

proteus

**Press kit**

**« 10 years of innovation @  
Protéus »**

Thursday, June 26<sup>th</sup>, 2008  
Nîmes (France)

**1998 . 2008**



protéus

Press kit

## **10 years of innovation @ Protéus**

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## The chairman's message

# Acknowledge the Global New Challenges

Today, ten years after betting that “Nature has more imagination than our dreams”, where are we? What has been achieved ? How will we respond to challenges for the next ten years?

Our scientific and technical foundation is confirmed. Protéus has become one of the best worldwide team in the area of discovery, engineering, production and the industrial & commercial use of proteins. We have acquired an unprecedented expertise by partnering with numerous industrial companies that are world leaders in their domains. Our production capacities, our integrated technical platform, our unique resources in biodiversity and proprietary technologies in protein engineering reinforce our partners' competitiveness by accelerating the development of new products and processes.

Which products and which processes? Thanks to their biological and catalytic properties, the proteins are at the heart of modern biotechnologies. Elaborate and produce new proteins, is the way to access to new medicines which improve the return on our medical care. This is also the way to achieve industrial processes with cost reduction, by using new and renewable raw materials and generating less waste. To put it in a nutshell, our technologies improve product quality, reduce environmental impact and reduce production costs.

How will we be responding to the challenges for the next ten years ? Our answer will be differentiated and adapted to each of our two key market segments:

(i) in the health care sector, where therapeutical proteins have an increasing impact, our mission is to accompany our clients throughout the development of their proteins through our dedicated business unit PSI (Protéus Services for Industry);

(ii) in the industrial sector, ten to twenty percents of the world chemical production will involve biotechnical processes in the coming years. All industrial areas will be concerned. Gradually, we will therefore reinforce our industrial partners through strategic alliances. Already, in fine chemicals, our partnership with the Chemist PCAS has allowed us to create PCAS Biosolution, a joint venture which produces intermediates and active pharmaceuticals ingredients.

From now on, Protéus accompanies its clients on both segments further up in the product value chain and allows them to generate Industrial Property, hence reinforcing their competitiveness and extending the lifecycle of their products.

All the potential in Protéus is far from being revealed. Our technical excellence, our production capabilities, our know-how and our outstanding human resources allow us to respond to the new demand for more sustainable manufacturing processes that steers us to the future, while sharpening our competitive edge.

*Gilles Ravot, PhD*  
President & CEO

## Company Profile

# Accelerating Time-To-Market

Protéus is a leading biotechnology company focusing on proteins for industrial applications. Protéus' primary mission is to accelerate time-to-market, reduce manufacturing costs, generate intellectual property rights and extend our clients' product life cycles.

Combining proprietary elements for proteins discovery, proteins optimization and proteins production, Protéus reinforces the competitive edge of its clients by providing them new industrial solutions. The comprehensive offering of Protéus includes :

- **Industrial Partnerships** to discover and develop improved products and processes and generate industrial property rights. Within industrial partnerships, we provide our partners with exclusivity to manufacture and commercialize the resulting products in their respective markets. Some partnerships turned into exclusive strategic alliances to address specific markets. To better serve the pharmaceutical market, Protéus created PCAS Biosolution, a joint venture formed with the European fine chemical company PCAS, in order to manufacture APIs and intermediates using novel chemo-bio catalytic routes. PCAS Biosolution provides our clients with combined chemo-bio catalytic process R&D and multi-scale cGMP industrial manufacturing capabilities ;

- A broad range of **services** provided by PSI (Protéus Services for Industry), a dedicated business unit created by Protéus to better serve the pharmaceutical and biotech industry.

Using our proprietary biodiversity, protein engineering, immunogenicity management, and protein manufacturing platform, we create significant value for our clients.

## Technical data

### Management

Protéus benefits from an experienced executive management team headed by Gilles Ravot, PhD, President and CEO of the company. All managers of the company have strong track record in the biotechnology industry. The team includes scientists as well as an expert in industrial property and business development. It has been designed to fit with the accelerated growth of the company.

