

Multy-, Inter - and Trans - disciplinarity: a triadic discourse

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Abstract

At the level of multi-disciplinarity we must conceive a common horizon for various scientific disciplines (and not only scientific). The inter-disciplinarity is represented by the transfer of method between at least two disciplines and the trans-disciplinarity is represented by the transfer of concepts and principles. The trans-disciplinarity may be conceived as an advanced inter-disciplinarity. We examine the content of terms *scientific-technic revolution* and *knowledg revolution*, then we enumerate a few arguments for which the mono-disciplinarity is becomed unacceptable for the evolutuin on topical market of labour and for an ethical attitude. In the second size of the paper we examine the project of trans-disciplinarity proposed by Basarab Nicolescu and we compare this project with other inter-disciplinary projects in the domain of semiotic. The principles of logic (first of all the excluded middle) are bringged into discussion in the purpose of distionguishing of the strategies of inter-isciplinarity.

Abrégé

En ce qui concerne la pluridisciplinarité, il s'agit d'un horizon commun pour plusieurs disciplines scientifiques (et non seulement scientifiques). L'interdisciplinarité consiste dans un transfert de méthode entre au moins deux disciplines et la transdisciplinarité, dans un transfert de concepts et de principes. La transdisciplinarité peut-être conçue aussi comme une interdisciplinarité avancée. Nous examinons le contenu des termes "révolution scientifique-technique" et "révolution en connaissance" (*knowledge revolution*), puis nous énumérons quelques arguments pour lesquelles la monodisciplinarité est devenue inacceptable sur l'actuel marché du travail et comme attitude déontologique. L'augmentation exponentielle des connaissances a inspiré des termes operationels pour les doxuments de l'Union Européene, comme *la société de la connaissance* et *la société informationelle*. Dans la deuxième partie de notre étude nous examinons le projet de transdisciplinarité proposé par Basarab Nicolescu et nous comparons ce projet avec autres projets interdisciplinaires ayant comme point de départ la sémiologie. Les principes de logique (le tiers exclu dans le premier fois) sont convoqués pour préciser les strategies de l'interdisciplinarité.

Mutidisciplinarity and Interdisciplinarity

Multidisciplinarity is one of the first steps we take when we study the interdisciplinary phenomenon, the necessary preliminary. Unless we were convinced of the important existence of multidisciplinarity nowadays we wouldn't need to theorize over interdisciplinarity and transdisciplinarity. On its

first appearance (which will soon come to be outdated) transdisciplinarity is advanced interdisciplinarity.

There are at least four reasons for which I won't take seriously monodisciplinarity in my study: i) the technico – scientific revolution (RST) which began to be theorized in 1960's and was continued by the "knowledge revolution" in the 90's; ii) the increasing number of population in our days so that the number of the existent perspectives reaches milliards (we have never had a larger society than this one); iii) nowadays life expectancy is about 75 years old; iv) multi and interculturality which should be accepted as long as we are citizens of the European Community not to say that we should spread them and accept them on the labour market since they have the status of two basic terms in today's political European construction. That is why words such as SI (informational society) and SC (knowledge society) are the words with which UE documents operate most especially from the beginning of the 21st century. I find the idea of the "specialist in multidisciplinary" to be a great one, although paradoxical.

Several things that I may add in order to support my choice are: RST brings about an exponential growth of the number of sciences (time function), a growth that the Internet and the present data basis accelerate. One single example would suffice: Jean Dieudonné divides algebraic geometry's history in seven époques. First of them is antiquity (400 B.C. and 1630 A.C.) and the last comprises the period 1950-1980.¹ To be more exact, two thousands of years of knowledge are described in two pages while the last 30 years of knowledge are described in about thirty pages. The seventh period of knowledge is given one page/one year as compared to the first period – one page per kilo-year. In other words the antique kilo- year is the correspondent for one year of the contemporary knowledge. However, there are advanced technologies for which the present year is, in neutral terms, a

¹ Jean Dieudonné *History of Algebraic Geometry*, Wardsowrth Advanced Books and Software, Monterey, 1985, p. 1-3, 91-113; also see Igor R. Şafarevici, *Bazele geometriei algebrice [Algebraic Geometry Basis]*, Ştiinţifică și Enciclopedică Publishing House, Bucharest, 1976, pp. 556-580

mega-year or even a giga- year of Antiquity (this is true for the computer science, for example).

