AUTOFUNCTORS AND THEIR MEANING

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Abstract.

Kato and Struppa (1999) proposed the notion of autofunctor. In the present paper, the meanings of this notion are analysed in the light of a proposed structural-phenomenological interpretation of the theory of categories (Draganescu 2000). The autofunctor may become important for phenomenological categories. It represents an informational and physical process, not only a mathematical notion. It might offer, for instance, a better understanding of the generation of a universe from the deep underlying reality consisting of phenomenological information and orthoenergy.

I. Preliminary considerations.

For an integrative science is necessary to develop an integrative mathematics [1]. This embraces both the structural and phenomenological aspects of reality. It seems that the categories and functors are very suitable [2] [3] for such a development.

In [3] were introduced new types of categories and functors:

- phenomenological categories, with phenomenological objects and morphisms;
- structural-phenomenological categories with objects and morphisms of structural-phenomenological nature;
- structural-phenomenological functors between a structural category (classical categories of mathematics) and a phenomenological category, and respectively phenomenological-structural functors between a phenomenological and a structural category.

In [4] the morphisms are seen not only as transformations, in a category, from one object to another, but also as communications between the objects of a category. This is a very interesting perspective for the structural-phenomenological modeling. Therefore the categories may be:

- Categories with <transformation morphisms>, that is with effective morphisms;

- Categories with <communication morphisms>, where the arrow between two objects means a process of communication.

Between two phenomenological categories there are phenomenological functors. For instance, between the category of the phenomenological senses of a human mind and the category of all the phenomenological senses of existence such functors are feasible.

Kato and Struppa introduced [4] the notion of autofunctor observing that "of particular interest is the problem of analysing the meaning of autofunctors (i.e. functors from U to itself)". U, in their paper, is a category, a universe defined as a model for a conscious universe.

In principle, an autofunctor might be structural, but as far as we know it was not defined and used for classical mathematical categories. An autofunctor might be phenomenological, or structural- phenomenological depending on the category it refers to. The principle of feasibility [3] seems to restrict the possibility of autofunctors somewhat only for phenomenological categories, because of the nature of phenomenological processes. Because a structural-phenomenological category is always a sub-category of a product between a structural category and a phenomenological category [3], and if the phenomenological category has autofunctors, then changes produced by the pheno- menological autofunctor, are transferred in changes of the structural-phenomenological category. In such a case, perhaps a structural-phenomenological autofunctor could be defined as a secondary or enhanced autofunctor for such a type of category, because it is only a consequence of the pheno- menological autofunctor.

II. The informational character of phenomenological categories and of their autofunctors

Let us consider the deep underlying reality (orthoexistence) as an out of space and out of time see of deep energy (orthoenergy) and of the fundamental orthosense <to exist> which is a phenomenological information (called also the infraconsciousness of existence [5]).

The phenomenological category $C_{phe!1!}$ is the part of the deep underlying reality (Fig.1) which contains the fundamental orthosense <to exist>, which is the fundamental "experience" of informatter, the last one being the phenomenological informational matter of the deep reality [5] [6]. The phenomenological sense <to exist> (noted <1>) is supposed to have three components [5]:

1. *to exist in itself* (which expresses also the unity of the entire existence);
2. *to exist from itself (which may be seen also as a carrier of an autofunctor which associates to <1> a generated family of orthosenses that might be the basic phenomenological information (active information after David Bohm) of an universe);*
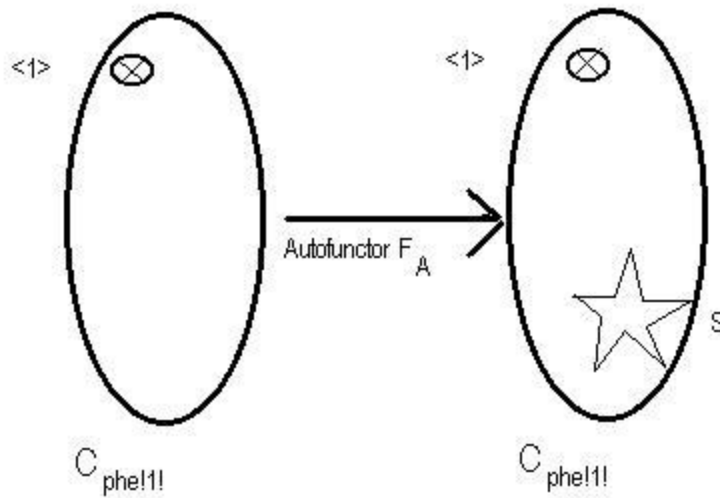3. *to exist into itself* (with some possible effects, one of them to be mentioned at the end of this section.

