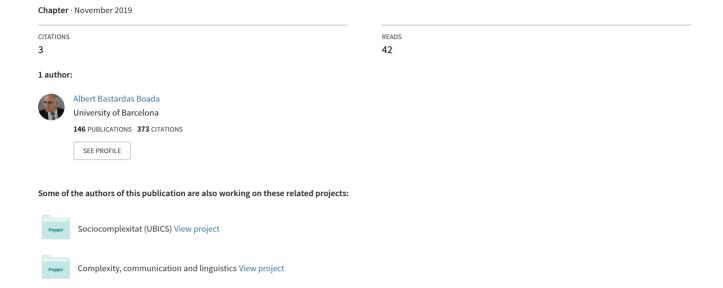# Biological and linguistic diversity. Transdisciplinary explorations for a socioecology of languages [Diversidad biológica y diversidad lingüística. Exploraciones transdisciplinaria...

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Biological and linguistic diversity:

Transdisciplinary explorations for a Socioecology of Languages

- **Introduction**

A Warning

As the new century begins, humanity can approach the question of preserving biological diversity and linguistic diversity with a certain unity of purpose. Today there is a widespread awareness that many animal and plant species are threatened by extinction, and a growing realization as well that many of the linguistic varieties that our species has created throughout its development are in danger of disappearing. Given the simultaneous nature of these two large-scale phenomena and the apparent coincidences of the processes at work, it is tempting to conceptualize them together. Equally, given the current state of development of the two fields, it is even more tempting to transfer categories and ideas from the field of biology to the field of linguistics, since the theoretical conceptualization of the biological phenomenon has made major advances which have led to the organization of conservationist movements and the proposal of strategies for intervention.

Though a firm believer in transdisciplinariety and the mutual nurturing of knowledge I am nonetheless aware that an uncritical transfer of ideas and concepts from one field to another is unacceptable. We should be particularly careful to avert the danger of a biologistic reification of linguistics, something which this discipline had not been able to avoid at earlier stages of its development. We must explore the immense potential of the concept of interdisciplinariety but without falling into a blind mimetism which, instead of helping us to describe and understand more accurately the phenomena that interest us, could lead to the construction of theoretical scenarios which have their own internal logic but are not entirely suited to the ontology of the facts we are examining. As the physicist David Bohm said, « a theory is primarily a form of *insight*, i.e. a way of looking at the world, and not a form of *knowledge* of how the world is ». We must always be aware of the risk of mistaking constructed representations of reality for the reality itself. In any field we must

be conceptually alert in order to avoid later misconceptions and problems, especially in areas that are particularly sensitive for humans.

Differences and coincidences between objects

One of our first tasks is to define the differences between the objects that concern us. On the one hand we have biological species, sets of organisms that belong to 'nature'; on the other we have linguistic varieties, established socio-communicative codes and behaviours of human beings, ascribable, therefore, to the ambit of 'culture'. However keen we may be to apply a systems theory approach to these two types of objects, and even though we may find specific similarities in their internal organization and in their relationship with their contexts, it is very clear that there are major differences between the characteristics and properties of biological systems and the systems of communicative behaviour of a particular evolved species. On the one hand we have genetic organization and biological development, and on the other, cerebral cognition and interpersonal and social behaviours which in fact are the products of the ways in which we experience the genetic and biological endowment. So our objects of study are 'integrated' in the organisms themselves and in their interactions, though they correspond to different levels and probably require different theoretical representations to give a full account of their peculiarities.

Whereas biological diversity is the product of evolution, that is, a complex sequence of chance genetic combinations inside specific ecosystems, linguistic diversity corresponds fundamentally to the sociocognitive and experiential vicissitudes of a particular biological species – one that appears to have greater brain power than others. Indeed, not only do the two elements differ constitutively, but the conditions of their existence are also very different. If biological objects are controlled fundamentally by genetic chance and the biosphere, linguistic objects are also controlled by the sociocultural experiences of their speakers; this fact differentiates clearly between the reproductive aspects of the two. In their struggle to survive through history organisms are affected by their natural environments, while linguistic systems are additionally affected by the socioeconomic and politicocultural conditions of individuals, who are able to decide personally on the language to be transmitted to their successors. Similarly, given the greater flexibility of cultural reproduction, language change will be faster than genetic change. Since linguistic varieties are the products of human social mechanisms, they may be constricted to the decisions – conscious or unconscious – of humans, in the framework of their personal autonomy, whereas non-human biological species will be in general much more subject to instinctive programming. The reproduction of biological diversity is a matter in which the protagonists – the species – have little say, controlled as they are by contextual conditions. But in the reproduction and preservation of linguistic diversity the main actors are human beings themselves, humans endowed with awareness and emotions who, confronted with change in their sociocultural context, have to take decisions which will ultimately affect the continuity or demise of the linguistic diversity that has built up over human history.

The existence of important differences between natural and cultural objects does not necessarily mean that we cannot find interfaces of connection between the

two theoretical fields or useful conceptual suggestions or adaptations for a fuller understanding of the nature of the level of language and communication. Indeed, the more exposure we linguists have to theoretical conceptualizations and research in the field of biology, the more interesting the contributions of the biologists will appear to us, especially as regards the potential of many biological approaches for the understanding of linguistic phenomena, in particular those deriving from the contact between distinct human groups and the ecological relations that languages maintain with their sociocultural context.

This paper presents the preliminary results of an exercise in reading certain contributions to the study of biological diversity from a 'linguistic' viewpoint. Never overlooking for one moment the differences between the objects, we have nonetheless tried to extract theoretical and conceptual analogies that may contribute to the construction of a socioecology or a linguoecology. This study is provisional and exploratory and aims to generate debate. It is not considered to be a definitive product, but a stimulus for thought, imagination and creativity.

- **A General View of the Conceptualization**

Examining and understanding the conceptual adventure of biological ecology will be useful in the construction of a sociocultural ecology, not only because the main protagonists of this other, often less tangible part of the reality are also biological organisms themselves, but also because, with the due care we mentioned above, many concepts and ideas that have taken form and become widespread in the study of the life of the biosphere are enormously rich in conceptual analogies and creative perspectives for the understanding of phenomena related to the life of linguistic aspects of human societies.

