

# The Evolutionary “Shuttle” of the Living Systems

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## Abstract

7 functional capacities allow every living system "to eat and not to be eaten", "to preserve its life (to survive), and to reproduce its life's form (to survive itself)." They are built-in through the alliance of 3 heritages, genetic, epigenetic and environmental. The epigenetic heritage is all at once, a bumper, a shutter and a breaker. It functions as “a shuttle” that allows the breakage between adjacent levels of organisation or integration, which allows “to be a guest and to be a host” of the inherited environment. The only species that may survive are those that are able to increase their degree of integration, in their ecoexotope, but not through the increase of the carrying capacity of their hosting environment, but, through the creation of “Associations for the Mutual Sharing of Advantages and of Disadvantages”, which increases the capacity of to be welcome by the biological environment.

## Keywords:

evolution, system, systemic; breakage, carrying capacity, heritage; environment, epigenetic, genetic.

## Introduction

Each living system is the guest of a host environment [Bricage (2000A)], its EcoExoTope [Bricage (2002B)]. Integrated into food chains, he is a parcenter in indivision with all the other living forms. In order to survive he must first “to eat“. Then, if he may “not to be eaten“ [Bricage (1991A, 1998)], and if its EndoPhysioTope [Bricage (2002B)] can grow in mass, he must “to survive itself”, to generate an offspring (and eventually to grow in number).

## 1. The 7 mutual capacities of the living systems

In order to survive, each system (bacteria, cells or man) inherits, from one generation to the other, the capacities of self-productivity (mobilisation of matter and energy), self-movement, and self-growth. It owns an inborn self-reactivity (specific reactivity in response to stimulations), an inborn self-organisation (structure into the space and regulation through the time). It is marked by its unique mode of self-integration to its environment of survival (its ecological occupation). And, it survives itself through self-reproduction. [Bricage (2001A)]

Each capacity  $C_j$ , with  $1 \leq j \leq 7$ , is all at once the result and the origin of the other ones and of itself

$C_j = \Phi(C_j, C_k, C_l, C_m, C_n, C_p, C_q)$  with  $1 \leq j, k, l, m, n, p, q \leq 7$  and  $j \neq k \neq l \neq m \neq n \neq p \neq q$ , and simultaneously the capacities, mutually, modulate reciprocally their expression (Figure 1).

$$\begin{aligned} & \text{(with } 1 \leq j \leq 7) \ C_j \rightarrow \rightarrow \rightarrow C_j \text{ (with } 1 \leq j \leq 7) \\ & \qquad \qquad \qquad C_j \uparrow \text{ (with } 1 \leq j \leq 7) \end{aligned}$$

## 2. The 3 interdependent heritages of the offspring

Each new generation (figure 2) inherits an environment, which has been transformed through the previous survival of the parental generation. This environmental heritage, **He**, is the result of a history. Its carrying capacity allows “eating“.

Many different versions exist, each “carrying” advantages and disadvantages. Each new generation inherits a genetic package **Hg** that has been “modified” during the parents survival. This genetic heritage allows, eventually, to “not to be eaten“. It is the result of a history. Many different versions exist, each “carrying” advantages and disadvantages. Each new generation inherits an epigenetic heritage, which has been modified through inputs and outputs of matter and energy, during the previous survival of the parental generation. This heritage, **Heg**, is both the cause and the result of the evolution of the system. It is both the cause and the result of the integration into the environment. It is both the cause and the result of the organisation into the space and through the time. It is also the result of a history. Many different versions exist, each “carrying” advantages and disadvantages.

