

Lecture Series

The Systemic Theory of Living Systems and Relevance to CAM**Part I: The Theory****José A. Olalde Rangel**

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The Systemic Theory of Living Systems is being published in several parts in eCAM. The theory is axiomatic. It originates from the phenomenological idea that physiological health is based on three factors: integrity of its structure or organization, **O**, functional organic energy reserve, **E**, and level of active biological intelligence, **I**. From the theory is derived a treatment strategy called Systemic Medicine (SM). This is based on identifying and prescribing phytomedicines and/or other medications that strengthen each factor. Energy-stimulating phytomedicines increase available energy and decrease total entropy of an open biological system by providing negative entropy. The same occurs with phytomedicines that act as biological intelligence modulators. They should be used as the first line of treatment in all ailments, since all pathologies, by definition, imply a higher than normal organic entropy. SM postulates that the state of health, **H**, of an individual, is effectively equal to the product of the strength of each factor $H = O \times E \times I$. SM observes that when all three factors are brought back to ideal levels, patients' conditions begin the recovery to normal health.

Introduction**Brief History of the Phenomenological Theory: H, F, O and E, I, O**

Fire \leftrightarrow **H, F, O**. At the end of the 18th century, Antoine-Laurent Lavoisier (1743–1794) unveiled the mystery of fire, discovering that its anatomy- and minimum common denominator- constituted a triangle whose sides corresponded to heat (**H**), fuel (**F**) and oxygen (**O**). Lavoisier also deduced the biconditional characteristic of fire, i.e., it can occur if, and only if, all three elements are present, **H, F, O** \leftrightarrow Fire. Since then the fire triangle has been the foundation of all firefighting techniques.

Life \leftrightarrow **E, I, O**. The Systemic Theory was conceived by the author in 1995, while pursuing a unified theory of living systems (1). As the result of an engineering background, an interest in philosophy, health, phytotherapy and knowledge of the General Adaptation Syndrome (2), he recognized in energy (**E**),

intelligence (**I**) and organization (**O**) a minimum common denominator in living systems, of a triangular anatomy, analogous to the fire triangle; establishing that a biological system can only exist if, and only if, all three elements were present, and vice versa: **E, I, O** \leftrightarrow Life. The author proposed its application in the field of phytotherapy (3) and medicine (4), in two local bestselling books, which created interest within the medical community and resulted in the creation of the first medical center. The application consisted in classifying and applying herbs according to whether they are: energy stimulators; biological intelligence modulators; or, finally, organizational (structural and functional) pathologically targeted enhancers. **Energy, Intelligence and Organization** structure a common denominator of life that answers an age-old question: what is the difference between a dead animal and a living one? Answer: a dead animal has no **Energy**, no biologic **Intelligence** nor **Organizational** function. A sick animal has diminished levels of these three elements, while a healthy one has all three in suitable amounts.

Early History and Prior Developments of the Theory

Aggressors or stressors were identified by Professor Hans Selye, and described and classified in over 1500 articles and

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32 books. He formulated the General Adaptation Syndrome (GAS) (5), which classified effects on animals and humans affected by threats (exhaustion, disease, fear, extreme cold ...) as: alarm (body's recognition of danger and its preparation to deal with threats); resistance (also defined as adaptation, in which the body adapts to resist stress); and exhaustion (condition in which the body's energy supply is depleted). The next step was taken by Soviet scientists led by Lazarev and Brekhman, who investigated properties of substances, with the ability to increase adaptability and resistance to stress. They named these 'adaptogens'. By 1960 more than 1000 studies had been published by Soviet scientists concerning the use of adaptogens.

In 1962, *Eleutherococcus senticosus*, *Rhaponticum carthamoides* and *Rhodiola rosea*, all adaptogens, were included in the Soviet Union's Pharmacopoeia. Since then many other plants and sources have been found to have the same properties (6–9). The new phytomedicines increased resistance to stressors as depicted by Selye (3), enhancing energy, and regulating immune, neuroendocrine and cellular function. Some researchers question the validity of the adaptogen definition in science; however, most concur on their health enhancing properties (10). Figure 1 is my interpretation of $E \downarrow$ (drop in Energy) in relation to Selye's description of biochemical collapse $I \downarrow$ and organic dysfunction $O \downarrow$. The latter also paved the way to the **E**, **I** and **O** triangle, explained further on, and the Systemic Theory.

