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Why Should We Reconsider Natural History?

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***Abstract**: Natural history is today finding into extremely diversified disciplines which are included in natural sciences field as well as into some medical specializations, like embryology, physiology, genetics etc. Decline of interest in research and education in natural sciences is followed by alarming consequences in young attraction to this field and within curricula of education and research activities to support development of society. Inventory, identification and monitoring of biodiversity, the protected areas management, landscaping, designation of places for recreation, agricultural and livestock production, food security, public health, etc. are bringing progress and benefits to science and for humankind – conservation of the environment, of biodiversity, in biological control, to public health, pharmaceutical research, agriculture, food security, recreation etc. Educational agenda for 21st century should recognize the need of co-operation between related disciplines with natural history, to include more and more participants in this agenda and to disseminate information with a serious effort of specialists, of educational institutions and scientific research as parts of the interested society.*

***Key words**: natural history, modern disciplines, biodiversity, interdisciplinary co-operation, suitable relation with nature.*

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I. Introduction

Tradition in finding the order within the three kingdoms* (mineral, botanical and zoological) was like a real assault in naturalists' research. Carolus Linnaeus (Carl von Linné) and Georges Buffon were the main personalities of this field. Linné invented an organizing system of the known plant and animal diversity. Buffon – father of natural history, followed the huge complicated amount of information on animals, writing an encyclopaedia of 36 volumes. The immediate effect of Linné and Buffon's papers were a vigorous stimulation in making new discoveries, activity which is still continuing.

Concentrating on the fields which diversified from the ancestral discipline, we can understand the meaning of genealogy of natural history, from the middle of the 18th century till nowadays. First divisions were made according to the kingdoms: geology, botany, zoology. Then, by setting different societies several specialized approaches have been settled: Linnean Society of London (1788), Zoological Society of London (1826), the American Society of Naturalists (1883), Ecological Society of America (1915), American Society of Genetics (1931), Association for the Study of Animal Traditions (1936), the Society for the Study of Evolution (1946), Animal Tradition Society (1964), International Society for Ecology of Customs (1986) etc.

Changing of natural history continues today with more specialized companies in an even more accelerated pace. Many modern disciplines derived from natural history that has reached critical mass in the 20th century. New companies and journals have emerged in recent decades and are dedicated to ethological ecology (behaviouristic), molecular ecology, molecular evolution, bioinformatics, genomics, etc. All are derivatives of natural history.

Of course, conceptual infusions must be assessed and the important ideas of other disciplines should not be neglected. One of the most important imports of such kind was the emergence of physiology at the beginning of 19th century.

*Today only organic world is shared into two Superkingdoms (Prokarya and Eukarya), the second one including five Kingdoms: Bacteria, Protoctista, Fungi, Plantae and Animalia.

Associated with medical education, beginning of physiology was represented by the traditional knowledge of natural history. Its experimental side marked the separation from the naturalists. In the next century, physiological experiments have kept the traditions of natural history, leading to the infusion of new and different disciplines: embryology, ecology, genetics, evolutionary biology, animal ethology.

II. Discussions

Currently we are in the midst of a mixture of molecular biology with different disciplines derived from natural history. Specialists in molecular biology strive to understand Darwinism; those specialized in animal ethology face a new molecular biology vocabulary. This marriage is welcome, on one hand, and on the other side, it is disputed - generating complaints and quarrels.

Meaning of "natural history" continues to contract. Today, the specialists in systematics and ecology-ethology do not anymore recognize that their field is natural history. The current trend is to define the natural history by what it is not (Arnold, 2003)..

Great naturalists are evoked for their concepts rather than for their activities in the field or because they realized collections. The natural history lives and breathes on produced concepts and which it continues to produce. The powerful concepts of naturalists' tradition of the past and today include:

- natural order of biological diversity;
- natural selection;
- phylogenetic heredity;
- increasing population logistics;
- trophic structures (relationships);
- biogeographic island;
- adaptation to the environment;
- descending with mutations (changes);
- Mendelian heredity;
- competitive exclusion or removal;
- allopatric speciation;
- adaptive landscape;
- adequate response to selection;
- optimal conditions of food;
- sexual selection.

The fundamental properties of the creatures or adjustment and maintaining of homeostasis by using energy to maintain metabolic processes, what are creatures, how and where they live, biotic and abiotic interactions linking the communities of creatures and ecosystems are items which belong to natural sciences or natural history.