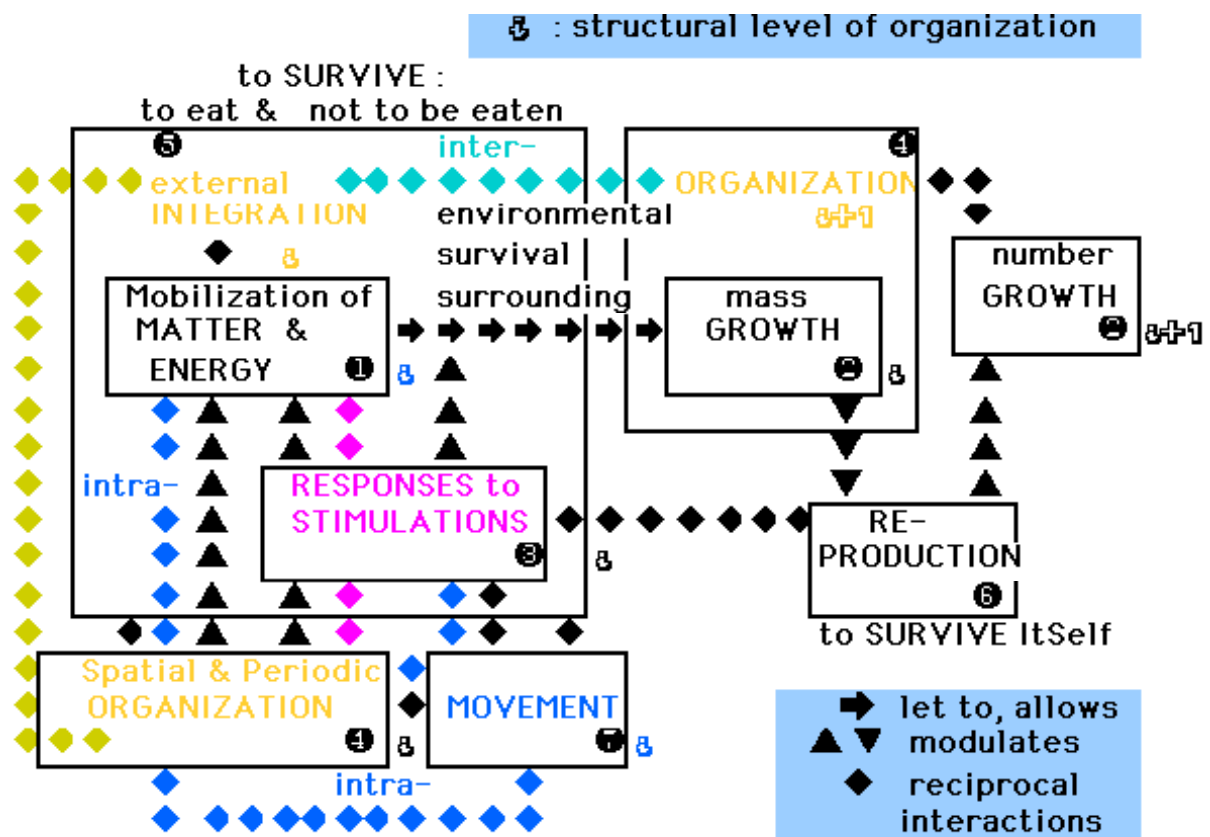


Figure 1. The 7 mutual capacities of every earth living system.  
Emergence of organisation and integration

### 3. The 3 evolutionary roles of the epigenetic heritage

The epigenetic heritage is all at once “the driver” of the possible changes, “the guard” of the necessary no-changes, and “the shuttle” between the adjacent “no-changed” and “changed” steps of organisation or integration of the successive life’s forms, because it is all at once:

-1 a bumper, which absorbs the ecological and physiological shocks and protects from damages the genetic heritage and itself [Bricage (2000B)],

-2 a shutter, which screens the flows of matter, energy and information, from the ecoexotope (the space-time of survival) into the endophysiotope (the space-time of growth and genesis), and inversely

-3 a breaker, which breaks even the advantages and disadvantages to maintain a durable and robust homeostasis (in order “to save” the organisation), or inversely, which disrupts the structures or the flows “to permit” a salt towards a new homeostatic stage [Bricage (2002B)].

The metamorphosis of the epigenetic heritage breaks up to new modes of organisation or integration. Step by step, through the space **x** and through the time **t** (Figure 3), **Heg** acts as “the medium” between **He** and **Hg**.