Fig. 1

The autofunctor F_A from Fig.1 is not a simple functor that associates to an object, from a category, an object of another category, because the second category is the same with the first catego- ry. If the category has many objects, an association of each of its objects with any other of its objects, in principle, is possible. But in the case of Fig.1 there is more. The object <1> in the initial category $C_{phe!1!}$ is associated, in the same category, with the object <1> and an object S that is a family of orthosenses. The autofunctor F_A is a physical and informational process that generates the active information of a possible universe (**note 1**) . It is to be observed that S is itself a phenomenological category with phenomenological objects and morphisms, every of its objects containing also the sense <1> (the part contains the whole).

In order to become a real universe it is necessary a phenomenological-energetic coupling, between S and the orthoenergy, which gives birth to the structure of a universe with its space-time and quanta [5] (perhaps strings).

This coupling is also a process, i.e. is a functor F_{SU} from the phenomenological category S to the category U of the structural universe.
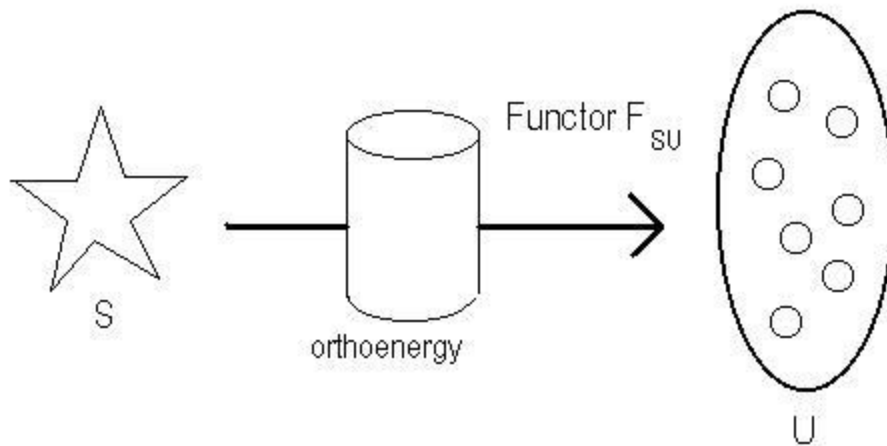
Fig. 2

If the autofunctor F_A is inherent in the nature of deep reality, as was suggested before, the functor F_{SU} is also a property of the deep reality ([Fig.2](#)). It may intervene or not, these possibilities (coupling or not coupling) being necessary for an internal play of the phenomenological senses in the deep reality, for a phenomenological processing of its internal information. When F_{SU} is acting, a universe is born. When it is not acting, the former category S disappears or is transformed. The functor F_{SU} is not acting at every generated phenomenological category S. When it does acting, due to the coupled orthoenergy, S is maintained together with the structural universe U, in the frame of the structural-phenomenological universe U (see also the next section).

Two possibilities may be envisaged for F_{SU} :

a) the component <to exist into itself> of <1> is acting the functor F_{SU} expressing the potential tendency to receive senses from the developments of a real universe;

b) the functor F_{SU} is controlled by the Fundamental Consciousness of existence [6] who may decide if it the case to apply or not this functor in a specific case of a generated phenomenological category S.

III. The role of autofunctors

   Which is the possible place of the Fundamental Consciousness? To the object <1> in $C_{phe!1!}$, an autofunctor based on the orthosense <to exist in itself> associates a family of orthosenses that are essential for the Fundamental Consciousness. For instance, beside the sense of existence, a sense of knowing, of self, of will and others (i.e. senses that are usual for a consciousness, although some other existential senses may be present). This family of orthosenses, which is a phenomenological category, will be noted with G, and the autofunctor from $C_{phe!1!}$ to $C_{phe!1!}$ with F_G as in Fig.3.
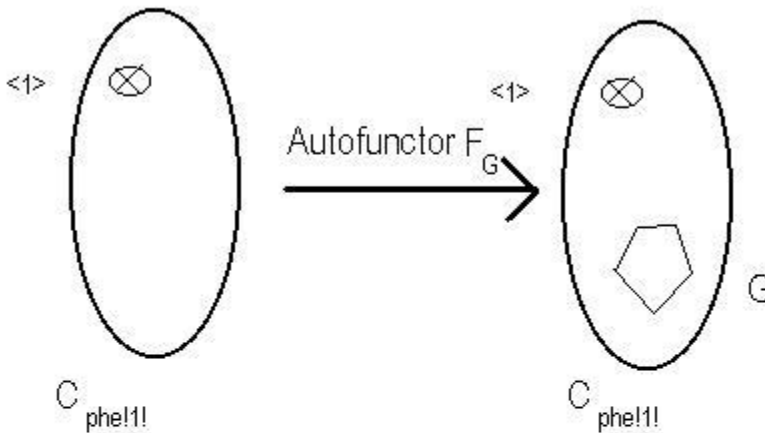

Fig. 3

   One observes that <1> is not necessarily a category. <1> is rather a set [3] with three elements (**note 2**). On the contrary, S in the previous case (Fig.1) and G in the second case (Fig.3) are categories with many objects and with morhisms among them.