Computers (which have known six generations), just like the robots (which have known six generations too), are very good examples of artificial intelligence. They are informational–energetic machines that were developed on the model of the intelligent human behaviour. Gordon Moore's law still acts on the electronic techniques that are based on integration on a very large scale. Every eighteen months the number of electronic circuits on board doubles (but we can expect that in 2010- 2015 silicium chip technology reaches its limits). These three years in which the advanced technology was doubled (if we look at the qualitative, quantitative and relational parameters) replaced the former five years plan. Nowadays technological prognosis doubles every two, three or four years as compared to the former forecasts that spoke about periods of five years and even more.

At present, multidisciplinary is a very good exercise, which is individually applied to a European society where education gradually shifts from elite culture to mass culture. Every specialist must check off 40 or 50 areas how many appear in the grade report annexed to the licence diploma. Since it is oriented towards competency and performance the labour market pressures people into a narrowing of specializations. But how many of the specialists really master their area? Over 8000 disciplines are taught in Northern American or Australian Universities. It is only natural that Bologna process criticizes the improper multiplication of specialisations („improper” in the sense that it has no connection to the labour market). A specialization such as „the elementary particles physics” is more than enough for one life (Basarab Nicolescu admits). This is also an anthropological characteristic: under specialization pressure, culture's theories and especially science and philosophy meet very seldom within the same human conscience.

Interdisciplinarity also represents the transfer of a method from one sphere to another even when the methodological prescriptions of the former science enter a conflict with the latter's methodological prescriptions.

Biochemistry is a (almost) natural product of science but it takes a greater effort for biophysics to solve the methodological conflict. „The ecart” between sciences can vary according to each component’s structure and the common scientific language (when it exists). Yet, we can’t create interdisciplinary compounds like „metaphysics physics” as easy as we develop areas such as astrophysics or „molecular biosemantics”. This combination of sciences has its limits too. We already have two very important sciences (physics and metaphysics) and there is no need to multiply specializations because this is interdisciplinary practice’s field. In elementary school, the teacher makes a list with all concepts no matter if they belong to grammar or mathematics, he pursues their evolution, and contextualizations untill the end of the school year. Just in the same way, the responsible researcher must resist words invasion and analyze the concepts’ significance only within the limits of his knowledge. One more problem could be the difference between the child’s flexible and open mind and the grown ups’ mind which is full of prejudices and therefore specialized in manipulation and perversion. Transdisciplinarity is an experiential method and not an experimental one.

Things become more and more difficult when the connoisseur - the observer - (a generic construction of the scientific world) studies different religions. Real sciences try to give us a general picture of the world but they use a far – reaching concept of reality and a multitude of sermocinal sciences don’t have access to it. If this is the case of real sciences think about religions that adopt ancient cosmologies or scientifical perceptions, which were founded centuries ago. Some of them are already abandoned by nowadays scientific world. In post-modern philosophy nobody is disturbed by the fact that Jacque Derrida uses a hundred year old semiotic model. Not even religion is against it. In fact, religion still uses sets of verbal and pragmatic languages that were created thousands of years ago. And Plato and Aristotle’s models of thinking and psychic are just as old. Yet, it is not indicated to use an outdated language in science and on the labour market people don’t feel comfortable if we use past - oriented

strategies (so that there is no referent in present world). Despite our conviction that „contemporaneity is a superficial statum of things” (Margueritte Yourcenar) we still believe that contemporary models are more appropriate to science. We have the history of science at our disposal whenever we want to go back in the past’s possible worlds.

We can say that today’s world lost its magic. Myths disappeared one by one and cold pragmatism dismissed mystery from science. The lack of trust among people (another variant of faithlessness) and therefore the confusion of values accelerated the secularization of knowledge. That is why I think that myth and sacrality are very important concepts. They must be reconstructed in a world in which we can speak about the existence of such things as possibilities and desiderata and in which negation feels at ease as an indicator of liberty. This is not to attack objectivity but to reconcile the knowledge with the knowing subject, an objective that was lost by more and more sciences.

But the so called „transdisciplinary figures” have the ill-fated role. The present of real, sermocinal, technical and humanistic sciences is marked by few very famous approaches: the strategy of outrunning the boundaries, the science of complexity, artificial intelligence, problematizant sciences like CNI (Unsolved Cases), the chaos theory, models such as the triad enigma – paradigm – metadigm and Substance – Energy – Information. Fractal geometry’s realisations (as generalizations of the geometrical approach seen at a certain point only Euclidian or non-Euclidean) astonish even the artistic spirits. Even the transdisciplinary programmes present us few exceptional approaches. One of these is transdisciplinarity itself but with a different meaning (the meaning congress from Arrabida - Portugal 1993 - gave that concept).