The concept of *ecology* itself, which has done so much to further our understanding of the existence, development and extinction of biological species, can provide interesting innovations in the linguistic field, and in the sociocultural field as a whole. The decision not to study linguistic objects and events as if they existed in a vacuum in isolation from other facts and phenomena but to see them as entities interrelated multidimensionally with their context is a huge step forward. The creation, then, of a *'linguistic' ecology* which analogously transfers « the study of relationships between organisms and their environment » (Brown, 1995 :18) to the level of the language behaviour of humans and promotes the study of the relations between language varieties and their geodemosociopolitical contexts may be illuminating for linguistics, which is still excessively centred on the code.

The ecological approach stresses the 'whole' rather than the parts, and makes us fully aware of the interrelation of phenomena of reality and of the key nature of these interdependencies inside the ecosystem in which the organisms themselves live, since in the systemic view – the basis of the ecological perspective – objects are principally networks of relationships embedded in larger networks (Capra, 1997 :37).

From the viewpoint of sociolinguistics and from that of general linguistics as well, the ecological metaphor is illuminating. On the one hand it allows us a better understanding of the vicissitudes of human systems of communication, and on the other it allows us to integrate these systems holistically in the world of social interaction, which they contribute to building (see Bastardas, 1996 and 1999).

In addition, the dynamic conceptualization of the ecosystems restores the temporal dimension to linguistic phenomena, a dimension often neglected by the mainstream approaches of the twentieth century. « Ecosystems can be seen more powerfully as sequences of events rather than as things in a place. (…) Ecosystems are process-oriented and more easily seen as temporally rather than spatially ordered » (Allen & H., 100). Rather than 'objects', then, there are events and processes, a fact that questions the still prevailing tendency in social and cultural sciences to treat statically and mechanically what exists as a meaning/action/emotion in human beings in society. The dynamic and ecosystemic perspective thus urges us to see reality as a process, not only as a 'structure'.

From an ecological perspective, evolution is always *coevolution*, since all organisms evolve interdependently with the others in their environment. Similarly, the evolution of human languages and verbal behaviours coevolve in conjunction with demographic, socioeconomic, political, and technological events in their milieus. Languages may intervene in the configuration of the events that affect other phenomena, and these events may affect the organization of the languages. For example, the political configuration of a State may be affected by the distribution of the linguistic groups that compose it; at the same time the political decisions of this State may have an enormous effect on the existence of these linguistic groups.

Other concepts derived from the ecological perspective also offer conceptual clarifications that are useful for our understanding of sociolinguistic phenomena. For example, the differentiation between 'population' and 'community' is interesting. 'Population' denotes a particular species, but 'community' describes the set of species that coexist in a particular habitat. More specifically, « the difference between a community and a mere collection of organisms is the accommodation that the different species make for each other. The community is not the presence of a particular set of organisms, it is the difference in the organisms because the other community members can be expected to be present. (…) A community at an instant is the embodiment of prior processes of accommodation, for example character displacement where a species has been selected to avoid direct confrontation with another species » (Allen & H., 1992 :127). Transferred to the linguistic field, 'population' could be used to designate a specific first language group (L1), while 'community' would refer to those societies formed by distinct first language groups, with some degree of mutual influence and adaptation. In the case of Catalan, for example, we might have populations who have Catalan as a L1, or Spanish, or both of them, or other first languages. In the dimension of 'community' all these groups can adapt to the presence of others and evolve in ways which would never have occurred in the

absence of the other group.

In Catalonia today, from phonetic aspirations in Catalan or excessively open vowels in Spanish to phenomena of bilingualization through contact or intergenerational substitution of the L1 inside a particular population are phenomena that an ecology of cultural communities must bear in mind. Indeed, I remember that Uriel Weinreich recommended that in the study of linguistic contacts a distinction should be made between L1 populations. In the case of Catalan -as in all other cases- we should ensure that studies make this distinction and thus offer more than just the compilation of data on, for example, the ability of the community as a whole to use Catalan, an important datum but one that may conceal more subtle processes at work at the level of populations. In the biological field, « the subdisciplines of population and community ecology are concerned with questions of how the abundance, distribution, and diversity of species are affected by interactions with other organisms and with the physical or abiotic environment » (Brown, 1995 :18), equally sociolinguistic research can and should be carried out in a similar way at the sociocultural level.

This distinction between 'population' and 'community' also sheds light on the treatment of sets of humans who speak the same language but may present different relations in different communities. We may refer to the Catalan L1 population as a unit, but we should not forget that this population is distributed in communities which may have very different compositions and different dynamics, and so they need to be studied separately. As a result, as the bioecologists say, « one might expect populations to have a larger spatial scale than communities. Note how competition, a principal process inside communities, is a very local affair (…). Interactions inside communities are generally slower than inside populations » (Allen & H., 1992 :173). At the same time, « the past processes that built a community have become part of community structure » (Allen & H., 1992 :128), a fact that might help us to understand the phenomenon of the persistence of the norms of intergroup use that favour Spanish and not Catalan in Catalonia itself, even among a large proportion of the new generation of subjects who have become bilingual. The present is clearly the fruit of historical events – political subordination, migrations, etc. – which may continue to determine, albeit indirectly, the reality of the groups that make up contemporary communities.

Another of the aspects in which the conceptualization of biological ecology seems to me to be interesting for the study and understanding of the evolution of linguistic diversity is the adoption of the notion of 'model' to formulate explanations of the functioning of the ecosystem, and in particular the idea of the 'minimal model'. « The minimal model gives predictions from the smallest number of explanatory principles. (…) The model must be consistent with the data, and scientific progress is made when data invalidate the model. (…) Minimal models give generality and that is the hallmark of good science (…) Science is about organizing experience in a manageable way, the more manageable the better, and it may or may not relate to ultimate truth » (Allen & H., 1992 :24-25)

The results of modelling have been spectacular. Models have made it possible to

push forward our understanding of the phenomena involved and offer an unsuspected predictive power. Knowing the flows that control each particular ecosystem, biological ecology can, in many cases, predict the disruptions that would occur if certain environmental conditions were modified. If only sociolinguistics had reached this stage; but we started a long way behind, and in addition the objects and phenomena that we have to understand may vary widely (though sometimes this does not appear to be the case) and may evolve in very different ways : this obviously makes a rigorous prediction more difficult.

