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Husserl' Analysis of the Crisis of the European Sciences from the Modern Point of View

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Abstract.– This is an attempt to apply some of Husserl's thoughts about comprehension of modern scientific revolution. It is expressed a hope for occasion to overcome the standard scientific understanding of nature as a 'mathematical universe' due to the creation of non-linear science.

This article is written by me not as a historian of science or a historian of philosophy, investigating the context or the grounds of the appearance of one or the other thought, but as a philosopher of science, finding in the history of philosophy the means for the comprehension of the modern situation in science.

If we take into account, that this is a revolutionary situation, and that the great role in the present scientific revolution belongs to the employment of Poincaré's mathematical methods of non-linear dynamics to natural sciences, we'll see: attention to the modern science at Poincaré Congress is very much to the point.

I'd like to say a few words more about the way I am going to appeal to Husserl's ideas for interpretation of the contemporary revolutionary changes in science. I'll refer to our outstanding philosopher Merab Mamardashvily. He wrote:

> the problem concerning the wealth we find in the history of philosophy is that it could be succeeded only as I can reproduce this wealth as the possibility of my own thought, that I can think it now in quite other modern subjects. Moreover, we hold our forerunners as alive, not as dead in their texts, when we think their thought as the possibility of our own ones. [Mamardashvily 1989]

So with deep respect to the historians of philosophy and to their way of consideration of the philosophical heritage my approach to it is quite different. As for as I'm concerned, it is more important to understand *what* Husserl thought, than *why* he thought like that.

And then we can correlate *what* Husserl wrote about the European science in 1937, *what* Poincaré did in mathematics at the beginning of century, *what* has been happening in science for last twenty years.

Which of Husserl's thought do I ask you to consider and what modern context do I mean?

This is the thought about substitution of the 'life world' by the idealized nature originated by Galileo. Husserl regarded Galileo as the genius, who at the same time initiated and accomplished physicalistic understanding of nature, who put forward the idea of method as the infinite way of physical investigations, who discovered the exact regularity, due to which every event of idealized

nature came to be regarded as determined by the exact laws. I can't help agreeing with Husserl, when he considers that in principle it's changed nothing as a result of criticism of classical causal laws by representatives of new atomic physics. For all its innovations principal entity saved, namely the idea of nature, mathematical by itself.

That is the clearest formulation of the thought I am interested in:

> The raiment of ideas inherent to mathematics and mathematical sciences, envelops all constructions with the aid of which scientists substitute the 'life world' (*Lebenswelt*), giving to it the cover of 'objective, real and true nature.' The raiment of ideas creates that, what we take for the true being, which is the method in fact. [Husserl 1936]

Professor J. Mohanty in his book *Edmund Husserl's Theory of Meaning* shortly expounds the Husserl's understanding of the above mentioned substitution way:

> Formalization of mathematics is no doubt both justified and necessary, but we must not forget the basis from which it all sprang. This forgetfulness is, we are told, in a large measure due to Galileo's attempt to give a purely quantitative-mathematical account of all nature, including the qualitative fullness of sensible contents. The mathematicization of the sense qualities though indirectly led to what Whitehead calls 'bifurcation of nature' into a real core consisting of mathematical forms and appearance, consisting of qualitative contents. Sensible experience, considered as doxa, was now finally subordinated to mathematical reason whose autonomy was fully assured thereby. Husserl protests against this bifurcation as fully as Whitehead did, and aims at restoring to doxa its rightful place at the basis. [...] This forgotten basis is nothing other than so-called *Lebenswelt*. The crisis of the sciences consists in self-forgetfulness; the remedy suggested is the attainment of self-knowledge. [Mohanty 1976]

I'd like to show, that what is happening in modern science proves that Husserl was right. As a matter of fact the change of mathematical methods in natural sciences, namely, application of non-linear equations, whose quantitative solution became possible due to computers, have led to the very special change of the world picture. As distinct from the previous scientific revolutions the principles of construction of the universe in the new picture of the world changed. In spite of usage of mathematical methods it is not already the 'mathematical universe' in the former sense. And its relation to the 'life world' can be thought as of quite different from the relation which was thought to exist between the foundations of

classical and non-classical science. Now the opportunity for revision of the foundations of science is open. It is desirable that this revision would not stop at the statement of the next paradigm shift and that we should avoid the relativism, Husserl warned against. In any case this is the chance to approach self-knowledge.

What changes have been taking place in the world picture during the scientific revolution we are now watching?

Following standard traditions of scientific rationality scientists applied the mathematical methods of non-linear dynamics, when opportunity presented itself. So far as previous methodological norms treated the non-linearity as the marginal negligible deviations from the main linear way things are, the non-linear processes were at first investigated to make classical theories more accurate (Thermodynamics, particularly). So that it was in full accordance with Galileo's method how Husserl defined it.

But as it's known, it very soon became apparent that non-linear methods describe much wider scope of processes, than linear ones do. And the non-linear distinctions are not the closer definition of the linear description. Just the opposite! The classical linear laws describe only the integrable systems. Comparatively with the non-integrable ones they constitute very narrow class: specific cases in the world of non-linearity the world of self-orgatization and self-reproduction of dynamic stable systems, the world, where chaos plays a constructive part.