Life and Entropy: Justification for the Use of Phytomedicines

The second law of thermodynamics states that a system naturally tends to go from a state of higher energy and order to one of lower energy and disorder. The same occurs in living systems whose internal entropy tends to increase in its journey through life, going from health, energy and physiological order towards sickness, asthenia (the loss or lack of bodily strength; weakness) and physiological disorder. Illness, however, can be countered based on the quantum physicist Erwin Schrodinger's notion that the general change of entropy in an open system, such as a living system, consists of (i) internal entropy variations and (ii) entropy exchange of the system with the environment; i.e. $\Delta S = \Delta S_{\text{internal}} + \Delta S_{\text{exchange}}$. Internal entropy in a biological organism, by definition, tends to be greater than zero due to inner irreversible processes. Therefore, the increase in entropy of an open biological system, and thus illness, may be reduced (11) by providing negative entropy from the environment. '... The decrease of entropy in living systems is provided by free energy, released when nutrients consumed from the outside dissociate, i.e. at the expense of the sun's energy. Thus, the flow of negative entropy is important to compensate for inner destructive processes and the decrease of available free energy dissipated by spontaneous metabolic reactions. This is the key point, circulation and transformation of free energy, which drives the functions of living systems ...' (12).

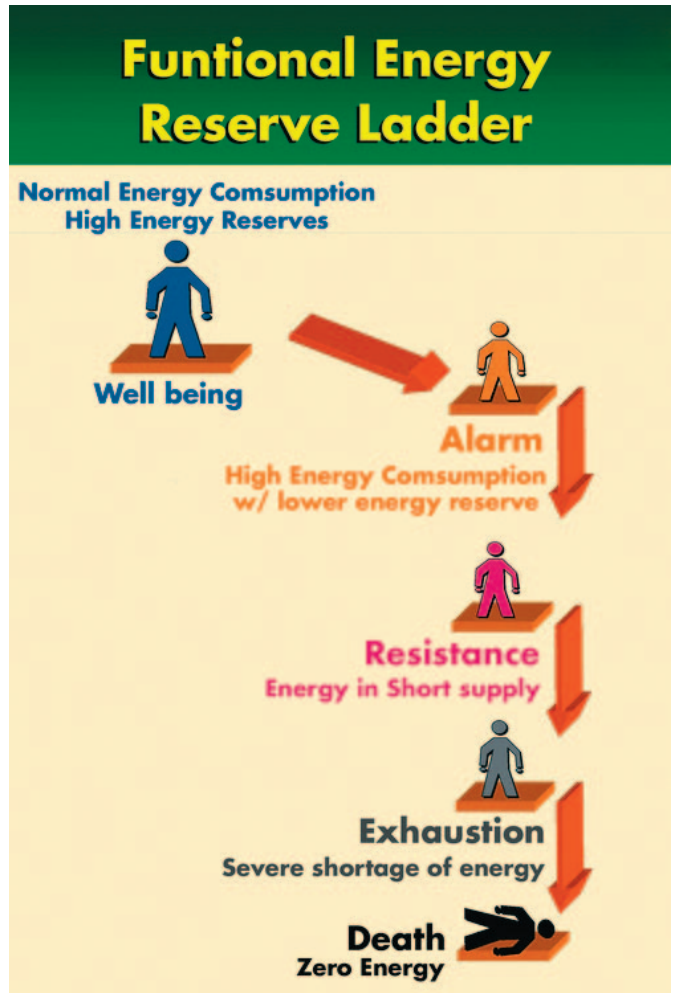


Figure 1. Functional energy reserve ladder. This figure depicts how a fall in Energy affects the human organism. It goes from a state of well being with high Energy reserves and low entropy or disorder, through several stages and finally to that of death, or a state of zero Energy and maximum disorder.

