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COGNITIVE EXISTENTIALISM AND PHENOMENOLOGY OF SCIENCE'S THEORETICAL OBJECTS

I.

The existential conception of science developed in Section 69b of *Being and Time* focuses on the genesis of scientific theorizing out of the everyday mode of being-in-the-world. At issue here is the transformation of the "locations" of things that are "ready-to-hand" in the (pre-scientific) everyday practices into "world-points" which are released from specific "environmental confinements". (Briefly, this is a transformation of what is practically and instrumentally ready-to-hand into what becomes objectified as a presence-at-hand.) Heidegger is preoccupied with the analysis of the constitution of thematic objects of scientific research. In this regard, he elaborates on a particular paradigm of transcendental analysis. The genesis of thematic objects becomes possible through the way in which a domain of doing research is mathematically projected. The mathematical projection discloses a structure of "world-points" that is *a priori*. (For instance, by projecting the structure encoded by partial differential equations which establish relations connecting space, time, and the electromagnetic field-magnitudes, one delineates the domain of classical electromagnetism. Similarly, by projecting the structure encoded by the Navier-Stokes equation, one constitutes the research domain of classical hydrodynamics, where all terms describing the dynamics of fluids are satisfying the Galilean invariance.)

The mathematical projection provides the "transcendental conditions" for articulating thematic objects within the domain that it delineates. This articulation is carried out by executing research practices like observation, calibration, calculation, experimentation, instrumentation, measurement, and so on. The transcendental conditions concern the construction of theoretical concepts (and models) and their empirical interpretations, the choice of themes, the clues of methods, the possibility of epistemic truth and objectivity of what is thematized, and the epistemic rationality of all practices employed in the articulation of thematic objects. By fulfilling the conditions posed by mathematical projection, scientific research objectifies. The transcendental analysis of science in terms of hermeneutic ontology addresses the process of objectifying as "the thematizing of the present-at-hand". In a highly sophisticated manner, Heidegger relates the mathematical projection (and the constitution of thematic objects of scientific research) to the temporal problem of the transcendence of the world. The thematization that objectifies "entities" and "items" within-the-world presupposes transcendence. More specifically, the transcendence of the world (a transcendence which is grounded in the "ecstatical unity of temporality") makes it possible to sketch out the way of objectifying.

Speaking not in strictly Heideggerian terminology, the transcendence of the world designates the fact that there are no objects (including all thematic objects of science) beyond the horizonal temporality (or, the horizon of temporalizing the constitution of meaning within the totality of all possible practices) of human existence. From a perspective that avoids a naturalistic postulation of an "independent reality out there that is opposed to the mind", the world is the unity of all practical relationships characterized by the moments of circumspective concern: the "in-order-to", the "towards-which", the "towards-this", and the "for-the-sake-of". Deviating again from Heidegger's terminology, the world is the complexity of organized equipment and practices in which human beings are involved. (While the world, from the viewpoint of epistemology, is the external totality of entities which is standing over against the mind of the epistemic subject, the world from the viewpoint of hermeneutic ontology does not have an essence behind the organized equipment and practices.)

Yet the same unity of practices and equipment is the existential-ontological meaning of temporality. This is why Heidegger ascribes to three of the moments of circumspective concern within-the-world the role of "horizonal schemata" of ecstatical temporality. (The reason why Heidegger is using the term "ecstasies" is that to each temporalizing involvement in the organized equipment and practices belongs a "whither" to which one is carried away.) On Heidegger's summarizing formulation, the "world is already presupposed in one's being alongside the

ready-to-hand concernfully and factically, in one's thematizing of the present-at-hand, and in one's discovering of this latter entity of objectification ... Having its ground in the horizonal unity of ecstatical temporality, the world is transcendent." (Heidegger 1962: 417) According to this formulation, the problem of transcendence consists in establishing the ontological possibility for "entities" to be encountered within-the-world and objectified thematically. The problem of transcendence is the main transcendental problem of *Being and Time.*

To a certain extent, the "existential genesis" of the thematization that objectifies is due to an atemporalization of a peculiar involvement within-the-world. This involvement is the "theoretical attitude", by means of which one is making-present a domain's subject-matter of thematic objects. As a theoretical kind of making-present the thematization that objectifies is not simply an "isolation" of the horizonal scheme of the present from the "ecstatical unity of temporality". This making-present that belongs to scientific research is rather "the kind of discovering which ... awaits solely the discoveredness of the present-at-hand" (Heidegger 1962: 415).