During the evolution run, the many quantitative and qualitative “avatars“ of the 7 capacities,  $C_j(x,t)=f(Hg,Heg,He)$ , are “the motors” for the emergence of new species, more complex, and more increasingly independent of their ecoexotope, but also increasingly more fragile in facing the dangers. And the only ones that survived were those that increased their stage of integration into their ecoexotope. But they did that not through the increase of the carrying capacity of welcome of the environment, but through their capacity of to be welcome (both to be a guest and a host) by the biological “lodging and lodger” part of **He**. Why ? How ? Through **Heg** ?

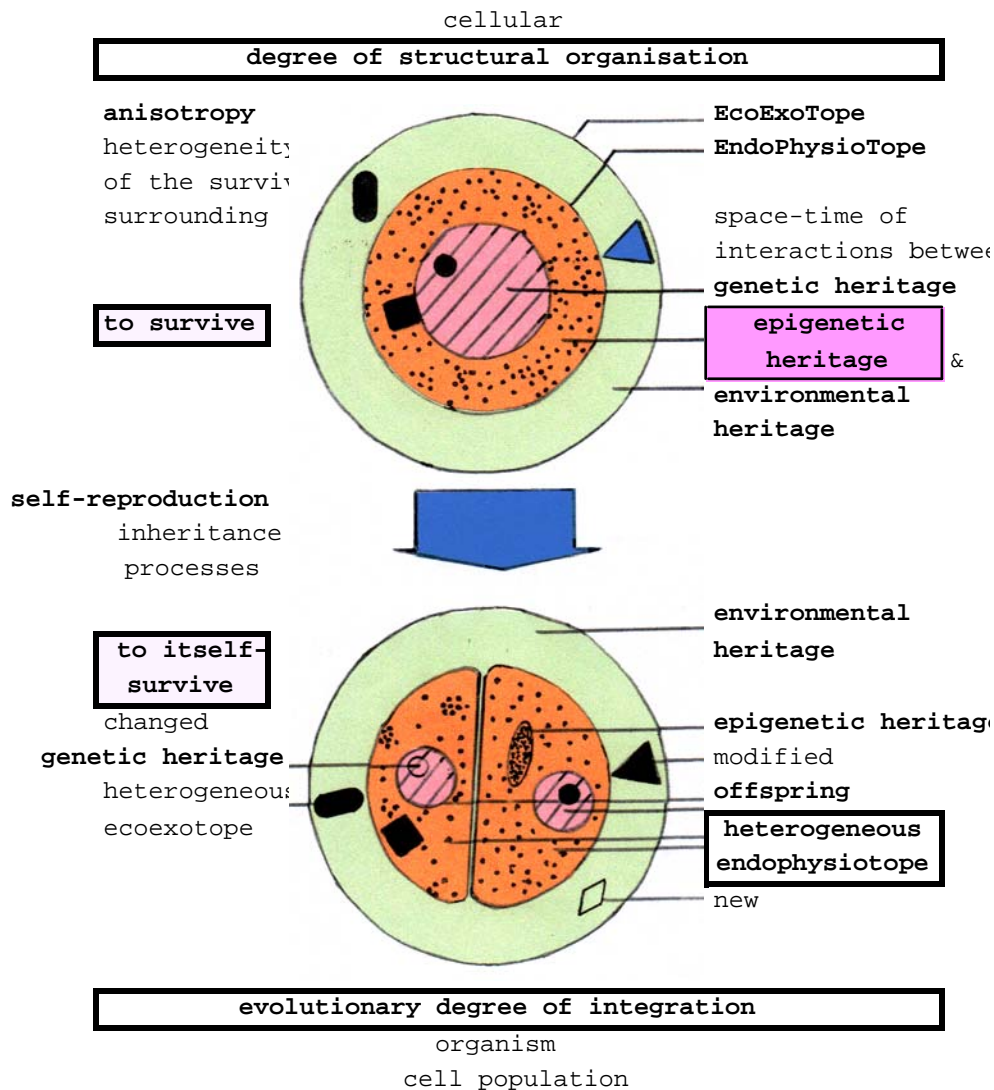


Figure 2. The inheritance of the 3 types of heritages.