The Systemic Theory of Living Systems

Key Definitions

The theory is based on the following essential definitions. Logic is defined as a correct reasoning that forms the basis of any science. Living System is a unit comprised of elements that work in a coordinated manner, each in service to the other, to achieve the common goal of survival. This definition applies to bacteria, viruses, ant colonies, persons, groups, institutions or countries. Intelligence (**I**) is the regulating entity that controls and integrates parts of a living system, in a functional unit, directed and geared towards survival. Energy (**E**) is any fuel that causes action or movement, also defined as that which makes things occur. Organization (**O**) is a group of elements ordered as a functional unit, directed towards goals established by the intelligence that rules them. In a living system, the functions performed by **I**, **E** and **O** are similar to those functions carried out in a moving vehicle, by driver, fuel and the vehicle itself.

The Logic

All living systems are, by definition, functional units that seek maximum survival (13). The cell is the simplest form of a living system that functions as a basic building block of the living universe, just as the atom does in matter (Fig. 2). Conversely, a virus is the simplest living unit, which in some situations acts as destroyer of living systems. **I** is the backbone of every living system in equilibrium. **I** controls, regulates, adapts and develops the living system. Chaos occurs in its absence. The proof of this is that no living system can exist without intelligence. The intelligence of the system creates and utilizes **E** with the prime role of achieving **O** and evolving into a higher system (14). **I** also creates/builds **O** with the primary end of producing **E**. There may be a corollary: as a consequence, **I** cannot act optimally when subjected to a severe deficiency of **E**. The concept of a functional biological Intelligence, as differentiated from the structural, is not fully described in this section since it will be explained in more detail in the next articles. The author is aware that this is an essential concept that should be fully covered. I ask the reader to bear with me until the publication of the next article. Similarly, its relationship with energy is further developed.

Life's Common Denominator

The common denominator in all living systems is the trio: **I**, **E**, and **O**. This is a self-evident truth and an essential condition to all living systems in the known universe. **I**, **E** and **O** constitute a triad, because none of the constituent elements can exist without the other two. The trio **I**, **E**, **O** has, in fact, a triangular

anatomy, since when any member of the trio decreases, the other two decrease as well (a synthetic drug such as methylphenidate diminishes the immune intelligence, thereby decreasing the other two members). When any member **I**, **E** or **O** increases [for example, *Panax ginseng* raises immune intelligence (15)] then the other two also increase as well (16). However, this increase is synergic, for a boost in any of the **I**, **E** and **O** results in a greater triangular anatomy of the new trio. Finally, if any one member of the trio disappears, the system dies. The triangle **I**, **E**, **O** reflects the survival status of a living system, corresponding to an organism's health. Health (**H**) is herein defined as the survival potential.

I, E and O as a Health Triangle

In every living system the trio **I**, **E**, **O** constitute the three essential sides of a triangle (Fig 3) (17–19). This triangle corresponds to the survival phenomenon, where each side constitutes a different aspect of survival. Together they represent a measure of the survival potential, which by definition is the **H** of the system. The survival potential or amount of **H** in any living system can be defined as the mathematical product of its amount of **E**, **I** and **O**. Thus, survival potential = $H = E \times I \times O$. It is possible to increase the survival potential **H** of a living system by increasing any of its three essential elements. Similarly, **H** can be reduced by a cutback in any of its fundamental components. The **E**, **I**, **O** triangle is not equilateral, because the system's intelligence acts as a generating entity. It is not necessarily a two-dimensional triangle either. It may be spherical, elliptical or hyperbolic. However,