So, as Capra says, « while behaviour in the physical domain is governed by cause and effect, the so-called 'laws of nature', behaviour in the social domain is governed by rules generated by the social system and often codified into law. The crucial difference is that social rules can be broken, but natural laws cannot. Human beings can choose whether and how to obey a social rule; molecules cannot choose whether or not they should interact » (1997 :206). Humans are therefore more *autonomous* in decisions on their sociocultural and therefore linguistic behaviours than the rest of the biological species, or than the biophysical level of humans themselves. Very probably, then, the sociocognitive order will have to have concepts and theories that are different from those of the biophysical order, even though they must be integrated, and consilient (see Wilson, 1998), and mutually inspirational in order to imagine models for understanding reality. The great challenge facing sociolinguistics, then, is to develop the concepts necessary for the creation of these basic models that will allow us to understand – at least approximately – the developmental dynamics of the different types of existing situations, and, if necessary, to guide the interventions considered appropriate.

All this highlights the need to move towards a *socio*ecological conceptualization which, being contextual, must include not only a process-oriented perspective, with open systems that are self-organized and causally circular, but also the most distinctive feature of human beings : the mind and its representational, emotional and behavioural consequences. Above all we must avoid the risk that the ecosystemic conceptualization will continue to treat human and social facts simply as 'objects'; to do so we must take full account of the level of sense and meaning in human facts.

- **The Formation of Diversity**

A brief look at some of the questions and fields for research that have been opened up - or re-emphasized – by the study of biodiversity will make linguists immediately aware of the problem of the *formation* of diversity. We see this diversity all around us; we believe we should try to preserve it; but how did it emerge? What implications do the ideas and concepts of biodiversity have for the understanding of the formation of linguodiversity?

Leaving aside the problems of the adequacy of the concepts of « species » or « language » inside the plural, varied reality, we must acknowledge the fact that distinct organisms and systems of linguistic communication have very different

solutions. One of the most frequently noted causes of biodiversity is the genetic isolation of a particular type of organism : « Each biological species is a closed gene pool, an assemblage of organisms that does not exchange genes with other species. Thus insulated, it evolves diagnostic hereditary traits and comes to occupy a unique geographic range. Within the species, particular individuals and their descendants cannot diverge very far from others because they must reproduce sexually, mingling their genes with those of other families » (Wilson, 1994 :38). This characteristic of isolation and the absence of interrelation that helps to form the development of biodiversity is also present, I would say, in the formation of linguodiversity. Just as « reproductive isolation between breeding populations is the point of no return in the creation of biological diversity » (Wilson, 1994 :46), if a fluid, relatively large-scale communication is not maintained, parts of linguistic groups of the same origin evolve in different ways, and increasingly grow away from the possible innovations that the original nucleus may produce. In the long term, the structural differences may become so vast that mutual comprehension is no longer possible; the codes are experienced as totally distinct, unrelated objects. The geographical distribution of the populations has a fundamental influence on the understanding of the production and existence of diversity. As Margalef says, in ecology « the importance of space should not be ignored » (1991;174), because it « functions as an insulator (…)-and so- the relations may be limited to species whose individuals live in close proximity » (1991 :209).

The linguistic evolution of humanity is still a mystery, in spite of the coincidences between groups and families of languages which have begun to permit the formulation of wider-reaching hypotheses. Nonetheless, it is still an open, complex field of research. Just as « the early man-ape populations both evolved and split into at least three distinct species » (Wilson, 1994 :48), the species sapiens-sapiens must have become fragmented into distinct linguistic branches as it expanded throughout the planet. Once the original intercommunication was lost, the evolutionary dynamics have followed divergent paths, but always in accordance the characteristics and properties of the species. This means that we may postulate that universal concepts and mechanisms are likely to exist in the study of the world's various languages.

This 'linguistic speciation', like its biological counterpart, was based, as we said, on a geographical speciation. On the basis of the property of autopoiesis or self-organization, the reproductive isolation of the group favoured the development of varieties of communication that were specific to each human subset; over successive generations these forms of communication have evolved dynamically to produce more historical diversity. As Capra states, « the theory of autopoiesis shows that creativity – the generation of configurations that are constantly new – is a key property of all living systems. A special form of this creativity is the generation of diversity through reproduction (…) » (1997 :216). This phenomenon, needless to say, is still alive today. The linguistic evolution of humanity is not a closed, finished process. It is in constant flux; the directions it takes are totally unpredictable.

An idea that comes in fact from one of the creators of the theory of autopoiesis - Maturana –seems to me to be particularly useful for the reflections of linguists.

Maturana draws attention to the static way in which we name specific objects in reality, a fact that may conceal from us the dynamic, process-oriented nature of many of the 'objects' supposedly identified. At the linguistic level, for example, the word 'language' which is very useful in many circumstances but may conceal the continuous state of change that characterizes the linguistic phenomenon. From the perspective of action and movement there are no languages; there is only 'languaging'. Humans engage in 'languaging', that is, we 'make language' when we speak and try to make others understand us. Especially in oral language – which is the basis of all linguistic communication – humans in part maintain, innovate, modify, alter, and create together linguistic forms in the framework, and in the service, of our social relations. So it has been this incessant 'languaging' that has created human linguistic diversity in space and in time.

So the 'languages' we see today are the evolutionary result of the sociolinguistic history of humanity. Just as « an organism's structure is a record of its previous structural changes and thus of previous interactions » (Capra, 1997 :215) the contemporary linguistic codes are the result of the sociocommunicative events of humanity's past. In languages are deposited all the ideas, concepts and images we have created in order to survive, and to improve our existence in this world. But we should be aware that the adventure is not over : the need for creativity and innovation remains.