The most important merit of Heidegger's attempt to develop an existential conception of science is the way in which he is figuring out relations between the existential-ontological problem of transcendence, the horizon of temporality, and the cognitive structure of scientific research. Nevertheless, *Being and Time* does not offer a coherent conception of the constitution of scientific objects in terms of hermeneutic ontology. There are several reasons for this failure. First, Heidegger's picture of science's cognitive structure is underdeveloped. Second, the paradigm of constitutional analysis being employed depends heavily on the (hidden metaphysics of) the ontico-ontological difference. Third, there is a number of missing links between scientific thematization that objectifies and the solution of the problem of transcendence. Fourth, the intrinsic horizon of the temporality of scientific research is completely ignored. (The making-present of thematic objects is a process distinguished by its own temporal dynamics. Heidegger conflates in an inappropriate manner two essentially different issues: the atemporalization of what is made-present in scientific thematization and the proper temporality of scientific research as a specific mode of being-in-the-world.) Finally, the contrast between the pre-scientific modes of "circumspective concern" and the scientific constitution of thematic objects is exaggerated.

The basic shortcoming of Heidegger's existential conception (as recognized against the background of the aforementioned five points of criticism) consists in ignoring the "intrinsic everydayness" of science. By implication, the interrelatedness of discursive practices of the research process does not play any signifi-

cant role in the analysis of objectifying thematization. Heidegger focuses chiefly on the "existential genesis" of science (as "theoretical attitude" and "mathematical projection of nature") from the everyday concernful mode of being-in-the-world. What he basically does not take into consideration is the fact that scientific research is characterized by its own everydayness, which exhibits important similarities to what Kuhn calls "normal science". (See Ginev 2003)

Like the pre-predicative (pre-thematic) "average" everydayness, the "secondary everydayness" of objectifying entities within-the-world through scientific research is predicated on its own hermeneutic fore-structure as a horizon of possibilities that can be worked out by effectuating practices of experimentation, measurement, constructing theoretical models, constructing systems of differential equations, and so on. The working-out of these possibilities constitutes a domain of scientific research. Accordingly, many important distinctions of *Daseinsanalytik* are to be applied not only to the inquiry into the "existentially primordial" mode of pre-thematizing (pre-objectifying, pre-epistemic) dealing with things that are ready-to-hand, but to the intrinsic discursive-practical fore-structuring of the cognitive structure of scientific research as well. In particular, the distinction between the "pre-predicative as-structure of seeing of the ready-to-hand" and the "thematic-predicative as-structure of seeing of the present-at-hand" is applicable to the interpretation of the intrinsic dynamics of scientific research. The transition from "hermeneutic as" to "predicative as" does not form a privileged point of reference in studying the existential genesis of scientific objectification. In opposing Heidegger's scenario of this genesis, the contemporary programs of hermeneutic phenomenology of the natural sciences advocate rather the view that there is a continuous interplay of hermeneutic as and predicative as in normal scientific research. (A view essentially anticipated by the pioneering projects for a "hermeneutic logic" developed in the 1920s by Georg Misch and Hans Lipps.) Let me now briefly focus on the principal revisions of the existential conception of science in the post-war period that promulgated the program of *cognitive existentialism*.

II.