There are many examples that highlight the vital importance of knowledge of natural sciences for many other disciplines: knowledge and conservation of biodiversity, protected areas management, environmental protection, landscaping and the need of places for recreation, agricultural and livestock production, food security, public health, etc. New technologies work in all fields, especially in natural sciences, bringing important benefits for both science and society (Cohen, 2003 and 2014; Joshua *et al*., 2014)..

The central theme of the natural sciences (natural history) is the observation and description of the surrounding world, studying the links of beings with their living environment. That definition requires interdisciplinary natural sciences, reflecting the scale and potential of these sciences. Although there were some voices who disagreed the place and role of natural sciences research in society, today they form one of the most comprehensive and diverse collection of academic disciplines. Human societies that have allowed decline in research and education in natural sciences have experienced serious consequences within the plan of research and social development.

Knowledge of creatures, what they are, how and where they live, what they eat and what habits have, longevity and their spread, serious threat of extinction of many species become vital necessary to science and society, today, when we live major global changes. Integration of this general knowledge, reinforces the importance of scientific research at the cellular level and molecular genomic. It contributes to the understanding and optimization of complex human-environment interactions, to the expanding of the use of technologies, of the design inspired by biomimicry (biomimetics), to the design inspired from biology, to the development of bionics. The careful observation of living creatures in their environment is necessary in political decision on the environment, with serious consequences for the environment, biodiversity conservation and, not the least, on public health.

It is known that the health of the human population depends on the understanding of the importance of human relations with the surrounding creatures. By WHO (OMS) statistics, 75% of infectious diseases affecting mankind are associated with the life of other being cycles (Lye *et al*., 2006).

Many of the current control strategies on these diseases are based on the understanding of the spread and habits of species and communities that influence transmission, distribution and their prevalence. Infectious diseases with vectors and reservoirs in the animal world include avian flu, acute respiratory syndrome (SARS), Ehrlichiosis - bacterial disease transmitted by ticks, which destroy leukocytes when they enter in human blood. Then there is the typhus, Lyme Diseases, transmitted by bacteria of the genus *Borrelia* infected through infected ticks, Hanta viruses, West Nile virus, the rabies, etc.

For all these diseases, research on natural sciences was involved in the knowledge of their dynamics in preventing and combating pathogens in saving many lives. While human population is growing, this information will acquire greater importance in combating pathogenic threats, including in the field of bioterrorism.

Colwell *et al*. (2003) mentioned that in the case of cholera, generated by *Vibrio cholerae* is a clear example of the key role of natural science research in disease control. The discovery that the bacterium *V.*

cholerae has also free populations associated with copepods (small peracarid crustaceans) and other species of zooplankton was the model of temporal and spatial preventing cholera outbreaks in human populations. The prevention was based on zooplankton and phytoplankton dynamics that those populations of vibrio feed. Armed with this knowledge of natural sciences, public health experts use satellite sensors today,to monitor phytoplankton chlorophyll, as the alarm system before the outbreak of cholera.

The same discovery explains why filtration of polluted waters using fabric is surprisingly effective in reducing the risk of cholera. Obviously, the fabric does not collect individuals of *V. cholerae*, but filters the zooplankton, to which the bacteria are attached. Understanding how organisms compete and defend each other against predators and pathogens represent new avenues for pharmaceutical research with the perspective of discovering new drugs. It is indisputable the value of medicines based on natural products.

Over 85% of known diseases are treated with drugs from natural products. The evaluation process of the bioactive compounds is automatically assigned to the research in natural sciences. There are cases in which instead of using knowledge of natural history for highlighting the sources of these compounds, in pharmaceutical research is adopted or are taken randomly sampling ethno-botanists' and anthropologists' identifications, as important historical and cultural traditions of local communities. Usually in such situations ecological knowledge are ignored, as well as that on the natural sciences on potential richness of the sources of bioactive compounds. An example is the herbivores that feed on certain types of tropical plants, recognized by colour and containing bioactive principles against cancer cells and parasitic protozoans.

In the field of food security, it is known that the requirements of sustainable agriculture involve detailed knowledge of local conditions, necessary to crop plant species and their interrelations with species characteristic of the area. Knowing the physiology and growth conditions, phenology, pollinators, herbivores, weeds, pathogens - all belong to the scope of research, knowledge and observations of the natural sciences.

