

The Social and Environmental Responsibility of Mankind.

1. About Man Interventions in the Living Networks:

Modelling with a “Qualitative Animated Semiological Holistic” Point of View, a Systemic Approach, in an Holistic Way of Education to Explain The Issues of the Fighting Steps and the Escalade of Violence between Mankind and the Wild.¹

BRICAGE Pierre

pierre.bricage@univ-pau.fr

Secretary General of the International Academy for Systems and Cybernetic Sciences (IASCYS)

<http://www.ifsr.org/node/68>

Association Française de science des Systèmes Cybernétiques cognitifs Et Techniques (AFSCET)

<http://www.afscet.asso.fr>

Faculté des Sciences, Université de Pau et des Pays de l'Adour (UPPA), 64000 Pau, France, Europe

<http://web.univ-pau.fr/~bricage/>

Abstract

Like a predator, is **Man species** the enemy of the other non-domestic and non-useful, species of the Wild? **Is Life only a struggle?** To survive that is **first “to eat and not to be eaten”**, but **“soon or late every living being is eaten”**. With only that single law, through a systemic and cybernetic approach, and with the use of **a presentation with animated diagrams**, we can fully explain **the origins of the today crises of survival of the life on earth** due to the mankind escalade of violence against domesticated and wild species.

There are always humans behind decisions and actions. **Education** must pay attention to **developing the human capacity to be a keystone species** for a **“natural sustainable and nature sustained”** economic, social, and ecological development [1]. Because, the **“today Man” is an endangered species** [6].

key words: antibiotic resistance(s), Association for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages ARMSADA <http://www.armsada.eu>, ecoexotope, emergent viral disease(s), endangered species, integration, percolation networking. [12]

Quelle responsabilité éthique, sociétale et environnementale de l'humanité ?

Vis à vis du monde vivant ? Vis à vis d'elle-même ?

1. Modélisation des interventions humaines, au sein du réseau associatif du vivant, et de l'escalade de la violence, entre les espèces associées à l'espèce humaine et les autres formes de vie.

L'homme est-il l'ennemi de la nature ?

Survivre c'est d'abord **“manger et ne pas être mangé”** pour permettre à sa forme de vie de survivre. Le **contrat synallagmatique** initial entre l'espèce humaine et ses plantes et animaux domestiques a été rompu. L'agriculture a permis de **produire toujours plus d'hommes**, jusqu'aux pratiques industrielles, intensives et violentes, d'aujourd'hui. Avec l'usage inconsidéré d'**herbicides**, d'**insecticides**, de **fongicides**, de **pesticides**, d'**antibiotiques**, menaces pour la survie de tous les cortèges d'espèces non-inféodées à l'homme, elles menacent maintenant la survie de l'espèce humaine. Pour produire toujours plus d'hommes, l'homme a sacrifié **la qualité de vie** des espèces domestiques et la sienne, en polluant **l'écoexotope de survie qu'il partage avec elles et dont il est “environnementalement responsable” en tant qu'espèce clé-de-voute**.

L'homme “dévoreur de chaînes alimentaires” par la violence de ses agressions contre les équilibres biologiques entraîne **“la libération des dangers contenus”** dans la chair qu'il mange (grippe) et dans la sienne (cancers). Pour survivre et se survivre, les bactéries sont **toujours plus** résistantes aux antibiotiques. Pour survivre et se survivre les virus diversifient **toujours plus** leur spectre d'hôtes.

¹ LUC V. & P. SWIRC, (mars 2011), *Into the Wild. “Guests of Nature”*, p. 138-152., Air France Magazine.

Comme l'espèce humaine est **toujours plus** l'espèce dominante en masse elle constitue **toujours plus** la source de nourriture principale pour des prédateurs de plus en plus petits, mais de plus en plus nombreux et de plus en plus agressifs. L'homme est l'ennemi de l'homme en étant l'ennemi de la nature !

Dans cette escalade de violence, l'homme ne peut pas gagner. L'espèce humaine est en danger.

"Tôt ou tard il est impossible de ne pas être mangé".

Cette unique loi **"survivre c'est manger et ne pas être mangé"** permet avec une suite de schémas, comme dans un dessin animé, **de présenter et d'expliquer qualitativement** toutes les situations de **la crise biologique de survie de l'espèce humaine**. Mais s'il est possible d'expliquer *a posteriori* ce qui s'est passé et ce qui est en train de se passer, ou ce qui peut arriver, même avec toutes les composantes qualitatives du système (les acteurs, les liens et le Tout) et toutes leurs valeurs, il est impossible *a priori* de prévoir qualitativement, et *a fortiori* quantitativement, tout ce qui peut se passer demain. Aucune situation émergente n'est "prévisible" *a priori*. La Vie possède une direction, elle est **"déterminée", qualitativement, dans certaines limites, mais "imprécise" qualitativement et quantitativement**.

Ce modèle, **transposable** du domaine biologique aux domaines sociétal et économique, explique les crises actuelles et donne une **unique solution, systémique, indépendante du contexte**. Pour survivre les systèmes vivants mettent en place des associations à avantages et inconvénients réciproques et partagés (**ARMSADA**) au sein desquelles **"pour que l'un survive il faut d'abord que l'autre survive, et réciproquement"**. Les espèces naissent, vivent et meurent. La vie est un cheminement au cours duquel il n'y a **ni gagnant, ni perdant**, où il n'y a **de bénéfices que pour le Tout**, la Vie. Il n'y a jamais d'avantages sans inconvénients. La terre n'appartient pas à l'homme [1]. C'est l'homme qui appartient à la terre, avec ses avantages et ses inconvénients. Survivre c'est transformer les inconvénients en avantages et éviter que les avantages deviennent des inconvénients.

Quand la vie est en danger, seules survivent et se survivent les ARMSADA.

Mots clés : ARMSADA(s) [12], maladies virales émergentes, résistances bactériennes aux antibiotiques.

Introduction

In October 2010 The International Standard Organization launched **ISO26000** on Social Responsibility. It advises human societies and their organizations **to behave in interdependency with an holistic approach**. Each day the Man species is growing up. **To survive that is "to eat and not to be eaten"** [2]. What does that mean about the Societal & Environmental Responsibility of the ethical mankind's management of the biosphere [1]?

More and more..., but until when?

More and more high is the number of man people on earth, more and more food is needed. So mankind is **invading, eating or destroying more and more wild ecosystems**. To allow the survival and the growth of more and more domestic vegetables and animals as food stuff, but only for himself, Man is using more and more artificial chemicals and more and more violent practices against the earth as a Whole [2, 4, 7, 8].

Like a predator, is Man species the enemy of the other non-domestic or "non-useful", species?

Is Life only a struggle? To survive that is to eat and not to be eaten, **but "soon or late every living being is eaten"**. With that single law we can explain, through animated diagrams, all the today crisis of survival of the life on earth due to **the mankind escalade of violence against wild species** [5].

1. Our global ecoexotope of survival, The earth, is limited.

Man species is **sharing** with all the other living species a common **ecoexotope** of survival, the earth. **The capacity of hosting of the earth is limited**. Since billions of years, the growing populations of the different species, soon or late, are **competing for the same water**, and the same mineral or the same organic food. Man and the Man's associated species are in conflict with all the others Man's non-associated species of the Wild. **Man versus Wild**. Who will win [6]?

Only 1 human species is surviving today on the earth. All the other ones are dead.

Both in the Wild earth's part and in the Human earth's part, **simultaneously Animal and Plant** species are sharing, locally and globally, the same common ecoexotopes of survival.

The **biodiversity is the amount of the different** species that are sharing the same place at the same time. **Each living system is hosted by a peculiar ecosystem. It has a capacity to be hosted.**

The global biodiversity of a "system of systems", like an atom, a cell or a forest, is the **result of the steady state of interactions between all of its local embedded and juxtaposed systems** [3]. It is the sum up of the various local energetic chains integrated into a Whole, an endosyncenosis. The spaces (the volumes and the interfaces) are limited, the times (the time delays, the time durations) are limited, the possible actions and inter-actions are limited too [10].

The Man's food chains' economy obeys the same laws as the Wild's food chains' economy.

2. To survive that is always, first, "to eat and not to be eaten".

Both in the Wild part and the Human part of the earth, animals are eating other animals or plants. **To survive that is "to eat and not to be eaten".**

2a. No survival outside a food chain!

Each ecoexotope of survival is structured with food chains networks in which all plant and animal endophysiotoxes have their own place. That is a great advantage to have a place, your life's form can exist! But there are no advantages without disadvantages, **"soon or late every living being is eaten". Man is not an exception.** The local biodiversity is the result of **the network of interactions between all** the interactive species. **Each living species is integrated into an ecoexotope in which it is more adapted at that network of interactions than the other species are.**

Continuously the Man is **more and more invading** the earth spaces where he is **eating all that he can eat**. That is a great advantage to be an omnivorous species! **But, to survive, the Wild species must to eat too, and not to be eaten too.** All that is an advantage for the Man is a disadvantage for the Wild.

Each living system is a system of systems (figure 1).

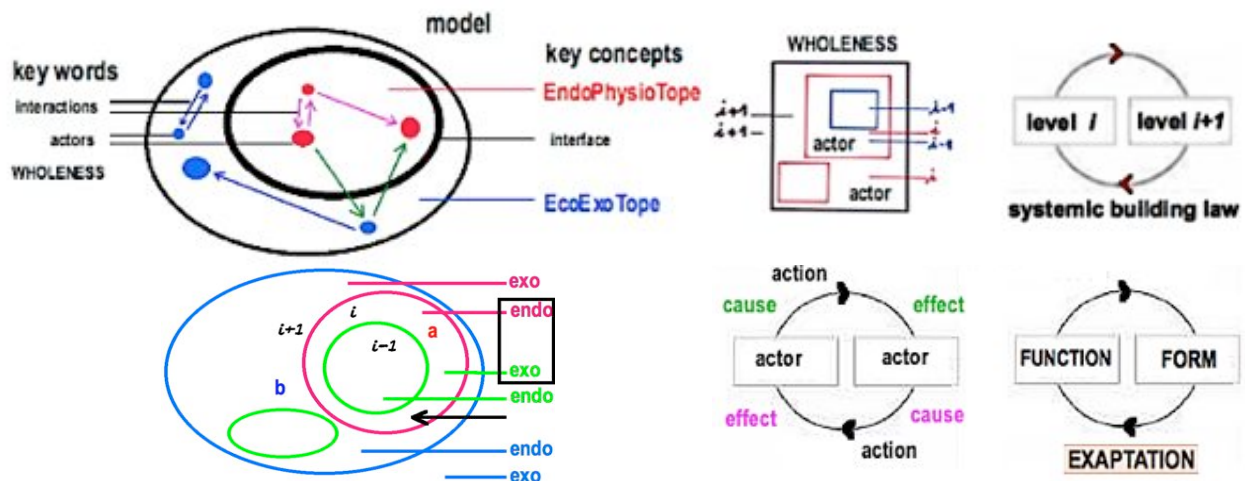


Figure 1. **Each system is not only a network of interactions between actors but first a Wholeness.**

system is made of 3 types of entities: actors, interactions (links) between (and within!) actors, the Wholeness.

Due to **the juxtaposition and embedding of the actors**, a system is always a system of systems, in which the endophysiotope (endo: internal, tope: space-time, physio: of functioning) of a i level of organization is the ecoexotope (exo: external, tope: space-time, eco: of inhabitation) of adjacent $i-1$ levels. Due to the retro-actions of actors (and levels of organization) on each others: **"interaction is construction and construction is interaction."**

2b. No food chain without a keystone species.

Different food chains, elsewhere else, even **not in the same space and not in the same time** too, can be stressed by a same factor that alters the survival of only one step of the chain. At the bottom of a food chain are always **organic producers**, like green plants. At the top are **organic eaters**, animals are always consumers. The destroying of the organic producers results always in a **destruction of the chain**.

There are **keystone species** the destroy of which results in the destroy of the whole chain.

Overexploited populations can collapse. No population increases without limit.

In a Whole, the changes of the number of actors and of their network of interactions are the result of a percolation process, into the space and through the time.

2c. The Man species is a keystone species for the Man's alleviated domesticated species.

Man is **more and more eating**, destroying or domesticating all the Wild species he can, to make food, or to make energy to have more food. Thus he is in **competition with wild species** of animals **to eat** wild plant or animal species and with all wild species to grow his domesticated plants and animals he is eating first (figure 2).

The survival of an actor into a chain is **depending both of that of the adjacent superior and inferior actors of the same chain**. **"Interaction is construction and construction is interaction."** **Man is a keystone species** for the survival of all the domesticated species he is eating.