- **Continuity**

As in biological ecology, in linguistic ecology we also need to adopt a dynamic, process-oriented perspective that accounts more precisely for the developments in our field. We must leave behind Saussure's dichotomy of 'synchrony' and 'diachrony', since one cannot exist without the other. The diachronic perspective is merely a historical view on the succession of synchronies, and the 'synchronic' states are merely stages in a particular evolutionary course.

Once the diversity of the linguistic expressions of the species has been created and has spread to the four corners of the planet, the continuity of this diversity will be closely linked to the fortunes of their particular bio-socio-cultural habitats and contexts. Linguistic varieties are likely to endure if there is a high level of intragroup relations and a low level of intergroup relations. As Wilson acknowledges, « the outright elimination of habitat (…) is the leading cause of extinction. But the introduction of aggressive exotic species (…) come close behind in destructiveness » (1998 : 328). Similarly, in the linguistic field, while human groups live in a habitat without the presence of other linguistic forms that can compete with their own, the continuity of these varieties is guaranteed – except evolutionary modifications which emerge inside the group. Without contact with other languages, permanence is a natural, inevitable fact. The intergenerational reproduction of linguistic forms is achieved via the process of socialization, though the auto-co-construction of speech varieties by members of the new generation may enable them to introduce a degree (however limited) of

innovation.

In the understanding of biological continuity a key role is played by the concept of 'ecological niche', defined as « any one of the places that can be occupied by individuals belonging to species of similar alimentary and abiotic requirements inside the structure of a biocoenosis », considered as « an *n* dimensional space in which a species may live inside a particular ecosystem » (Gran Enciclopèdia Catalana, 10 :541). According to Brown (1995 :30), as early as 1957 Hutchinson « suggested that the niche of any species could be represented quantitatively in terms of multidimensional combination of abiotic and biotic variables required for an individual to survive and reproduce, or for a population to persist ». For Hutchinson, « the niche is an attribute of species, not of environments ».

Centred then on the species – and not so much on the ecosystem – the concept of 'ecological niche' allows us to imagine the minimal contextual conditions required for a particular linguistic group to achieve sustainable continuity in a framework of linguistic contact. (Without contact, obviously, continuity is guaranteed, as we said above, unless other events occur that affect the group's demography). In addition, the accurate multidimensional conceptualization of the term by ecologists can be transferred to the linguistic domain, as we can thus study together « the combined effects of many variables on a single species over a long period of time or over the entire geographic range », since « abiotic conditions, competition, and predation all play important roles in limiting the local distribution of this species » (Brown, 1995 :32).

What environmental conditions do linguistic varieties require to achieve their continuity? What is the minimal ecological niche that a particular language needs in order to ensure its permanence and reproduction? In the domain of linguistic behaviours, the maintenance of linguistic varieties depends above all on the use their speakers make of them. And this use corresponds to social conventions that are adopted inside the context of a particular socio-politico-economic situation and particular cognitive representations that rationalize, 'explain' and justify the behavioural decisions taken.

Once it is established that in situations of more or less irreversible linguistic contact the individuals present different levels of bi- or multilingualization, the key element is the distribution of functions of the languages involved, and the historical evolution of this distribution of functions. Since, as the ecologists say, « stability at all levels is not a requirement for persistence, for only one stable level of organization is necessary » (Allen & H., 1992 :222), we should explore carefully the idea of 'exclusive functions' for the codes which are in situations of high contact with others and are in danger of falling into disuse. Some situations, in Africa for example (though there are cases in Europe as well), show that a population that is functionally bi- or multilingual does not necessarily lose the use of its own language.

This seems to happen in human groups able to maintain a clear functional distribution that assigns 'exclusive functions' to the code that is the language of the society in question. For instance, groups in Africa which have been multilingual for many years reproduce their own language varieties in all (or the

vast majority of) the functions that could be described as 'local', and use the other codes basically for the functions of relations with the 'exterior'. In Europe, in Luxembourg or in the German speaking area of Switzerland, the populations have historically been bi- or multilingualized but intergenerational transmission does not seem to have been affected.

Very probably, the secret of the maintenance of a language lies in the clear reservation of certain important functions for the group's code. Although the group has had to acquire and use other allochthonous languages, these other languages are habitually appropriated for 'external' uses or for specific, clearly defined functions. So we need to define these minimal important functions that allow the continuity of linguodiversity, and we should investigate how sociolinguistic organizations of this type can be constructed and made stable and sustainable in the future. This will require commitment at the socio-political level of human groups, because the whole community will be involved in the debate on the organization of its linguistic communication and in the decision-making process.

- **Change**

If biodiversity presents variations during its evolution, linguodiversity presents even more. The forms of diversity present at a particular moment of history are not eternally fixed, since both forms of diversity live and reproduce – totally or partially – inside the dynamic of ecological succession. These diversities will vary then not only in terms of time but also in terms of space, since populations and communities undergo quantitative and qualitative changes in their compositions, processes of expansion and processes of contraction (see Flos & Gutiérrez. 1995 :194).

Evolutionary change, therefore, is seen from the ecosystemic perspective as « the result of life's inherent tendency to create novelty, which may or may not be accompanied by adaptation to changing environmental conditions » (Capra, 1997 :221) since « evolution is not just tinkering … It is emergent order, honoured and honed by selection », as Stuart Kauffman said (quoted by Capra, 1997 :221). Also then at the level of language, change and stability coexist in a continuous and interrelated flow, through the incessant 'languaging' of human beings, which can be innovated autopoietically and/or organized adaptively to the various situations and configurations that humans experience.

So, in biological diversity « all forms of life have emerged from that ancestry by a continuous process of variations throughout billions of years of geological history. In this evolutionary process many more variations are produced than can possibly survive, and thus many individuals are weeded out by natural selection, as some variants outgrow and out-reproduce others » (Capra, 1997 :218). In linguistic diversity as well – though over a shorter time period – evolution has produced new forms and varieties, some of which have reached us in often highly modified forms, while many others have existed and disappeared without trace. Equally, in the incessant communication between individuals, new forms and terms are created which then spread to other groups, are used for

a time and then forgotten.