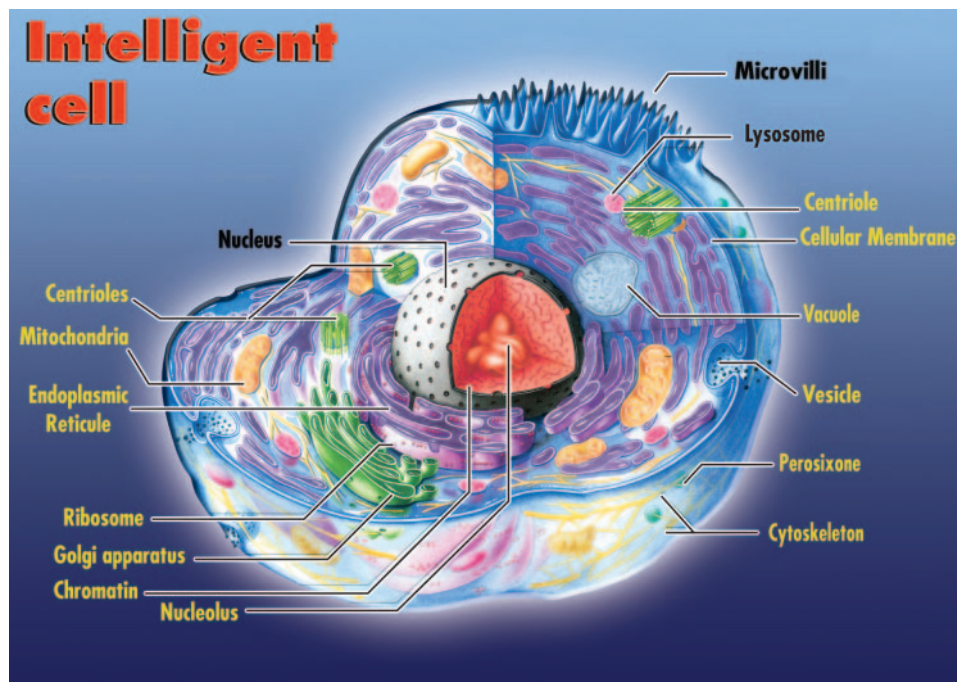


Figure 2. Intelligent cell. The intricate sub-cellular organization denotes the existence of a cellular intelligence. Thus, Systemic Theory recognizes the cell as an Intelligent Living System.

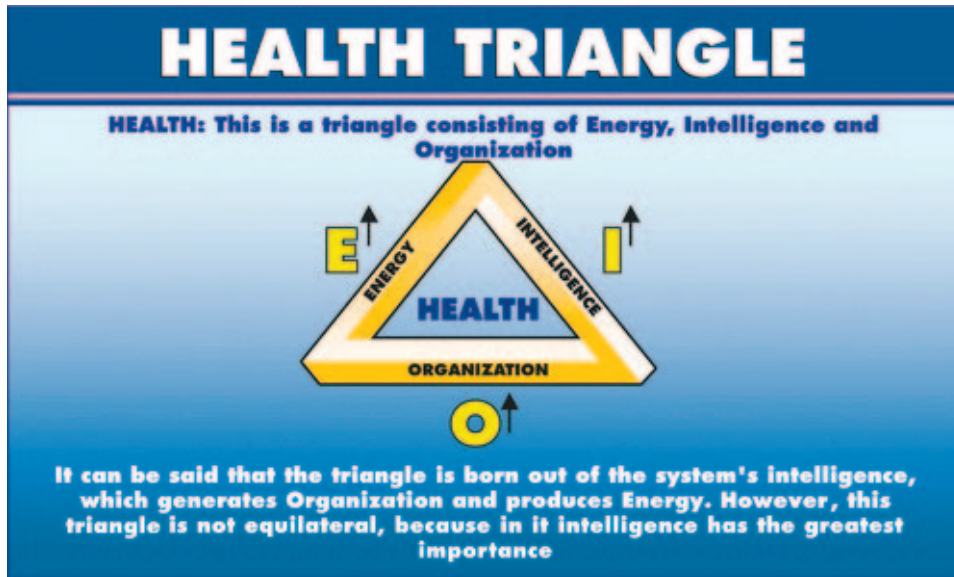


Figure 3. The health triangle. The survival potential of all living systems, **H**, is expressed in the health triangle, structured with life's common denominator: Intelligence, Energy and Organization.

the determination of this was not essential to develop the systemic technology. Finally, **I** is the most important side of the triangle, since it concurrently generates both energy and organization (20).