Agricultural practices such as associated crops, crop rotation, pest control are based on knowledge of local natural history. Much such knowledge is overlooked or lost with the advent of the Green Revolution, which relied heavily on chemicals, the irrigation and the creation of more productive varieties and breeds. The initial success of the Green Revolution in Mexico and India led to the adoption of a single system wide approach throughout agriculture (Evenson and Gollin, 2003).

In many parts of Africa, in order to solve the difficulties with local crops, agricultural modernization based/focused on the import of new plant varieties and animal breeds suitable to other regions. Local environmental conditions and known varieties have been ignored, resulting a serious failure in regional agricultural production, which was not alleviated until agronomists have not begun to evaluate how and why local or specific varieties could thrive in local conditions.

There are many examples of successful integration of knowledge of natural science, which brought significant improvements to agriculture, including the use of integrated pest management practices and successful biological control.

In the oceanology field, knowledge of the natural sciences was a double-edged sword. Always success of oceanic fisheries, fish finding discovery depended on the knowledge of natural sciences. Such knowledge combined with ultrasound technology to track fish finding led to overexploitation of marine fishery resources. However, many of the same knowledge of natural sciences (reaching sexual maturity, longevity, fecundity, spawning, habitat requirements, brood care, etc.) have been criticized as recommended restrictions on fishing to save the clutch, to avoid disturbance to habitats juveniles and for the protection of species against overexploitation. The difficulty in the rapid development of fisheries was through ignorance of biology species, because of economic interest (Bailly, 2011). Therefore, instead of making less effort for understanding the species biology than their harvest, drastic consequences have occurred after fishing was compromised. It is widely known fishery collapse in the Bering Sea, of Alaska code (*Theragra chalcogramma*).

The most abundant and lucrative natural fishing has been in North America until the unrestricted fishing focused on females, for spawn, combining advanced technology and swift fishing, which led to the complete collapse: in 2007, only 3% of fishing was made as it fished in 1980. This collapse could be prevented, if studies of natural sciences had been made, which had put pressure prohibiting the exclusive fishing of females (Bailly, 2011). The accumulation of essential knowledge on natural sciences, on many economically important species, from fishing to the pest control on agricultural crops has always been behind the strong growth in predictive policies for the benefit of humanity.

In many industries, repeated collapses of sustainable management have occurred if deep knowledge of natural sciences were not at its base. Where the natural sciences have been integrated into management agenda, the results were significantly positive.

It is frequently given the example of the beetle *Iceria purchase* that feeds on the leaf veins and the undergrowth of the citric trees. Caltagirone and Doutt (1989) wrote a history of the vedalia beetle importation to California and its impact on the development of biological control. Why? Because in California of 1888 - 1889 ladybird *Rodolia cardinalis* and the homopteran *Cryptochetum iceriae* were brought from Australia, exactly to

control insect pests. Adults and their larvae feed on the injurious bugs at all stages of their development, and juveniles feed on beetle eggs. Natural science research have helped farmers in stimulating biological control, in saving money, in reducing the environmental pollution by replacing pesticides with the parasites of the injurious insects and with eco-agricultural management proposals (Huntington, 2000).

In the field of biodiversity conservation and management and landscape restoration, also detailed knowledge of natural history led to the success. Plant-fungi symbiotic relationships within healthy forest systems have imposed the practice of injecting trees and native plants with mycorrhisae. Ignoring of the information in the natural sciences has led to expensive policies. Annually, in Germany and the US over a billion dollars are spent for firefighting, ignoring the importance of fire, well-known by Native Americans, for the prevalent tree species. Expenses on extinguishing fire assumed important management measures for threatened species.(Regrettable experience of wildfirein Australia, in summer 2019 – 2020 also suppose huge charges to recover destroyed landscapes and drastic reduced populations of plant and animal species).

In the US, water management has also suffered from the lack of natural sciences knowledge. Thus in the rivers with trout of north-western USA, intentionally stumps and fallen logs were removed for ease of navigability and trout migration. Only after the "cleansing" of hundreds of rivers the accumulation of debris of trees was recognized as being essential for maintaining optimal habitat of trout. Today millions of dollars are spent for restoration of old habitats - works involving the use of helicopters, for the placement of logs in rivers.