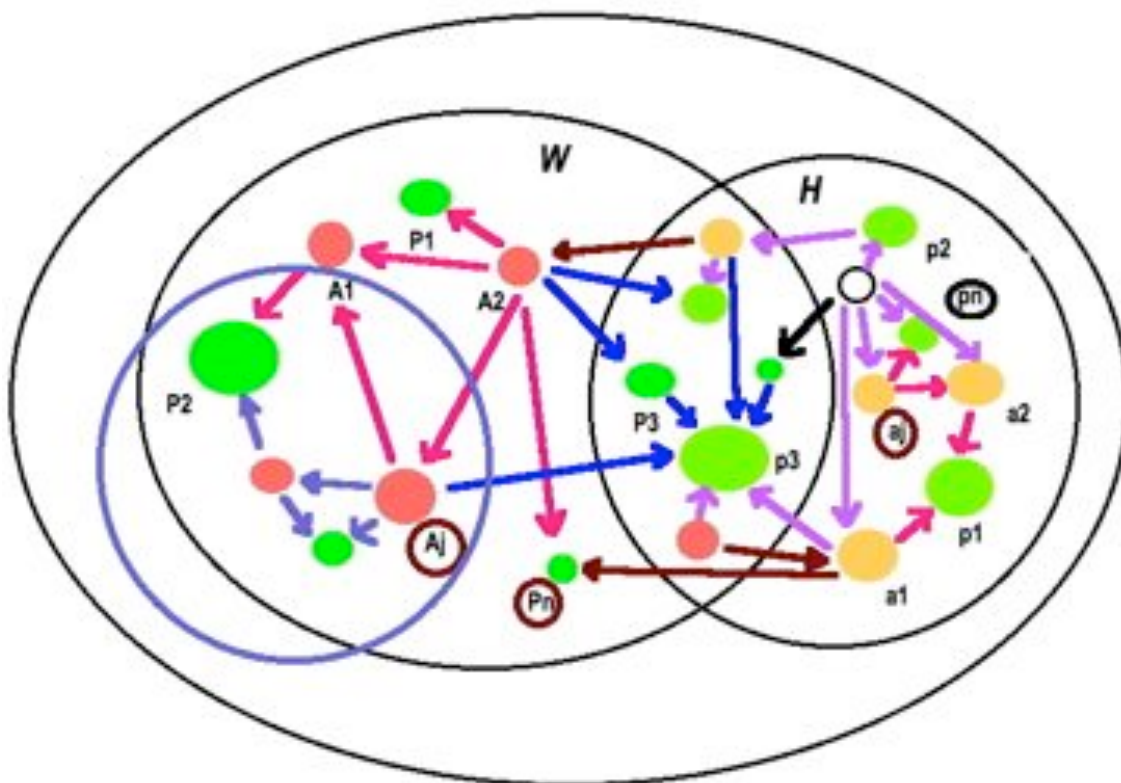


Figure 2. Each system is not only a network of interactions between actors but first a Wholeness.

W wild species' ecoexotope (actors: A animals in red, P plants in green, biodiversity of animals A_j and plants P_n),

H domesticated Man's species ecoexotope (actors: a animals, p plants, biodiversity of animals a_j and plants p_n).

The survival of each part of the Whole, W and H, is the result of their agoantagonistic interactions: arrows are indicating the way of the eating process (from the eater to the eaten) in a food chain. The value of the local biodiversity is the result of a steady state due to a percolation process (p1, p3, P2 are keystone species of respectively the H part, the interactive part where Wild species and Man species are co-existing and the W part). All food chains are juxtaposed and embedded into circular networks of flows of matter and energy.

- QASH ("Qualitative Animated Semiological Holistic") model, diagram n° 12b - [11, 12].

3. “All which does not kill makes stronger.” A child would understand that!

The Monera are the first inhabitants of the earth. Through waters they can move everywhere. They are more diverse than any other earth life's form. They are sharing a common ecoexotope of survival, the endophysiotoxes of all the living species, without food chain barriers. Man is using chemicals to kill those livings that can eat his plants and animals and himself.

3a. More and more drug resistant species.²

First, the use of biotoxic chemicals is a great advantage. But...

The use of antibiotics has had always unexpected side effects outside the Man's biome:

- Species of the Wild's biome may be favoured and turned as invaders.
- Species of the Man's biome may be freed of predators that were regulated their growth.
- New consumers of food chains may rise because of a new availability of food.
- New bacteria species may invade Man's plants or animals and Man.
- To survive, bacteria species become resistant to the chemicals.
- Soon or late, the resistance is transferred between species of the Wild's biome and from species of the Wild's biome to species of the Man's one. Thus increasing the death of useful domesticated species. Soon or late, the advantage of the chemical is turning to a disadvantage.

“In the economy of Nature, if any one species does not become modified and improved in a corresponding degree with its competitors, it will be exterminated.” Ch. Darwin.

Like every where the malaria vectors mosquitos species are more and more resistant to insecticides, there are now bacteria that are resistant to all the available antibiotics. They are surviving best where there is a lot of antibiotics like in the hospitals, where they can invade us. New invaders from the Wild but antibiotics' resistant can now infect all the Man's biome species. Each new pesticide, herbicide, fungicide, insecticide can not kill all the living beings but, soon or late, it does select rare resistant ones. And all which does not kill a living being makes him stronger.

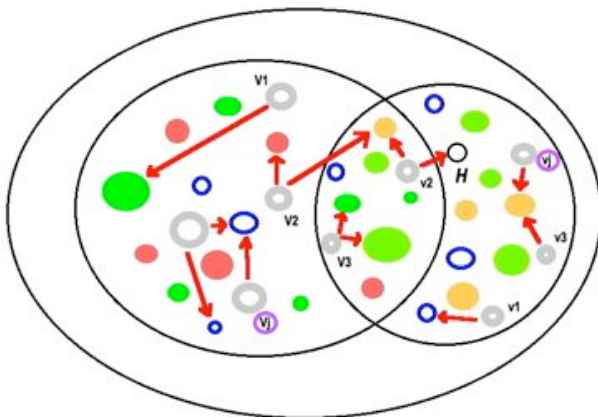
3b. More and more diverse viruses.

Like bacteria, viruses are moved through water, but with the air and water flows they can move everywhere and they are hosted and protected into the livings they inhabit, and they are moved with their moves. Viruses are eating all living forms, cells or bacteria. In marine ecoexotopes, like coral reef, phages and viruses are 10 times more abundant than bacteria (that are 10 times more abundant than cells). Their genomes are smaller and genes are continuously and easily transferred among each other and the bacteria (or the cells) they infect. Viruses account for 94% of the nucleic acid-containing entities in the marine ecoexotopes.³ The entire gamut of functional genes is represented in the virome, indicating that viruses influence globally all the metabolic processes by serving as repositories to store genes that get shared among their common ecoexotope of hosts.

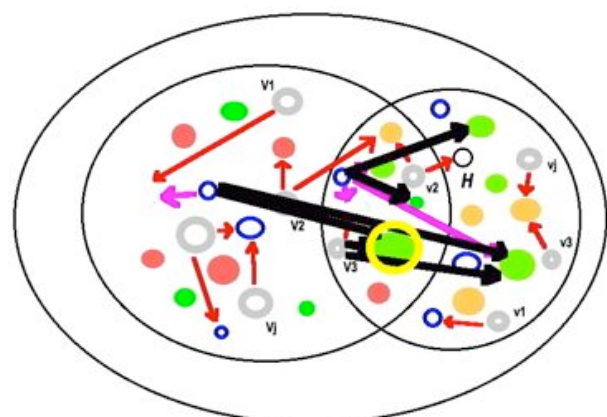
The viral biodiversity is the result of the global changing of the Plants' biodiversity, the Animals' biodiversity and the Bacterial biodiversity. Flows of viruses are bursting from Wild species to domesticated animals and to man at end (figure 3). When you disturb the ecosystems -for example, in sea water by overfishing, or in land soil by treating with high nitrates flows- you affect the microbial (bacteria and cells) and viral communities. Useful bacteria, or viruses, can become more or less abundant. Pathogens can become more virulent, which has a great effect on the health of the whole biosphere. But, microbial communities are maintaining their diversity and stability, their metabolic processes are so diverse and stable because viruses kill the bacteria (or cells) on a strain level. Each killed strain gets replaced by a similar one. So the Wholeness at the bacterial and viral levels stays globally the same as the strains turn over. The microbial community of genes is globally not affected, but huge flows of deaths are running into the adjacent superior levels of the cells and meta-cells organisms. “Man is an endangered species!”

2 GICQUEL Brigitte (mai 2008), *Tuberculose.*, p. 1.9, PASTEUR Le Mag' N° 5.

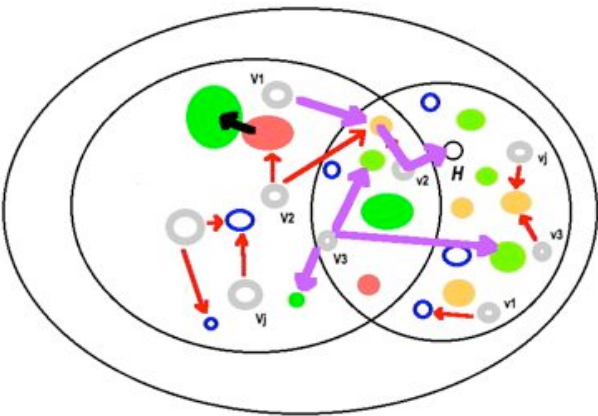
3 GITIG D. (2010) *Marine Metagenomics. Phages and Viruses.*, p. 361-365., BioTechniques Vol. 48, N° 5.



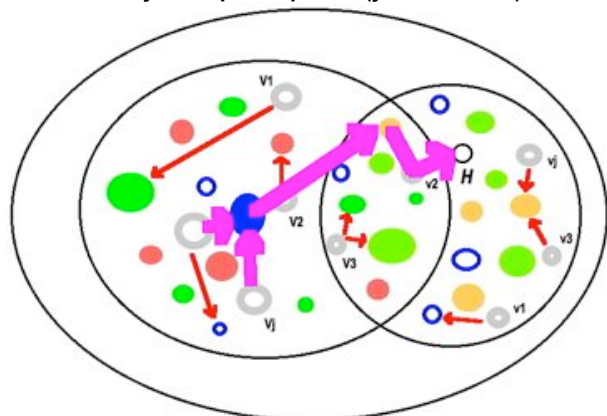
3a. Viruses (in grey) are eating (arrows in red) bacteria (in blue), plants (in greens), animals (in red and orange) and Man (H)



3b. The destruction of a plant population of the Wild resulted in the change of ecoexotope of their eaters, with a new load of disadvantages (black arrows) for a domesticated keystone plant species (yellow circled).



3c. Viruses invading from the Wild.
After the extinction of keystone plant species, a new network of food chains has arisen through a process of percolation. The last invaded hosts (violet arrow) at the end of the chains are the domesticated species and Man (like in flus' epidemics).



3d. New emergent Man diseases.
The selection of antibiotics' resistant bacteria species (in blue) has created a new ecoexotope for ancient and new viruses that following their genomic integration give the bacterial hosts new invading virulent properties (like in cholera and pestis pathogenicity).

Figure 3. Man's endophysiotope is more and more an ecoexotope of survival for endangered bacteria and viruses.