According to Capra, « Lynn Margulis claims that the formation of new composite entities through the symbiosis of formerly independent organisms has been the more powerful and more important evolutionary force » (1997 :226). Perhaps we should consider this hypothesis even more seriously in the context of linguistic diversity. It is true that we are used to thinking that contact between populations that speak different languages tends to culminate in the extinction of one of the codes present – the language of the less powerful group – but we should not neglect the possibility of a kind of symbiosis, in which part of one of the codes lives in the structures that develop in the other. Examples of this include the emergence of new varieties of linguistic communication formed through the mixing of different codes, reorganized at the system level to create a new set of structures. Good examples of this process are 'pidgins'. 'Pidgins' are formed from a base code, but adapt this base code to conform to structures from the language of the recipient population, and at the same time create innovative solutions based on the new, reorganized system.

- **Extinction**

Whether or not linguistic contact is resolved symbiotically, it has always been one of the great forces of change in the linguistic diversity existing at any one time. To use a term from bioecology, contact between languages could be described as a 'disturbance'. "A disturbance is any change, unpredictable from inside a particular system, that modifies the existing environmental conditions and creates new ones. It represents the disorganization of the ecosystem and releases new resources. Their frequency and intensity, and also the area they affect, are key attributes of the dynamic of the ecosystems and are at the basis of the organization of the environment. (…) The intensity of disturbances is usually measured in terms of their effects on the ecosystem" (Flos & Gutiérrez, 1995;193-4). In the historical dynamic, many of these cases of contact lead eventually to the disappearance of the languages of proportionally weaker groups, and to the adoption by these weaker groups – with a greater or lesser degree of modification – of the language of the groups which are dominant.

As is often the case in biology, the environment is particularly important in the evolutionary dynamics generated by linguistic contact. In the intense interaction between species, there will be often be « environmental conditions that favour certain species to the detriment of others » (Flos & G. 1995 :205). Given that « most extinctions are caused by a combination of demographic population processes and environmental changes » (Brown, 1995 :159), our attempts to understand these dynamics must be centred on both levels and we must be alert to their synergies and interdependences. Indeed, the cases in which language shift occurs most rapidly may be precisely those in which the disturbances are acute at both the demographic and the sociopolitical levels. The *tempo* of the evolutions may be slow if the disturbance occurs at only one of the levels, but if it occurs at both at the same time, the imbalance in the sociolinguistic habitat will be far more serious and may indeed accelerate the abandonment of a

population's own linguistic forms.

The sociopolitical context, however, may exert a profound influence on the evolutionary course of the contact, even in situations in which the influence of the demographic factor is low. As shown by cases in which the politico-economic subordination of certain groups has been the key element, with little – though select – immigration, the power of state institutions to transmit ideologies and representations in humans is immense; once these ideologies are internalized, they justify the abandonment of the population's own code, and the adoption of the dominant group as the group of reference. As Allen & Hoekstra say with reference to biology, in the linguistic setting as well the « survival of the fittest is in fact survival of the ones that fit the context » (Allen & H., 1992 :31).

Another decisive factor is migration. As Brown says, and as we noted above, the « movement of individuals into new areas or out of previously inhabited ones can also have important effects on diversity on local to continental scales » (1995 :168). Migration can be one of the great determinants of extinction, of either species or languages. In the linguistic context, both the ecosystems that receive immigrants and the systems the emigrants leave behind may be deeply affected by the process, especially if it is on a large scale. For an established population in a particular setting, mass immigration may represent a major disruption of the sociolinguistic organization, particularly if the demographic proportions are strongly in favour of the immigrant group. As the new community evolves – above all if the recipient community is not socioculturally superior to the newcomers – the language of the immigrant population may predominate. The language of the recipient population may eventually die out if the immigrants do not adopt it for daily use.

Equally, in the communities that emigrants leave behind, the departure of large numbers from the traditional habitat – particularly in groups with relatively low populations – may mean the gradual disappearance of their language, especially if those who stay in the community come into politico-economic contact with other dominant populations. Those who leave, in most cases, eventually become integrated in their new environment and assimilate the behaviours of the recipient population; very frequently they abandon their original language. When the migration is to societies with a low capacity of absorption or if the migrants are members of majority language groups moving to areas in which the autochthonous languages have fewer speakers and/or relative power, the evolution may be unpredictable. There may be a slow absorption of one of the groups by the other, or else a dynamic equilibrium may emerge in which each group more or less maintains its speakers. Population movements, then, will almost always be an important source of alterations in linguistic diversity.

- **Preservation and Recovery**

In recent decades we have become increasingly aware of the fact that biological diversity is disappearing, and of the need to intervene to ensure its preservation

and recovery. Preservation has become a public issue and the media, parliaments and governments all take the demands of the NGOs active in the area very seriously. There are obvious differences between the domains of biodiversity and linguodiversity, but it is interesting nonetheless to ask whether the theoretical and practical experience of preservation and recovery in biology may be an interesting analogy for the linguistic domain.

One of the key features of the vision of biological conservation is, as we have seen, the concept of 'ecological niche', the habitat seen from the perspective of what a species needs to survive (Brown, 1995 :35). The vision, obviously, is based on the fact that species do not live in a vacuum, but are fully involved in their natural context and are interdependent inside it. What we have, then, as Gregory Bateson would say, are species-in-their-context. Species and their habitat – their ecological niche – form the basic unit of existence. If we seek to transfer this idea to the domain of linguistic varieties the analogy may be useful in that it brings home to us the fact that languages are also, in all likelihood, languages-in-their-context. Clearly, the human systems of linguistic communication are not elements that live in isolation but are inevitably linked to the historical experiences of their speakers. Speakers change and develop these systems, omitting or adding words and expressions, mixing them with other words and expressions which originally derived from other human groups, and spreading them to other areas; either this, or they stop using them, replace them with other systems and thus condemn their original language to extinction.

