA, Professor at the Collège de France (2008–2010)
Discussant: Jean-Louis Mandel, Professor at the Collège de France (biocomputing explosion)
- Academic research and biotechnology industry
Jean-Paul Clozel, C.E.O. of Actelion Pharmaceuticals Ltd, Professor at the Collège de France (2007–2008)
Discussant: Pierre Joliot, Honorary professor at the Collège de France
- The large facilities of the cognitive sciences and their results
Denis Le Bihan, Senior researcher at CEA, Head and founder of Neurospin, physicist and Doctor of Medicine, Professor at the University of Kyoto
Discussant: Claudine Tiercelin, Professor of philosophy at the University Paris XII, Institut Universitaire de France
- New means, new funding, new research questions in archeology
Jean-Paul Demoule, Professor of archaeology at University Paris I, former Director of the INRAP (Institut national de recherches archéologiques préventives)
Discussant: Michel Gras, Director of the École française de Rome
- New tools and new controversies in demographics
Hervé Le Bras, Senior researcher at the EHESS
Discussant: Brigitte Dormont, Professor of Economics at the University Paris-Dauphine, Head of the chair of Health of the Fondation du Risque
- Restructuring ‘neighbourhoods’, building new towns
Roland Castro, urban planner/architect
Discussant: Michel Lussault, Professor of geography at the ENS-Lyon, Director of the Urban Planning Institute at the ENS in Lyon
- Research libraries and scientific information.
Constance and transformation
Daniel Renoult, Dean of the Inspection Générale des bibliothèques
Discussant: Roger Chartier, Professor at the Collège de France
- Estimating scientific productivity using databases
Jacques Mairesse, Honorary senior researcher at the EHESS, Head of the scientific committee of the

Observatoire des Sciences et Techniques

Discussant: Serge Haroche, Professor at the Collège de France

Friday 15 October 2010

The researcher’s ethics in the face of globalisation

- The research boom in developing countries and international cooperation
Marc Fontecave, Professor at the Collège de France (the example of India)
Discussant: Jacques Livage, Honorary professor at the Collège de France (the example of North Africa)
 - Worldwide knowledge sharing on a global scale
Gabriele Veneziano, Professor at the Collège de France, Emeritus professor at the CERN (particle physics)
Discussant: Xavier Le Pichon, Honorary professor at the Collège de France (geodynamics)
 - Changing scales and the worldwide cooperative management of biological means
Philippe Kourilsky, Professor at the Collège de France
Discussant: Pierre Corvol, Professor at the Collège de France (medical and pharmaceutical research)
 - Small and large scientific frauds: the weight of competition
Anne Fagot-Largeault, Honorary professor at the Collège de France
Discussant: Alain Prochiantz, Professor at the Collège de France
 - The ‘disinterested’ role of researchers in promoting a new global legal order
Mireille Delmas-Marty, Professor at the Collège de France
Discussant: Peter Piot, Former chief executive of UNAIDS, Professor at Imperial College, London, Professor at the Collège de France (2009–2010) (international organisations)
- Roundtable: restructurings and evaluation tools around the world
- With the participation of:
- Stephan Leibfried, Professor of political science at the University of Bremen, a member of the Academy of Sciences of Berlin;
 - Jacob Palis, Professor at the Institute of Pure and Applied Mathematics in Rio de Janeiro (Brazil);
 - Jean-François Sabouret, Senior researcher at the CNRS, Director of Réseau-Asie;
 - Pierre Veltz, Professor at the École des Sciences Politique and at the École des Ponts, Paris Tech;
 - Elias Zerhouni, Former Director, National Institutes of Health (USA), Professor at the Collège de France (2010–2011).



History, through time



As the Renaissance spread throughout Europe, great minds started to explore subjects that had previously aroused no curiosity, and the invention of printing meant that the wealth of philosophy contained in the chefs-d'œuvre of Antiquity was becoming more widely available. Teachers capable of interpreting and commenting on these matters were in demand. Thus, the Collège Royal was set up, which later became known as the Collège de France.

1530



King François I, on the advice of Guillaume Budé, his "master of the library", appointed six "royal readers": three for Hebrew (François Vatable, Agathias Guidacerius, Paul Paradis), two for Greek (Pierre Danès, Jacques Toussaint) and one for mathematics (Oronice Finé). Their lectures were free and open to anyone.