   The categories S and G could not maintain themselves without coupling with orthoenergy, i.e. without generating a real universe or, after the case, the selfconstitution of the Fundamental Consciousness. The category S after coupling with orthoenergy becomes the **structural universe**

U. The category G after coupling with orthoenergy becomes **the Fundamental Consciousness G.**

Between S and U there is an association of the objects of the first category with objects of the second category, and the same for the respective morphisms. Therefore between these two categories there is a phenomenological-structural functor H_1 and inversely [3] a structural-phenomenological functor H_2. *Together, **the structural universe** U and **the phenomenological universe** S constitute **the structural- phenomenological universe U**, **or the universe** U*. This may be named also the integrative universe.

Therefore, the universe **U**,

$$\mathbf{U} = < S, U, H1 , H2 > \quad (1)$$

is formed by two categories of objects and two functors (may be two families of functors) between them. The dynamics of a universe depends on the characteristics of all these four items (Fig.4).
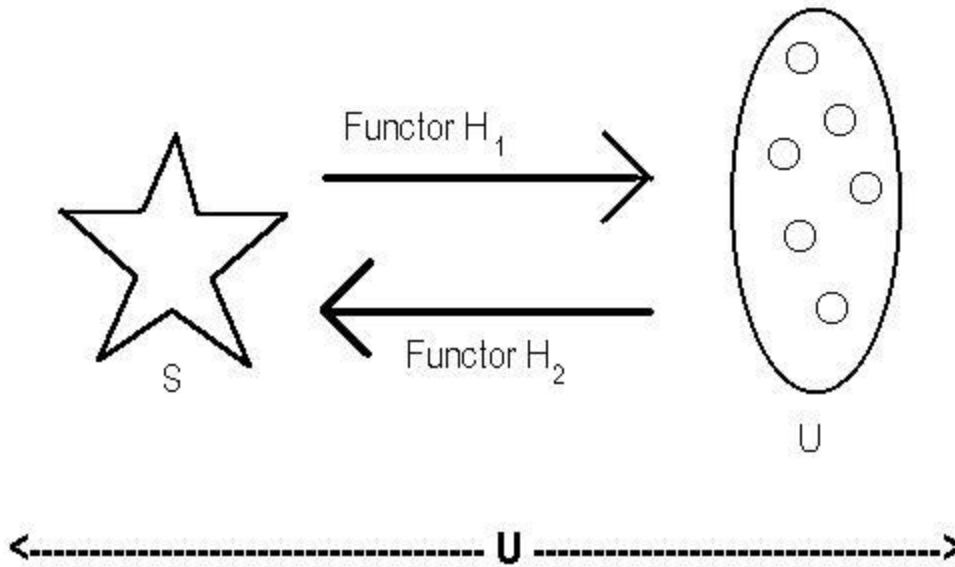
Fig. 4

The Fundamental Consciousness **G** is also formed by two categories, the category G with specific orthosenses for this consciousness and a structural universe U_g resulted after the coupling of G with orthoenergy. This is done by the functor F_{Gug} (Fig.5). Between G and Ug there are the functors F1 and F2 . Then (Fig. 6),

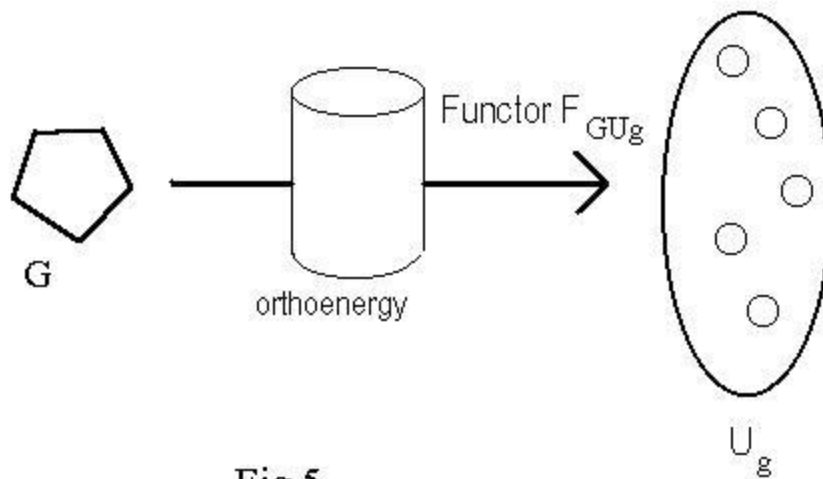$$\mathbf{G} = < G, Ug , F1 , F2 > \quad (2)$$

Fig.5

There is perhaps a principle of structural-phenomenological symmetry in the frame of the foundational principle of complementarity [6] between the structural and the phenomenological, or between the orthoenergy and the phenomenological information of orthosenses . The human consciousness is structural-phenomenological, the Fundamental Consciousness is phenomenological- structural, and there is a symmetry of them. There is also symmetry of a universe with respect to the Fundamental Consciousness, as may be seen from the expressions (1) and (2). There is also symmetry between an organism and a universe, an organism having a similar general expression like (1) or (2) as it was shown in [3] .