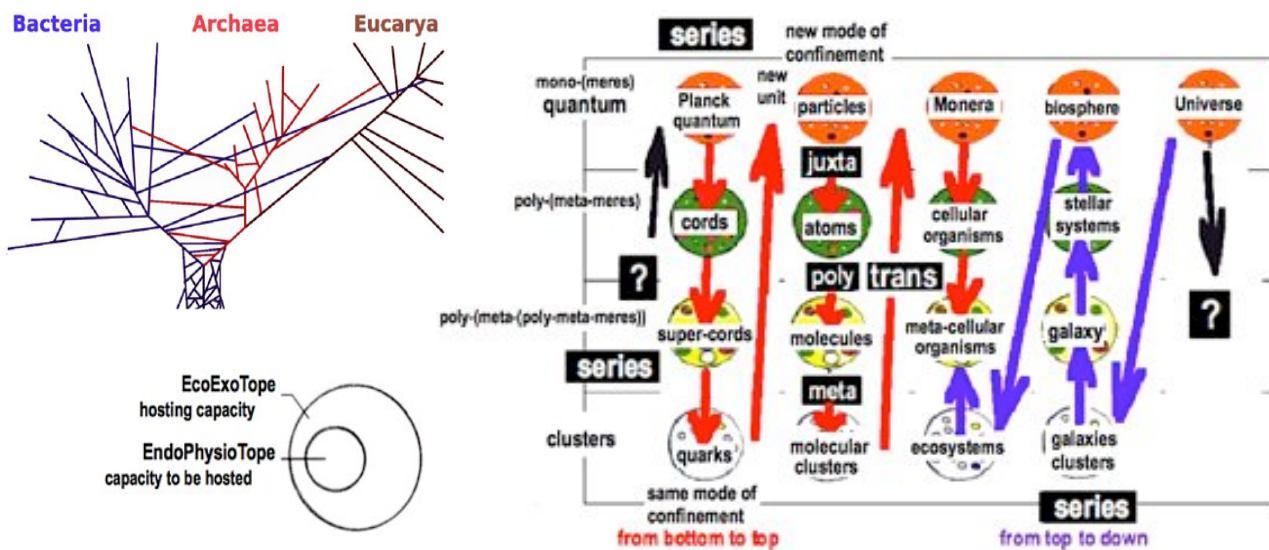
Due to the abuse of chemicals by Man's industrial management of the economy of nature, viruses and bacteria flow from their endangered wild species to the domesticated species and Man at end!
(QASH model, diagrams n° 31, 38, 46, 50) [11, 12].

And finally that is the local molecular interactions⁴, between proteins and nucleic acids, between proteins and metabolites, at the adjacent inferior level of survival (figure 4), that are governing the survival of the whole superior level of the biosphere (figure 1: systemic building law).

The earth -airs, waters, soils and organisms-, is the property of the microbial community!

With the Man's industrial food producing, **flu's epidemics** are more and more frequent and **influenza viruses** are more and more diverse in their hosts' requirements. **Bacteria and viruses are competitors in the eating of living forms of the same food chain.** Man's use of chemicals like **herbicides may result in the death of wild plant species that were usually the ecoexotope of survival of viruses** (it is also the case with bacteria). This result either in **the death of viruses (or bacteria), or their invading into other food chains.**

4 LEE D. Y. & al. (2010) *Mass spectrometry-based metabolomics, analysis of metabolite-protein interactions, and imaging.*, p. 557-565., BioTechniques Vol. 49, N° 2.



4a. Living systems are systems of systems, that are made through the juxtaposition and encasement of previous ones.
4b. Whatever is the level of organization it is defined relatively: "hosting and to be hosted".

4c. The "periodic" table of organization of the living systems. The first line enlists the modules at the beginning of a new series. Series are vertically listed. Each one begins with a new unit, new "quantum" of confinement, which is a new mono-mer for all the new blueprints that emerge through polymerization ("poly") and metamorphosis ("meta") of the previous adjacent levels.

Figure 4. The systemic building of the adjacent organization's levels of survival of the living systems.

Man's use of chemicals like **herbicides** may result in the death of wild plant species that were usually the **ecoexotope of survival** of viruses (Like it is also the case with bacteria). This can result either in the death of viruses (or bacteria), or their invading into other food chains. A **key-stone species**, that previously was free of bacterial aggressors, may be **endangered** (figure 3b). Man is not at all an exception (figure 3c). A great pressure may result on any **selective species**, that were previously free of bacterial eaters or invaders. **Competition between bacteria** may result in an **increasing growth** of a few bacterial species that initially were not pathogen and become so (figure 3d). When scientists discover a new unknown species⁵ it may be the result of its hyper-proliferation or that of the disappearance of its predators or of its ecoexotope. It is discovered because of a change in the network of survival of its ecoexotope!

3c. Man is an endangered species.

Man is a prey⁶ like another one, because our cell are embedding mitochondria that are descents of bacteria, bacteria that were eaten by bacteriophages⁷, and that are susceptible to antibiotics. The use of herbicides to destroy plants of the Wild may result in the destruction of the ecoexotopes of viruses (and bacteria too). Thus if any one species of viruses (or bacteria⁸) does not become modified and improved in its integration into a new ecoexotope, it will be exterminated.⁹ So it does and flows into other hosting species.⁹

Man is not an exception but an hosting ecoexotope like another one.

Changes in the percolation networking (figure 5) of predators and preys result in the emergence of new food chains and **the disappearance of previous ones**. Thus, this leads to a **decrease in biodiversity**. But the maintain and extension of the biodiversity is a key process to protect against aggressions (figure 6b).

5 MALAKUNAS K. (2010), *Unknown species found in Amazon.*, p. 10, China Daily, October 27, 2010.

6 Collectif (mai 2008), *Virus. L'homme, milieu de culture.*, p. 6., PASTEUR Le Mag' N° 5.

7 Collectif (janvier 2008), *Virus. Les bactériophages.*, p. 24-25., PASTEUR Le Mag' N° 4.

8 FLEURY H. (mars 2007) *Tuberculose. Toujours un fléau pour la santé publique mondiale.*, p. 7-19., PASTEUR Le Mag' N° 1.

9 BARREIRO Luis (septembre 2007), *Évolution. Des avantages acquis.*, p. 16., PASTEUR Le Mag' N° 3.

"Les infections virales exercent une pression sélective beaucoup plus forte que les infections bactériennes."

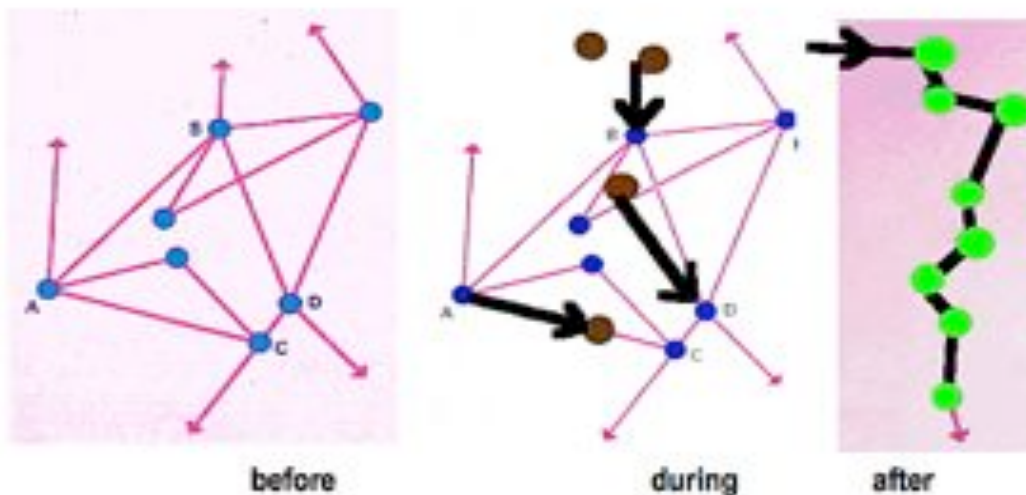


Figure 5. The percolation process of emergence of a new network of interactions.

It is a metamorphosis with 3 simultaneous processes: -ancient actors disappear during the interactive process of integration of at least 1 new actor, -new actors, that were not there before, are integrated into "the coming network", - ancient actors are conserved but "transformed" in their action, or in their place, or in their time of action. Integration is depending both an age and on stage of the actors, the interactions and the Whole. Connectedness in a network often shows a threshold behaviour. When there are few connections, there are isolated islands of connections, and the largest connected group is a small fraction of total members in the network. However, at some point, the addition of a just a few more connections can cause a substantial fraction of the network to be connected.¹⁰

A world without bees will be **a world without fruits and seeds** of a lot of cultivated plants.

But **soon or late the vacant places** of the biomes will be occupied by ancient or new adapted species.

All the possible places in a food chain are occupied. Whatever was the intensity of the extinction of species in the past, more and more diversification of the livings has occurred, with **new invaders of ancient and new ecoexotopes**, **new avoiders** of new chemicals or **new evaders** of Man's polluted ecoexotopes. Soon or late, **new food chains are taking place**. Finally **new patterns of hosts** allow the expansion of ancient and new viruses (or bacteria). Viruses are more susceptible to invade, and more aggressively, **Man's biome species** because they are **genetically less diverse than Wild's species** always are. **Soon or late**, in the course of a percolation process (figure 5), **Man himself will be a host** (figure 3d).

When the previous ancient limitations are broken, full growth is the rule, like it is the case in cancer diseases, **unless new limits are stopping it** [4]. **The growth** of antibiotics resistant bacteria **allows the growth** of new populations of bacteriophages. Mixing together into the same bacterial species viral genomes can allow the birth of **a new recombinant virus**. A new virulent virus can, **from host to host, invade Man's species**. A new antibiotics' resistant bacterial strain¹¹ **can do so too**. Bacteriophages are transporting the genes of resistance or virulence from a bacterial host to another one. New virulent bacteria lines were born, like those of the cholera¹² (*Vibrio*) or the pestis¹³ (*Yersinia*)¹⁴, when an ancient virus¹⁵ integrated into the genome of a non-pathogenous bacterium.¹⁶

10 RIORDAN O. & L. WARNKE, (15 July 2011), *Explosive Percolation Is Continuous.*, p. 322-324, Science Vol. 333 N° 6040.

11 POPOFF Michel (mai 2008), *Une bactérie qui profite de l'antibiothérapie.*, p. 30., PASTEUR Le Mag' N° 5.

12 QUILICI Marie-Laure (mai 2008), *Le choléra sévit toujours.*, p. 24-25., PASTEUR Le Mag' N° 5.

13 MOLLARET Henri & Jacqueline BROSOLETT (janvier 2008), *Peste. Le fléau.*, p. 10-13., PASTEUR Le Mag' N° 4.

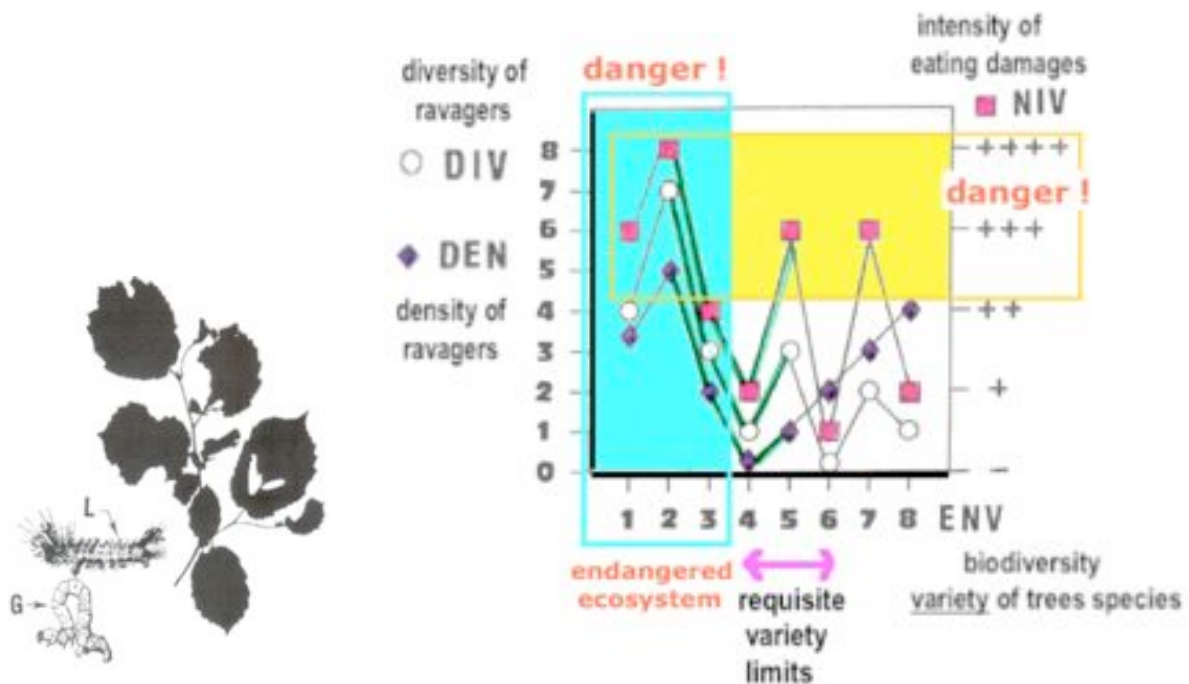
14 CARNIEL Elizabeth & Françoise GUINET (mai 2008), *La peste n'est pas en reste.*, p. 26., PASTEUR Le Mag' N° 5.

15 **Many bacteria carry a variety of mobile genetic elements that contribute to their diversity and adaptability.**

Usually plasmids are very stable because the viability of plasmid-free bacteria is reduced.