**4. Associations for the Mutual Sharing of Advantages and DisAdvantages AMSADA are steady states, for the maintain of organisation levels, and origins, for the foundation of new modes of integration, because they are able to save, and to extend, biodiversity**

The survival of a lichen, a whole with 2 partners (occasionally 3), depends on a steady state for the sharing of advantages and of disadvantages: the benefits for the host are the damages for the guest and reciprocally. The symbiosis is an association for the mutual sharing of profits and losses but not an association "for mutual benefits" ! Together the partners survive in environments where the surviving for each is impossible. But, the mutual survival depends on reciprocal limitations.

Each partner will survive only if the other(s) survive(s) first ! [Bricage (1998)]  
 The growth of each is limited by the growth of the other(s) [Bricage (2000B)].  
 That sort of long-term partnership of "unity through diversity" for the mutual sharing of profits and injuries, the symbiosis, has been allowing the survival of the organisms for billions of years.  
 For supporting the environment changes, they have joined together into wholenesses, which have allowed the increase of the carrying capacity of the ecoexotope, because it is their host only through the increase of their capacities, through the metamorphosis of **Heg**, to be the guests of it.  
 The development is not durable, if it is not sustainable for the environment. The organism's survival is durable if it is sustainable for the environment, namely if it does not impair the durable survivals of the other organisms that share the same environment. Through the time **t**, the parental generation's **Heg** is the offspring's **He**. Through the space **x**, the **Heg** of the **i+1** step of organisation is the lodger and the lodging, the **He**, of the previous adjacent **i** step of integration (Figures 1, 2, 3).  
 "To convert the disadvantages into advantages." and "To prevent the conversion of the advantages into disadvantages." such is the natural survival's rule [Bricage (1998)]. In order to achieve that, in terms of information, **Hg** is the **ROM** (the Read Only Memory, the support of the previous ratified interactions between **Hg**, **He** and **Heg**, recorded through **Heg**), and **Heg** is the **RAM** (the Random Access Memory). But, all at once, **He**, **Hg** and **Heg** are sources of inputs. In terms of computing, **Hg** is the software, and **Heg** is the hardware that manages the inputs and the outputs.

