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## FOUNDATION OF LIFE

**The French Foundation for Research on Biodiversity** represents a point of convergence between science and society. Launched in 2008, the Foundation has already proved successful in fostering innovation, promoting biodiversity science and building fruitful collaborative initiatives in the sector. We speak with Patrick Duncan, Chair of the FRB Board, to find out more

## Would you outline some of the present challenges facing the landscape of biodiversity research in Europe?

Biodiversity is the living tissue of the planet. Through the services and functions provided by ecosystems, biodiversity sustains the wellbeing of human societies. However, we are losing biodiversity in all environments, from farming systems to near-natural systems, and at different scales and rates. These losses do not threaten life on Earth; they threaten our lifestyle. They also raise ethical issues on human responsibility towards other life forms. This is why it is crucial that we understand better the mechanisms that sustain biodiversity, and for this, we must harness scientific research.

### **Biodiversity is a transversal issue for scientific research – it needs careful attention.**

The European Commission Horizon 2020 road-map for thematic research outlines six priorities:

- Health, demographic change and wellbeing
- Food security, sustainable agriculture, marine and maritime research and the bioeconomy
- Secure, clean and efficient energy
- Smart, green and integrated transport
- Climate action, resource efficiency and raw materials
- Inclusive, innovative and secure societies

This vision is consistent with Future Earth, an international programme coordinated by Belmont Forum and G8 Research Councils Initiative on Multilateral Research Funding aiming 'to provide the knowledge required for societies in the world to face risks posed by global environmental change and seize opportunities in a transition to global sustainability'.

Biodiversity is not explicitly named as one of the themes, but these challenges imply managing biodiversity, particularly those elements which determine ecosystem services. Biodiversity needs to be addressed in all the themes. In the current context of a financial crisis and a strong focus on climate research, we need to be very careful that biodiversity research has a key position in Europe's scientific initiatives.

### **Biodiversity science is complex; understanding the dynamics requires several disciplines.**

As ecosystems are very complex, we need an integrated science of biodiversity dynamics with a theoretical framework that incorporates all relevant disciplines: ecology with sociology, economics, philosophy and genetics, to cite a few. Models must be developed to understand the drivers of change, and help anticipate future changes in biodiversity under different management options. This is a thrilling scientific challenge which is every bit as exciting as exploring the infinitely big (astronomy) and the infinitely small (particle physics).

To build these models, strong data is required. We must address the challenges associated with the collection, standardisation, operability, maintenance, and access to data. Currently, essential data on ecosystem interactions is lacking or not accessible; a major effort is needed to improve the quality of data, and to collect it over the long term. We need to hammer home this need to strengthen biodiversity data and everyone should know that only the surface has been scratched to date. At the simplest level, we have described only 15-50 per cent of the species living on Earth. As for the interactions which drive biodiversity dynamics, such as parasitism and predation, the principles are still largely mysteries.

### **Human behaviours need to be better understood and articulated with biodiversity management policy.**

Successful biodiversity management requires two things: science, to gain knowledge of the systems involved, and effective measurements of the consequences of management actions; and political will, to deal with the

inevitable trade-offs to maintain the tissue of life in a state that benefits human societies in the long term.

The disastrous management visible all over the world (eg. 70 per cent of the major fisheries have collapsed or are close to it, and our failure to respond appropriately to climate change) demonstrates that to improve the state of the planet's living tissue, a better understanding of human behaviour and of the drivers of decisions by people and policy-makers is required. It is particularly important to understand how we manage trade-offs between the three pillars of sustainable development – economic, social, environmental – and between individual and community benefits. Finally, human behaviour seems flexible, but is partly hard-wired by our biological history, by natural and sexual selection – we have little idea how this affects our decision-making.

### **How is the Foundation working to resolve these issues? What are its aims and objectives?**

FRB is France's science-society interface for biodiversity. The ultimate aim is to provide the best available knowledge for decision making on the management and sustainable use of biodiversity. FRB's missions are to contribute to coordinating biodiversity research, to foster consultancy/expertise by scientists, to initiate partnerships between academic research and other stakeholders including raising funds, to share new knowledge quickly and widely, and to promote biodiversity in secondary and tertiary education.