In order to coordinate the R&D and production activities of both Protéus and its affiliate PCAS biosolution, an executive committee including the management of the two companies has been established :

**Gilles Ravot** : President & CEO, Protéus

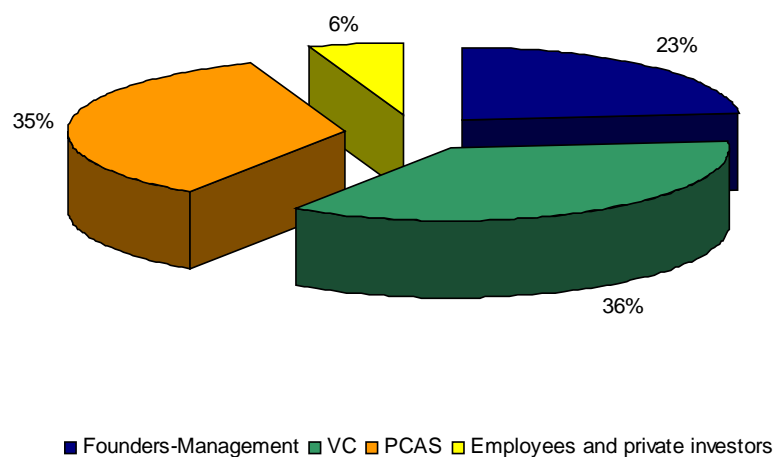
**Jean-François Bloch** : Deputy General Manager, Protéus

**Jean-Marie Sonet** : General Manager, PCAS Biosolution

Created in 1998, Protéus has over thirty highly trained staff, including 9 Ph.Ds. It is located in Nîmes having around 2100 m<sup>2</sup> made up of laboratories and all necessary supporting services and equipment such as

- Screening platforms
- Clean rooms
- Fermentation capabilities
- Analytical equipment (HPLCs, GCs...)

Equity :



Turn-over 2007 : 2,1 M€ increased by 25%

Subsidiary in joint venture : PCAS Biosolution SAS

## Fields of applications

### Proteins for life sciences industries

Proteins are widely exploited in the industry because of their catalytic properties or their biological properties.

The proteins with catalytic activities, otherwise known as enzymes, are used in many industrial sectors. In chemistry, after appropriate formulation, enzymes become biocatalysts that are used for production of speciality products, intermediates or active molecules. The enzymes are also used as such for their ability to degradation of complex molecules in different fields such as detergents, animal food or for the production of bio fuel from plant origin.

In the field of health, biological and pharmacological properties of proteins are widely used in the development of new medicines, especially to supplement the natural deficiencies (e.g.: insulin in diabetes cases). The advantage of using proteins in the industry is illustrated below through various areas.

#### ***Fine chemicals and specialty chemicals***

The molecules resulting from the R&D are increasingly complex and the constraints which are on the chemical industry are becoming heavier and heavier (e.g. REACH regulation). Traditional means of production are too expensive and their impact on environment too strong. Protéus develops and produces enzymatic proteins which have catalytic properties with extraordinary power and specificity. They are called "biocatalysts". Protéus develops and provides biocatalysts perfectly adapted to the industrial chemists requirements. Their selectivity can eliminate many steps required by chemical processes and get much better yields. The gain of productivity and quality is considerable, as well as the reduction of the quantities of secondary products and waste, often toxic, of which it would be much more expensive to get rid of without biocatalysts. In total, biocatalysts provide the opportunity to improve productivity together with energy and environmental balances.

#### ***Healthcare***

In the pharmaceutical industry, proteins for health are still representing the segment that is experiencing the strongest growth of the sector. Over the past decade, this segment has known annual growth rates ranging between 10 and 15%. Today, the arrival of "biosimilars" is changing the sector significantly. In order to allow the pharmaceutical companies to accelerate the development of both princeps and generic products, Protéus provides them a comprehensive platform of services for engineering and production of proteins, including the evaluation and control of immunogenic proteins properties.

### ***Bioenergies***

In the field of bio energy, Protéus is involved in R&D programs aimed at elaborating new enzymes able to transform efficiently lignocellulose wastes and agricultural by-products. These new proteins will be used to develop second generation processes for the production of bioenergy and to fulfill the human energetic needs without jeopardizing our food supply.