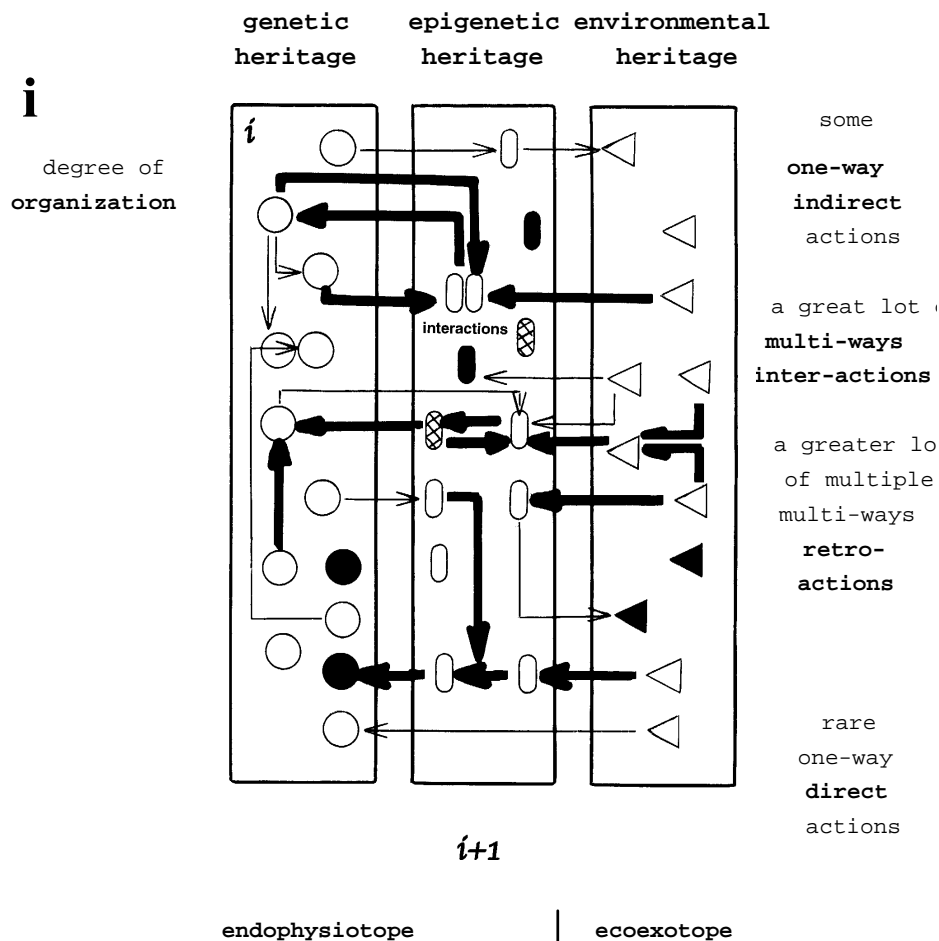


Figure 3. The multiple roles of the epigenetic heritage  
stages of regulation: in black "off" (absent, inactivated, repressed), in white "on" (activated, induced), hatched "unstable, unsteady"; interactions' network: thin arrows "basic network of surviving", thick arrows "specific network of a differentiated stage"

## 5. To preserve the previous stages of biodiversity and to create some new ones, each new life's form must "to be a guest and to be a host", "to welcome and to be welcome"

An eucaryotic plant cell is an **AMSADA**, which emerged from the juxtaposition (**ceno**) and the fitting in (**endo**) of previous adjacent steps of organisation in a whole (**syn**): an EndoSynCenoSystem **ESCS**. It functions as a "unity through diversity" for the recycling of waste products into foods. Its growth in mass is only a way to acquire new capabilities. The surviving is possible without growing.

The Ruminants' survival is the result from their aptitude to be the hosts for guests allowing an increase of the host capacity of the environment. The Ruminants provide the house and the food: their rumen offers an optimal environment for microbes. But, they eat products of microbes' digestion and digest them, without them they would die from hunger ! The hosts' advantages are disadvantages for the guests and reciprocally. As a whole, it is also an **ESCS**, it represents a more complex **AMSADA** than the one of the eucaryotic cell. But, it has emerged, step by step, through the progression from an **ESCS** to an other one. "Running makes the way." Conversely, each one organism of any **ESCS**, to survive itself, must to retrogress to the basic eucaryotic cellular level (Figure 2).

As all living forms, the man is "the hostage" of the biological environment **He** within which he is a partner of the other life's forms. In the contingent context of development of the earth life's forms, the human species is only a new degree of integration, which can, through its **Heg** (education, culture, science and technology), allow a best survival of the previous integration degrees. They are the steps of the interactions, between the multiple **Heg**, that gave rise to the human species. And it is only by making this, that the man can hope to maintain, and eventually increase, its own integration degree, and therefore the survival of its life's form [Bricage (2002B)]. As all organisms, the man is contingent to the space-time of the biological environment (whatever are its scales of space **x** or of time **t**), within which he is a guest and an host, a partner and an hostage, a lodger and a lodgement for the other life's forms.

A partnership should be considered as a whole. The partners should have benefits (advantages) but they have also to share the benefits between them. A partnership implies also disadvantages, to assume and to share [Bricage (2002A)]. Life is an **AMSADA** of **AMSADAs**.

## Conclusion

The man shares a common environment with the other living beings. What brings some risks! Epidemics of influenza originate from viruses that survive into birds and pigs, before they invade the man. The viruses and the cancerous cells are life's forms; the endophysiotope of man is their ecoexotope [Bricage (2002B)]. The human survival depends on the survival of other organisms. Their mutual survival depends on a limitation: the need of a sufficient survival of plants and animals. The man must "not survive to eat", but he needs "to eat to survive" ! Through his himself increase of the host capacity of the environment, the man increases the violence between species that were previously associated into mutual networks. The displacements of the steady states between the epigenetic heritages provoke unpredictable changes [Bricage (1991B)] ! Through the destroy of the dynamic of the previous **AMSADAs**, only for his himself benefit at a short duration, the man species impairs its survival at a long duration. Man is an endangered species.

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