A common denominator of the programs of hermeneutic phenomenology of science developed in the second half of the last century is the search for a post-metaphysical identity of the natural sciences achieved through certain revisions of "Heidegger's philosophy of science". (On this programs, see Ginev 2006: 65–85.) This common denominator informs some important tendencies in the studies into hermeneutics of science and phenomenology of scientific objects. Let me mention three of them. (1) While criticizing the hypostatization of an indepen-

dent transcendental position, the programs retain a transcendental dimension. This sort of "de-transcendentalization" brings into play attempts at closing the gap between ontical and ontological in "Heidegger's philosophy of science" (as a part of hermeneutics of facticity). (2) While suggesting paradigms of analysis of the constitution of science's cognitive content, these programs reject any representational model of scientific knowledge. On the programs of hermeneutic phenomenology of the natural sciences, the cognitive content is not the outcome of an already fixed subject-object relation. (See Kockelmans 1985, 1993, 1997, 2002; Heelan 1983, 1994, 1997, 1998; Kisiel 1976) On the contrary, all types of epistemic cut that objectivist and representationalist theories of knowledge take for granted are "produced" within the constitution of cognitive content. The very constitution takes place within the hermeneutic fore-structures of scientific research. Furthermore, the interplay between configurations of research practices and horizons of theorizing informs the dynamics of this constitution. (3) While discarding all forms of the ideology of scientism and objectivism, the programs defend the autonomy of scientific research and the cognitive specificity of the natural sciences. In another formulation, the programs of hermeneutic phenomenology of the natural sciences put forward various non-essentialist ways of defining (and defending) this cognitive specificity in terms of an "existential analytic" of the interrelatedness of research practices (or, the modes of scientific communities' being in the worlds of scientific research). The strategy and politics of the philosophy of science based upon this existential analytic should be called a *cognitive existentialism*. Basically, it is an outcome of the principal revisions of Heidegger's existential conception of science. Its task is to reveal the specific hermeneutic situations, on which the research processes in the natural sciences are predicated.

According to cognitive existentialism, a hermeneutic fore-structure of scientific research is not to be confused with a theoretical framework imposed upon the research practices. Such a fore-structure is rather a horizon of projected possibilities for scientific inquiry. Yet these possibilities are not constantly given to the participants in the research process. If the horizon of possibilities is always out there, then the hermeneutic fore-structure would be only another kind of a "cognitive essence". The possibilities are opened up only within the changing configurations of scientific practices. They are contextual and situational possibilities, which do not exist *per se*. However, the horizon of possibilities "always already" transcends the particular configurations. Furthermore, neither the horizon nor the particular configurations in which the possibilities become appropriated has/have a temporal priority. They are mutually dependent. There is no causal relationship but a hermeneutic circle of co-dependence. It is this circle that informs the proper temporality (in the sense of hermeneutic phenomenology) of scienti-

fic research. On cognitive existentialism, the circle between the horizon of projected possibilities and the particular configurations of research practices has a transcendental status with respect to the empirical dynamics of science. Paraphrasing Heidegger, the main task of a hermeneutic philosophy of science is how to enter into this circle.

To stress again, the horizon of possibilities is always already transcendent as regards the actual situations of scientific research. These situations come into being as a result of an appropriation of possibilities projected (in their totality) as a horizon of doing research in a scientific domain. For the sake of illustration, consider the research process on the borderline between biochemistry and molecular biology at the time when the central issue was the acceptability of the suggestion that amino acids should become substrates for peptide bond formation. Examples of actual situations of scientific research at that time are the inquiry into the role of adenosine triphosphate as an energy supplier in protein synthesis; the inquiry of enzymes which are necessary for protein synthesis in vitro; the search for theoretical models of polypeptide synthesis based on already revealed mechanisms of acid synthesis; the verification of the view that new protein within the bacterial cell was made from the pool of free amino acids; the inquiry into connections between cytoplasmic RNA and protein synthesis; the inquiry into the structure of microsomes as an integral part of the subcellular morphology; the inquiry into the structure of DNA as a generator of the code for protein synthesis. In all these situations, the appropriation of possibilities of doing research widened in turn the horizon of new possibilities regarding inquiries into genes whose activity might exercise a control over the activity of cytoplasmic messenger (mRNA), the ways of relating changes in protein structure to changes in protein activity, the kinetic parameters of regulated protein activity, and so on. For several reasons, the appropriation of these new possibilities proved to be impossible in the period under discussion – the late 1950s. The constant widening of the horizon of new possibilities, while there is a scientific domain's growing conceptual articulation, epitomizes an important aspect in which this horizon is transcendent. Yet there are other aspects which I will take into account as well.