Example of I, E and O Increase by Providing *Panax ginseng*

Panax active principles are bonded to beta-adrenoceptors in the cellular membrane (Fig 4). This triggers a secondary transmitting message system (cyclic AMP), the signal travels through a transducer pathway to the mitochondria to increase activity of MDH, SDH and CTS, enzymes of the glycolysis or tricarboxylic acid cycle. ATP generation is thus increased, raising energy levels using glucose as fuel, as shown in Figure 5. Moreover ginsenosides, such as the sulfonylureas, are insulin secretagogues (**I** stimulators) since they help regulate blood glucose levels by directly stimulating first-phase insulin secretion in the pancreatic beta cells (**O**). These cells are responsible for sensing and secreting appropriate amounts of insulin in response to a glucose stimulus. Mitochondrial glucose metabolism leads to ATP generation and increases intracellular ratios of ATP/ADP, which result in closure of the ATP-sensitive potassium channel (K_{ATP} ; a 140 kDa membrane protein) on the plasma membrane. Closure of this channel depolarizes the membrane and triggers opening of voltage-sensitive calcium channels, leading to the rapid influx of calcium. Increased intracellular calcium causes an alteration in the cytoskeleton and stimulates translocation of insulin-containing secretor granules to the plasma membrane and the exocytotic release of insulin. Either an increase in the ATP/ADP ratio or binding of ginsenosides to cell membrane receptors results in the closure of the K_{ATP} channel and insulin secretion (21). This is depicted in Figure 6. As a corollary, with increasing energy we obtain a significantly larger health triangle

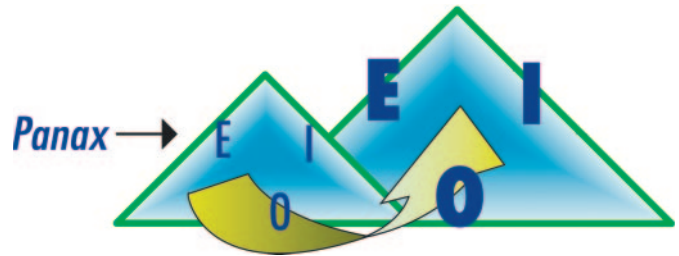


Figure 4. Example of an increase in survival potential in a living system. The diagram shows the evolution from a given health situation and an initial **E**, **I**, **O** triangle (left) to that of an improved **E**, **I**, **O** triangle (right) thanks to an energy, intelligence and organization enhancement, negative entropy, provided by *Panax ginseng*. This phytoceutical increases all sides of the triangle.

because the system's intelligence has acquired more capacity to organize. *Panax ginseng* provides an example of a phytomedicine capable of enhancing **I**, **E** and **O** simultaneously in the living system.

Closing Comment

In the next articles I will expand on the Systemic Theory to the human body, demonstrate its application in medicine and provide results of 17 clinical studies in 12 pathologies. Published in the proceedings of the First International Congress of Systemic Medicine held in Caracas on January 21 and 22, 2005. The objective is to demonstrate Systemic Medicine's utility as a CAM (22), i.e. as complementary to other systems of medicine and in many cases as the first choice of medical treatment. I am aware that some of the concepts described herein are completely new and may be the cause of controversy. This, however, can sometimes be a positive reaction since new and contrasting scientific views in science have, in

