

BIOMIMICRY: DRAWING INSPIRATION FROM NATURE FOR SUSTAINABLE INNOVATION

Seeking inspiration in nature is not a new concept; in fact, it is something that has featured regularly right throughout the history of humanity.

Imitating nature for the purposes of sustainable innovation, however, is a concept that has truly taken on its full meaning now that France is committing to a transition with both energy-related and ecological aspects, and it is this goal that is behind the concept of biomimicry.

This approach encourages man to draw upon the multiple sources of inspiration that nature can offer, be it in terms of form, substance or even eco-systems. It provides an opportunity to observe solutions that have been developed and perfected by living organisms over the course of the evolutionary process with a view to reproducing them in a way that makes it easier to resolve the problems facing human societies and to enable them to satisfy their own needs whilst at the same time limiting material and energy consumption. Biomimicry is one of the tools we can use to promote sustainable development.

Biomimicry has a wide and diverse variety of applications in the scientific, technical and industrial spheres; indeed, from agriculture to industry and even architecture, this field would appear to offer great potential with regard to innovation and the creation of economic activity. Whilst there is now a framework for innovation that incorporates an environmental aspect in

The three sources of inspiration for the biomimetic approach.

👉 Forms:

Source of inspiration: marine animals with undulating bodies or fins that enable them to get around.

Accomplishment: an undulating membrane designed to produce electricity using the energy provided by fluid pressure (currently at the trial stage).

👉 Processes and materials:

Sources of inspiration: the spider's yarn and the mussel's byssus.

Achievements: exploitation of mechanical properties to produce new, highly resistant and elasticated materials, suture threads that can be used in liquid environments, glues for medical or industrial use, etc.

👉 Eco-systems:

Sources of inspiration: the ability of certain fungi to absorb the metals contained in the soil, such as lead and cadmium, or to destroy hydrocarbons.

Achievements: requalification and restoration of polluted soil and reuse of the organic matter produced in accordance with principles that closely resemble those of the circular economy and industrial ecology whilst optimising flows in a way that reflects how eco-systems work.

place both in France and at European level, as well as a number of tools available to economic players and from which biomimicry could benefit, there remain certain obstacles with regard to its expansion. The present opinion aims to put forward potential solutions for overcoming these and further developing the field.



Patricia Ricard

is Executive Officer and President of the Paul Ricard Oceanography Institute.

Within the ESEC she is a member of the Section for Agriculture, Fisheries and Food and the Section for Environment, where she represents the Qualified Individuals Group.

Contact:

patricia.ricard@lecese.fr
 +33 (0)1 44 43 62 27

In order to achieve this, the ESEC would recommend the following:

BOOSTING THE VISIBILITY OF BIOMIMICRY

👉 Defining the terms used:

- Clarifying the scope and the nature of biomimicry, reinforcing its need for durability, and explaining the associated concepts to ensure that biomimicry becomes a clearly identified tool for transforming innovation and production methods.

👉 Drawing up an inventory of biomimetic activities:

- Producing a list of French research teams (both public and private) and companies operating within the field or adopting a biomimetic approach;
- Undertaking market research on a national, European and even international scale with the aim of highlighting the economic potential that biomimicry represents.

👉 Structuring the network and making it sustainable:

- Enabling the European Centre of Excellence in Biomimicry by Senlis (CEEBIOS) to initially benefit from a financial boost to help coordinate the network and undertake the initial studies, and creating a platform for biomimetic expertise.

ELIMINATING OBSTACLES TO BIOMIMETIC APPLICATIONS

👉 Creating conditions that are conducive to the development of biomimetic practices in the agricultural sphere

- Improving awareness of biomimetic practices in the agricultural sphere and measuring the results thereof, incorporating the subject into official curriculums taught at agricultural schools and on continuous training programmes, and structuring dialogue between players in the agro-ecological and traditional agricultural sectors.

👉 Developing permacultural and micro-agricultural practices in confined spaces, and in urban and peri-urban areas in particular

👉 Making way for innovation in the field of biomimetic architecture

- Promoting innovative projects by granting greater regulatory flexibility, such as authorising the creation of experimental and demonstration areas, for example, and incorporating biomimicry into specifications where appropriate.

👉 Improving research and development in the field of biomimicry:

- Encouraging manufacturers to increase their use of innovative processes, intensifying research efforts, developing a digital knowledge structure, forming cross-disciplinary working groups that might incorporate engineers and researchers looking at a specific issue, and encouraging the sector-specific strategic committees of the National Council for Industry (CNI) to really take the issue of biomimicry on board.

FIRMLY ESTABLISHING THE ISSUE OF BIOMIMICRY WITHIN THE EDUCATIONAL LANDSCAPE

👉 Promoting nature observation in schools

- Raising pupils' awareness of biodiversity from as early as primary school with the emphasis on nature observation, as the first step towards a biomimetic approach, and encouraging cross-disciplinary teaching on the issue of biodiversity in *lycée* secondary schools.

👉 Promoting biomimicry in higher education

- Identifying teaching modules relating to biomimicry that are incorporated into broader teaching programmes, producing an inventory and forming a network thereof, and developing a digital education network to facilitate cooperation between higher education and research institutions. Training professionals in the field of biomimicry who could then provide a link between the fields of biology, chemistry and engineering sciences and technologies.

MOVING TOWARD SUSTAINABILITY

👉 Developing life cycle analyses

- Asking companies to perform life cycle analyses on biomimetic products and technologies wherever possible and to publicise the results thereof, and promoting systematic reflection on the product life cycle as a whole.

👉 Strengthening links between biomimicry and biodiversity

- Expressing the desire to have biodiversity feature among matters of priority for public policy in terms of the resources allocated, and effectively expressing a desire to entrust public organisations with the task of supporting networks operating within the biomimicry field.