1551

After requisitioning the Collèges de Tréguier and de Cambrai where he installed "royal readers" in 1551, Henri II extended the range of subjects taught by the Collège to philosophy. He created a chair for Ramus (Pierre de la Ramée), a notorious and controversial anti-Aristotelian philosopher, who then went on to teach mathematics from 1559 onwards.

1567

The Collège was mentioned for the first time in a document. It was a diploma awarded to Nicolas Goulu, certifying that he was qualified to teach Greek.

1610



On August 28, Louis XIII laid the first stone of a new building bearing the following inscription: "In the first year of the Reign of Louis XIII King of France and of Navarre, aged nine, and of the Regency of Queen Marie de Médicis his mother MDCX" (En l'an premier du Règne de Louis XIII Roy de France et de Navarre, agé de neuf ans, et de la Régence de la Royne Marie de Médicis sa mère MDCX).

1699



On January 18, 1699, the Collège Royal was granted its coat of arms: against a sky blue background there is a silver book lying open in which are written the words Docet omnia. The book is surrounded by three golden fleurs-de-lis, two at the top and one at the bottom.

1707

There were now twenty chairs: eleven for the arts, nine for scientific subjects.

1772



Louis XV entrusted the architect Jean-François Chalgrin with the construction of the Collège Royal. Chalgrin was a winner of the Grand prix de Rome and a member of the Académie d'architecture. On May 16, the Collège was incorporated into the University of Paris. It regained its independence in 1794. On March 22, 1774, the Duc de La Vrillière laid the first stone of the new buildings, which were completed in 1778.

1824



A picture portraying the establishment of the "royal readers" by François I (on display in the Assembly room). It was painted by G. Guillot Lethière.

1870

The Collège Royal then the Collège Impérial became the Collège de France. There were now forty professors.

1963

The creation of two new chairs brought to fifty-two the number of professors.

1976

The professors were allowed to give some of their teaching outside Paris.

1988

The professors were allowed to give some of their teaching abroad.

1989

Creation of the European chair.

1992

Creation of International chair.

1998



Inauguration of new Collège de France premises. The renovation was carried out by the architects Bernard Huet and Jean-Michel Wilmutte.

2005

Creation of the chair of Artistic Creation.

2006

Creation of the chair of Technological Innovation Liliane Bettencourt.

2009

Creation of the chair of Information Technology and Digital Sciences

AGENDA



COLLÈGE
DE FRANCE
1530

Academic Year 2010–2011

New Chairs Created

- Physics of the Earth's Interior
- Chemistry of Hybrid Materials
- Metaphysics and Philosophy of Knowledge

New Professors

- Ismail SERAGELDIN, Knowledge against Poverty, 2010–2011
Inaugural lecture: 18 November 2010
- Anselm KIEFER, Artistic Creation, 2010–2011
Inaugural lecture: 2 December 2010
- Jean-Marie TARASCON, Sustainable Development–Environment, Energy and Society, 2010–2011
Inaugural lecture: 16 December 2010
- Elias ZERHOUNI, Chair of Technological Innovation Liliane Bettencourt 2010–2011
Inaugural lecture: 20 January 2011
- Martin ABADI, Chair of Information Technology and Digital Sciences, 2010–2011
Inaugural lecture: 10 March 2011

The Inaugural Lectures take place at 6 pm in the Marguerite de Navarre Lecture Hall.

Guest Conference Speakers

- Timothy BROOK, Professor, University of British Columbia, Vancouver (Canada)
- Anne-Laure DALIBARD, Chargée de recherche au CNRS
- Hans HELANDER, Emeritus Professor, University of Uppsala (Sweden)
- Lars LIND, Professor, University of Uppsala (Sweden)
- Agostino PARAVICINI BAGLIANI, Emeritus Professor, University of Lausanne (Switzerland)
- Simon PRICE, Professor, Oxford University (Great Britain)
- Victor STOICHITA, Professor, University of Fribourg (Switzerland)

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site:

52 rue Cardinal-Lemoine
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subway: line 10, Cardinal Lemoine

The Letter of the Collège de France

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