PIOTR LENARTOWICZ SJ
JOLANTA KOSZTEYN

DESCRIPTIVE FOUNDATIONS OF THE METAPHYSICS OF LIFE

Opublikowano w: ***PROCEEDINGS OF THE METAPHYSICS FOR THE THIRD MILLENNIUM CONFERENCE*** (Rome, September 5-8, 2000), Editorial de la Universidad Téchnica Particular de Loja (Equador), 2001, pp. 513-518[*].

Ruined concept of life. During the last centuries, philosophy questioned some fundamental evidences obvious even to a child, not to mention an adult specimen of *Homo sapiens*. The concepts of „whole/fragment", „substance/attribute/accident", „immanent/transient activity", even the empirical input – sense and intellectual data – were banished to the sphere of common-sense illusions, subjective categories, mental constructs or misunderstandings. We will not discuss the painful question whether the epistemology of the Cartesian, Humean, Kantian, Comtian, Hegelian and postmodernist tradition is beyond redemption or not (cfr. Jackson, 1996). Instead we will try to indicate, that the recent progress in biological sciences forcefully confirms or reinstates the long abandoned, „childish" concepts of the Artistotelian and Thomist philosophical tradition.

Spontaneous, pre scientific foundations of the concept of life. From childhood on everyone accumulates a mental data-base on various dynamisms manifested by „living beings" (humans, animals and plants). A primary, fundamentally valid idea of life is thus shaped. A relatively young child is also aware of the limits of life – namely death and pathology. The child recognize several variants of biological dynamisms in the different forms of life. This early, poorly verbalized, partly subconscious data-base constitutes an important, irreplaceable prerequisite of the more systematic, scientific biological language, and is absolutely necessary for any further, more systematic study of biological phenomena. A philosopher must not see less than a child. If he does, he is like the duped personages from Andersen's fairy tale „The Emperor's Clothes".

Let us enumerate some essentially descriptive traits of biological life.

Dynamism. „Something which is alive" is not a physical structure but a dynamism evident in the incessant movement of physical components. Living being has no fixed, static mass (it grows), no fixed, static shape, no fixed, static composition, no fixed, static structural organization. A structural, morphological concept of life is a caricature of biological entity.

---

[*] The drawings were presented only during the conference.

Life cycle and lineage. What exactly is the „living being"?

A seed? A germ cell? A juvenile dynamic form? A juvenile structural form? An adult structural form? An adult dynamic form? A complete organ of a living body? An external structure produced by a living body? A life-cycle? A series of life-cycles in a lineage? What kind of phenomena might pretend to be a proper illustration of the term „living being"? Some have to be discarded. It would be imprudent, for instance, to identify an „organ" (e.g. the locomotor system), a particular developmental stage or an external product (e.g. spider's web) with a „living being". Therefore, we are left with the idea of a „life-cycle" and the idea of a „lineage".

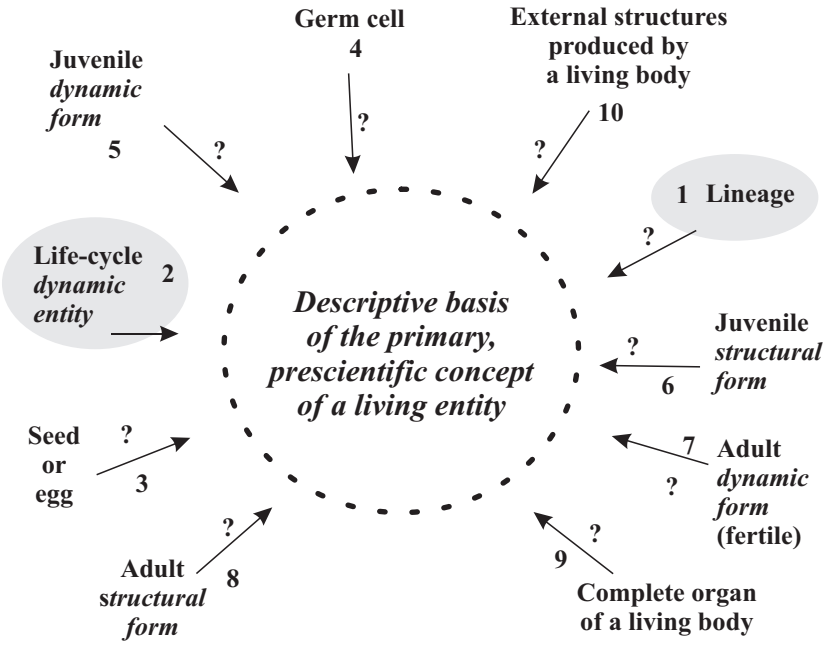

Fig. 1. Elimination of the evidently fragmentary and defective descriptions of the biological entity.