In hermeneutic phenomenology, the appropriation of projected possibilities is conceived as a constitution of meaning. Each mode of existence (distinguished by a characteristic everydayness of routine practices) is a being-towards-possibilities. An existential mode articulates its meaningful world by means of the ongoing working-out (appropriation) of possibilities projected in the horizon of self-understanding. The very articulation takes the form of interpretation. Thus, the nexus of understanding (projected horizon of possibilities) and interpretation (articulation of a world of everyday practices) informs the constitutional ana-

lysis of meaning in hermeneutic phenomenology. Since the reflection upon this nexus shows how the world of everyday practices is transcendent, it has a character of a transcendental reflection. In *Being and Time*, Heidegger specifies the nexus of understanding and interpretation by stressing three principal moments of the constitution of meaning: meaning we have in advance (a fore-having of possibilities), meaning we see in advance (a fore-sight of possibilities), and meaning we grasp in advance (a fore-conception of possibilities). He calls the unity of these moments the "existential fore-structure" of each and every mode of being-in-the-world. It is not difficult to see that the notion of "hermeneutic fore-structure of scientific research" is a specification of the notion of "existential fore-structure". As a transcendental reflection, the constitutional analysis of meaning reveals the existential fore-structure without presupposing any essence that determines the appropriation of possibilities within the world of everyday practices. In this regard, hermeneutic phenomenology provides a radical (much more radical than any empiricist position) form of anti-essentialism. According to this form, the unity of a given mode of being in a world of everyday practices, in which the possibility of the meaningful articulation of that world rests, is a unity that consists in the interpretative appropriation of the projected horizon of self-understanding.

As a mode of being-in-the-world, scientific research "projects its being upon possibilities". There is an ongoing appropriation of these possibilities in the normal scientific everydayness of interrelated practices. Through this appropriation an ongoing articulation of a domain's research objects comes into being. (Classical hydrodynamics, quantum electrodynamics, molecular biology, ecosystems ecology, geochemistry, and nonlinear thermodynamics are few typical examples of domains with established conceptual structure where an everydayness of scientific practices takes place.) The research objects in such areas are constantly undergoing small changes in normal scientific research due to their "recontextualization" in new configurations of practices. The everydayness of this appropriation of possibilities ("inscribed" in the configurations of practices) and articulation of a domain of research objects is characterized by both a horizon of anticipations, expectations and orientations and a horizon of projected self-understanding. Their unity within normal scientific everydayness informs the "horizonal-temporal integrity" of a community-being-in-a-domain-of-scientific-research. As a hermeneutic fore-structure of domain's structure, this unity is not behind or beyond the interrelatedness of practices. Now, there is an important component that has to be added to this picture. A domain's research objects are always related to theoretical objects that are not present at hand in normal scientific everydayness. Like the horizon of projected possibilities of doing research, the theoretical objects always already transcend the actual configurations of practices. There is

always a "content" of these objects that cannot be exhibited by the models constituted by the configurations in progress.