A case of useful application of knowledge in the natural sciences is the management of tropical forests restoration on degraded pastures, abandoned by cattle. A number of processes can be barriers to forest regeneration, as it is the case of lack of nutrients, competition for pasture expansion, lack of seeds spread by animals. These observations led to the establishment of some management practices that favour forest regeneration. Where it was understand the necessity the decreasing of grazing pressure, forest restoration has been much faster. The example of Guanacaste Province of Costa Rica is frequently presented, in which wooded areas increased from 24% to 47% between 1979 and 2005.

Natural sciences proved vitally necessary in the conservation efforts and responsible use of "icon species and landscapes" - creatures and places that represent valuable heritage of social-ecological systems. Social actions are stimulated by the idea cherished species protection. Their decline (e.g. of the eagles, whales, of Sequoia trees. Redwoods, of the songbirds) could recover only after efforts of knowledge dissemination and understanding of their biology and habitat requirements.

Long-term monitoring of reproductive success of the Bald eagle (*Haliaeetus leucocephalus*) registered a drastic numerical reduction of populations, first due to pesticides DDT (*dichlorodiphenyltrichloroethane*) and then recovered. The using of insecticides in pest control is allowed only in the absence of biological species, parasitic pests. Then, only imidacloprid can be used but it is highly toxic for other groups of insects, such as ladybugs. For Boreal whale or Greenland whale (*Balaena mysticetus*), intensively hunted by Inuit in Alaska, a quota for the sustainable exploitation could be set, because the Inuit population had detailed knowledge of migration routes and habits of these whales. Such information was then confirmed by acoustic surveys, aerial monitoring and analysis of stable isotopes, on which we could evaluate the abundance and spatial dynamics, on which sustainable hunting quotas were established, according to biodiversity conservation policies.

All around the world, in terms of recreational (hunting and fishing), there is a direct link between knowledge of natural sciences and rural economy. When these activities are well managed, from safari, hunting and fishing sessions, they have a low impact on biodiversity and increase guides' revenue, licensing agencies, the adjacent industries (transportation, accommodation), which often must keep a balance between natural resources and economic growth. Often, hunters, fishermen, rangers and protectionists focuses and lay at the base of their programmes the knowledge of natural sciences, for management plans to preserve fish species and species of birds and mammals of hunting interest.

Success of pond birds care and other hundreds of species have aroused the interest of different groups who have recognized the importance of basic knowledge of natural sciences in determining management plan and policy objectives for the protection of species, thus creating a flow of funds financing the construction of a database - with information about the biology of the species.

Those interested groups have not always acted on the basis of a clear understanding of the natural history knowledge. When they dropped the inclusion of natural science knowledge, the results were catastrophic, unsuccessful in achieving industry support system. So for example, sport fishing of trout in lakes in western North America was an enlightening experience, with considerable economic importance to local communities that depend on revenues from tourism.

To support this industry, to increase feeding and increase the production of salmonids, the shrimp *Mysis relicta* was introduced into Lake Tahoe in 1963 and in 1968, into Kootenay Lake (Spencer *et al*. (1999). This intentional introduction was followed by the accidental admission of the crustacean in other lakes. At first, it was an increasing of fish production in Lake Kootenay. Subsequently, the mysids migrated in deep waters to escape from predatory trout during the day. It is known that these mysids go back to the water surface during the

night. So instead to serve as prey for salmonids, mysids became strong competitors, because they consumed small zooplankton, which was trophic base of the spawn.

The result was blaming shrimps for the decreasing of salmonid production in both lakes. In addition, the decline of salmonids in other lakes was followed by the decreasing number of bald eagle *Haliaeetus leucocephalus* fishing and the tourist interest decline, followed by economic difficulties for the local community.

But in natural sciences, mysid daily migrations were very well known. If this knowledge wouldn't have been ignored, it could prevent the introduction mysid impact on salmonids.

Within recent decades, despite recognizing the importance of natural history knowledge in some sectors of society, presentation and education in traditional forms of natural sciences did not follow the rhythm with the important discoveries in the field, especially technical ones. One way to track the orientation and education in natural sciences concepts change is the protection and use of biological materials. Despite the use of plant and animal specimens from nature and from collections in the global climate change research and the development of eco-informatics, general trend for natural history collections is to consolidate and conserve them, and not expansion. By consolidating collections we mean the increasing of the researchers' access, as well as of the specialists in taxonomy to investigate them. The same processes limit local guidelines and reduce the employment opportunities and of education of local communities.