So the first context of languages is constituted by the people that transport them and make them exist. These special cultural beings live in natural contexts but also in specific politic, economic, demographic, and psychocultural environments. As long as the multidimensional habitat that gave rise to the development of a particular form of human communication remains stable, the continuity of this linguistic variety occurs 'naturally' and automatically from one generation to the next, even though there is always the possibility of a certain degree of change due to the process of auto-co-construction of linguistic varieties that each new generation conducts. If, however, there are alterations in any of the important dimensions of their existence, this intergenerational reproduction may be affected and, in frameworks that are unfavourable to the continuity of the traditional forms of linguistic communication, the languages may be replaced by others that are also present in the environment and are considered by speakers as socioculturally advantageous (see Bastardas, 1996).

The continuity of linguodiversity depends on the degree of disturbance of the traditional habitats and, as the physicist Prigogine says, on knowing how « to find out under exactly what conditions non-equilibrium situations may be stable » (Capra, 1997 :86). The current era is characterized by the introduction of technological, economic, and political changes in the traditional organization of human groups which lead to an indiscriminate increase in linguistic contact, either due to migratory movements, political associations, economic transnationalization or innovations in communication technologies. The great challenge, therefore, appears to be not so much to avoid this contact – inevitable in the vast majority of cases – but how to manage it to ensure that it does not destroy a large part of the linguistic diversity that human groups have created

over the course of history. In many cases, the level of contact that has been reached requires the creation of a « restoration ecology » (Allen & H. 1992 :265), so as to preserve what remains – in many cases, very little – but also to reinstate the lost equilibrium and thus to ensure a sustainable continuity of linguistic diversity. Many of the human communities whose historical languages are disappearing – for instance, the indigenous populations of Canada today – deeply regret this loss and would welcome the chance to re-establish contexts which would permit the recovery of their ancestral codes of communication.

A perspective for the management of an ecology for the restoration and preservation of biodiversity which I feel could be usefully applied to linguodiversity is the one presented by Allen & Hoekstra : « The central management principle we wish to erect is : the most effective management will recognize the manner in which the context is missing, it will identify the services that the context would have offered to the managed unit, and it will subsidize the managed unit to as close to that extent as possible (…). Before management, the unit to be managed lies orphaned from the context. Management fosters healthy development in the absence of a natural context. (…) If the managed unit is being provided with all it might expect from a natural context, then it can function to full effect » (1992 :276). This is an area that ecological sociolinguistics has not yet researched. What should we prioritize in our reconstruction – or conservation – of the sociocultural contexts in order to recover and/or preserve the functions of the linguistic varieties in recession? What changes should be reintroduced in today's socio-political organization in order to bring about this revitalization? And what changes should be implemented in the economic domain? What, in sociocultural contexts, is vital for the preservation and recovery of languages in danger of extinction?

What is clear is that linguistic communities in recession today will continue on the way towards disappearance unless they introduce major changes in the social organization of their habitat – changes that halt the neglect of their historical codes and promote the recovery of functions for these codes. But it would probably be wrong to think of an approach based purely on « subvention » – in the most everyday sense of the term – as the most appropriate : that is to say, an approach that provides aid for the linguistic varieties in question on a sporadic basis, which fails to take account of the real needs of the sociocultural group, and simply focuses on more folkloric aspects. The actions implemented should be based on « (maximizing) the natural contributions of energy to the functioning of the managed system, while minimizing artificial energy subsidies » (Allen & H., 1992 :275). That is, there is a need to intervene at the level of the everyday functions of the community, which are what in a 'natural' way give continuity and functionality to linguistic varieties, and not on a partial subsidy of specific aspects of little importance to the recovery of the autonomous energy of the group seeking its sociocultural continuity.

The restorative intervention, then, must be conducted from a holistic perspective, since « sustainable solutions can only be achieved if the manager works with the underlying processes in the system to be managed, not against them » (Allen & H., 1992 :277-78). The ideal is therefore that the use of language should be governed by the habitual practices of the group itself in their

everyday activities and not by enforced constraints. This involves a knowledge of the dynamics of the language uses in human communities in situations of linguistic contact, and the attempts to attain this knowledge should seek to build models -within the limits imposed by the contingent character of human behaviours. Indeed, it may be more difficult to preserve a human language in danger of extinction than a species facing the same threat.

One way of applying these principles could be, as we noted above, to promote the use of the varieties in recession for specific *exclusive functions*. Given that, in many cases, it is impossible to return to a context which reproduces or bears a great resemblance to that before the language fell into disuse, we have to imagine how its maintenance and recovery can be achieved in the new situation. In this framework, as William F. Mackey indicated, the attribution of exclusive, specific uses to the code in recession means that the code returns to (or at least does not lose) everyday functionality, even though it is not used to express all the community's communicative exchanges. Without exclusive functions the language will become dispensable, superfluous, and will rapidly become extinct; but if the code is functional and regularly used, its speakers will have a greater motivation to transmit it 'naturally' to the coming generations, who will see it not as a relic of the past but as an active part of their habitual communicative behaviour.

Of course, each case is different. As Flos & Gutiérrez indicate with regard to biology, « environmental conditions (…) and the regime of disturbances (or the way in which the forms of external energy enter the system) will also determine the set of possible strategies (…) » (1995 :212). The causes of language contact and the overall situation of the recipient community will be important factors for deciding which types of action are the most suitable. For example, there are differences between a case in which contact is due to the subordination or political integration of the community in recession in a State dominated by a different linguistic group, and the case of a contact produced by migrations, or a case in which both factors are at work. The dynamics, even though apparently similar, may be distinct, and will require different actions (see Bastardas, 1996 and 2000).

The easiest cases to resolve are in principle the ones in which the population in question occupies a particular territory in which the presence of outside elements is limited, even though it is part of a State with linguistic groups that are demographically more numerous. These situations – situations of vertical contact – can be organized around a clear distribution of functions, in which local communications will be attributed to the historical language and 'exterior' communications will be conducted in the dominant language, if the State's central administration cannot be organized multilingually. More difficult are the situations in which contact is horizontal, i.e. demographic, in which populations with different L1s share the same geographical space. The organization will be more complex, though it can be achieved; the more the populations are able to lead their lives as they would have if there had been no contact, the lesser the potential for tension and conflict. If this is not the case, a possible solution is to achieve a balance of disadvantage : neither group has complete linguistic control over functions and so both must know the language of the other. Here the basic

problem is to guarantee the balance of the balance, that is, to take great care that the distribution of functions does not lead to the abandonment of the language of the group that is subordinate.