### ***Cosmetics***

The cosmetic industry is subject to the same constraints as the chemical industry, to which is added the growing interest of the consumers for natural products, containing as few additives and "chemicals "as possible. Producers who are able to meet this demand without increasing their production costs have a decisive competitive advantage. The use of biocatalytic processes allow to industrialize new cosmetic ingredients production processes which do not involve any synthetic chemicals, such as organic solvents. Protéus designs, produces and develops biocatalysts adapted to these processes.

### ***Other applications***

Beyond the above examples, proteins allow to achieve unprecedented performance in all areas of the life sciences industry including detergents, animal feed, paper industry, biodefense, while using more environmentally friendly processes. For ten years, Protéus has acquired a unique experience in these areas, working in partnership with the most important players of these sectors.

## Proprietary Resources & Technologies

### Integration Makes the Difference

Protéus' business is backed by a unique set of technologies, know how, and intellectual property portfolio, including exclusive resources in natural microbial biodiversity and proprietary technologies for the development of industrial proteins. It is supported by scientific knowledge and a dynamic network of internationally renowned experts. An entire range of services has been developed by Protéus, enabling it to provide support to its customers from discovery through industrialization of their products. In addition, Proteus also provides manufacturing know how and capabilities through PCAS biosolution, in order to industrialize the innovative and efficient bio-processes developed by Protéus and accelerate time-to-market for its clients.

#### **A collection of microbial biodiversity: an extraordinary source of new proteins with a strong industrial potential**

Through close collaborations with international partners (academic and private) specialized in the exploration of natural biodiversity, Protéus has put together an exceptional collection of microorganisms (bacteria, alga, fungi...) adapted to extreme environments (ocean deep, volcanoes, glaciers...). This broad microorganisms collection is an extraordinary source of novel proteins and other additional biochemical compounds.

#### **Industrial proteins with improved performance « Dream'line™ »**

Protéus has patented technologies which provide unique opportunities to generate new proteins for demanding applications. EvoSight™ (reasoned random mutagenesis) and L-Shuffling™ (random recombination) are two highly efficient methods allowing the optimization of protein in order to meet industrial process needs in terms of activity, specificity, stability, solubility, production cost...

#### **High throughput for functional screening platform (HTS)**

Protéus' HTS-platform enables to rapidly screen libraries of proteins, either natural ones, or resulting from directed evolution methods. Combined with the other technologies and know-how of Protéus, this platform enables to find the right protein for the desired bioprocess amongst thousands.

#### **Protein immunogenicity assessment « Immuno'line™ »**

Proteins have enabled the development of very promising drugs for new treatments of many diseases. The immunogenicity of protein-based drugs is a crucial parameter in the success of clinical development. Protéus, in collaboration with the French agency for nuclear energy (CEA - DSV - Saclay), has launched a new range of services "Immuno'Line" which provides particularly relevant information on the immunogenic potential of candidate proteins prior to clinical development.

By combining this new approach to its discovery, engineering and protein production platform, Protéus provides a unique range of tools to develop competitive and optimized therapeutic proteins (also called Biologics).

### **Proteins production « Prod'line™ »**

Industrial proteins economic value depends on the ability to bridge the gap between lab-scale and industrial-scale production. The availability of optimal recombinant protein expression system is therefore crucial. A world-class specialist in microbial expression systems (bacteria, yeast and fungi), Protéus created an expression platform using microorganisms that can be rapidly industrialized. This expression platform comes together with capabilities and know-how in proteins production, purification and formulation.

### **Production of intermediates and active pharmaceutical ingredients**

Through PCAS Biosolution, its production subsidiary, Protéus operates four cGMP production sites regularly audited by the FDA. Those sites, acquired from large pharmaceutical companies, have a great expertise in the production of APIs and pharmaceutical intermediates.

### **Industrial Property**

Since its creation, Protéus has devoted substantial resources to intellectual property ("IP"). A team of Ph.D's and lawyers, specialized in intellectual property, is full time dedicated to writing patents, updating procedures and contracts of collaboration, and to technological and strategic intelligence survey . Thanks to its own in house research and to a series of agreements and scientific and technology collaboration, Protéus has built a unique and attractive intellectual property portfolio. Protéus constantly strengthens this portfolio by maintaining its efforts in research and development along with a proactive policy of external growth, acquisition of technologies and licensing agreements with industrial and / or academic laboratories.