Transdisciplinarity’s carta highlights two phenomena which manifest themselves in present day knowledge and whose opposition often becomes an unbearable antagonism: 1) on the one hand we notice an unprecedented increase in the volume and of the quality of knowledge from varied domains (an increase of civilization’s area takes place simultaneously);

2) on the other hand a crisis that technoscience undergoes because of its inability to justify the material and the spiritual investment (is unable to contribute to the spiritualization of that human beings who benefit by its results). The preliminaries of the transdisciplinary manifest from Arrabida created an burdensome and gloomy atmosphere. A long time ago people used to about a research on the angels' sex but today this is decomposed in constituent elements which are launched on the market. At a general view the fact that techno science, the motrical part of knowledge, the part with the highest dynamism, not only does it push the limits of knowledge but also causes situations in which spirituality has to suffer, seems strange.

In the table of the main scientific disciplines, elaborated by UNESCO on the basis of International Provisionary Classification from 1979, mathematics and physics make up the A class. Real sciences (astronomy, physics, chemistry, biology, geotechnics) make up class B, medicine and technologies are included in the C class, humanist disciplines with a powerful empiric side enter class D, pychology, art, literature and sociology form E class while ethics and philosophy belong to the class F. The list of the main scientific disciplines contains almost one thousand areas and few dozens are of mathematical origin. There is no doubt that nowadays science, just like language, turned itself into the Babel Tower. If we take into account the secondary sub domains too, the number of sciences and technologies reaches few thousands and the estimated tendecies of growth are exponential and they double every five years in areas such as: the number of the titles, of the articles' pages, of the researchers and the data basis. If we want to take a bird's eye view over the realist sciences in International Provisionary Classification (1979, UNESCO), physics occupies B class and has the 22 indicative sign and is placed near astronomy (21), chemistry (23), biology (24) and geotechnics (25). C, D, E and F class round this multidisciplinary picture. If we add to the main scientific disciplines the limited domains of research the number we reach is almost one thousand. Those that do not have an acknowledged name define themselves by the object

of the research. However, if we add the secondary subdomains, technologies and sciences' number reaches thousands. The assessed growth tendencies are usually exponential and the way in which we determine the exponential basis is very important.

The process of thinking operates with the form's expressions (thoughts) and is a matrix that does not avoid only the deformed (which is cultivated in the ugly aesthetics) but also the amorphous. Information is the placement in a form (objective) and many times the content, more difficult to understand, drops behind the formal code. The SEI (Substance–Energy–Information) model is one of an indisputable epistemological authority and is used in different areas. The researcher has to overcome the incongruence resulted from the defective correlation among the ample concepts (having a general value) and those which refer to the concrete. The theories about the information presence in the universe reflected themselves so as to crystallize this model. These are universalist (information is a global phenomenon) or insular (information only occupies some parts of the universe and there is no communication among them). In the first phase, it does not depend on the knowing subject. The knowing subject appears in the second phase and has the role of an observer.² Therefore, the SEI model is applied to both the informational universe (the first perspective) and to the enclave (the second point of view). For now, it is free from the knowing subject who can be added later. The known universe is susceptible to transformations provoked by the human beings (at least the aspects that can be modified by observation). That part of the universe, which is accessible to the present day means of observation, is a 15 milliards light-years sphere. The Universe in general or The Great Universe should be postulated with much attention as the main source of antinomies (the appearance of The Unknown universe as compared to The Known universe). The observed universe that continually expands by the overcoming of the

² Paul Constantinescu, *Sinergia, informația și geneza sistemelor [Synergy, information and Systems Genesis]*, Tehnică Publishing House, Bucharest, 1990, pp. 16 sqq.

observational limits may be included in the last two levels of the universe. Few of my works concentrate on such matters.³

Transdisciplinarity

Transdisciplinarity is that approach by means of which all concepts and principles circulate from one science to another. Petre Botezatu, a professor we all miss, suggested a sort of Mendeleev's table of nature looked at from a logical perspective. This table was divided into four areas: thinking, language, action and reality) and five levels to which the former can be applied: subject, object, form, operation and structure). Our reasoning may be continued by taking into account Stefan Lupascu's tripartite division among physical, biological and psychological matter and by applying it to logic and ethics.⁴ Once we agree that multiplication is a mathematical operation specific to physics then quadrature belongs to biology due to the logarithmical form many different mathematical rules have. This is especially the case with Weber – Fechner's centenary law of sensation. The square of the square is an operation specific to our psychic. The application of the arithmetical system to Lupascu's model could be rendered in the following way: physics is super polynomial; biology is exponential while psychology is super-exponential and sociology super- super- exponential. To the logical system of the Romanian thinker, we can add this arithmetical system. If matter allows to a classical, homogenous logic, biological allows to a heterogeneous one and psychics accepts a dynamic logic of contradiction. A