Other trends suggest a general decline in natural history or orientation towards the natural sciences, in the enrolment of students at specialized faculties, the low number of graduates, postgraduate, PhD students. Orientation and highlighting the natural history fell also at pre-university education. To measure this decline two units are used: - the minimum number of courses in natural history and related courses to biology faculty graduates in universities and colleges in the US, Japan and other countries. The decline of interest for traditional natural history coincided largely with the development of molecular biology, with ecological modelling and experimental biology. The decrease in interest in natural sciences also coincided with the parallel decline rate of natural history publications and the decrease in funding to this area in many countries.

Changes in science and society are difficult to measure and only rarely originate from a single cause, and the decreased alertness for nature and natural history is no exception. Urbanization, nature removal and decreased interest in it, reduction of children's free time, increasing interest in television and computer are also involved in lowering public interest and concern for nature and natural history. Even reading and writing decreased interest in this area are part of a broader social context, with unexpected implications for science and society.

State and evaluation of natural history in many academic institutions will depend on its ability to make perceived by academic trends for measuring the success of individuals and programs. In the orientation of university research, this movement is measured by major grants, publications in journals with high impact factor and the public recognition of institutions. Subjects which cannot compete in this current will be given less and less attention in critical decisions of promoting the provision of courses, in the degree of programs, in the acquisition of buildings and infrastructure, in institutional direction.

Even in the educational institutions, natural history subjects may be marginalized because a higher cost/student is required for courses of field observations and of making collections, but also because they occur less in disciplines of high profile.

Maintaining a rich natural history curricula in higher education will depend on its relation to related disciplines, to the educational agenda of funding agencies and to the public of the 21st century. Such an agenda must:

- recognize its connections with a wide range of other disciplines and promote new ways of dealing with natural history;
- acquire rapidly the changes in demographics and technology, to include a larger and more diverse structure of participants;
- promote open collaboration with the community and to distribute information at a relevant level to other disciplines and to the entire society

Thus, for the 21st century, some suggestions addressed to individuals and concerned institutions:

- Natural history vitality will depend on the professionals'willingness to identify themselves, to be seen as experts, to learn natural history and to articulate the importance of their expertise across a broad range of disciplines, through lectures, conferences, and professional societies public discussion.
- Those professionals seeking revitalization of natural history within and outside their institution will lead and define this subject for the 21st century.
- This is not an easy route for a young man in his academic career, but it is essential to change their image in the academic settlements because they can use their acquired jurisdiction to validate and promote natural history programs within and outside these institutions.
- An important part of this activity is to establish a strong underlying platform or structure that would allow professional naturalists at all levels to claim credit for their work, using traditional criteria of institutional

assessment. Such a platform must include prime ministers meetings and conferences, organizations and sectors of society to support and recognize naturalists throughout their career and integrate with other natural history subjects.

- To print journals with high impact factor highlighting excellence in natural sciences, to increase the recognition degree of product quality information and justify the scientific and university education. For example, natural history societies and institutions around the world have promoted the work of professional naturalists more than a century and many of these groups have formed consortia to support a wide community of naturalists and allow better integration into other disciplines. In the U.S., there are a number of recent initiatives (e.g. Natural History Initiatives, Projects of Natural History, Natural History Section, founding of ecologic societies, etc.) that have joined museums' efforts and companies to concentrate in explicit attention to the importance of links between natural history and other disciplines. In addition, the journals published by different companies have also suffered changes. Reintegration of different sections (Natural History Miscellany) in the American Naturalist Society is an excellent example of ways in which journals with high impact factor legitimizes the work of naturalists. Some journals focus on pedagogy (i.e., Journal of Natural History Education and Experience), which provides a platform for exchanges on teaching techniques and courses on the curriculum.

To survive in the 21st century, practice of natural history needs to be inclusive and adaptive (Evans, 1985; Noss, 1996 a and b; Bowen, 1996). The relevance will depend on the willingness of its practitioners to adopt new ways of observing the world around us. It will depend on their ability to recruit naturalists to use a much wider range of work equipment than were used in the past. Using the advantages of new equipment and techniques from other disciplines, and the rapid expansion of capacity for digital collaboration, curation and of spreading knowledge of natural history, naturalists can combine disciplines and modes of observation, structuring and addressing a wider range of beneficiaries. This is important both in developing new curricular trends and to develop research collaborations and scientific programs of interest. Finally, at revitalization of natural history, it should be encouraged open debate on natural history future.

