

Vital Phenomena vs. Vital Signs

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Most people are familiar with vital signs. They are the blood pressure, body temperature, and pulse rate (and perhaps blood oxygen concentration) of some higher-level creatures such as human beings and dogs. They are not common for all living things such as plants.

The authors have recently found that consciousness, information, and life are a *unique* set of “vital phenomena” common to ALL living things from human beings to plants to single cells.[1]

A phenomenon is an observable fact or event, or an object or aspect known through the senses rather than by thought or non-sensuous intuition. There are natural and man-made phenomena. Natural phenomena are physical or biological. Examples of physical phenomena are light, sound, and electrical discharge. They can appear separately, but they can also come together in a thunderstorm, carried by rain cloud (inanimate matter). On the other hand, consciousness, information, and life are distinct biological phenomena that are not subject to physical laws themselves, but that they ALWAYS occur together in a whole pattern and are always carried by matter, which is subject to physical laws.

We define life as a specific process of birth-maturation-reproduction-aging-death that advances irreversibly in time. Life is not the same as a living being. The body (histological structures) of a living being (organism) is a physical entity. It has mass, and is a life carrier. The life process is a phenomenon that is observable by humans and is unique to all living beings.

Consciousness is a state of being aware of one’s own existence, sensations, thoughts, and surroundings, etc. It requires an exchange of information. A robot or computer can receive signs and signals (e.g., shapes, forms, and patterns), but a living being is ultimately needed to program or interpret signs and signals to obtain meaningful information that can enhance survival. In other words, it is not possible for information exchanges to take place if there is no organism present.

Fundamentally, there are two different types of information on Earth, and both are absolutely essential for the existence and continuation of life in our biosphere: genetic and non-genetic information.

Genetic information is the heritable, biological information coded in the nucleotide sequences of DNA or RNA (e.g., certain viruses), such as in chromosomes or plasmids. Every organism is a carrier of genetic information obtained from its ancestors. Genetic information provides knowledge for the continuity of life, and it involves a variety of intercellular information exchanged via intracellular signal transmissions to mediate gene expressions. The basic genetic information network (a genome) contains almost all of the inherited genetic information that is characteristically present in one organism, and is transmitted from parents to their offspring. Genetic information is also present in every individual cell of every organism. Consequently, because matter is an information carrier, the body of an organism is a life carrier. Similarly, the DNA and RNA molecules in the genes of a living cell are carriers of genetic information, but are not the information itself. Moreover, genetic information is a requirement for living beings. Computers, robots, and computer viruses cannot and do not possess genetic information. Therefore, they are not considered living beings.

An example of non-genetic information includes information exchanged between the organisms and the environment. Because every organism originates in an environment, sustaining life also depends on the environment. Every cell in a multicellular organism and every multicellular organism itself has the tendency and ability to regulate its internal conditions, such as the chemical composition of its body fluids, to maintain a stable internal environment to compensate for external environmental changes. In the natural world, no organism exists in absolute isolation; thus, every organism must interact with the environment and other organisms. An organism’s non-genetic information interactions with its environment are fundamental to the survival of that organism and the functioning of the ecosystem as a whole. Inanimate

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material does not carry genetic information and does not have a living body, so where there is no living being, there is also no environment.

Various perspectives on the nature of consciousness are commonly debated, such as illusionism (the idea that consciousness is an illusion), dualism (the mind and body are separate entities; initially proposed by Descartes), and panpsychism (the mind is fundamental and ubiquitous to reality). Purposive behavior of organisms (such as seeking light or food) is also related to consciousness.

Generally speaking, there are at least five categories of consciousness: cellular consciousness, multicellular consciousness, neurophysiological consciousness, self-consciousness, and human self-consciousness, in ascending order of complexity. An organism that exhibits neurophysiological consciousness as its highest level of consciousness, for example, would also exhibit the lower levels of multicellular consciousness and cellular consciousness, but would not exhibit the higher-level self-consciousness and human self-consciousness.

