What Does Artificial Life Tell Us About Death?

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ABSTRACT

This paper discusses how concepts developed within artificial life (ALife) can help demystify the notion of death. This is relevant because sooner or later we will all die; death affects us all. Studying the properties of living systems independently of their substrate, ALife describes life as a type of organization. Thus, death entails the loss of that organization. Within this perspective, different notions of death are derived from different notions of life. Also, the relationship between life and mind and the implications of death to the mind are discussed. A criterium is proposed in which the value of life depends on its uniqueness, i.e. a living system is more valuable if it is harder to replace. However, this does not imply that death in replaceable living systems is unproblematic. This is decided on whether there is harm to the system produced by death. The paper concludes with speculations about how the notion of death could be shaped in the future.

Keywords: Artificial Life, Death, Organization, Uniqueness, Value

Every evil leaves a sorrow in the memory, until the supreme evil, death, wipes out all memories together with all life.

–Leonardo da Vinci

1. LIFE AS PROCESS/ORGANIZATION

One of the open problems in artificial life discussed by Bedau et al. (2000) is the establishment of ethical principles for artificial life. In particular:

Much of current ethics is based on the sanctity of human life. Research in artificial life will affect our understanding of life and death (...). This, like the theory of evolution, will have major social consequences for human cultural practices such as religion. (Bedau et al., 2000, p. 375).

Focussing on our understanding of death, this will depend necessarily on our understanding of life, and vice versa. Throughout history there have been several explanations to both life and death, and it seems unfeasible that a consensus will be reached. Thus, we are faced with multiple notions of life, which imply different notions of death. However, generally speaking, if we describe life as a process, death can be understood as the irreversible termination of that process.

The general notion of life as a process or organization (Langton, 1989; Sterelny & Griffiths, 1999; Korzeniewski, 2001) has expelled vitalism from scientific worldviews. Moreover, there are advantages in describing
living systems from a functional perspective, e.g., it makes the notion of life independent of its implementation. This is an essential aspect of artificial life, where the properties of living systems are studied independently of their substrate. Also, we know that there is a constant flow of matter and energy in living systems, i.e., their physical components can change while the identity of the organism is preserved. On the one hand, not a single atom of an organism is maintained within the organism after a few years (Grand, 2003). The matter changes, but the identity of the organism is maintained. On the other hand, one can make a variation of Kauffman’s “blender thought experiment” (Kauffman, 2000): if you put a macroscopic living system in a blender and press “on”, after some seconds you will have the same molecules (matter) that the living system had. However, the organization of the living system is destroyed in the blending. Thus, life is an organizational aspect of living systems, not so much a physical aspect. Death occurs when this organization is lost. Given the above arguments, I argue that a physicalist perspective is less suitable than a systemic one for understanding life and death.

2. DIFFERENT NOTIONS OF LIFE AND DEATH

From a systemic perspective, different notions of death can be derived from a non-exhaustive set of different notions of life:

- If we consider life as self-production (Varela et al., 1974; Maturana & Varela, 1980, 1987; Luisi, 1998), then death will be the loss of that self-production ability.
- If we consider life as what is common to all living beings (De Duve, 2003, p. 8), then death implies the termination of that commonality, distinguishing it from other living beings.
- If we consider life as computation (Hopfield, 1994), then death will be the end (halting?) of that computing process.
- If we consider life as supple adaptation (Bedau, 1998), death implies the loss of that adaptation.
- If we consider life as a self-reproducing system capable of at least one thermodynamic work cycle (Kauffman, 2000, p. 4), death will occur when the system will be unable to perform thermodynamic work.
- If we consider life as information (i.e., a system) that produces more of its own information than that produced by its environment (Gershenson, 2007), then death will occur when the environment will produce more information than that produced by the system.

3. LIFE, MIND, AND DEATH

One of the main properties of living organization is its self-production (Varela et al., 1974; Maturana & Varela, 1980, 1987; Luisi, 1998; Kauffman, 2000). When death occurs, this self-production cannot be maintained. But is this organization the only thing that is lost with death? What about experience and mind?

The notions of life and death have been much related to those of mind, cognition, awareness, and consciousness. On the one hand, the mind is a property closely related with life. Some even propose that mind and life are essentially the same process (Stewart, 1996; Bedau, 1998). On the other hand, people have speculated since the dawn of civilization on what occurs with the mind after death.

Life is a process described by an observer (Maturana & Varela, 1987), in first or third person perspective. When the process breaks, only description in the third person observer remains. By definition, we can only speak about death from a third person perspective. Since the mind requires a first person perspective, all evidence points to the conclusion that after death the mind is lost together with the organization of the living system.

What can artificial life add to this discussion? Artificial life simulations (“soft” ALife)
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[www.igi-global.com/article/mathematical-model-assess-relative-effectiveness/54746?camid=4v1a](www.igi-global.com/article/mathematical-model-assess-relative-effectiveness/54746?camid=4v1a)

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