In any event, the recovery and maintenance of linguistic diversity is never easy, since the contexts in which linguistic groups live are more likely to oblige those that are demoeconomically less influential or politically subordinate to abandon their own code. Without sufficient control over their public life and their linguistic organization, many human groups cannot implement actions to maintain and sustain their language. Often, even those who have a certain – if limited – control over their life as a group will continuously encounter obstacles in their attempts to implement policies for protecting their language, because the dominant group may see these policies as threatening. A classic quotation from Dawkins which may help to illustrate situations of this type : "the fox runs for his supper, and the rabbit runs for his life" (quoted in Margalef, 1991 :176).

- **Linguoecology : Theories, Ethics, And Politics**

As we have seen, a 'linguistic' reading of some of the theoretical approaches and conceptual tools of bioecology are stimulating and suggestive for the development of a 'linguoecology' or a sociolinguistic ecology. The systemic approach provided by biological ecology offers the chance to consider linguistic forms and codes as elements that are irremediably integrated in their sociocultural habitat. Analogously, we may think that linguistic forms and codes are interrelated inside ecosystems with other objects such as the ideas that the individual have of reality, the social meanings they attribute to forms and codes, the socioeconomic categorization of individuals, and the group's representations. Turning now from the bioecologists to more broadly *socio*ecologist authors such as Edgar Morin, we can base our theoretical constructions on the circular premise that forms and codes are present in society and culture which, at the same time, are present in linguistic forms. We can express in this way the non-fragmentation of the reality, the non-separation of elements and their contexts. In fact, a linguoecological perspective may affect linguistics in general in a way that goes far beyond the simple conceptualization of the (co)existence of the different varieties which humans use in order to communicate.

From a multidimensional and interdependent perspective we can try to give an integrated account of grammar, of the interpretation of meanings, and of language uses, as in fact they form an inseparable whole.

From this viewpoint, we can advance towards the 'consilience' – conceptual coherence and integration – that Edward O. Wilson (1998) requests for knowledge. The ecological perspective allows us to bring together aspects which previously appeared to be separate, at the same time retaining a sufficient degree of autonomy for each distinguishable part. We are now in a position to put an end to the separation of linguistic codes from the other elements in reality, a separation that has presided over linguistics for many years. Taking the

interpretative capacity of human beings as our starting point we can now reassociate – as Gregory Bateson proposed – the various levels and phenomena in socio-communicative activity. The theoretical construction, by starting from the individual rather than the pure linguistic form as interpreter and creator of meanings, becomes far more powerful and integrative, and far more placed to explain phenomena that were previously unclearly or poorly conceptualized (see Bastardas, 1999).

In fact, Wilson's idea of 'consilience' should also be achieved in the field of sociolinguistics. Constituted as a 'transdiscipline', sociolinguistics receives contributions from the various schools and branches of the sociocultural sciences – from cognitive psychology to political sciences and law – without having so far a unifying paradigm that gives conceptual and theoretical coherence to these various contributions. The ecological imagination can help us here as well to try to deal with the various lines in an integrated way and to see their interrelations, and to advance towards a common, shared ensemble, even though each of the academic traditions that participate can conserve their particular research focus. In my book published in 1996 I suggested an orchestral or polyphonic image as a possible way to articulate this integration. Individuals live their lives in a temporal flux on the basis of their own auto-co-constructed minds, in interactional relations with other individuals, also categorized on the basis of their group – in ethnic, linguistic, economic, professional, or religious terms – and under the influence of economic and political powers and the media. Language – or languages – are the result of all these pentagrams which tend to harmonize or deharmonize mutually in accordance with the historical tensions and changes that take place. Linguistic systems thus reflect the events and the needs of their users and their environments, and co-evolve with them.

Apart from the theoretical and conceptual benefits that the knowledge of the work of bioecologists can bring to linguistics in general, social movements in favour of the preservation of linguistic diversity can also be illustrative at the ethical level, in spite of the substantial differences we noted above between biological and linguistic or cultural objects, which must be borne in mind in the design of interventions to favour the continuity of diversity. If we value biological diversity and seek to conserve it, it should be equally important to take moral responsibility for the preservation and development of linguistic diversity. Why should we sentence to death hundreds of languages and cultures which may contain the seeds of creativity and innovation for humanity as a whole? How can we not be moved by the suffering of the minority groups forced to abandon the use of their own codes in order to survive?

There is much work to be done; we have only just begun, and we can expect to meet fierce resistance from the economic and political powers. Only the creation of international, global organisms able to make their voice heard universally can help the subordinate linguistic groups to implement the contextual changes necessary for them, at the same time as they develop economically and culturally, and to do so from the perspective of a modernization and conservation of their languages and cultures, not as part of a process of unchecked, savage assimilation into the dominant languages and cultures in

today's world.

Indeed the attempt to harmonize economic 'development', international communication, and the maintenance of languages is one of the great theoretical and practical challenges before us. Applied ecologists are aware that their interventions will have to be conducted inside new contemporary contexts, since it is impossible to return the ecosystem to its original state. As we have said, we need to find at least a 'sustainable' situation, ideally via the use of processes that arise spontaneously to advance their development rather than by opposing them and fighting against them. The ideal strategy is to direct the changes in favour of the population in recession. Applied ecology clearly assumes the need for an ecosystemic approach that takes into consideration the ecological, economic and sociopolitical systems that coexist in reality and inter-co-determine it. The main idea is, as Allen & Hoekstra state, the centrality of the context and consequently the need to compensate for its loss.