The concept of „life-cycle" denotes the observed continuity of developmental stages between a germ cell and the adult (reproductive) form.

Germ cells	DEVELOPMENT	**Adult forms**
(fern, moss, oak, spider, hydra, crow, shark, salamander, antelope, elephant)	**embryogenesis** **organogenesis** **morphogenesis** **biosynthesis,**	*(fern, moss, oak, spider, hydra, crow, shark, salamander, antelope, elephant)*

Fig. 2. Generalized, abstract concept of „life-cycle".

The concept of „lineage" denotes the observed continuity between the successive generations of a given biological form (e.g. dogs, cats, finches, cichlids). Lineage, line of descent, or a phyletic lineage is an observational datum.

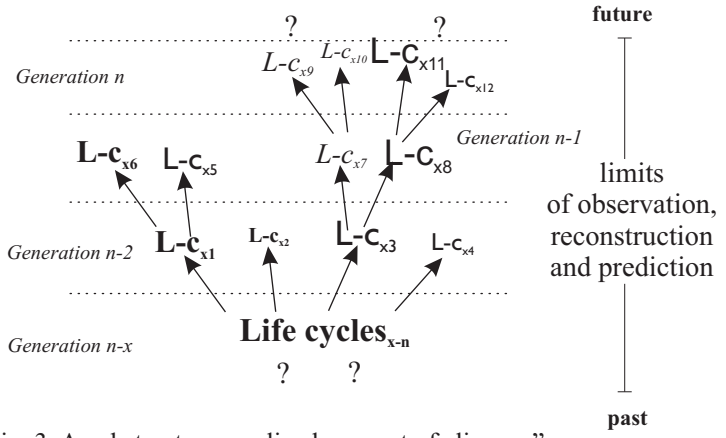

Fig. 3. An abstract, generalized concept of „lineage".

Integrative dynamism. Within the life-cycle, even a child can easily distinguish several distinct, regular, repetitive, pattern-like forms of dynamism – for instance:

Utilization of matter (nutritive tendency) – it is a highly selective exploitation of raw materials and random portions of energy present in the environment. Every form of life cycle (prokaryotic, eukaryotic) reveals a capacity to find and ingest a particular kind of raw material, and a particular form of energy. The nutritive tendency necessarily presupposes a basic kind of orientation in the properties of its environment and a capacity to discriminate between the appropriate and inappropriate forms of the raw material. Modern biology proved this tendency is common-place in the invisible forms of life. Even the simplest bac-terial cells manifest search-like and escape-like dynamisms. These search and escape dynamisms were discovered to be finely-tuned with the physico-chemical peculiarities of bacterial molecular machinery (cfr. Adler, 1975; Liu *et al*., 1997; Lowry *et al*., 1994; Parkinson, 1993; Spiro *et al.*, 1997).

Construction (morphogenetic tendency) – it is a highly selective, utterly economical construction of complex, machine-like structures in which the specific properties of the material, its shape, arrangement and quantity necessitates perfectly economical and effective functioning. This kind of constructive (morphogenetic) dynamism – described by the ancient Greek philosophers – was recently discovered in the simplest forms of bacteria – e.g. proton ATPase biosynthesis, structure and function (cfr. Noji *et al*., 1997) or locomotor mechanism of these bacteria (cfr. MacNab and Parkinson, 1991).

Biosynthesis (synthesis of new chemical substances) – it is a highly selective production of specific forms of material, and specific forms of energy carriers, finely tuned with the requirements of the above-mentioned morphogenetic dynamism.

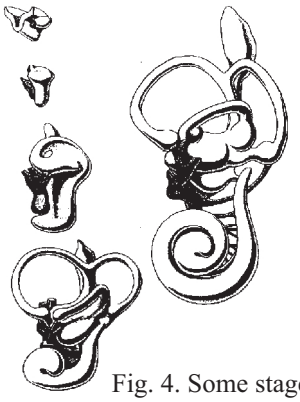

Fig. 4. Some stages in the development of the inner ear – the last one at about 9th week of pregnancy. (After Moore, 1980/77)

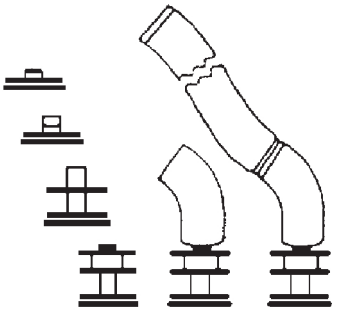

Fig. 5. Some stages in the morphogenesis of the bacterial proton engine. (After MacNab and Parkinson, 1991)

Why were these forms of dynamism labeled „integrative"? The word „integration" denotes a complex network of dependencies and correlations between these distinct activities (Lenartowicz and Koszteyn, 2000). Even a child is aware of the necessary link between animal's senses, its muscle activity, its respiration and nutrition. Modern biology only amplified the sense of this integration.