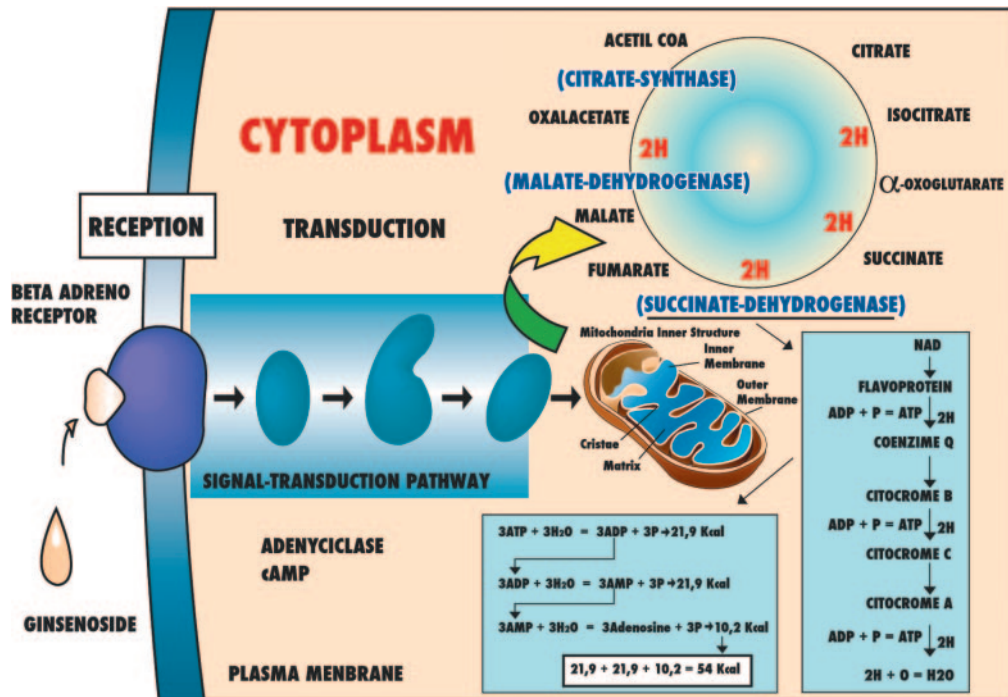


Figure 5. Ginsenoside energizing mechanism. Intracellular action mechanism of *Panax ginseng* that results in stimulation of ATP synthesis whose hydrolysis produces energy.

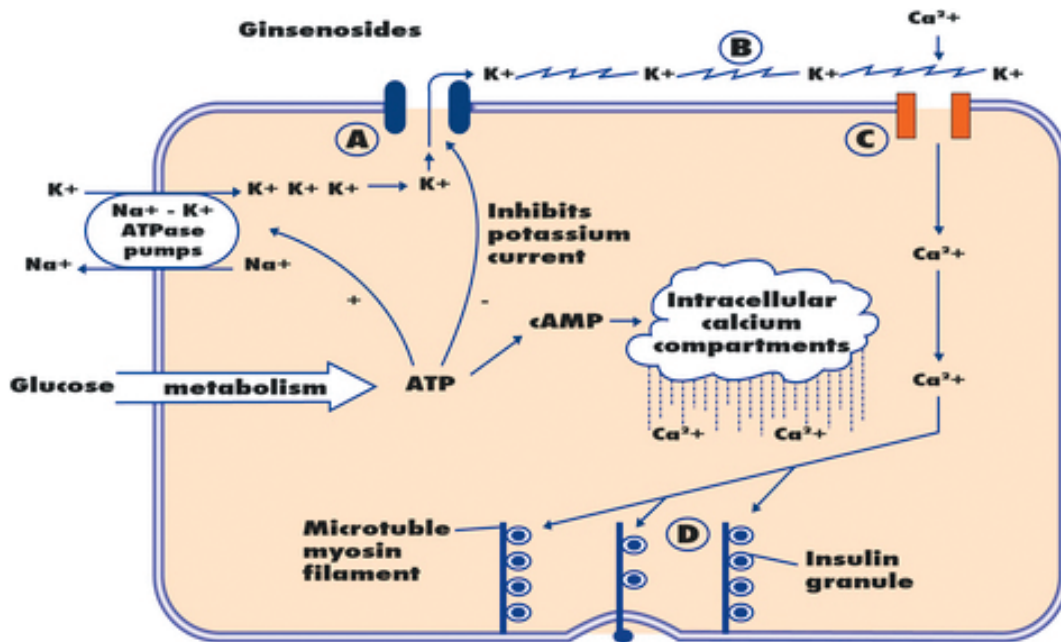


Figure 6. Sodium-potassium ATP pump. This shows the generation of ATP by administering ginsenosides in *Panax ginseng* to the Living System.

many cases, made possible its evolution. If medical science is to advance beyond its present frontier, 'old truths' have to be challenged. Independently of the formal agreement or disagreement that readers may have with this article, systemic technology has achieved important breakthroughs in pathologies heretofore unresolved.

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