An original feature of FRB is its Conseil d'Orientation Stratégique (COS), which represents over a hundred stakeholders, businesses, NGOs, and agencies that manage biodiversity. Our Scientific Council does periodic 'Prospectives' to identify new challenges for biodiversity research; with the COS, they propose priorities for the Foundation's actions. These perspectives by FRB also feed AllEnvi, the national alliance for environmental research ([www.allenvi.fr](http://www.allenvi.fr)).

This think-tank activity has led to launching programmes to discover new knowledge to underpin decisions on managing biodiversity. We have three major ones: Modelling and scenario-building, the Centre for Synthesis and Analysis of Biodiversity (CESAB, [www.cesab.org](http://www.cesab.org)), and ECOSCOPE, the national network for research infrastructures on biodiversity data.

Our Modelling and Scenario-building programme has developed strongly over its three years. Initially rather academic, the majority of projects now have the user(s) of the final scenarios as central partners. For example, the ESNET project addresses the ecological services used by the city of Grenoble, their dynamics and the trade-offs involved in managing them. This programme has had a European extension through BiodivERsA: in 2011, eight European partners combined to fund a programme modelling for scenarios on biodiversity change with nearly €9 million. This theme has also been proposed to the Belmont Forum and G8 Research Councils Initiative on Multilateral Research Funding (International Opportunities Fund).

The CESAB, Europe's first centre for biodiversity analysis and synthesis, has 10 projects running on a variety of theoretical and practical issues. The most advanced one, GASPAR has gathered data on thousands of species and from all over the oceans, and shown that the great differences in the diversity of the planet's coral fish communities are caused mainly by isolation. Reefs far from 'refugia' where reefs survived in periods of stress in the last 3 million years have fewer species and less abundant communities. Local environmental conditions play only a secondary role to explain today's biodiversity. These results can clearly be used to support conservation policy at global as well as local scales.

As *International Innovation* highlighted in the December 2012 issue, we are in a 'New Dawn' of environmental data – covering subjects like climate, economics and biodiversity. These data are the building-blocks of the syntheses and models to understand how and why biodiversity is changing. FRB developed the programme ECOSCOPE to ensure the data collected by the French research teams is accessible and interoperable, and connected to European and international initiatives: Ecoscope is the French component of GEO Biodiversity Observation Network (GEO BON).

In addition to these major programmes, we explore key conceptual issues for interdisciplinary and transdisciplinary research, such as values of biodiversity and genetic resources. We also have thematic programmes with shorter

lifespans like EcoPhyto, to find new ways of reducing the use of pesticides and fertilisers. It is financed by the Ministry of Agriculture.

### Why was FRB originally established and who are its founding members?

In 2008 the Environmental conference (Grenelle de l'Environnement) recommended that the two national committees on biodiversity research be united: the Bureau des Ressources Génétiques (BRG) on domestic biodiversity and the Institut Français de la Biodiversité (IFB) on wild biodiversity. The structure chosen by the Ministries concerned, Ecology and Research, is a 'Fondation de Coopération Scientifique', which operates under civil law and can hire staff and receive donations as a charity. The founding members are the eight research establishments which deal with biodiversity: Bureau de Recherches Géologiques et Minières (BRGM), La Recherche Agronomique pour le Développement (CIRAD), Centre National de la Recherche Scientifique (CNRS), IFREMER, Institut National de la Recherche Agronomique (INRA), IRD (Institute de Recherche pour le Développement), Institut National pour la Recherche en Sciences et Technologies pour l'Environnement et l'Agriculture (IRSTEA), and the National Museum of Natural History (MNHN). Three Ministries (Research, Ecology and Agriculture) are observers on the Board. The roles of the Universities and of business are being strengthened in the Foundation.

This complex domain of research requires organisation, and the merger of BRG with IFB was undertaken to encourage exchange of concepts and methods between two research communities which were following different paths. This idea came at a good time – when scientists and citizens alike realised that wild and domestic biodiversity should be understood as interacting with each other, with one species – Homo sapiens – as the major driver of change since we currently use about half of the energy produced by the rest of life on the planet.

### How do collaborations support FRB's goal to advance biodiversity research and create an interface between science and society? Could you discuss some of the activities underway within this programme?