Protéus has developed a policy of patents, agreements and licenses which can protect efficiently its intellectual property, proprietary elements, and industrial property of products and processes coming from its work as well as the means to value it. This policy is an important source of competitiveness and revenues for Protéus and its scientific partners. It is also an important element of the freedom to operate for its industrial partners.

So far, Protéus has filed over 100 patents in 15 families covering its technology platform. Most of these patents have been granted, including in the U.S. and in Europe where a careful review is carried out. Granted patents include patents covering the technologies of directed evolution and expression of proteins developed by the company. Moreover, Protéus, in collaboration with industrial partners, has registered several patents on enzymes and products resulting from its research.

## Partnerships & achievements

### Protéus : a Reference Partner for the Life Sciences Industry

For 10 years, Protéins have been Protéus' core business. Thanks to a unique technology platform, Protéus is contributing to industrial innovation through industrial partnerships. Here are some examples of achievements and partnerships:

- **Cosmetics**

Protéus designs and develops new bio processes of the production cosmetic ingredients. These achievements resulted from partnerships with worldwide leaders such as L'Oréal and Evonik (formerly known as Degussa). The partnership with Evonik has become a strategic alliance to develop and commercialize innovative products for industrial and consumer care applications of organomodified silicones and oleochemicals

- **Flavors and fragrances**

Protéus has created an industrial partnership with Swiss company Firmenich, second world leader in flavors and fragrances. Several molecules currently under development have been patented.

- **Fine Chemicals**

Protéus has designed and developed biocatalysts for all the most important reactions used in fine chemicals, including the synthesis of complex chiral products. These biocatalysts are used in Protéus' industrial partners plants, and particularly in those of PCAS together with Protéus has created the PCAS Biosolution joint venture.

- **Health**

Protéus has provided its customers in the health sector with various proteins such as therapeutic targets, antigens or therapeutic proteins. Companies like Bioalliance, Ipsen, Servier belong to customers of the company. Protéus recently published results obtained with its partner Medimmune (formerly Cambridge Antibody Technology), applying L-Shuffling™ technology on anti-Fas antibodies (Protein Engineering Design and Selection, vol. 21 no. 5 pp. 343-351, 2008).

- **Biodefense**

As a biotechnology company specialized in the discovery, optimization and protein production for various industrial applications, Protéus has been asked to develop efficient decontamination tools both against biological and chemical agents. During these studies, we also developed detection and identification methods of various microbial species in real time. Protéus' achievements in biodefense were done through industrial partnerships with leaders of the defense sectors such as Thales and NBC-Sys (formerly GIAT Industries).

- **Environment**

Protéus has established an industrial partnership with Véolia Environnement, the world leader in environment services. Under this partnership, innovative processes for wastewater treatment have been developed.

- Feed and Food

Protéus has developed new enzymatic molecules in order to improve the assimilation of food, as well as the cattle health, the breeding productivity and to reduce pollution from livestock slurries. Investigations conducted in partnership with industrial partner Adisséo have led to the filling of patents.

- Detergents (home care and fabric care)

Protéus develops new proteins designed to improve washing and cleaning products performances, while making them less dangerous for the environment. The Company has been engaged in partnership with the German Group Henkel, a world leader in adhesives, floor treatment, detergents and maintenance products and cosmetics.

## Scientifique collaborations

### A unique network of collaboration

The Scientific Advisory Board of Protéus has been chaired by Prof. Jean-Michel Masson since founding of the company in 1998 and it has been one of the key elements of the company's strategy. The Scientific Board members have been chosen among the top specialists in the fields of protein engineering, industrial microbiology, fermentation processes, molecular biology, genetic engineering and protein immunogenicity. It has recently attracted Dr. Bernard Maillère, who joined the Scientific Advisory Board to bring a strong expertise in the field of protein immunogenicity and therapeutical application.