So, it is very difficult to make plasmids free except in endangered situations. (HALE L. & al. (2010) *An efficient stress-free strategy to displace stable bacterial plasmids.*, p. 223-228., BioTechniques Vol. 48, N° 3.)

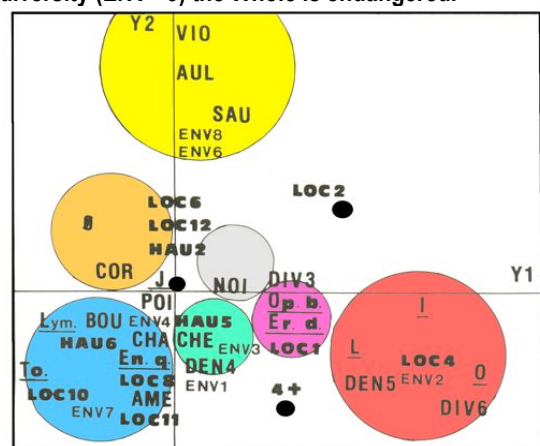
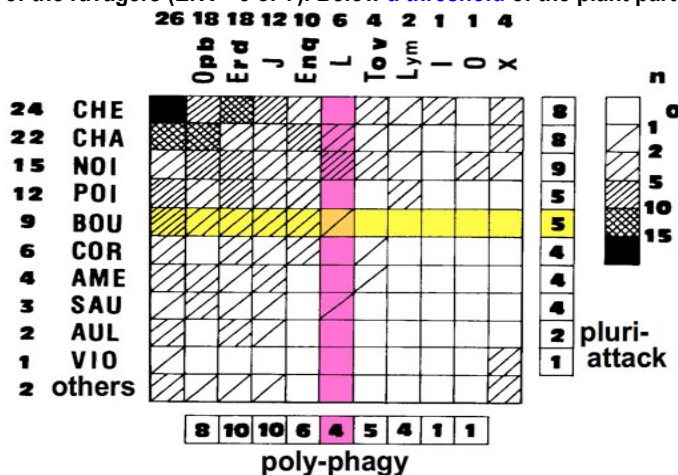
16 CARNIEL Elizabeth (juin 2007), *La peste, toujours.*, p. 2-3., PASTEUR Le Mag' N° 2.



6a. Each prey is eaten by diverse ravagers.

6b. The local plant biodiversity and the global resistance.

Each tree species (the prey actors) are aggressed by a mix of species of caterpillars (the predator actors L, G): a part of the animal part of the forest is eating (the links) a part of the plant part. More high the density of the ravagers (DEN), more high the intensity of the eating damages of the leaves (NIV) and more difficult the survival of the trees. And if the trees are killed, the forest will vanish. But, there are values (4, 6) of the local species diversity of the trees (ENV) that are protecting the Whole against the damages. And, even if the intensity of the damages is high, the increase of the biodiversity (from ENV= 4 to 8) is not only protecting against the increase of the density of the ravagers but also allowing the increase of the diversity of the ravagers (ENV= 5 or 7). Below a threshold of the plant part biodiversity (ENV= 3) the Whole is endangered.



6c. The table of the local predators/preys links.

The plant species (leaves): CHE, CHA, NOI..., the moth species (caterpillar): Opb, Erd,... X, effective probability in %, n "load" number. [7]

6d. Multifactorial analysis of linkage groups.

The "optimal steady state" is at the (Y1,Y2) centre.
From the centre to the top: resistance thanks to diversity.
From the centre to the right: danger due to diversity loss!
From the centre to the bottom left: danger due to density.

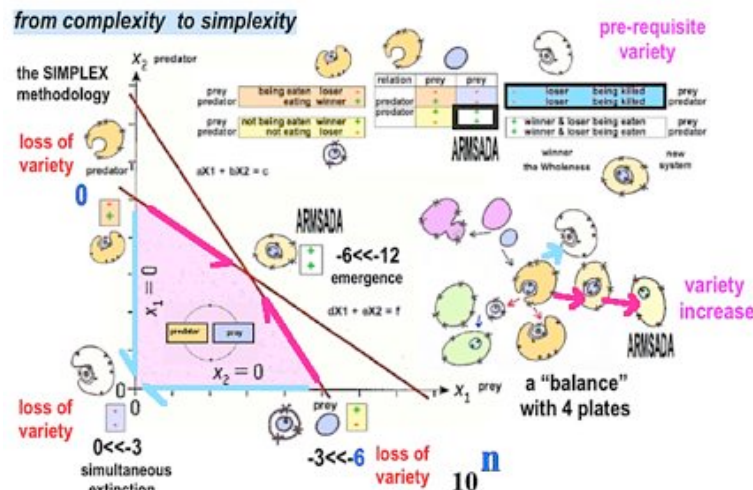
Figure 6. The global behaviour of a forest (an ecosystem, the Wholeness) face to local internal aggressions.

To measure (quantification) all the local links between all the actors (table 6c), into the space and through the time, is not sufficient. To evidence into the Whole, qualitatively and in probability, all the linkage groups of response to aggressions (figure 6d) is not sufficient. We must change the space-time-action of representation to know the behaviour of the Whole (figure 6b) face to changes of the predation pattern or of the preys' association.

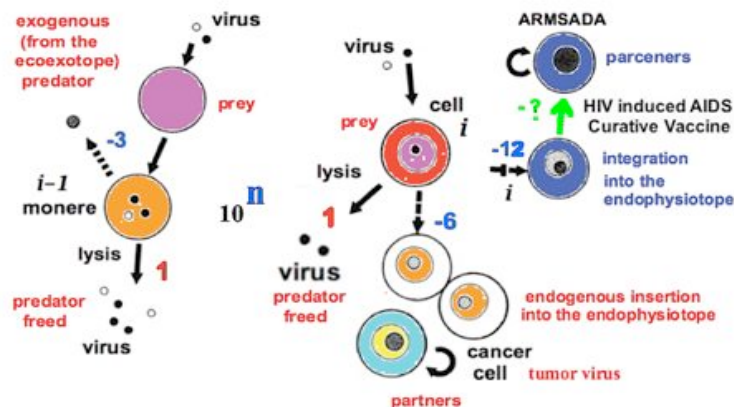
The resilience of Life is in its local and global (bio)diversity. Soon or late, each species is a prey for another one.

*"A childish species would understand that."*¹⁷

Deforestation, primarily caused by slash-and-burn agriculture and by charcoal production, is the major ecological and economical threat to the biodiversity in Madagascar. A holistic conservation program for forests, by WWF, has targeted 500,000 hectares. Certain areas will be reforested, some restored and other protected. But, the primary aim of the project is to help local communities to manage effectively and sustainably their forest(s) at a global scale, by setting up "income generating" agricultural practices.¹⁸



7a. X1 prey (forest, bacteria, Man, chicken), X2 predator (caterpillars, bacteriophage, virus, Man), 10^n probability of the result at the end of each struggle: $n = 0$ usually, near 100%, the predator wins!, but it loses too, no more prey equals no more predator; $-3 < n < -6$ exceptionally, less than 0.1%, the prey wins!; $0 < n < 3$ possible, the two are reciprocally killed; $-6 < n < -12$ "impossible", less than 1 per million, maybe 1 per billion, or less at each time, "but certain!" at the time scale of evolution.



7b. Probability of the resulting organization at the end of each struggle: soon or late, even the most rare event will arrive. 1 usually near 100% (0.999999999999), 10^n : maybe $n = -3$ (0.001), rarely -6 (0.000001), extremely rare -12 (0.000000000001)

Figure 7. The fate of predator/prey "interactive participation":

no survival outside an ARMSADA co-making, whatever the levels of organization that are involved in.

Steady growth is the rule, but "explosive percolation" (figure 5) is said to occur in an evolving network (figure 6) when a macroscopic connected component emerges in a number of steps that is much smaller than the system size (figure 7).

17 **Tout était dit** en images simples, il y a une génération... pour la prochaine génération ? http://fr.wikipedia.org/wiki/Albert_Barill  (1978) http://fr.wikipedia.org/wiki/Il_ tait_une_fois..._l'Homme, (1987) http://fr.wikipedia.org/wiki/Il_ tait_une_fois..._la_Vie BARILL  A., (2008) *Il  tait une fois... notre Terre*. S rie t l vis e d'animation fran aise en 26  pisodes de 25 minutes, cr  e pour les studios Procidis et diffus e sur Gulli puis sur France 3, http://fr.wikipedia.org/wiki/Il_ tait_une_fois..._notre_Terre

18 BAROIN V., (Mars 2011), *L'avenir vert de Madagascar*, p. 158-162., Air France Magazine

4. Only will survive the Associations for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages (ARMSADA):

Biological and Environmental Responsibility.

But before knowing all the actors and all the interactions between them, we can not make a prediction about the future of a Wholeness (figure 6).

4a. A minimal requisite variety is necessary for the survival of a Wholeness.

But, even if we are knowing the existence of equilibria between predators and preys into a lot of food chains, even if we are knowing **qualitatively all the actors** and **quantitatively all their interactions**, in an ecosystem like a forest, when we are killing a previously present species or introducing a new species, we do not know what the result will be (figure 6). For example, the loss of trees in the Amazon forest creates hospitable breeding grounds for malaria-carrying mosquitoes.¹⁹ From August 1997 to August 2000, an only 4.2% rise in deforestation has resulted in a 48% increase in the number of malaria cases! The Amazon Anopheles species proliferates in forest clearings, and fields, where the rate of mosquito bites is 278 times higher than in the middle of the forest!²⁰ For example, in The Amazon forest, the CO₂ fixation mean is usually less than 0.4 billions tons a year. But, in 2005 and 2010, because of a big lack of the dry-season rainfall, the forest has released, respectively, more than 1.6 billions and 2.2 billions tons of CO₂ than fixed.²¹ Thus now, at least 10 years of usual fixation, of the previous healthy forest, without any future stress, are necessary to compensate. And, "Human made" "domesticated" forests, like pines' forests, with only 1 species are like a corn field, and are less able to resist to ecological damages than natural wild forests like the Amazon forest.²²

The climatic stresses and the biotic stresses are enhancing the human stresses **and reciprocally**. The Humankind is **now engaged in a positive feedback of loss** of biodiversity like the ones that in the geological past were at the origin of the huge extinctions of a lot of species.

4b. ARMSADA are at the origin of both the conservation of biodiversity and its increase.

There is always a **4 results fate** in the predator/prey dilemma (figure 7).

Usually the predator wins. But it is **a game where the one who wins loses too**. To survive a predator must have preys to eat. To survive that is to eat. Either the predator or the prey may win, but they can lose together. In all cases the biodiversity is reduced!

The obligate mutualism between leafcutter ants (*Atta* sp.) and their fungi (*Attamyces* sp.) is functioning like the lichens' ones. It originated 8 to 12 million years ago in the tropics, but it is today **extended** also into temperate regions in South and North America. The northernmost leafcutter ant *Atta texana* sustains fungiculture during winter temperatures that would harm the cold-sensitive *Attamyces* cultivars of tropical leafcutter ants. Cold-tolerance of *Attamyces* cultivars increases with winter harshness along a south-to-north temperature gradient across the range of *A. texana*, indicating selection for cold-tolerant *Attamyces* variants. The northernmost *A. texana* populations are able to sustain fungiculture throughout winter because of their cold-**adapted** fungi and because of seasonal, vertical garden **adapted**-relocation (maintaining fungi gardens deep in the ground in winter to protect them from extreme cold, then moving gardens to warmer, shallow depths in spring). Although the origin of leafcutter fungiculture was **an evolutionary breakthrough** that revolutionized the food chains of tropical fungus-growing ants, the original adaptations of this host-microbe symbiosis to tropical temperatures and the dependence on cold-sensitive fungal symbionts eventually **constrained** expansion into temperate habitats.

19 **Sleepless nights in the jungle:** "I began to detect a faint whining sound. In a few minutes I was completely surrounded by it. I turned on my light. The mosquitoes were no longer to be reckoned by individuals. They formed a cloud, **a thick droning fog**. There was something extremely frightening in the light." Adapted from HALLE J., (1941), *River of Ruins*, In ANDRÉANI R., (1968), *Explorers and Experiences*, p. 89-90., **Wild creatures**. Masson & Cie, Paris.

20 JACQUET K., (2010), *Deforestation and malaria*, p.112., Air France Magazine N° 162.

21 LEWIS S. L. & al. (2011), *The 2010 Amazon Drought*, p. 554., Science N° 331.

22 TUQUOI J.-P., (2010), *Frappée par les tempêtes, attaquée par un insecte, la forêt des Landes ne se relève pas*, p. 4., Le Monde 22 octobre 2010.