Of course, current technologies provide tremendous opportunities to build a common understanding of the complex processes interact across a broad range of levels. A key challenge that will push things forward will be smart integration of natural history information collected from the ground to facilitate transdisciplinary research. Global natural history will require collective efforts of professionals, society, museums, universities, institutes, scientific research centres and resorts.

Individual naturalists with isolated knowledge have a poor ability to demonstrate the importance of their work. But the groups that integrates specialists and share interdisciplinary knowledge will develop. Naturalists of all kind need to contribute to the enrichment of common resources, to work in standardized teams and put their work into the public sphere. In these deposits with open data, the objects (parts) and empirical observations can be shared, used and reviewed or reconsidered to respond (to be required) continuously changing needs of society.

Investments in the naturalists' partnerships can add value to a greater effort to facilitate the general access to the knowledge of natural history and their applications. Many institutions have begun to see the value of collaboration across these borders.

In Europe there are organizations and programs, such as Consortium of European Taxonomic Facilities, Natural Europe, SYNTHESIS. They are a model of cooperation. In the US, the National Phenology Network and the U.S. Virtual Herbarium Project are engaged in similar activities. But on a larger scale, such projects (e.g., GBIF – Global Information Biodiversity Facility) provide coordination and international support.

In the US there is a movement entitled Children and Nature Network, which provides resources and working equipment (tools) practical advice or a catalogue listing of local events for families and educators to connect with nature. Recently, this movement has acquired a resolution entitled "The child's right to connect with nature and to a healthy environment". This resolution was adopted at the International Congress of the Union of Conservation of Nature (IUCN).

Special attention will be given to structuring the conditions for collaboration and participation fairness for these collaborations to be lasting, quality and provenance data to state. The current capacity of humanity to alter our planet's natural systems has created an unprecedented need to prevent the wrong direction in its relationship with nature. The empirical data on complex natural systems are essential in accurately provisions and the natural history provides this essential basic information, the reality estimation of change purpose. Or just lack of basic knowledge of natural history is often a limiting factor in the development of the predictive ecological theory. The behaviour of complex environmental systems cannot be predicted with simple modelling and complex model cannot be achieved without empirical knowledge on organisms in their real conditions. Overcoming these challenges will require significant investment in organizing, integrating and disseminating current knowledge of natural history, inside and outside dedicated institutions.

From now, the collaborative approach to observing and understanding the environment is remarked. The number of natural history projects also include species identification using video cameras, and increase research in this field is illustrated by the increasing number of digital platforms (iNaturalist with over 850 projects, iSpot, iBird), which combines the social media side with the identification and monitoring of natural capital.

Vitalization of natural history will depend on its ability to support large collaborative efforts, using advanced technologies to overcome obstacles in sampling, analysis and dissemination of knowledge of natural history. The rapid growth of interdisciplinary research has important potential for increasing the number of specialists who will help the knowledge development on natural history and this specialists' habit of collaboration and participation needs the penetration of natural history research in society, overcoming barriers and educational appearances.

III. Conclusions

1 – Natural history has achieved critical step, stage phenomenological shift towards sustainable management, to provide as many solutions and predictive capability to adapt new concepts and expand interdisciplinary research in the interest of public health, agriculture, environment, conservation biodiversity, recreation.

2 – As vital and prolific domain, natural history has the mission to formulate concepts that enable the perception of order in nature.

3 – Slowly but surely, naturalists have learned human population's subject and environmental impact of multinational corporations, invasive species, the concept of sustainable use of forest management, grazing, construction of dams, roads and highways, mining, etc.

4 – All naturalists (morphologists, zoological and botanical systematists, ecologists, evolutionists, populational geneticists, etc.) must make a common front against the trends of making biology "in house" (indoor), on the "dead work" and technology without direct contact and personal experience in nature. The value of environmental prediction and restore populations of endangered species will depend on future biodiversity.

5 - As fundamental knowledge will be applied *extramuros*and extent of use of new technologies, the natural history of the 21st century will look differently from that of the 19th century.

6 - Despite the current crisis, the importance of natural history and management of natural resources policies for science and society remains eternal. This is why we must reconsider natural sciences.

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