A phenomenon of clinical unconsciousness occurs when a patient's cerebral cortex is damaged or is affected by illness or drugs, and that patient's cerebral cortex is unable to control the abnormal, neuropathological behavior. While the normal cerebral cortex's neurophysiological function is being suppressed, the neuron cells are still viable, and the unconscious brain functions only at the basic, subcortical state of consciousness. That is, the cerebral cortex has malfunctioned in its thinking or learning capability, and an unconscious patient does not mentally recognize the external world. Consequently, unconsciousness only means that consciousness is clinically suppressed; it does not mean the termination of the phenomenon of consciousness, which would lead to death.

Life, information, and consciousness are separate and distinct phenomena, each with its own characteristics. Therefore, life is not the same as information, and information is not the same as consciousness. However, all living beings, from a single cell to a human being, must display all three of these biological phenomena. If any of these three phenomena are missing, a living being would become inanimate matter.

These three phenomena should not be considered ingredients of a living being, like a body that is made of chemical molecules. Rather, these phenomena are characteristics of *all* living beings and *only* living beings, and they are displays of innate behavior of all living beings (which results from genetic information passing from one generation to another). They are indivisibly linked in living beings, and these three phenomena always occur together simultaneously. Additionally, these phenomena are observed by human beings and are not aspects created by thought or non-sensuous intuition. These phenomena appeared

only after the Earth became a biosphere. This unique set of three phenomena may therefore be collectively called '*the vital phenomena*,' and the observation and interpretation of the unique and vital characteristics of the vital phenomena can provide a novel approach to identifying what is alive and what is dead.

It is important to note that different aspects of the vital phenomena are impacted by the different types of death. For example, biological death of an individual organism is the irreversible cessation of all biological phenomena (information, life, and consciousness) of that organism, which then becomes inanimate matter. Biological death is initiated at the cellular level and is a pathological process that begins with the destruction of the normal cellular structures and is due to the cessation of normal, active biochemical processes in the cells. In humans, cellular death is an example of cessation of cellular consciousness. Alternatively, organ death is an example of cessation of multicellular consciousness, and brain death is an example of cessation of neurophysiological consciousness.

Brain death is only a clinical diagnosis; it is not complete biological death at the cellular level, because some of the cells, tissue, and organs from the cadaver may still be viable and are available for transplant, and all viable cells are carriers of information, consciousness, and life. After biological death, human self-consciousness does not exist because there is not a viable cerebral cortex and all the other cells of the cadaver are dead. Therefore, in biological death, there is irreversible disruption of all cellular states of consciousness, but in brain death, some low levels of consciousness may continue in other viable histological cells.

It is easy to see that different stages of death (e.g., brain death, organ death, and cell death) are closely associated with the permanent loss of various categories of consciousness (neurophysiological consciousness, multicellular consciousness, and cellular consciousness, respectively) and the corresponding permanent loss of information, illustrating the indivisibly linked relationships of the vital phenomena to the very end.

We identified the vital phenomena, which are the three characteristic phenomena common to *only and all* living beings. However, we feel that there were several limitations to our work.

First, we feel that we have not proven, nor are we suggesting, exclusivity of the three biological phenomena. In the future, other researchers may find new biological phenomena (e.g., intelligence) that are also common to all organisms. Second, we feel that we have made observations and interpretations of life, information, and consciousness, and their characteristics and relationships to each other and matter and environment,

but that we have not explained the reason or origin of these phenomena. For example, life is only a continuous process from birth to death, and matter (such as protein, RNA and DNA molecules) is nothing but a carrier of the life process. Life reproduces from life, and all the organisms in the biosphere, from individual single cells to plants and human beings, exist as a result of an extremely large network of genetic information being propagated. However, we have yet to determine how that information network originated. Future research to determine

the origin of aspects of the vital phenomena, such as the information network, would help better elucidate the dynamics of the life process.

REFERENCE

1. Lau, Leon L. & Lau, Wang. "Vital Phenomena: Life, Information, and Consciousness", *All Life*, Volume 13, Issue 1, pages 151-163, Taylor and Francis, London, England, March 3, 2020, <https://doi.org/10.1080/26895293.2020.1734670>

The authors; Leon Lau and Wang Lau are retired brothers (with ages well into their 80's) from the USA. Leon is a pathologist. Wang has his Ph.D. in nuclear engineering and is a national champion (2018) in USA Masters Swimming.

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