Evolution of cold-tolerant fungi within the symbiosis **relaxed** constraints on winter fungiculture at the northern frontier of the leafcutter ant distribution, thereby expanding the ecological niche, enhancing **the ecoexotope's hosting capacity** of an obligate host-microbe symbiosis.²³

Only **the emergence of an ARMSADA** which is at the origin of a new blueprint of life's forms (figure 7) can increase the biodiversity and thus to allow the resilience of Life. The domestication of a fungus species by an algal species (within the lichens), the domestication of a fungus species by an ant species (with the leafcutter fungiculture), the domestication of a population of a corn species into a field by a human population are the same evolutionary breakthrough. Indeed the Whole Ants' Society is an organism, here it is a (fungus-growing)-eater one but it could be a beef-eater one.²⁴

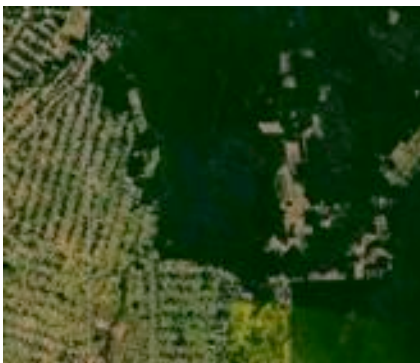
4c. "The viral behaviour of Man species". At what time scale?

The emergence of an ARMSADA between **a human population and a peculiar species of a plant and of an animal** from the Wild is at the origin of the so diverse modern civilizations.

The emergence of an ARMSADA is very rare but soon or late, with the time, it comes.

An ARMSADA is an **"association for the best and for the worst"**. It emerges when all the partners are losing together the capacity to kill the other ones. **For the one to survive all the other ones must survive first.** It is an association for the reciprocal and mutual sharing of advantages and disadvantages, in which all that is an advantage for a partner is a disadvantage for all the other ones.

Like the Elephant, Man is **a trademark from the earth's biome**. His species is the property of the earth but the earth is not his property. Man is an endangered species.²⁵



8a. The Amazonia forest (Brazil): forest "crunching" with latifundia. Man is a ravager eating the Wild.



8b. Kansas (USA): fields of corn, sorgho, wheat. Man is a keystone specialist for domesticated plants.



8c. Al Kufrah (Lybia): irrigation with fossil water. Could be Man a keystone generalist for all species?

Figure 8. Man use of technology to be a keystone species, "for the best and for the worst".

8a. Lysis plagues in the primordial forest: loss of diversity, Man is eating the Wild part of the earth.

8b. No Wild rest? Man's conquest of the interaction zone between the Wild and Human parts: the least diversity.

8c. Propagation of more Life: more biodiversity and more to eat! But at what cost?

To survive it is **"to eat and not to be eaten"**.

"There are never advantages without disadvantages."

All the living systems emerged from an ARMSADA (figure 7).

Viruses may be regulators of the temporary steady states of the Life (figure 6) through their controls of **the "capacity of hosting"** of the ecoexotopes and **the "capacity to be hosted"** of their endophysiotoxes.

23 MUELLER U.G. & al., (2011), *Frontier mutualism: coevolutionary patterns at the northern range limit of the leaf-cutter ant-fungus symbiosis.*, Proc. R. Soc. B, doi: 10.1098/rspb.2011.0125. Online ISSN: 1471-2954.

24 **Devouring ants...**: "We slept soundly. But I was suddenly awakened by a series of hideous yells, and my surprised eyes dimly saw, half-naked brown-skinned bodies dancing wildly around the fire. A thousand red-hot needles pricked me. An army of black foraging ants found the bodies of men intercepting their path, and **after the manner of their kind, proceeded to sample them.**" Adapted from THOMPSON E. H., (1932), *People of the Serpent.*, In ANDRÉANI R., (1968), *Explorers and Experiences.*, p. 93-94., **Wild creatures.** Masson & Cie, Paris.

25 BRICAGE P., (2007), *Vers la fin des saisons ?*, p. 60-78., In BELLANGER B. dossier spécial Science & Vie N° 1075.

Man behaviour is that of a virus.²⁶ Viruses that are at the origin of cancers are destroying their ecoexotope (killing their organism of survival) and then, soon or late, they disappear. Viruses that are at the origin of an ARMSADA through their integration into a new ecoexotope of survival (the endophysiotope of a bacterium) are disappearing but they are “eternalised”, because a jump in the scale of their space-time through their internalization. What sort of virus is Man's species (figure 8)?²⁷

4d. Contingency: food chains are chains of transfer and accumulation of dangers.

There are 2,500 serotypes of Salmonella. All Salmonella are adapted to the digestive tract of all animals. The invasion is the result of the eating of crude or insufficient baked food. Into the intestinal flora, there is a struggle between our domesticated bacteria and the pathogenic Salmonella.²⁸ The use of antibiotics not only killed the pathogenic bacteria but also the domesticated ones and results in the proliferation of antibiotics resistant bacteria, like *Clostridium difficile*, the agent of botulism. Usually the resistance is transferred from a bacterium species to another in less than 1 year!²⁹

Harmful algal blooms cause significant economic and ecological damage worldwide. The harmful alga *Aureococcus anophagefferens* outcompeted co-occurring phytoplankton in estuaries with elevated levels of dissolved organic matter and turbidity and low levels of dissolved inorganic nitrogen. The genome of the algal species contains gene sets that facilitate dominance within the new conditions present during blooms, with more genes involved in light harvesting, organic carbon and nitrogen use, and encoding selenium- and metal-requiring enzymes, and a larger genome, compared with those of six competing phytoplankton species. Genes for the synthesis of microbial deterrents likely permit the proliferation of this species, with reduced mortality losses during blooms. This suggests that **anthropogenic activities** resulting in elevated levels of turbidity, organic matter, and metals **have opened a new ecoexotope within** coastal ecosystems' ecoexotopes that ideally suits the unique genetic capacity of *A. anophagefferens* and has facilitated its harmful proliferation.³⁰

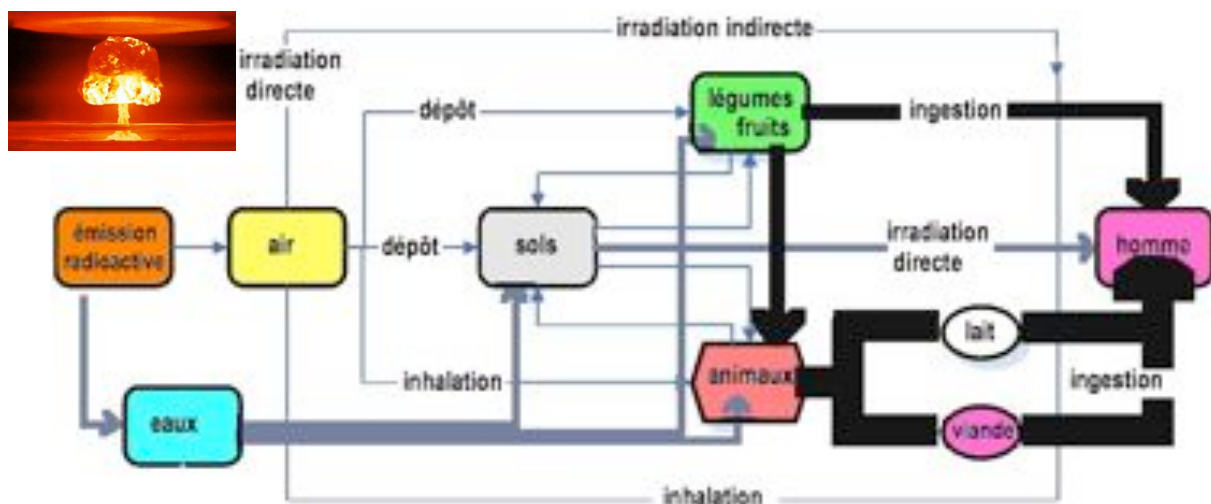


Figure 9. Man abuse of technology: never advantages without disadvantages. (for the best and) for the worst.

Quelle que soit la source du “polluant”, physique (radiations), chimique (métaux lourds, toxiques, hormones) ou biologique (toxines, bactéries, virus), le chemin suivi est le même ! L'homme est toujours l'accepteur final.

26 “... le symbiote admet le droit de l'hôte, alors que le parasite -notre statut actuel- condamne à mort celui qu'il pille et qu'il habite sans prendre conscience qu'à terme il se condamne lui-même à disparaître.”

SERRES Michel, (1990), *Le contrat naturel*, p. 67, Éd. François Bourin, Paris.

27 “L'homme responsable calcule les conséquences de ses actes; il met en regard son action du moment... avec le long terme et l'entourage même lointain et l'environnement...” Gilles Curien

28 WEILL François-Xavier (mai 2008), *Salmonella typhi* et autres salmonelles., p. 27-28., PASTEUR Le Mag' N° 5.

29 COURVALIN Patrice (mai 2008), *La résistance des bactéries aux antibiotiques*, p. 8-10. & 15-18., PASTEUR Le Mag' N° 5.

30 GOBLER Ch. J. & al. (2011), *Niche of harmful alga Aureococcus anophagefferens revealed through ecogenomics*, doi: 10.1073/pnas.1016106108.

Not only pathogenic bacteria or their toxins, or poisons, or viruses, but also radioactive elements are flowing through food chains and are stored at the end of the chain into the final eater (figure 9). But, Man's **abuse** of chemicals like herbicides may result not only in the death of wild plant species, and domesticated ones, but also in the introduction in the matter flow of unusual³¹ amino-acids into proteins. And bacteria are particularly able to mutate to use them, but organisms can not! Bacteria are also particularly able **to avoid that advantages turn to disadvantages** and they **easily transform disadvantages into advantages**.³²

Locally, the "conservation of the diversity of the environment" is not only linked to the education of people³³ it must be a way of life.³⁴ Globally, only international organizations are able to preserve durably a collective common living heritage.³⁵ This is an investment that has a cost but further that can save money!

There is no need to talk about climatic³⁶ or technologic³⁷ **catastrophes**, "**of the usual nowadays life**", they just may **accelerate the process** of extinction of our species due to its own too much high degradation of its ecoexotope of survival. There is no need to argue about the rediscovering of the Life's laws of the Living Systems.³⁸ **Only 1 law is needed: "to survive that is to eat and not to be eaten"**.³⁹ A system cannot be understood through analysis locally, but through synthesis globally, looking at it as a wholeness within its ecoexotope of survival. In the case of the Living Systems we deal with messes of interrelated de-controlled dangers with huge unintended systemic actions and reactions.⁴⁰ There is no need to talk about processes of control, **finally, soon or late, there is only 1 rude process: "percolation"**. We must help the natural goods sources to save themselves face to dangers, in taking part both in their global conservation and local recycling.⁴¹ Locally, in its territory, everybody is an actor.⁴² Are the today crises, like the deforestation, the waters' and soils' pollutions or the large-scale accidents, either the consequences of a too proud science⁴³ or the consequences of a non-consideration of an inaccessible science to people, or of the non-consideration of a future outside its own generation? Trophic cascades can occur when the consumption of one species impacts the abundance and distribution of species at lower trophic levels. Such cascading effects have been documented across all the terrestrial and aquatic ecosystems, and often the top, or apex, consumers⁴⁴ (such as predators or large herbivores) have been lost due to human activity over the last several thousand years.

31 NEERATHILINGAM M. & J.L. MARKLEY (2010) *Auto-induction medium containing glyphosate for high level incorporation of unusual aromatic amino acids into proteins.*, p. 659-661, BioTechniques Vol. 49, N° 3.

32 The "**mutator**" phenomenon allows clones of asexually reproducing bacteria to evolve at different rates, enabling bacteria to escape selection pressure by antibiotics. After several hundred generations, clones of *Escherichia coli* that had initially showed low competitive fitness outcompeted initially more successful clones. **The apparent losers turned into winners**, not by increasing mutation rate and running off with the innovations, but because their competitors acquired mutations that, **while conferring superior fitness in the short term, in the longer term hindered their "evolvability."** In WOODS R. J. & al., (2011), *Second-Order Selection for Evolvability in a Large Escherichia coli Population.*, p. 1433-1436., Science Vol. 331, N° 6023.

33 BOYER P., (2011), *Le respect de la nature, une question d'éducation.*, p. 2-3., La Croix N° 38971.

34 CABON M., (2011), *Dans leur bois, les scouts redécouvrent savoir être et savoir-faire.*, p. 4., La Croix N° 38971.

35 BRAN M., (2011), *Une immense aire protégée naît le long du Danube. Le deuxième fleuve d'Europe va bénéficier de la coopération de cinq pays pour sauvegarder sa biodiversité.*, p. 4., Le Monde 15-16 mai 2011.