'Linguoecological intervention' should be, clearly, very different from purely bioecological intervention. Its starting point should always be the mental capacity of human beings, since, despite the substantial influence of their material contexts, the mental possibilities of humans mean that they can be more creative in their relations with their surroundings; unlike beings with less awareness and intelligence, humans can consider the possibility of resisting the pressures of the context and can attempt to modify it in their favour. In the human context the degree of determinism is lower and the chance that protagonists have to redirect the sociocultural processes in which they take part is far greater.

So the approach cannot be purely 'contextual' – as in the case of animal species without mental faculties – but must also consider the level of representations, narratives, social practices and values through which humans experience situations. An excessively bioecological perspective would lead us, as I said above, to conceptions that have proved erroneous – but are still widely held in certain sectors – based on a sociology that does not take the mental faculties into account, that is, on a sociology that views people as automata determined externally rather than as individuals able to think and to change their reality. So we should construct a sociocognitive and historical ecology that considers the contextual influences, sees them in dynamic terms and also bears in mind the mental abilities of the subjects, with all that this involves.

So, from the ethical point of view, it is not exactly the same to act in order to try to save a species from extinction as to intervene to try to maintain or recover a particular language. In the former case, there is no need to obtain the explicit authorization of the participants – who, we presuppose, would be in favour of the intervention – while in the latter case not to so would be amoral and abnormal. However justified conservationist linguists may consider themselves to be, we cannot oblige a human group to maintain particular linguistic behaviours without their voluntary and active participation, and even less against their will. Sociolinguistic ethics, then, taking the equality of all languages as the starting point and aspiring to preserve the linguistic diversity that our species has created, cannot forget that acceptance and support from the

social agents involved is absolutely necessary. We cannot create forced linguistic 'reservations', even though they might manage to maintain a particular linguistic variety. Ecolinguistic ethics must always bear in mind the people involved and their autonomy, and people must be its centre and its main reason for existing.

This ethical dimension obviously introduces important differences at the political level between a bioecology and a socioecology or applied ecolinguistics. The measures must be adopted by means of democratic procedures and participation, carried out with the respect and consideration necessary for dissenting voices. Indeed, achieving agreement between all those affected will not always be easy, given the typical situation of minority linguistic groups who are practically always faced with the dilemma of utility and identity : whether to neglect their linguistic varieties and adopt the dominant language, or to ignore the dominant language and maintain the collective identity in spite of the potential economic disadvantages of doing so. Bioecological restoration encounters none of these difficulties; it is enough to construct a natural habitat suited to the needs of the species, which will adapt to it deterministically, if the conditions are adequate for its survival and continuity.

In fact, not only success, but the very possibility of effective intervention in favour of the preservation of the linguistic diversity is far more difficult in the case of humans. While, for example, a majority human group may applaud the adoption of policies to preserve animal or plant species in danger of extinction, the same group may object to action in favour of the maintenance of linguistic diversity in areas controlled by the State in which it forms the dominant part. In parallel to the absence of an ethical awareness (however small) in the domain of language preservation, there exists a predominance of ideologies and interests which, instead of favouring linguistic difference, promote homogeneity and the assimilation of groups other than the predominant one. In the case of language, we may find then that majority groups will refuse to help minorities maintain their language. Against this background, action in favour of creating contexts of cultural continuity may be impossible in spite of the active requests of the subordinate group, which, lacking control of its own social space, may find itself condemned to a slow but irreversible process of extinction as a specific linguistic group.

- **To Conclude**

This 'linguistic' reading of certain texts on biodiversity and bioecology can be valid and stimulating providing, as I said above, we do not unthinkingly accept all the possible analogies. Like all readings, this interdisciplinary reading runs the risk of misinterpreting the concepts and the ideas of the field that the author knows less; this may have been the case here. What is important, however, is not so much the correct interpretation of the concepts of the other discipline – important though that is – as the analogous suggestion or questioning of the classical procedures of the paradigm that the author knows well. This brief exploratory attempt may or may not be considered successful, but what is

certain is that it has made us and will continue to make us think beyond the usual limits of our discipline – an important exercise if we mean to encourage scientific creativity and innovation, and indispensable if we are to achieve 'consilience' in human knowledge.

In fact, the result of this exercise is the conviction of the need to promote an autonomous socioecology from the perspective of complexity. A socioecology – which would include linguoecology – which, taking all the productive analogies from bioecology, attempts to provide a rigorous theoretical conceptualization of the state of its own area of research, from a realistic epistemology, and placing human beings at its centre. This is clearly the way marked out by, among others, Gregory Bateson, Edgar Morin, Fritjof Capra and David Bohm. Inspired by the analogies of other disciplines, but at the same time creative and innovative in our attempts to understand the facts of our fields, sociocultural researchers now have the historic possibility to produce new paradigms which, while maintaining this integration with other scientific disciplines, open up the way towards a fuller understanding of human phenomena.

There is an urgent need today for the application of holistic ecological perspectives and theories of complexity to widely differing fields. Perhaps this renewed thinking should be inscribed in the broader framework of a crisis of civilization which leads us to reconsider fragmentary and reductionist images of the world and to adopt representations that are closer to the reality of human life, through values based on universal complexity, sustainability and fraternity. To start us on our way Fritjof Capra (1997 :10) proposes this short list of global paradigmatic principles displayed in the right hand columns of the table below, each one paired with a corresponding term on the left : the terms in the left hand columns are the ones that prevail and are, in part, responsible for some of the impasses that face humanity today :

Thinking		Values	
Self-assertive	*Integrative*	*Self-assertive*	*Integrative*
Rational	Intuitive	Expansion	Conservation
Analysis	Synthesis	Competition	Cooperation
Reductionist	Holistic	Quantity	Quality
Linear	Non-linear	Domination	Partnership

Indeed, this change of paradigm is essential if we are provide an adequate response to the main problems facing the societies of our times. Now that genetics has established that humans are a single species – if we were not convinced of the fact before – and that the genomes of other species are not so different from ours, perhaps we will be able to enter a new era characterized by solidarity between different cultural groups and with other species with which we share the biosphere. Biologically and linguistically, as Wilson says, « soon we must look deep within ourselves and decide what we wish to become »

(1998 :309).

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