This observation makes as it were plausible the hypothesis that the theoretical objects are "cognitive essences" which are not only independent of the dynamics of practices of normal scientific research but even determine this dynamics. Following this line of reasoning, one might state that the research practices serve only the function of "operationalizing" the invariant theoretical objects (conceived as quasi-Platonic entities) by transforming them into research objects that are ready to hand and present at hand in normal scientific everydayness. It is exactly this view that hermeneutic phenomenology of scientific research strongly opposes. The theoretical objects do not exist *per se*. They are rather "inscribed" in the horizon of projected possibilities. These objects project its existence upon possibilities. In other words, the theoretical objects do only exist through their possible readings within the "horizonally open" interrelatedness of research practices. This doctrine about the status of science's theoretical objects constitutes the kernel of cognitive existentialism. The latter can be read as a program that aims at giving an account of the status of science's theoretical objects without presupposing (or appealing to) any kind of essentialism about scientific rationality, scientific method, scientific truth, or objectivity of scientific knowledge.

IV.

Science's theoretical objects are embedded both in the hermeneutic fore-structure of scientific research and in the structure of a scientific domain. Thus, for instance, regulatory genes and structural genes are theoretical objects postulated by the operon theory and the theory of allosteric regulation. By taking part in different theoretical scenarios of the control of gene expression, they play an important role in the conceptual structure of the domain of molecular genetics. At the same time, these theoretical objects are "partially" present at hand and ready to hand in the research practices of this domain. Within the "practical everydayness" of molecular genetics, they exist through various anticipations, expectations, and orientations assigned to them. Anticipations of heritable patterns of gene expression, expectations of the activity of the lactose-metabolizing enzymes, and orientations towards the isolation of protein repressor are cases in point. By implication, the status of science's theoretical objects has to be revealed by the same transcendental reflection that unfolds the hermeneutic circle between fore-structure of interpretation and explicit structure as the very circularity is mediated by the interrelated practices of normal scientific research. *Prima facie*, the theoretical objects are predicated on a double status.

Upon a closer inspection, however, the theoretical objects do have a unitary existence that is to be spelled out in ontological terms. Science's theoretical objects exist, on the one hand, in the possible models of their reading. The set of these models is potentially infinite. Technically speaking, the notion of a theory's possible model can be explicated in terms of a certain formalized semantic conception of scientific theory. (In this case, one is preoccupied with finding possible empirical systems that provide models satisfying a theory's postulates. Notoriously, if at least one of the possible models provides an actual interpretation of the theoretical scenario, then the theory is semantically consistent.) From a phenomenological point of view, however, the expression of the "possible models of reading science's theoretical objects" refers in the first place to the horizon of projected possibilities.

On the other hand, the theoretical objects exist in various spaces of representation in normal scientific everydayness. Roughly speaking, to each particular configuration of practices corresponds a space of representation (e. g., graphically and linguistically recorded experimental results, computer-designed simulations, data-models obtained by measurements of characteristic parameters, statistical models of stochastic processes, mathematical patterns of research objects' behavior, and so on). I entirely accept Hans-Jörg Rheinberger's view that the spaces of representation do not exist as separate systems of symbolic copies of independent referents. Since this view plays an essential role in my understanding of cognitive existentialism, I will pause for a brief comment on it. Rheinberger (1997: 104) succinctly notes that "anything represented, any referent, as soon as we try to get hold of it, and, concomitantly, as soon as we try to shift it from subsidiary to focal awareness, is itself turned into a representation. As a result, the term loses its referential meaning". The claim of the constant de- and recontextualization of referential meaning in scientific research is a counterpart of the picture of normal scientific everydayness as inextricably interconnected and crisscrossing configurations of research practices.

The never-ending interplay of representations and represented objects in normal scientific everydayness does not allow to draw a firm demarcational line between the research process and the reality under inquiry. There is no external referent for this interplay. Scientific representation arising out from Kuhn's "puzzle-solving activities" is an interconversion of signifiers. Thus considered, representation of research objects is an integral part of their constitution. Such an object is represented in being constituted. More specifically, this constitution involves engaging in the potentially endless production of traces that emerge from the permanent replacement of presumed signified objects by other signifiers. Like the ongoing interpretative constitution of research objects within the interrelated-

ness of scientific practices, scientific representation is to be conceived as a process without assignable starting points and final referents. The reality of a domain's research objects is a world of traces. This claim has much to do with the discussion of the status of science's theoretical objects.