FRB is the advocate for the French biodiversity research agenda at the national, European and international level; it is France's representative at DIVERSITAS which is soon to be part of Future Earth. The creation of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) in 2012 has provided the international context to strengthen the efforts to build a strong science-politics interface for biodiversity, and FRB coordinates the national contribution to IPBES.

At the European level, FRB coordinates the ERA-NET BiodivERsA, and FRB is involved in the communication and support of the EU Seventh Framework Programme (FP7) project BioVeL, which develops informatics tools for biodiversity research. We are also part of KNEU, an FP7 initiative coordinated by researchers and practitioners to help all societal actors in the field of biodiversity and ecosystem services to make better informed decisions. We contribute to EPBRS, the European platform that elaborates proposals for scientific strategy in biodiversity research. Finally, CESAB is strengthening links with other centres sharing similar research methodology and practice (ie. s-DIV in Germany, NCEAS in the US, and ACEAS in Australia).

### FRB is involved with the coordination and management of the national biodiversity programme of the Agence Nationale de la Recherche (ANR). Could you discuss some of the activities underway within this programme?

Having managed the first programme on biodiversity science funded by ANR, we now work closely with the ANR to develop themes for the programmes of the European ERA-NET BiodivERsA. We have applied to manage a think-tank for ANR to programme future research on biodiversity and ecosystems in preparation for the work of IPBES. We anticipate it will involve the synthesis of available knowledge, scientific and traditional, modelling and scenario building, and an analysis of the knowledge gaps.

### Are there any projects or initiatives that FRB is involved with that you are particularly excited about?

Some of our scientific programmes are 'blue skies' (CESAB, ModeloScenarios), some are thematic like the new EcoPhyto programme.

All the projects in these programmes are exciting – especially the 'blue skies' ones. They deal with a wide range of important issues, the dynamics of coral reefs, the effects of climate change on glacial lakes in the Andes, and the ecosystem services upon which the city of Grenoble depends. It would be unfair to single-out one – they are all exciting because of their high scientific quality. They demonstrate the creativity of the scientific community, and its capacity to take on new challenges.

An exciting new development is the national evaluation of ecosystem services (EFESE) which has just been initiated by the Ministry of Ecology to prepare for Europe's contributions to IPBES. FRB is at the heart of this, helping to involve the relevant researchers.

A major issue behind all biodiversity-related projects is the values people attribute to biodiversity. At the moment, monetisation is fashionable, but FRB's synthesis on the topic shows that there are many values associated with biodiversity, including ethical values which cannot be monetised. We produced two reports on the fundamentals and a dissemination document ([www.fondationbiodiversite.fr/les-programmes-frb/valeurs](http://www.fondationbiodiversite.fr/les-programmes-frb/valeurs)), which presents the conclusions in four pages for decision makers and the public.

### What are the main focal points of the BiodivERsA network?

Like all research, work on biodiversity and ecosystem services must be promoted and integrated across borders in Europe and the results of this research made freely available to policymakers and other stakeholders. This explains the Foundation's role in BiodivERsA, an ERA-NET funded by the European Commission. FRB is the coordinator for this project which brings together a network of 21 funding organisations from 15 European countries to help promote coordinated and effective pan-European research into the conservation and sustainable management of biodiversity. BiodivERsA has produced a comprehensive 'map' of the current state of biodiversity research in Europe, based on its database of more than 6,500 projects funded at national or European levels. This mapping, in turn, allowed for the creation of a common research agenda, focusing on key topics of common interest on a pan-European scale and eliminating duplications.

By the end of 2014, BiodivERsA will have allocated approximately €50 million of funding to projects, through five calls. BiodivERsA also ensures that the knowledge generated by these projects is made quickly accessible to policy makers, through events and production of policy briefs. Promoting coordinated pan-European research to provide the knowledge needed for policy makers and stakeholders, BiodivERsA helps making informed decisions to maintain biodiversity and associated services in Europe, which complements FRB's work in France.

### Finally, what more can be done to harmonise human and environmental ecosystems? To what extent can this ultimately be achieved in your opinion?

Solutions to most of the challenges outlined above are likely to be found – the question is when? This will depend on the effort our societies make and on our investments in biodiversity research. We have so much to gain from understanding how the tissue of life works, and how it maintains the quality of the air, water and soils we use!

[www.fondationbiodiversite.fr](http://www.fondationbiodiversite.fr)

