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Readings of biological plasticity

The concept of plasticity has emerged in many areas of recent biology. Of course, we knew for a long time the use of such a concept in neurophysiology where one is speaking about neuronal plasticity. But now in every all branches of biology this concept is used and is connecting to important life features at each level of an organism. The aim of the talk is to study this concept and to think about its possible implications for the philosophical and theological thought.

It is possible to build a sufficiently general definition of biological plasticity that summarizes its main features. Plasticity happens to be the property of systems that can be coherently deformed. This reveals a kind of robustness that does not forbid vulnerability or in other words some dynamical relation between coherence and deformability. This definition can be easily implemented using mathematical formulations that are natural in statistical mechanics, dynamical systems theory or graph theory. In this respect, the concepts of multistationarity and of (energetic, epigenetic, adaptative) landscape play an important role. The mathematical modeling of plasticity concept exhibits also the deep unity that exists “under” the different uses of such a notion in various fields.

Plasticity happens to be a necessary, nevertheless not sufficient, condition of life to emerge and to develop. With respect to the evolution, plasticity is not globally growing inside an organism. In fact, plasticity is only locally growing when complexity is risen. We call this fact the “law” of ascendant plasticity: in complex organisms plasticity must rise locally in their high level coordination of defense systems (brain and immunological systems). It is interesting to note that for human being neuronal plasticity means that our brain is highly malleable and undetermined. The local rise of plasticity inside complex systems is also a kind of decrease of strong determinations.

If we realize that plasticity understood as a feature of the organisms able to deform themselves coherently which is also a necessary condition for life to appear and to evolve, then we are lead to a philosophical conception which cannot consider life as based an immuta-

ble or fixed forms, species. The problem here is to renew the philosophy of life organism admitting a kind of malleability of forms (1). Therefore, plasticity seems to suggest a deep incompleteness of life. The nature of living beings happens to be incomplete in the sense that they seem always open to future determination. But plasticity strongly suggests also life vulnerability (2). To exist, life has to reveal a kind of fragility!

- 1) First of all we will have to study philosophically this possibility of nature, or form (in the metaphysical sense) change, malleability and, we dare to say also, this philosophical possibility of substance vulnerability, fragility.

Let us remark that we must be here very careful because of the deep implications with respect of ethical problems. Therefore we have to analyze first the possibility of thinking this form mutability.

Let us remark first that even in formal sciences like mathematics and logics, this form mutability is become very usual. A real constant can be metamorphosed into a function just changing a topos (the mathematical universe in which the concepts are defined), a natural number can be viewed as a function using p-adic expansion, a structure is not either a fixed and absolutely stable essence, it can be deformed using some well defined algebraic techniques,... In these sciences, we are used now not simply to pass from one fixed idea to another, but to let the ideas deform themselves!

Philosophically we can approach the problem of form mutability using for example four "models".

The first one is the Aristotelian and partially Thomist conception (which can be compatible with evolution of life being but not with a form mutability). The second is the Hegelian one with a concept of substance self-determination. The third one could be Heidegger's model of metamorphosis. And the last one is the one of Maurice Blondel which put forward being incompleteness and the fact that life organisms are only sketches with respect of the real Being.

We will check that the latter is interesting to take into account this life plasticity and also to respect being coherence and unity. In fact it is interesting to remark that up to now no specialist of Blondel have focused on that the term of plasticity which is nevertheless very frequently used by the "Maître d'Aix" in his famous Tetralogy and also elsewhere. In fact the blondelian understanding of plasticity is not completely stranger to the thomist tradition. We will explain why. The conclusion

of this is that we can build a philosophical framework in which substance mutability can be coherently thought.

Theologically this is very interesting because we can rediscover here new way to underline the incompleteness of the creation waiting for its achievement, a personal gift "in quo omnia constant". We understand also some texts saying that we are "intium aliquod creaturae" (Jc, 1, 18) "quod Deus ipse perficiet, confirmabit solidabitque" (1 P, 5, 10). Indeed it is not possible to conceive this final gift with a fixist ontology involving no undetermination and incompleteness of beings. The form itself, the substance, intrinsically have to open themselves to this final gift. Otherwise beings and God would remain, side by side, denying what is written: "omnia intendunt assimilari Deo". It is worth to note that in the Blondelian thought the being consistency, the substance coherence is weakened but it does not break being unity because of the proposed final completion, achievement. The risk for a Christian thought is to exaggerate this being weakness towards a possible dislocation without any possibility of achievement.

With a framework where mutability of forms is integrated, we will also be ready to understand some theological propositions such as those of Maurice Zundel, the friend of Paulus VI: "Coller à soi c'est se réduire à zero. Être à distance de soi c'est exister d'autant plus fort que cette distance croît" (to adhere to oneself is to reduce oneself to zero. To exist is to be at distance of oneself and the more this distance grows, the more one exists). A meaning of plasticity allows us to build an anthropology which thinks human being through his ability of centration and decentration with respect of himself.

- 2) Afterwards we have to study a second philosophical implication of life plasticity: the intrinsic and also the necessary vulnerability or fragility of living being. This allows us to build a philosophy of biology where the evolution is not read as the triumph of the strongest on the weakest. It is may be the contrary which is true! Evolution would not be possible without a kind of fragility, of vulnerability which allows precisely the evolution ability. Arrived at the level of human being we are placed in front of a highly vulnerable state of the biosphere. On the point of view of ethical thoughts, it is very important because this underlines the central role and value of the weakness. This cannot be treated as a purely negative aspect. On the contrary we have perhaps to grasp an argument placing the vulnerability at a cen-

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**Katolicki Uniwersytet Lubelski Jana Pawła II
15-16 listopada 2006 r., Collegium Jana Pawła II, sala 1031**

tral place for the definition of human as such. Theologically this is very relevant because it could help us to shed some new light on important texts of the Gospel which articulate force and weakness.

Here also there is a risk. Several philosophers have interpreted this life vulnerability as an invitation to manipulate life without any constraint but the human power dreams. But we can, following Hans Jonas or others interpreted this vulnerability as an invitation to respect an essential condition for life to evolve. The first philosopher type would profit of the vulnerability to transform life under the purely human standards. But we can view the situation differently and to consider this vulnerability as something which opens far beyond, something which indicates that the final consistency is not yet there and not reducible to some power dreams.