36 RENARD J.-D., (2011), *1976, 2011 : les deux printemps de la soif.*, p. 2., Sud Ouest Magazine 1er juin 2011.

RENARD J.-D., (2011), *Pas d'eau en 76, les gelées en 77.*, p. 2., Sud Ouest Magazine 1er juin 2011.

37 GOAR M., (17 mars 2011), *La centrale de Fukushima hors contrôle.*, p. 9., 20 minutes Edition France N° 2007.

38 HAINES S.G., (2011), *Life's Laws Rediscovered: The 12 Natural Laws of Living Systems*, p. 16-18, General Systems Bull. N° 40.

39 Nearly 4 million people **die of hunger** every year! 40 million people, **10X more, are eaten by infectious organisms** every year!

40 **"Effective managers do not solve problems. They dissolve messes."** Russell L. ACKOFF

41 Conseil Régional d'Aquitaine, (2011), *La forêt filière d'avenir.*, p. 1-7., L'Aquitaine N° 41.

42 17 juin 2010 Journée mondiale de la lutte contre la désertification, SOS sahel International, (nov. 2010), *Une stratégie pour enrayer les crises.*, 8 p., La lettre du SAHEL N° 113. *"On ne peut pas arrêter la sécheresse mais on doit en amoindrir les effets."*

43 More than 150 years ago Eugène HUZAR described In "La Fin du monde par la science." all the crises we are living today.

BOUDIA S., (janvier 2009), *Eugène Huzar. La Fin du monde par la science.* 150 p., p. 90., La Recherche N° 426.

44 ESTES J.A. & al., (15 July 2011), *Trophic Downgrading of Planet Earth.*, p. 301-306., Science Vol. 333, N° 6040.

Until recently, large apex consumers **were ubiquitous** across the earth and had been for millions of years.

The loss of these animals may be **humankind's most pervasive influence on nature**.

5. Only will survive the Associations for the Reciprocal and Mutual Sharing of Advantages and DisAdvantages (ARMSADA):

Societal and Economical Responsibility.

To eat you must each day have "a part of pie". But you can not eat the pie and have the pie! The size of the pie is limited (K) and the number of eaters (Q) is increasing. So the size of the mean of their individual part (q) is decreasing $qQ=K$. In living systems **we can not create virtual** organic matter and **the flow** of synthesis **is limited** (figures 3, 6 & 9). We can **just recycle**, to allow more and more eaters to survive the food of the ones must be the waste-products of other ones (figure 10).

The earth is limited!⁴⁵

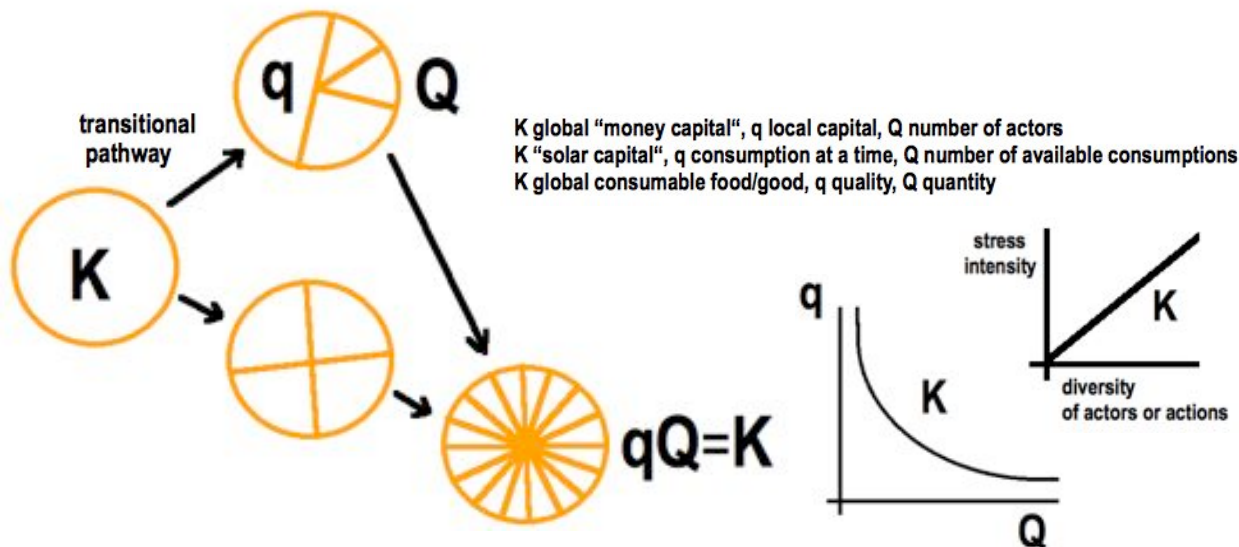


Figure 10. Variety/diversity and capital.⁴⁶

To eat you must each day have a local "pie". The size of the global pie is limited (K), so when the number of eaters (Q) is increasing, the size of the individual part (q) is decreasing: $qQ=K$. Living systems can not create virtual organic matter and the flow of their syntheses is limited. So they will recycle, to allow more and more eaters to survive: the food of the ones must be the waste-products of other ones. So will do economical organisations. Goods may be recycled to have more and more goods. But goods can not be created from nothing. Increasing food, goods or technology allows to increase the diversity of the actors and the creation of groupwares to resist to higher stress. But, they must not be virtual but real!

Living systems do that only through **the juxtaposition and embeddings**, of the metabolic chains at the molecular level, and the food chains at the ecosystems level. Ecology is the economy of the limitations⁴⁷ of Nature: **there no gains without costs, there are never advantages without disadvantages**. And the type of the gains is different when we jump from an emerging level of organisation of a living system to an other one compare to the kind of the gains actors can obtain when they shift/move within the organisational state of a level (figure 11). Maybe Economy must learn and practice in the same way ecology does (Table 1).

We can evaluate the advantages and disadvantages de la **"soumission de l'homme à la nature"**.⁴⁸

We know yet the consequences of poisoning Nature. To survive that is first to eat! All the poisons, soon or late, are coming into our plates.⁴⁹ And they concentrate into our bodies. "A child would understand that!"

45 March 22 : **World Water Day**. One-sixth of the human world population, **more than 1 billion people, does not have access to fresh healthy water, to drink or to cook**.

46 "Une société où l'on fait de la **quantité** (du chiffre, de la monnaie) est **addictive et destructrice**." : lire à l'envers les flèches ! A l'inverse, "Une société où l'on fait de la **qualité** (de la diversité) est **productrice** (de nouveautés) **et adaptative** face aux dangers." (comme l'indique le sens des flèches)

47 HAMANN J., (2008), *Sustainability in Farming - Food Production and Environment Protection*., p. 48-53, STIQE, Maribor.

48 DOCKÈS P., (mars 2002), *Quand les grenouilles demandent un roi*., p. 36-39., Sciences Humaines N°125.

"convention d'obéissance" : **"se soumettre faute de se démettre"**...

49 DOS SANTOS G., (30 juin 2011), *Ces poisons qui polluent nos assiettes*., p. 68-72., Le Point N° 2024.

Vers un nouveau contrat⁵⁰ sociétal et environnemental :

“une vision panallélotropique, une attitude holistique, panallélopathique et panalléloramique”^{51 52}.

In economy **the alleloramic attitude** consists in watching constantly that a correspondence becomes established between the micro- and the macro-economics, that they are looking and reflecting each other.

The progress of the knowledge and the techniques brings at once advantages and disadvantages.

It is necessary to go out of the religion of the market by bringing conceptual, ethical and psychological limits on the merchandising of the world⁵³ :

- **the consciousness of limitations and the measure of the limits must impose temperance** (figure 10),
- we need to impose the behaviour to prevent and to forecast. **To be cautious** means ordering the purposes and means, **weighing and distributing reciprocally and mutually** the advantages and disadvantages
- the justice is first equity: “a place for each one and each one on its place”, “on each one the owed according to its needs and its role (figures 6 & 11),
- thus the force of mankind is in the courage necessary for the implementation of this program, with the perseverance, the endurance and the enthusiasm that are necessary to have an influence on our self.

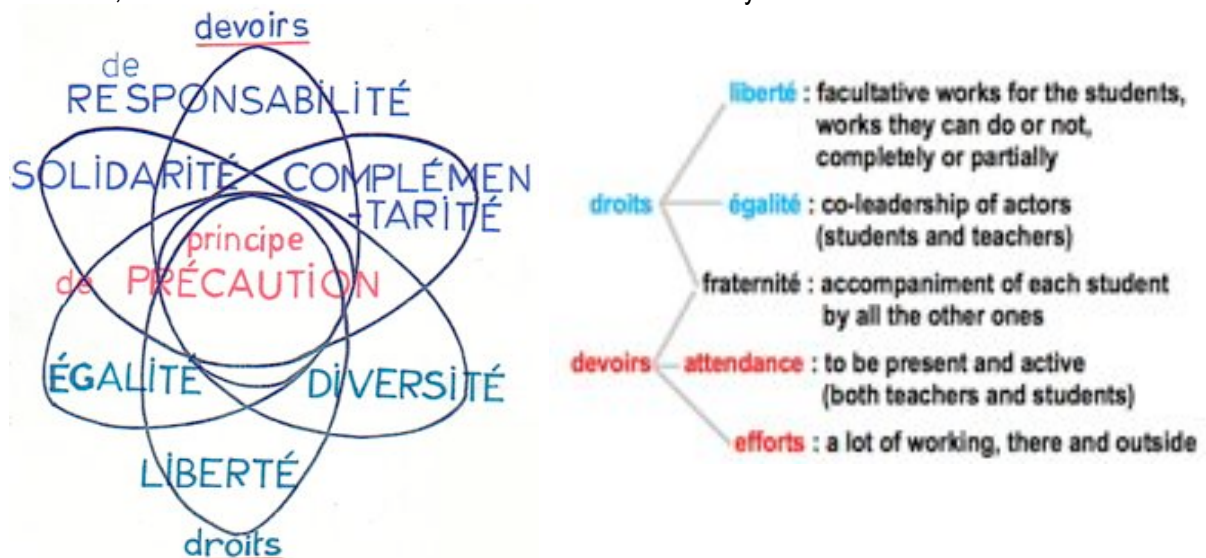


Table 1. Man ab-use of technology: never advantages without disadvantages, never free without duties.

De même qu'il n'y a pas d'avantages sans inconvénients, **il n'y a pas de droits sans devoirs.**

Aux droits de liberté, égalité et diversité sont associés les devoirs de responsabilité, solidarité et complémentarité.

Le principe de précaution résulte de leurs respects, provient de leur mise en oeuvre et permet leur mise en oeuvre.

“L'homme est le remède de l'homme.” (proverbe sénégalais).

“Nous pouvons tout changer mais rien ne peut nous obliger à le faire...”⁵⁴

50 ... la passation d'un contrat naturel de symbiose et de réciprocité...

où la connaissance ne supposerait plus la propriété,.. ni la maîtrise

SERRES Michel, (1990), *Le contrat naturel*, p. 67, Éd. François Bourin, Paris.

51 Du grec, **allellos** : l'un et l'autre, **pan** : tout, **path** : aller, conduire, **horama** : vision (globalement) , **trop** : tendance

panallélopathique : se mettre à la place de l'autre, la survie de l'un passe par celle de l'autre et réciproquement

panallélotropique : conformer son action à celle de l'autre et réciproquement,

“pour que l'un survive il faut d'abord que l'autre survive et se survive”.