Dynamic indivisibility vs. structural destructibility. The term „integration" implies a kind of indivisibility. One of the major achievements of modern biology was the discovery that biological indivisibility refers to constructive dynamisms not to the resulting machine-like structures. Biological structures can be severely damaged but the tendency to build them again and again is not damageable and hardly destructible (cfr. Kühn, 1971). The same planarian body can be decapitated again and again, but the perfect reconstruction of the head continues at a constant rate whether it is the first or the fifteenth decapitation.

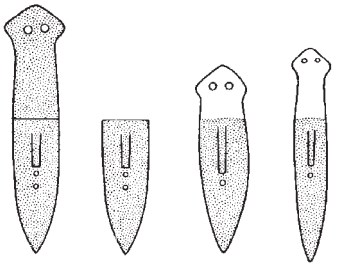

Fig. 6. T. H. Morgan's obserations on the decapitatet planarian body. (After Kühn, 1971/419)

The experiments concerning totipotentiality (cfr. Driesch, 1891; Spemann, 1967; Steward *et al.*, 1958; Gurdon and Uehlinger, 1966) and the subsequent attempts to master cloning procedures illustrate essentially the same kind of evidence. Multiple forms of DNA repair illustrate the organism's capacity to detect the most minute injury and restore the damaged structures to their functional state.

Immanent dynamism. Dynamism of life differs from the „transient" dynamisms observed in the mineral world. It is immanent. It starts within itself and it ends there. In the most literal sense, it is selfish.

Perfect dynamism. Dynamism of life is perfect in the physico-chemical sense. The quality of the materials produced by biosynthesis is perfect. Their quality, quantity, shape and arrangement within the organs of a living body cannot be improved. Economy of biological dynamisms could not be greater. This state of perfection is relatively independent from the fluctuations of the environmental sphere (Koszteyn and Lenartowicz, 1997). Modern biology fully confirmed many previous indirect inferences on the constant flux of matter within the body (cfr. Stahl, 1707; Magendie, 1816-1817; Haldane, 1908; Schoenheimer *et al*., 1939). It was demonstrated that every living being constantly adjusts its structures to balance on the edge of perfect economy and efficiency. This adaptive dynamism goes on incessantly on the anatomical, cytological and molecular level.

Immanence, integration and perfection are all manifestations of a curious restriction of physico-chemical properties of inanimate, dead matter.

Death (and pathology). No serious biological research can be carried on without a constant awareness of the death limit and the danger of pathology. It is crucial to determine whether the object of study is living, pathological or dead, and to ascertain whether the data gained refer to a truly biological dynamism, a pathological dynamism or the processes of decay.

Paleoanthropologists are aware that fossil bones of the Cro-Magnon Man have to be completed by the reconstructed dynamic pattern of these living beings. Some modern philosophers, however, manifest a dangerous tendency to mix together the observational data collected on the both sides of the death limit. This blindness seems to be rooted in a non-empirical thesis that *the material, passive and structural element is the genuine source of the life dynamism*.

The most fundamental phenomena of death are the lack of: perfection, integration, immanence, and nutrition.

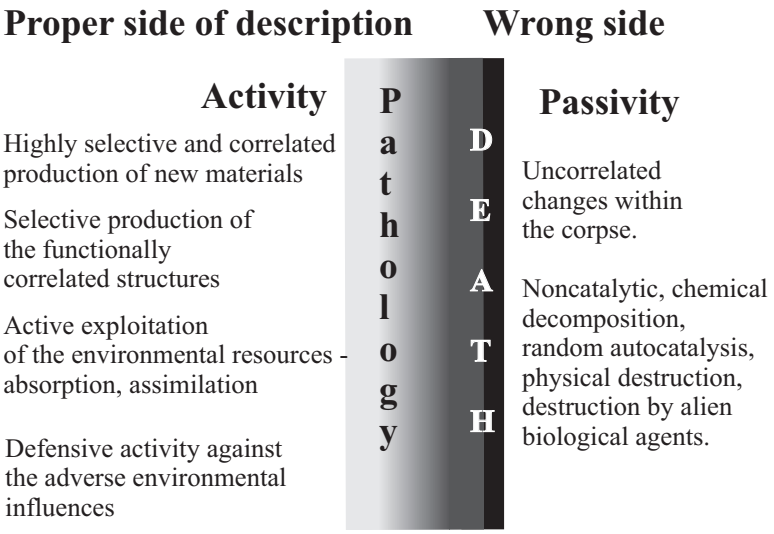

Fig. 7. Descriptive properties of vital, pathological and post-mortem phenomena.