In order to constantly expand its platform and strengthen its technological leadership, Protéus has created and keeps on expanding a network of exclusive collaborations with internationally renowned scientists. Most prominent members of this network are listed below.

<b>Laboratoire</b>	<b>Nature de la collaboration</b>
BIODEEP	Microorganisms from deep sea hypersaline anoxic basins
CARGILL	Diverse lactic bacteria
CEA	In vitro protein immunogenicity assessment
Univ. Griffith (Au)	Microorganisms from Great Artesian Basin
Univ. Hébraïque Jerusalem (Il)	Microorganisms from (hyper)saline environments
HERMES	Microorganisms from marine margins
IFREMER	Microorganisms from marine environments (including deep sea hydrothermal vents)
INRA	Expression systems
IRD	Microorganisms from intertropical areas
Total	Microorganisms from oil fields
Univ. Buenos Aires	Microorganisms from cold environments
Univ Berne	New Chemistry for HTS
Univ. de Moscou	Microorganisms from extreme environments

Thursday June 26th, 2008



proteus

Invitation



With the presence of  
**YVES CHAUVIN**  
*- Nobel Prize of Chemistry in 2005 -*

**ALFREDO AGUILAR**  
*- Head of Biotechnology Unit  
at the European Commission -*

1998 • 2008



Making your dreams an industrial reality

Registration required  
Response before  
June 16th, 2008

# P r o g r a m



## « 10 years of Innovation with proteins »

2 :45 pm - 5 pm (EERIE site)

Welcome speech by **Gilles Ravot**  
*Chairman and CEO of Protéus*

Under the Presidency of **Professor J.M. Masson, Ph.D**  
*(Chairman of the Scientific Council, INSA of Toulouse)*

**Joël Querellou (Ifremer)**  
*Extreme Env.  
& New Enzymes*

**Gérard Guillaumot (PCAS)**  
*Biotechnology & Green Chemistry*

**Bernard Maillère (CEA)**  
*Proteins' Immunogenicity  
Evaluation*

**Robert Schulman (Hunton&Williams)**  
*Industrial Property and Innovation*

**Marie-Sophie Charvolin (NBC-Sys)**  
*Proteins & Biodefense*

**Gwenaëlle Pestel-Corre (Metabolic Explorer)**  
*Metabolic Engineering*

**Emmanuel Trouvé (Véolia Environnement)**  
*Environment & Biotechnology*



**Break : 5 pm – 5 :30 pm** (EERIE Site)



## « Innovation and Prospects »

5 :30pm – 6 :30 pm (EERIE Site)

**Alfredo Aguilar-Romanillos**  
*(Head of Biotechnology Unit, European Commission)*  
Progress and prospects of the Lisbon strategy in the field of Biotechnology

**Yves Chauvin**  
*(Nobel Prize of Chemistry in 2005)*  
The difficulty of Innovating



**Speeches : 7 pm – 7:30 pm** (Protéus Site)



**Aperitive and Cocktail : beginning at 8 pm** (Protéus Site)

## Speakers presentation

### “About the Difficulty to Innovate”

#### Yves Chauvin Nobel Laureate in Chemistry

Born in Belgium, Yves Chauvin graduated from the Ecole Supérieure de Chimie Industrielle of Lyon, France. He started his career as a research engineer at Progil, then joined the IFP where he stayed until retirement. In 1995, he joined the Ecole Supérieure de Chimie-Physique-Electronique of Lyon as professor Emeritus.

Yves Chauvin's research deals both with fundamental and applied projects. He authored numerous publications on the reaction mechanism of industrialized reactions and industrial processes, as well as many patents. He strongly involves in the process of industrial innovation, in line with the constraints of sustainable development. He is deeply concerned with technology transfer and the transition between invention and innovation, as well as the formation of young researchers.

In 2005, he was awarded the Nobel Prize in Chemistry, along with Robert H. Grubbs and Richard R. Schrock, for their work on the metathesis method in organic chemistry. This mechanism, which was explained for the first time in 1971 by Yves Chauvin, is now routinely used in the chemical industry for applications ranging from the production of drugs to the synthesis of plastic polymers.

