Editorial

Living systems share a common general pattern: information is devoted to nucleic acids, catalysis to proteins, delimitation of territories to lipids, management of energy to ATP, *etc.* . Reality is, of course, more complex and offers many singularities but, really, prokaryotes and eukaryotes, unicellular, plants and animals illustrate a quasi-universal model, rooted in oceanic waters and elaborated during nearly 3,8 billion of years (continental life emerged only 400 millions years ago).

Oceans are much more stable than terrestrial environments and support less 'niche' effects. In contrast, this stability favoured the keeping of the very many organization forms found today in the ocean. Scientists studying life in the great depths are capturing rare or even never described species of fishes, of squids and still unclassifiable organisms. Even the commercial fishing brings back regularly completely unknown fish species. Sometime, the observation of sea-beds let see, furtively, perfectly unknown living beings. Perhaps, some of them represent ignored and, undoubtedly for a long time, out of our field of investigation phyla. It is also clear that the most important part of the production of biomass in the oceans comes from tiny photosynthetic organisms (pico-phytoplankton), still unknown twenty years ago, and that these organisms take a major share in the geophysiological operation of the planet.

Many other factors must be taken into account to include/understand the specific nature of the marine biodiversity. Physicochemical constraints: pressure, absence of light at very the great depths, small chemosynthetic islands close to the abyssal smokers or, quite simply, the fact that the sea is salted: chlorine, bromine, iodine, all of that is at the origin of completely original organic molecular structures created and then destroyed by specific enzymatic mechanisms.

An early trend consisted of limiting the scope of marine biotechnologies to the production of biological models that facilitate the study of the general mechanisms of life. These studies feed our knowledge and understanding of life but marine biotechnologies now reveal their genuine potential in offering the investigation and exploitation of molecules and mechanisms for which we do not know any terrestrial counterparts.

Today, the field of marine biotechnologies is considerably widened: fundamental aspects or applied genomics, optimization of exploitation of fished or cultivated biomasses but also environmental applications, such as bioremediation, biofouling or resources management.

Marine biotechnologies can be understood as the various means or techniques of managing marine living systems for the benefit of mankind. The first goal we had been for marine life to provide biomass for food. However, today it is not certain that a significant increase of total world fisheries' catches will be possible in the future.

Now, we need to generate better, more complete or different uses of marine biomasses that still exist and are readily available. This is mainly a matter of upgrading fish and fish wastes, considered as a huge reservoir of molecules: polysaccharides, enzymes, fats, etc., exhibiting physical, chemical, or biological activities of interest for various purposes. The main problem - not a minor one -, in terms of techniques and cost, is to isolate and purify these molecules.

The critical field of the stock management also became a field of marine biotechnologies, by associating biology of the species, modelling and genetic identification of exploitable stocks.

The interest for the immense marine resources also targets molecules of therapeutic value, thermophilic or psychrophilic enzymes, texturing substances for industrial uses. The domains covered by marine biotechnologies are vast and range over various overlapping disciplines, from molecular approaches of developmental biology and bio-diversity to chemistry of natural substances.

To grip on these questions represent real strategic tasks for the marine biotechnologists. It requires basic research in developmental biology, genetics, gene engineering, endocrinology, pathology, and immunology of species as different as flatfish, salmon, shrimps, abalone, among others, but also a real knowledge of ecological relationships between species.

The term biotechnology also means that industries are associated and strongly involved in order to develop processes and, *in fine*, marketable products. This is not the easiest part of the job and, perhaps more than in any 'classical' industrial domain, this issue requires positive collaborations between all the stakeholders of the marine biotechnology field in order to exploit but also to manage correctly the marine natural resources.

However, marine biotechnologies cannot simply be considered as the use of transversal approaches for a new field. Marine biotechnologies really correspond to a specific albeit comprehensive vision on a largely remaining to discover field with al implications in terms of emerging.

The ESMB Marine Biotechnology Conference of Concarneau was original and successful, as it enabled the presentation of straightforward reports under the 'classical' headings of Systematic, evolution, genes, Natural substances, Cell Cultures Fouling/pollutions, Biomasses and biomaterials and very constructive discussions during the two round table sessions: Marine biotechnologies and innovation in the enterprises and Integrated value chain for marine products and co-products, gathering scientists and industrialists.

Yves LE GAL[1]
Alain Van WORMHOUDT[2]

[1]*Sous-directeur honoraire du laboratoire de biologie marine du Collège de France. Correspondant du Muséum National d'Histoire Naturelle Station de biologie marine de Concarneau*

[2]*Directeur de recherche CNRS au Muséum National d'Histoire Naturelle Station de biologie marine de Concarneau*