Conclusions. Immanence, integration, perfection, and manipulation of raw material belong to the elementary, empirical and pre-scientific concept of life. The modern scientific investigation of living beings deepened, intensified and confirmed the essential credibility of this concept. But this concept puts forward some important, metaphysical questions. Perfect, integrative dynamism cannot emerge from mineral substance. A hypothesis of a distinct kind of substance seems to be unavoidable (Lenartowicz, 1999). The origin of this substance constitutes another metaphysical problem. These are genuine metaphysical problems. Our task was to review the fact that the most important descriptive results of biology call for a metaphysics of life, distinct from the metaphysics of the inanimate, mineral world.

REFERENCES

ADLER J. (1975). *Chemotaxis in bacteria*. Annual Review of Biochemistry 44,341-356.

DRIESCH H. (1891). *Entwicklungsmechanische Studien I. Der Wert der beiden ersten Furchungszellen in der Echinodermenentwicklung. Experimentelle Erzeugung von Teil- und Doppelbildungen*. Zeitschrift fuer wissenschaftliche Zoologie 53,160-178.

GURDON J. B., Uehlinger V. (1966). *„Fertile" intestine nuclei*. Nature 210, 1240-1241.

HALDANE J. S. (1908). *The relation of physiology to physics and chemistry*. Nature 78, 553-556.

JACKSON F. L. (1996). *Post-modernism and the recovery of the philosophical tradition*. Animus, vol. 1 [www.mun.ca/animus/1996voll/jackson.htm].

KÜHN A. (1971). *Lectures on developmental physiology*. Springer-Verlag, Berlin.

KOSZTEYN JOLANTA, LENARTOWICZ P. SJ (1997). *Biological adaptation: Dependence or independence from environment*. Forum Philosophicum. Fac. Philos. SJ, Kraków, T.2, 71-102.

LENARTOWICZ P. S.J (1999). *Substance and cognition of biological phenomena*. Forum Philosophicum Fac. Philos. S.J, Kraków, Kraków, T. 4, 55-71.

LENARTOWICZ P. S.J, KOSZTEYN JOLANTA (2000). *On some problems concerning observation of biological systems*. Analecta Husserliana LXVI, 107-119.

LIU Y., LEVIT M, LURZ R., SURETTE M.G., STOCK J.B.(1997). *Receptor-mediated protein kinase activation and the mechanism of transmembrane signaling in bacterial chemotaxis*. EMBO Journal 16(24),7231-7240.

LOWRY D. F, ROTHA. F, RUPERT P. B., DAHLQUISTF. W., MOYF. J., DOMAILLE P. J., MATSUMURA P. (1994). *Signal transduction in chemotaxis. A propagating conformation change upon phosphorylation of CheY*. J. Biol. Chem. 269 (42), 26358-26362.

MACNAB R. M, PARKINSON J. S. (1991). *Genetic analysis of the bacterial flagellum*. Trends in Genetics 7, 196- 200.

MAGENDIE F. (1816-1817). *Précis elémentaire de Physiologie*. Méquignon-Marvis, Paris, p. 19-20.

NOJI H., YASUDA R., YOSHIDA M., KINOSITA, K. (1997). *Direct observation of the rotation of F1-ATPase*. Nature 386, 299 - 302.

PARKINSON J. S. (1993). Signal transduction schemes of bacteria. Cell 73, 857-871.

SCHOENHEIMER R., RATNER S., RITTENBERG D. (1939). *Studies in protein metabolism. X. The metabolic activity of body proteins investigated with L(-)-leucine containing two isotopes.* J. Biol. Chem. 130, 703-732.

SPEMANN H. (1938). *Embryonic development and induction*. Yale UP, New Haven.

SPIRO P. A., PARKINSON J. S., OTHMER H. G. (1997). *A model of excitation and adaptation in bacterial chemotaxis*. Proc. Natl. Acad. Sci. USA 94, 7263-7268.

STAHL G. E. (1707). *De vera diversitate mixti et vivi corporis ... demonstratio, etc*. Halle, pp. 1-12.

STEWARD F. C., MAPES MARION O., SMITH JOAN (1958). *Growth and organized development of cultured cells*. Am. J. Bot. 45, 693-708.