IV. The physical and informational importance of autofunctors.

 An autofunctor represents an important part of the internal dynamics of a phenomenological category.

 In [3] it was shown that in the structural realm, the automaton might represent a category of which objects are all the states of that automaton. Every state being an object of the category, the

morphisms among its objects represent the transitions from one state to another. These transitions listen to some formal rules.
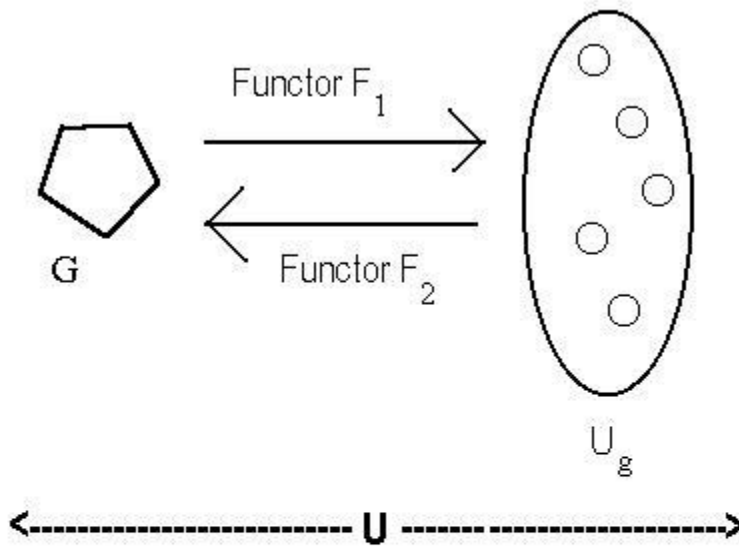

Fig.6

For an autofunctor, the passage from a category to itself is non-formal, much more, may be creative in a way like in Fig.1 and 3. The essence of an autofunctor for a phenomenological category is to give birth to a physical and informational process, which is non-computable, non-formal, unpredictable for an observer from a universe. The autofunctor is therefore a quite special type of functor. It does not only associates objects, it creates phenomenological objects!

The above landscape may be corrected when the Fundamental Consciousness intervines in the processes, but only in the general frame of autofunctorial events of a phenomenological category as described above. A mixture of unpredictability with censorship of the Fundamental Consciousness to let one or another phenomenological event to have consequences, and with the will of It to deter- mine, perhaps, one or some possible ways of action, is to be envisaged.

To refine a structural-phenomenological theory of categories, which might be called also integrative theory of categories, such new notions as those introduced in [3] and in this paper are to be examined in connection with theories of consciousness, with cosmological theories and

with all the aspects of an integrative science [1]. For the time being, the papers [1] - [4], [6] bring only introductory thoughts.

NOTES

note 1: For the physical reality of functors see [2].
note 2: If every element of <1> is seen as a set with one element, then <1> may be considered as a collection of three objects, but not with morphisms among them, because every object has its individual phenomenological sense. There are not physical and informational morphisms among these phenomenological objects, therefore they are not forming a phenomenological category.

REFERENCES

[1]. KAFATOS M., DRAGANESCU M., *Toward an integrative science,* NOESIS, XXVI, 2001, to be published. See also http://www.racai.ro/~dragam, the section NEW.

[2]. STRUPPA D.C., KAFATOS M., ROY S., KATO G., AMOROSO R.L., *Category theory as the language of consciousness,* George Mason University, preprint, 2000.

[3]. DRAGANESCU M., *Categories and functors for structural-phenomenological modeling,* communication at the Section for the Science and Technology of Information of the Romanian Academy, Bucharest, September 18, 2000, to be published by Proceedings of the Romanian Academy, Series A, vol.1, No.2, 2000. See also http://www.racai.ro/~dragam, the section NEW.

[4]. KATO G. and STRUPPA D.C., *A sheaf theoretic approach to consciousness*, The Noetic Journal, 2, No.1, p.1-3, 1999.

[5]. DRAGANESCU M., *Ortofizica* (Orthophysics), Editura Stiintifica si Enciclopedica, Bucuresti, 1985.

[6]. DRAGANESCU M., KAFATOS M., *Generalised Foundational Principles in the Philosophy of Science*, The Noetic Journal, 2, No.4, Oct. 1999, p. 341-350.