52 “alléloramique”, du grec : **allellos** l'un l'autre, et, **horama** vision,

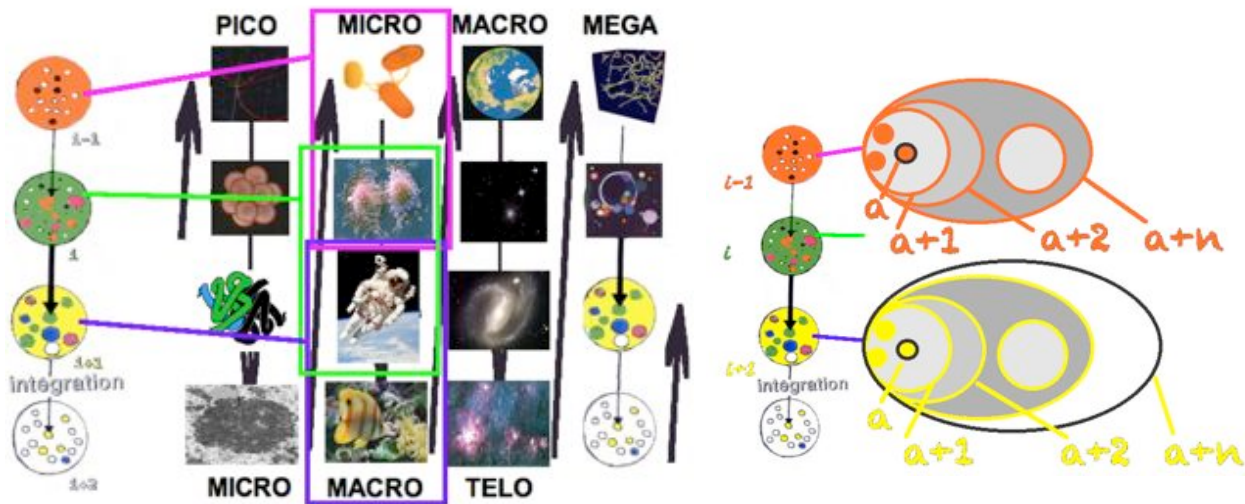
en chimie sont dits “allélotropes” les corps qui prennent la forme l'un de l'autre

CURIEN Gilles, (mars 1991), *Quid d'une économie alléloramique ?*, p.80-86., La revue d'Ethique et de Théologie Morale (Cerf, Paris), Le Supplément N° 176.

53 BENKIRANE R., (janvier 2009), *Sortir de la religion du marché*, p. 96., La Recherche N° 426.

54 **“Le changement doit être volontaire et non pas imposé.”** Buddha, **“Vivre c'est souffrir” (et mourir)**. Le bouddhisme affirme la permanence de la douleur humaine. La souffrance résulte du désir. Le renoncement est le seul moyen de s'en affranchir. Le Jânisme (de Jânina, ou Mahavira ou Vardhamana, contemporain de Buddha) exige le respect de tous les êtres vivants.

The unanticipated impacts of trophic cascades on processes as diverse as the dynamics of diseases (figure 3), carbon sequestration (figure 6), invasive species, and biogeochemical cycles (figure 9) emphasize the urgent need for interdisciplinary systemic and cybernetic researches to forecast the effects of trophic and economic downgrading on process, function, and resilience in global ecosystems (figure 8) and the societies (figure 10) of the Man's species (figure 11).



11a. The levels of organization and the location of Man's species.

11b. Convergent hierarchical sub-levels.

Figure 11. Man's species' place and Mankind's related societal/economical organizations

"L'homme raisonnable s'adapte au monde, l'homme déraisonnable s'obstine à essayer d'adapter le monde à lui-même.

Tout progrès dépend donc de l'homme déraisonnable". George Bernard SHAW

11a. **Living steps levels of organization.** $i-1$, i , $i+1$, $i+2$: - jumping (pink frame) from the level of the Monera species (orange, $i-1$) to the level of Cells species (green, i), - jumping (pale green frame) from the level of Cells species to that of MetaCell Organisms (yellow, $i+1$) species (like Man species), from MICROscopic scale to MACROscopic scale, - jumping (violet frame) from "Organisms" species to "ecosystems" species (white, $i+2$).

11b. **Societal organisational states of encasing within a level of organization:** a , $a+1$, ..., $a+n$. Each species of a **level of organisation**, $i-1$, i or $i+1$..., can produce groupwares $a+1$ of individuals a and "groupwares of groupwares" $a+2$ (adaptations) and so on... $a+n$, but they are not living steps levels. They are convergent forms of responses of the endophysiotoxes to similar constrains of the ecoexotoxes and n is depending of both the level of organization and the strength of the constrains. **New Living systems** emerge only from groupwares of different species a , b , c , d , ... whatever their, different or not, level of organizations. With the domestication of living species, Man species has evolved (exaptation) in a new state of integration in the earth biosphere.

A unification of the pico-, micro-, macro-, telo- and mega- modelling ($i-1$, i , $i+1$, $i+2$) within a single model, like that of the growth (Bricage, 2009 [3]) would give new insights into **the social dynamics involved in each case of the table** (figure 4c). For example, **the ontological theory developed by Bohm**, a kind of algebra that was originally designed to describe thought and consciousness, but which has also proven valuable for understanding the social dynamics of financial systems. Bohm's scheme, like in percolation (figure 5) is one of **participation rather than of interaction** (figure 7). **In a set of individuals constituting a population, every individual participates in every other individual's existence and actions** (figures 2 & 6); that is, **the totality is present implicitly in every individual, and every individual makes a mark on the totality** (figure 9, table 1). Bohm⁵⁵ refers to this **holistic concept** (figure 1) as the implicate order. **The concept of wholeness makes it impossible for primary laws to be summarized in a simple set of statements, since every aspect of reality enfolds all other aspects of it in the implicate order.** In contrast, the explicate order, which current laws of all natural sciences are based upon, refers to the apparent reality of things (figure 10).

Education is the key actor of the integration of humankind into its ecoexotope of survival, the earth. But, it must not be uniform (linked to a dominant society!) and with only one language (English!).⁵⁶ Because

55 ALMBERG W.-S. & M. BOMAN, (2010), *An Ontological Quantum Mechanics Model of Influenza.*, p. 42-43. ERCIM NEWS N° 82.

56 GAL R. & J. VIAL (1983) *Histoire de l'éducation.*, 128 p., Que sais-je ? Presses Universitaires de France, Paris, N° 310.

Sinon on court "le risque d'une hérédité des fonctions sociales au niveau mondial" !

diversity is the key word to ensure globally an effective conservation of all our natural, cultural, educational and historical heritages!⁵⁷ Only diversity allows the society **to be resilient!** To make new ARMSADA you need **a sufficient minimal pre-requisite variety first! But within limits** (figures 6 & 12). The capacity of resiliency is **operating at the Limits**, it resides through regulations **within limits and between limitations**.

Control theory provides a mathematical basis for engineering the dynamic behaviour of a system by using feedbacks. The system's design, like in the glycolytic one (to survive that is first to eat!), is constrained by trade-offs between making the system efficient and robust while minimizing output errors.⁵⁸ Both engineering and evolution are **constrained by trade-offs between efficiency and robustness**, with oscillations as an inevitable side effect (figure 6b). This hard trade-off "law" is universal, in that it depends minimally on the details of the system (figure 1) and generalizes to the robust efficiency of any auto-catalytic and auto-poietic network, with **only one law**: "to survive that is to eat and not to be eaten" and with **only one process**: "percolation".⁵⁹

Conclusion

"I cannot count to one. I know not the first letter of the alphabet."

***In this state of luminous ignorance, we catch a glimpse of who we really are:
mere passengers, guests of nature for a short time.***

Henry D. Thoreau (The wilderness)

The respect of human rights is necessary everywhere locally. But this is less important than the respect of environmental rights at a global scale (Table 1). For the one (humankind) to survive, the other ones must survive first, not only the domesticated species but also the wild ones. That must be taken into account in organizational management of the earth. Of course, fair business practices, with the respect of the truth about the quality of the products and the transparency of the processes are requirements for the producers and the customers. The involvement in the development of communities needs first an holistic sensibility of the real common local place of man's species in the global "economy" of Nature.⁶⁰

There are always humans behind decisions and actions. Politics must pay attention to developing human capacity as a key leverage for a "nature sustainable and sustained" economic, social, and ecological development. Balancing agricultural production economics and biodiversity, Social Responsibility goes far wider than the business world, it includes all managers and decision makers from all ways of our life (environmental, sustainability, poverty alleviation, agriculture, health systems, governance, education).⁶¹

Sinon on court "le risque d'une société statique, uniformisatrice, avec une éducation dédaignant les qualités d'originalité, d'initiative, de liberté, de solidarité et d'invention."

La diversité, facteur de résilience, émerge de la diversité ancienne. On ne peut créer de diversité, physique et psychique, sans diversité, physique et psychique, pré-existante ! (loi systémique constructale)

57 **Comment se préparer à vivre dans un monde mobile en étant immobile ?**

Comment se préparer à vivre dans un monde changeant sans diversité de choix ?

LÉON A. (1986) *Histoire de l'enseignement en France.*, 128 p., Que sais-je ? Presses Universitaires de France, Paris, N° 393.

58 Glycolysis is a metabolic pathway that consumes glucose to generate adenosine triphosphate (ATP) with two key enzymes that are feedback-inhibited by ATP. Under certain conditions, glycolytic intermediates in yeast oscillate between limits. **The oscillations are a consequence of operating at the hard limits of maximizing robustness while minimizing complexity.** CHANDRA A. F. & al., (8 July 2011), *Glycolytic Oscillations and Limits on Robust Efficiency.*, p. 187-192., Science, Vol. 333, N° 6039.

59 La percolation se définit **uniquement qualitativement** : "La Nature a horreur des places vides !" **Dès qu'une place** (un écoexotopie) **est vacante** (libérée ou créée), **elle est immédiatement** (tôt ou tard, selon le temps de latence de l'interaction entre capacité d'accueil de la place et capacité d'y être accueilli des endophysiotopes occupants potentiels) **occupée**. Par analogie avec les réseaux de neurones, **quantitativement** différentes règles de percolation sont possibles au sein d'un système de systèmes : en termes d'interaction entre systèmes partenaires, ou de ressemblance des systèmes partenaires, ou en termes de contingence.

60 **"Tôt ou tard un changement est nécessaire. Si nous ne sommes pas capable de nous l'imposer, volontairement, à temps, il nous sera imposé d'autant plus rudement par les circonstances qu'il sera plus tardif."**

61 BRICAGE P., (2002), *Only sustainable development can ensure both care of the environment and intra-generational equity.*, 1 p., **Global Ethics for a Humane World**, 2.5. Environmental care, intra-generational equity, inter-generational justice, good governance



Figure 12. Alleviation of Man species: depending on societal context?

De même qu'il n'y a pas d'avantages sans inconvénients, **il n'y a pas de droits sans devoirs** (table 1).

Aux droits de liberté, égalité et diversité sont associés les devoirs de responsabilité, solidarité et complémentarité.

Le principe de précaution résulte de leurs respects, il provient de leur mise en oeuvre et permet leur mise en oeuvre.

**We need to provide an "education towards a holistic behaviour"⁶² everywhere⁶³,
an education network to bridge the gap between scientists, teachers and everybody
and to seed the future.
"Turbulent" times...**

Man is only one of a lot of local actors into a global living organism into which **he is hosted**.

But he is also a global organism of survival for a lot of local actors **he is hosting** (table 1).

Agricultural systems that are taking into account the functioning of Wild systems⁶⁴, without struggle, are more effective in their durability: **durability though duality and participation**. The modelling of the functioning of agrosystems⁶⁵ is first an interdisciplinary holistic way of the local management⁶⁶ of the present global biodiversity⁶⁷ at the light of its past history.

The growth (augmentation in mass and number) and the development (acquisition of new capabilities) in the domain of Information and Communication Technologies are at the origin of, and have emerged from, **origin mutually reinforcing innovations**.⁶⁸

We are not able to predict what may arise and when, we only know why it could but not what it could be. For example, flows undergo a sudden transition from laminar **to turbulent motion as the velocity increases**, and the onset of turbulence radically changes transport efficiency and mixing properties.⁶⁹

leading to solidarity and equity., <http://fsw.kub.nl/globus/conference>

62 « Je distingue deux moyens de cultiver les sciences : l'un d'augmenter la masse des connaissances par des découvertes, l'autre **de rapprocher les découvertes et de les ordonner entre elles afin que plus d'hommes soient éclairés** et que chacun participe selon sa portée à la lumière de son siècle. » Denis DIDEROT

63 BRICAGE P., (2001), *A new evolutionary paradigm: the Associations for the Mutual Sharing of Advantages and of Disadvantages*, 1p., *The creation of a sustainable society depends on Innovative Systems Thinking*. 100th Anniversary of Karl Ludwig von Bertalanffy's International Conference on Systems Thinking "Unity through Diversity", Vienna.