Rheinberger treats the growing dispersion of traces (of represented objects of inquiry) in the everydayness of scientific practices on the analogy of the grammatoloical conception of *ecriture*. (For Derrida, the latter expresses the unity of the writing, the written, and the "how to be written". *Ecriture* constitutes a sort of machine which is productive in turn, regardless of the future disappearance of its producers.) By the same token, the recordable marks produced by scientific practices become themselves productive. According to Rheinberger (1997: 111), the whole experimental arrangement "has to be taken as a graphematic articulation. Written tables, printed curves, and diagrams are further transformations of a graphematic disposition of pieces of matter, a disposition that is embodied in the design of the experiment itself ... Fractions, centrifugal pellets, and supernatants are a partition of the cytoplasm. They are handled as inscriptions. The scientific object itself is shaped and manipulated 'as' a traceable confirmation. Temporally and spatially, the object is a bundle of inscriptions. It displays only what can be handled in this way."

A representation of a particular research object (e. g., a chemical reaction that under given conditions demonstrates sustained oscillations) is identified by all traces left by practices of experimentation, measurement, formalization, calculation, and so on, through which the object is actualized. These are traces representing actualized (appropriated) possibilities in scientific everydayness. Their matching gives that sense of reality which a scientific community ascribes to the particular objects under investigation. Yet with regard to the theoretical objects, they are traces of something that constantly goes beyond the actual presence of research objects. In other words, these are traces of possibilities that are still not appropriated. For the theoretical objects are inscribed in the horizon of understanding and interpretation, their traces are referring to the hermeneutic fore-structure of scientific research as well. (To take up again one of the previous examples, structural genes and regulatory genes are objects that refer to the hermeneutic fore-structure of doing research in molecular genetics, whereas the lactose-metabolizing system is a research object that has no other being but the traces it leaves by accomplishing certain scientific practices.)

In saying this, I am not going to claim that there is a crucial dividing line between the particular research objects and the theoretical objects. Quite the contrary, the dispersal of traces exhibits the common being of what is actually present

in a domain's scientific everydayness and what always already transcends the latter. With respect to this claim, the ambiguity of science's theoretical objects (their double status) can be conceived as a kind of "immanent transcendence". These objects remain always beyond the everydayness of routine research practices. In other words, their meanings can never be revealed totally (or, can never be "exhausted") within the interrelatedness of these practices. However complete are domain's theories and however advanced is the research process, there is an open horizon of possibilities for their appropriation in normal scientific research. The theoretical objects of a given domain are "transcendent" with respect to (the particular situations and contexts of) normal science. Yet these objects are domain's "most immanent entities" since all traces left by the interrelatedness of a domain's practices "make them present". The "immanent transcendence" of science's theoretical objects is actually the expression for their unitary being behind the *prima facie* double status.

To sum up, the changing configurations of practices in normal scientific everydayness is a production of traces as (in Rheinberger's words) "a game of representation/depresentation". The being of traces (like the being of *ecriture*) is a dynamic unity of presence and non-presence. Against the background of the foregoing considerations, to follow the traces of the interplay signifying representations and signified objects means to be engaged in searching for the existential-ontological unity of hermeneutic fore-structure of scientific research, normal scientific everydayness, and domain's conceptual structure. It also a unity constituted by that complementarity of transcendental circularity and hermeneutic circle.

In conclusion, let me stress once again the chief ideological tenet of cognitive existentialism: The hermeneutic phenomenology of science's theoretical objects has important consequences for discussing the autonomy of scientific research. Roughly speaking, cognitive existentialism defends this autonomy without presuming whatever kind of epistemological justification of science's authority. By stating that scientific research is autonomous when it moves within the room of possibilities projected by the interrelatedness of its own practices, cognitive existentialism champions the ethos of scientific research without succumbing to scientism.

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