But what is the reason to consider this new picture of the world not as the new edition of 'mathematical universe' by Galileo?

To begin with, the new scientific description gives rise to the picture of the world, which can not be completed on the former foundations. The point is that the self-organization is not fully a regular process. Random choice of version of system development in singular bifurcation points is not determined by law. It makes the destiny of a self-organized system irreversible. Thus, the formal science acquires the features of historical science. In this case the subject of science doesn't exhaust by Kant's definition: "*nature as being of things so far as it is determined by general laws*" [§ 14 of Kant's *Prolegomena*]. And this means there are no reasons for considering the world as a mathematical universe, where each event is determined by the action of laws.

Thereby, the stability of existence should have different grounds, unreduced to the continuous action of linear laws, to which complex self-organized systems are not followed. The stability characteristic of the objects of both classical and non-classical physics as physics of being can be regarded from the standpoint of

physics of the becoming as a dynamic stability, as a self-reproduction by self-organized systems.

Perhaps, researchers have not been under shock by limitation of universality of regularity, because from the very beginning the investigation of self-organizing systems was aimed to the conditions of their stability.

Thus, now not the action of laws grounds the true reality of essence as distinct from the transient appearance, as it was in former foundations of science. But on the contrary: the self-organization of transiently existent systems grounds the conditions for action of laws sometimes. Regularity in the behavior of the open non-equilibrium systems is possible, if the parameter of order and control parameter exist in the systems. It isn't always so, as it's known.

As we see, there are no more grounds to oppose the mathematicized nature as core or the essence of the existence of phenomenon. So, there is no mathematical universe in the former sense of the word. But the mathematicization, idealization and generalization remain as scientific methods. I think the opportunity to clarify their sense will gradually open while the new system of the foundations of science becoming.

Now I'd like to touch on the problem of generalization as important aspect of scientific method. The discovery of several types of realization of stable solutions for non-linear equations in theoretical modeling of self-organization processes allowed generalization to be retained. With all unpredictability of random choice of alternative variants of self-organization in every self-organizing systems, synergetics discovered the applicability of general theoretical principles and mathematical models to theoretical description of self-organization processes in different realms of reality. Even if this generality was to be interpreted as a set of typical ways of realizing the self-organization, discovery of them shows, that the specific features of natural science, oriented on the cognition of the general, have been retained.

From my viewpoint this ability of science to retain its way of research, when its subject and methods are changed is connected with the development of scientific rationality by extension of methodological consciousness in the course of revolutions in science.

Such extension of scientific rationality are often experienced due to appealing philosophical heritage. It's typical for founders of modern non-linear science as well as for prominent scientists in all turning-point periods in science. Thus, for example, Prigogine appeals to Aristotle in order to clear the difference between outer and

inner time of a self-organizing systems by association with Aristotle's concepts *metabole* and *kinesis* as the kinds of motion [Prigogine 1980].

To comprehend the situation of the break in the function of laws, when the becoming system in its new stable state is subjected to a new law, limited categorical forms, effective in physics of being cannot be used. The conception of probable causality comprehends randomness as a manifestation of necessity at best. In this limited matrix of understanding one cannot pose a question of becoming of new necessity, of the role of randomness in this becoming.

The correlation between necessity and randomness in the process of becoming of a new whole could be naturally associated with the concept of real necessity [Dobronravova 1990]. By Hegel's expression, real necessity contents randomness. Hence, the general theory have to reconstruct the situation of bifurcation as situation of random choice in its necessity and uncertainty. But the full explanation of the phenomenon have to include the knowledge of the real choice of the way of further evolution by system. It is not always the way of necessity: after a few bifurcation the typical transition to dynamic chaos takes place (to the strange attractor, particularly).

It's interesting, that the extension of scientific rationality means at the same time the understanding of its limits, which creates the opportunity for revaluation by science of its own cognitive pretensions in comparison with the other kinds of human cognitive practice. Thus, as distinct from the classical rationality, which regarded all what's happening in the world exactly cognizable in principle, synergetics introduce the notion of so called 'time horizon'. For example, meteorology predictions, because of the inevitable appearance of a strange attractor in the theoretical description, are possible in a certain horizon of time: for nearest days or a week. Next predictable periods of time are already year. Between these windows of transparency weather is unpredictable for scientific rationality. But folk signs about the weather exist and work there.

Such examples inspire the hope for a change of relations of idealized world of science to the 'life world'. Besides I'd like to mention another hopeful features of modern science. They evidence about the movement to overcoming the gaps between human and nature, between animate and inanimate nature. The first feature is very brightly described in the famous book by Prigogine and Stengers [Prigogine & Stengers, 1984] and so I can only name it. Second one is connected with the achievements of Ukrainian scientists and deserves separate consideration. I mean the appearance

of the new scientific trend physics of the alive and its elaboration by the scientific school of Prof. Sit'ko from Kiev [Sit'ko 1993].

I am far from the thought, that sometime there will not be difference and contradictions between life world and idealized nature of science. It would be the death of science. But if we would listen to Husserl we have to help to both of science and humanity in their movement from self-forgetfulness to self-knowledge.

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