# “Progress and Prospects of the Lisbon Strategy in the Field of Biotechnology”

Alfredo Aguilar-Romanillos,  
Head of Unit for Biotechnologies,  
Directorate General Research  
at the European Commission

Alfredo Aguilar has been at the European Commission, Directorate General Research, for more than 20 years. His job involves preparation, implementation and follow up of the EC Research Framework Programmes, and be at the interface between research policy and other Community policies. He is currently the Head of Unit for Biotechnologies, within the Directorate Food, Agriculture and Biotechnology and his main objective is to promote the so-called KBBE (Knowledge-Based Biotechnology in Europe) through the R&D activities in Framework Programme 7 (FP7).

Prior to this, Aguilar was the Head of the INCO (International Cooperation) Programme promoting International Scientific Cooperation between Europe and Third Countries. Other previous responsibilities include Head of Unit for Biotechnology and Applied Genomics, within Directorate Health Research; Head of Unit "The Cell Factory" and Head of Demonstration Projects in Life Sciences, both in the Directorate Life Sciences and Technologies, Directorate General Research of the European Commission.

Aguilar is Associate Professor of Microbiology (tenure position) at the Faculty of Biology, University Complutense of Madrid. Other academic positions include Associate and Assistant Professor of Microbiology at the University of León (Spain).

Aguilar has a First and a Master Degree in Chemistry (Biochemistry) and Ph.D. in Chemistry (Biochemistry) from the Autonomous University of Madrid. He has carried research at postdoctoral level for several years at the John Innes Centre (Norwich, UK) and at the Institut für Zellbiologie, Eidgenössische Technische Hochschule, ETH (Zurich, CH).

He has also worked at the Chemistry R&D Department, Lever Ibérica (Unilever), Aranjuez, E

## “Extreme Environments and New Enzymes”

Joël Querellou

Principal Investigator, UMR6197 IFREMER-CNRS

*Extremophiles thrive in the most unexpected habitats on earth and develop at the boundary of life on the planet. Their cellular components have to adapt, throughout evolution, not only to extreme conditions but also, within certain limits, to their variations. The properties of extremophilic enzymes are especially attractive for numerous industrial applications.*

National institute of marine research, the French public institute for marine research, Ifremer contributes, through studies and expert assessments, to knowledge about the ocean and its resources, monitoring of marine and coastal zones and the sustainable development of maritime activities.

Joel Querellou graduated from the National Agronomic Institute (INA) of Paris and holds a Ph.D in genetics from Paris XII. He joined the CNEXO in 1981, after working for the CEMAGRF at INRA. He managed successively the fishing and aquaculture station of Brest, the Aquatic Resources Department of IFREMER, then the IFREMER Center of Brest. In 2003, he founded the UMR6197 research unit (Microbiology of extreme environments) which he managed until 2007.

## “How Intellectual Property Protects Innovation”

Robert Schulman

Partner and Co-chair of the Life Sciences  
Practice Group, Hunton & Williams

*The discussion will focus specifically on Protéus technology and how we have been able to use Intellectual Property to protect innovation in several ways. We will discuss in particular Protéus shuffling patent and some of the claims that we have obtained. We will also generically discuss some of the basics of patents, i.e., why they are important, what rights they confer, how they can be used in the marketplace and some basics of what types of inventions can be protected and what the general requirements are for obtaining a patent.*

The IP group of Hunton & Williams, over 90 attorneys strong, can handle any aspect of intellectual property. The Hunton & Williams law firm is present across the United states but also in Asia and Europe.

Holding a B.S in chemical engineering, Robert Schulman is a recognized attorney specialized in pharmacy, chemistry and biotechnology IP. He Teaches Interference Practice at Georgetown University Law School and represents a substantial number of domestic and foreign chemical, pharmaceutical and biotech companies, including Protéus, at the Patent Office and before the. Federal Circuit and Board of Appeals.