64 ALARD V. & al. (2002) *A la recherche d'une agriculture durable*, 346 p., INRA Editions, Paris.

65 MALÉZIEUX E. & al. (2001) *Modélisation des agroécosystèmes et aide à la décision*, 448 p., INRA-CIRAD Paris.

66 MOITY-MAÏZI P. & al. (2001) *Systèmes agroalimentaires localisés*, 216 p., INRA Editions, Paris.

67 LE PERCHEC S. & al. (2001) *Agriculture et biodiversité des plantes*, 170 p., Dossiers de l'Environnement N° 21.

68 CHROUST G. (2008) *Mutually reinforcing innovations in ICT, business and Society*, p. 19-26, STIQE, Maribor.

69 In 1883, Reynolds described **the key factors that influence the transition** of a flowing fluid from a smooth, laminar flow to a

By analogy, maybe life's flows undergo a **sudden transition from adaptation to exaptation**, and ARMSADA emerging (figure 7), when "the ratio" of the hosting capacity of the ecoexotope and the capacity to be hosted of the endophysiotope (figure 8) undergoes a critical value (figure 10).

In contrast to the classical view that turbulence/emergence arises from an increase in the temporal complexity (of fluid motion), spatial proliferation of chaotic domains is the decisive process (of percolation) and intrinsic to the nature (of fluid) turbulence, that is ultimately responsible for sustaining turbulence/emergence.

Nnaemeka Ikegwuonu, a Nigerian businessman, has set up a **radio broadcasting service** to farmers in the southeastern region of his country, **providing information in their own language** on agricultural management, watering techniques and the price of commodities and foodstuffs, plus **an educative program** on climate changes. Farmers can send messages to the radio via portable solar equipment. Financed by selling air time to organisations and farmers, the radio is currently reaching 250,000 listeners. *Ikegwuonu* won a 2010 Rolex Prize and hopes the money will enable him **to increase listenership to 10 X more people**.

Yasuni National Park in Ecuador, **the world's most diverse biosphere**, sits atop an estimated 850 million barrels of crude oil -20 percent of the nation's reserves-. *President Rafael Correa* offered to renounce drilling in the 100,000 hectare area to protect the biosphere, home to thousands of species and to indigenous peoples -a decision that would keep 410 million metric tons of CO₂ from entering the atmosphere-. Ecuador is asking, in exchange, the international community to pay half the revenues that the oil would be expected to generate -or about 350 million USD a year over a period of 10 years-. The funds would be deposited into a blocked account managed by *the U.N.D.P.* and the interest earned would **help maintain Yasuni**.

The university system, based on research and technological assessments, has won in terms of technological applications and in money-making, **BUT it has failed in terms of ethical value and education**. Knowledge and technology have succeeded (won) but only for some people, not for all. Education has failed (lost) and humankind is failing (losing) in **its integration** into the earth organism.

That is not the earth that is endangered but man species.

What we do need to do is not to make better researchers and money-makers (through the take-make-waste processes) -or better speakers or thinkers- **BUT first we need TEACHERS**. More than 1 century ago, the French "Lumières" gave rise to the "hussards noirs de la République" in France (in some similar manner as nowadays the Chinese "thinkers" have given rise to the "bare feet physicians" in Africa). Everywhere, a lot of "motivated" people (in French: the "*instituteurs*") had been able to transfer knowledge for every one in every social condition. Nowadays everybody in France knows "reading and writing". We need to create new "*green soldiers of the Earth*" so as to that every people in the World can read and write about how **our organism -the earth- is functioning (with or without us)**. And that **"there are never advantages without disadvantages"**. And that **"everyone is both a winner and a loser"**, depending on the space in which he is, and the time "of functioning" he is in. FIRST, we do not need better researchers BUT new teachers and a new mode of thinking and new applicators in systems science, *in an epistemo-praxeological view and manner*.

We do need **teachers for everybody, at every level and everywhere**, to claim what earth -and solar system and so more else, in an upwards scaling view- is, and what earth -and cell system and so more else, in a downwards scaling view- also is (figures 4, 6, 7, 9, 10, 11), why and how, **"a system is always more and less than the sum of its parts"**, why and how every system is an ARMSADA, and that we are only a tiny (but maybe useful) part. **We need the "instituteurs" of our limited native world, to tell everybody:**

"We can make the world without You, but it will be better IF we could do it with You."

choppy, chaotic, turbulent flow.

The Reynolds number (Re), the ratio of inertial forces to viscous forces is used to predict the change in flow behaviour at a critical value for a specific flow geometry. At low Re, a puff eventually decayed, while at high Re, a puff split into two by absorbing energy from the flowing liquid.

Finding the point where the lifetime of a single puff reached a maximum allowed the minimum Re required to sustain turbulent flow to be determined. Turbulence that is transient at low Reynolds numbers becomes **sustained at a distinct critical point**.

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[9] "Le Tout est à la fois plus et moins que la somme de ses parties.", dans certaines limites.

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[11] figures & complementary data : <http://www.armsada.eu/files/pbManSERqash.pdf>

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ANNEXES : BACK TO BASICS.

[A] Tout était dit il y a 30 ans ! Mais rien n'a été fait pour en tenir compte... ou

De **combien de fois la durée d'une génération** est le **temps de latence** de la **réponse adaptative** des sociétés humaines pour **éviter la trop grande perte de la "variété requise"** nécessaire à leurs survies ?

"Jetez dans les champs un herbicide sorti de l'imagination des chimistes et nouvellement synthétisé, un produit jamais vu dans la nature. Bientôt on verra croître des bactéries qui non seulement ne se laissent pas empoisonner par l'herbicide, mais en consomment avec autant de plaisir que si c'était du sucre." [A](1) (figure 3)

Comme avec l'écosystème forestier (figure 6) - de niveau **i+2** -, au niveau moléculaire - niveau **i-1** -, dans l'écosystème cellulaire -niveau **i** - (figure 11), c'est toujours le maintien d'une diversité minimale entre les "belligérants" (figure 7) qui permet la survie commune, sans atteindre l'excès dévastateur dû à la surabondance d'une forme de vie ou d'une forme d'agression (figure 3):

« ni trop, ni trop peu ! »

L'évolution acquisitive est la conséquence de la diversité et réciproquement elle en est la cause (Loi systémique constructale : figure 1). Au niveau moléculaire elle est à l'origine du code génétique, universel, et des défenses moléculaires, spécifiques, et infinies... [A](1)

Ces changements moléculaires (niveau moléculaire) sont à l'origine de formes de vie nouvelles (endophysiotoypes nouveaux), organismes nouveaux (niveau) avec une nouvelle capacité d'être accueilli, qui sont à l'origine d'écosystèmes nouveaux (niveau) donc d'une biosphère nouvelle (niveau) [A](2). Réciproquement, et inversement, cette biosphère nouvelle, nouvel écoexotopie de survie, avec une nouvelle capacité d'accueil, est à l'origine de nouveaux endophysiotoypes qui développent de nouvelles capacités «s d'être accueilli et modifient (directement ou indirectement), par percolation (figure 5), les anciennes capacités d'accueil de tous les écoexotopes de survie.

C'est la **diversité qualitative**, et non quantitative, de la constitution génétique d'une population qui permet sa survie à long terme. **L'adaptabilité est la conséquence de cette diversité** et l'adaptation peut la modifier quantitativement, permettant, éventuellement, une évolution acquisitive, voire une exaptation vers une autre diversité. Ceci dépend de la taille de la population (aspect quantitatif), de la nature des variations, continues ou discontinues (aspect qualitatif), de la nature des éléments soumis à variation (caractères qualitatifs ou quantitatifs, à seuil ou corrélatifs) et du type d'appareillement. [A](3)

Le polymorphisme, inné (héréditaire, génétique) ou acquis (phénotypique) de l'endophysiotope, est présent à tous les niveaux d'organisation du vivant. [A](4) La fragmentation et la ré-association de populations, "ni trop nombreuses, ni trop peu nombreuses", et d'effectifs suffisants "individus ni trop nombreux, ni trop peu nombreux", permet la disparition minimale et la conservation maximale de la diversité, et l'enrichissement qualitatif avec l'apparition de nouveaux polymorphismes, à tous les niveaux d'organisation (**i-n, ..., i, i+1, ..., i+n**) du vivant (figures 4 et 11) [A](5).

[A](1) NINIO J., (1979), *Approches moléculaires de l'Évolution*. Masson Éditions, Paris, New York, Barcelone, Milan, 131 p.

[A](2) GRASSÉ P.-P., (1978), *Biologie moléculaire. Mutagenèse et évolution*. Masson Éditions, Paris, New York, Barcelone, Milan, 128 p.

[A](3) BOELLE H. & al., -traducteurs- (1974), *Introduction à la Génétique Quantitative.*, de D.S. FALCONER (1972), Masson Éditions, Paris, France, 284 p.

[A](4) GUY Y., -traducteur- (1972), *Génétique Écologique.*, de E.B. FORD (1971), Gauthier-Villars Éditions, Paris, France, 448 p.

[A](5) GUY Y., -traducteur- (1974), *Populations, espèces et évolution.*, de E. MAYR (1969), Hermann Éditeur, Paris, France, 496 p.

**[B] ÉMERGENCE : le TOUT est à la fois PLUS ET MOINS que la somme de ses PARTIES.
L'exemple des religions.**

"C'est la **représentation que sa société lui transmet de sa propre nature et de sa place dans l'univers** qui conditionne le développement de l'homme et la qualité de son humanité... Contrairement à Descartes..., Toutes les traditions spirituelles distinguent l'âme, ou psychisme (la psyché des Grecs), de l'Esprit. Et **toutes la situent à la charnière** du corps et de l'esprit... ", "Les Égyptiens distinguaient l'esprit ou ka, partie divine non périssable de l'homme, l'âme ou ba, sa conscience individuelle, et le corps.⁷¹ De même, pour les anciens Celtes, l'homme était **composé de trois corps** : le corps physique, le corps animique, et le corps spirituel.⁷² "Quant aux grecs, ils considéraient **trois niveaux dans l'homme** : le corps ou soma, l'âme ou psyché, et l'Esprit ou Noûs.⁷³ **[B](1)**.

Dès l'origine, il y a 2 façons de concevoir le monde. La matière du monde pré-existe au monde : **conceptions ex deo**. La création est comparable à la création humaine, elle se fait à partir de quelque chose, une matière pré-existante. Cette tendance est très marquée dans les religions indo-européennes. Dans les **conceptions ex nihilo**, c'est le néant, l'impensable, le rien qui pré-existe au monde. Seul Dieu est incréé et entièrement **libre de l'espace et du temps**. C'est la tendance propre aux monothéismes (mazdéisme, judaïsme, christianisme, islam) **[B](1)**.

Peut-il être à la fois l'un et l'autre et ni l'un ni l'autre ? Simultanément ? Alternativement ? Périodiquement ?

"Le jour et la nuit, l'été et l'hiver, la vie et la mort, ne sont pas vus comme des opposés mais **inclus dans un système d'alternance et de continuité**", dans l'univers métaphorique des Indiens hopis **[B](2)** : **interaction** (et éventuellement destruction) **est construction, et, construction est interactions**⁷⁴ (et éventuellement destruction, ou dé-construction). La mort permet la naissance et réciproquement.

[B](1) CONSOLO I., (2006), "ex deo / ex nihilo" *Les deux grandes conceptions du monde.*, *L'homme et le sacré* N° 7, p. 40-45.

[B](2) CAYOL M., (2006), *L'univers sacré des Indiens hopis.*, *L'homme et le sacré* N° 7, p. 46-47.

[B](3) Collectif, (2006), *L'origine des religions*. Sciences Humaines, Les Grands Dossiers N° 5,

71 "La distance qui sépare le corps et l'âme est aussi grande que celle qui sépare l'âme de l'esprit.", "Qu'elles existent **hors du champ expérimentable** par le binôme âme-corps, n'empêche pas les réalités spirituelles d'être des réalités.", "Combien de temps, l'Homme occidental, consacre-t-il à son corps : manger, dormir, être actif physiquement ? Combien de temps à son âme : lire, parler, discuter, écouter ? Et combien de temps à son esprit : prier, méditer, contempler ?". **[B](1)**
Quelle est la vocation de l'Homme ?

72 "Par son corps qu'il perçoit, grâce à ses sens corporels, comme **une forme limitée séparant** l'intérieur (l'endophysiotope) de l'extérieur de lui (l'écoexotope), l'Homme est **ouvert** sur le monde et la matière dont son corps dépend pour vivre..., Par son âme, ou psychisme, soit l'ensemble de ses facultés cognitives (intelligence, imagination, mémoire...), affectives (sentiments, émotions, humeurs...) et instinctives (pulsions, besoins, tendances), l'Homme est ouvert aux autres hommes. Et par son Esprit, il est ouvert à Dieu." **[B](1)**

73 Platon comparait les hommes non éveillés à l'Esprit à des êtres ne voyant du réel que leurs ombres projetées sur le mur de la caverne où ils étaient enchaînés.

74 **Loi systémique constructale**