## “Enzymes For a Greener Chemistry”

G rard Guillamot  
R&D Director, PCAS

*The principles of green chemistry and their implementation in the field of biocatalysis applied to fine chemicals will be exposed, with examples derived from a rich, 15 years development experience within pharmaceutical laboratories.*

PCAS manufactures complex molecules with high added value. The Company focuses on Pharmaceutical Fine Chemistry and Specialty Chemistry. Backed by its strong R&D and its excellence in technology, PCAS provides complete solutions to its clients all throughout the development of their projects.

G rard Guillamot holds a Ph. D in chemistry. He spent more than 10 years as a R&D engineer with Marion Merrel Dow and Schwarz Pharma before being appointed as R&D Director at SELOC-France. He joined PCAS in 1999 and became a member of the Board and of the Executive Committee of the company. As the R&D Director, he manages over a 100 persons belonging to 6 research groups located in France, Finland and Canada, and 4 pilot plants.

## “Metabolic Engineering”

Gwena lle Pestel-Corre  
Head of the analytical platform, METabolic EXplorer

*Optimization of metabolic routes in microorganisms that lead to the production of chemicals that are intermediates of commodity compounds production will be illustrated with examples.*

METabolic EXplorer is a leading industrial biotechnology company focused on the production of bulk chemical intermediates via economically and environmentally attractive production processes.

Gwena lle Pestel-Corre received her PhD in Proteomics at the INRA of Dijon in 2002. Then, she joined METabolic EXplorer in February 2002 to take in charge the platform of Analysis and Enzymology.

## “The role of Biotechnology in the Evolution of wastewater treatment”

Emmanuel Trouvé  
Municipal Wastewater & Sludge Dpt Manager,  
Véolia Environnement

*Biotechnology is increasingly used in wastewater treatments. This will be illustrated by various examples, including the contribution of innovative proteins.*

Veolia Environnement is the only Company to offer solutions addressing client needs in four complementary segments. The Company is the world's leading operator in the water sector. It proposes a complete range of waste management services and leads the European market for energy services to public authorities and industry. In addition, Veolia Environnement is the top-ranking private operator of public transportation systems in Europe and the United States.

Emmanuel Trouvé graduated from the ENSAIA engineering school of Nancy. A specialist in membrane bioreactors, he spent all his career in the industry, at first in the dairy industry, then for the past 17 years in the water & wastewater industry. As the Director of the 45 people strong Wastewater & Sludge R&D of Veolia, his role is to set up and manage R&D projects and initiate transfer to the market.

## “Proteins and Biodefense”

Marie-Sophie Charvolin  
Project Manager R&D, NBC-Sys

*The situation of decontamination for biodefense will be presented. Problems arising from the use of traditional decontaminants are a major issue for the future of decontamination. The benefits of the new decontaminants, including enzymes, translate into a progress regarding both compatibility with the materials and performances towards the targeted contaminants.*

NBC-Sys is a business unit of Giat Industries. Its vocation is to develop, market and carry out protection systems, individual and collective, against the Nuclear, Biological and Chemical (NBC) hazards for our military and civil customers.

MS Charvolin, a chemical engineer, joined NBC-Sys in 1995 after earning a Ph.D in physico-chemistry of solids at the Ecole des Mines of Saint-Etienne. In charge of decontamination projects, she participated to the development of decontamination and operational study systems for the DGA. She also works in the field of individual protection.

## “The prediction of therapeutic proteins immunogenicity”

Bernard Maillère  
iBiTech Saclay, CEA

*Proteins have become the major source for new drugs. However, therapeutic proteins can be immunogenic, that is triggering an immune response, as vaccines do. These responses can neutralize the therapeutic proteins or even promote serious side effects. The CEA and Protéus have developed a proprietary technology based on in vitro assays to predict and minimize the immunogenicity of therapeutic proteins.*

A leader in research, development and innovation, The CEA is active in three main fields including energy, information and health technologies, and defense and national security, relying on outstanding fundamental research.

Bernard Maillère, a graduate from the AgroParisTech, earned a Ph D in immunology. He leads a research group at the Biology and Technology Institute (Ibitech) of the CEA at Saclay. His research is focused on the cellular immunological response directed against proteins and the identification of immunogenic sequences. Applications range from the development of vaccines against viruses, cancer and allergy to the evaluation of the immunogenicity of therapeutic proteins.