³ George Ceaușu, *Materie, evoluție, istorie: o aplicație la demersul "fatalist" al lui Vasile Conta* [Matter, Evolution, History: An application to Vasile Conta's fatal approach], *Analele Științifice ale Universității «Al. I. Cuza»* din Iași (new series), Philosophy, tom XLIX (additional), 2002, pp. 89-102

⁴ Ștefan Lupașcu, *Omul și cele trei etici ale sale* (în colaborare cu Solange Mailly-Nesle și Basarab Nicolescu) [*The human being and its five ethics* (in collaboration with Solange Mailly-Nesle și Basarab Nicolescu)], Ștefan Lupașcu Publishing House, Iași, 1999; idem *Logica dinamică a ontrdictoriului* [*Contradictory's dynamic logics*], Politică Publishing House, Bucharest, 1982; idem, *Universul psihic* [*Psychical Universe*], Ștefan Lupașcu Publishing House, Iași, 2000

recursive calculus can only be applied beyond the real sciences area. However, primarily it is necessary for us to establish the general expressions and, to the extent to which is possible, some phenomena that take the equational form laws usually have.

Philosophy itself is transdisciplinary. Metaphysics' transdisciplinary propensity can be easily noticed because the word metaphysics is derived from the word physics. In philosophy we go beyond physics through natural language and by the respect we have towards existential conjectures. This is so because conjectures can be applied even to a total concept, an ultimate, proximate genre such as our existence. "One thing exists or it does not exist" is a true statement that has the form $P \vee \neg P$. And, just as Aristotle agreed with, it follows the principle of the third party excluded. "One thing exists and it does not exist at the same time" ($P \wedge \neg P$) is a false statement. In the previous statement as well as in the statement "nothingness exists" the principle according to which there must be no contradiction is broken. It was only in the last century that existentialists started to recognize non-existence's intervention in human life. Thus, our existence is enlarged by our conscience with a new category: nothingness. For Jean Paul Sartre, conscience itself in a more abrupt or subtle way determines the process of transformation into non-existence.⁵ We may include in the same category phenomenologist' recommendation to study our spiritual body (this is the case when not our biology but our mind and spirit decide for the physical body) and not the physical body itself (Regine Kater) just in the same way we make the difference between the look and the eye (Jean Paul Sartre). We may consider that we do not perceive ourselves in a scientific way so as to gradually reach that corporeal identity which best characterizes us. On the contrary, self-knowledge is not scientific because of the many changes in perspective (some of them truly catastrophic) it undergoes. In this way the spiritual body's perception and not the physical body's perception is

⁵ Jean-Paul Sartre, *Ființa și neantul [The Human Being and Nothingness]*, Paralela 45 Publishing House, Pitești, 2005, pp. 74 sqq.

justified. It has been more than three decades since physicists who also had a humanistic and sociologic background set the premises for a discussion about reality's levels. This happens because of the different turn physical phenomena take when we leave the "familiar macroscopic" to find ourselves in the situation of describing to a macroscopic scale (quantum, sub-quantum) or to the scale of Observable Universe (Bing Bang theory) different phenomena. Basarab Nicolescu is the leader of the ideas generated by Stefan Lupascu's work and by taking as a starting point his view on existence, he created the multilevel theory by assuming the contradiction in the very core of some natural phenomena. Let us not forget that Stefan Lupascu foresaw, in the dynamic logic of contradiction, the presence of the event together with the anti-event. More than that, the philosopher of Romanian parentage admitted the existence of equilibrium state that mediated physical phenomena's course. According to Basarab Nicolescu the logical law is one of reality's components and so are arithmetical, geometrical and topological proportions.

Scientist (the science's ideologists and fundamentalists) ideologies claim that there is only one level of reality and thus they simplify the world in a grotesque way. The concept of global causality (that does not stay in contiguity with local causality) makes the difference between quantum mechanics and the theory of relativity (Special Relativity) and it depends on a space which is allowed to (to use probability) elementary particular trajectories. Compared to the continuous character of energy in macroscopic physics, quantum mechanics brings us face to face with a discontinuous flux of energy that is dissipated into quanta. The universe itself is a quantum system in which the moving particle should be studied as a wave. Our other choice is to conceive an entity that is neither particle nor wave (ground wave/light wave).

There is no doubt that the first years of school are transdisciplinary. Pupils' flexible mind accepts the idea of a "general dictionary" not only in principle but also in practice. Both reading and writing are not reflex actions yet and therefore are difficult for children. Let us suppose we discuss with 3-4 years old kindergarten children the following three

notions: apple, pear and tomato. Cognitive multiplicities (tomato is a vegetable but it is not the only vegetable we know), generalizations and classifications (the apple and the pear are fruits), and additive arithmetic (one apple + one pear = two fruits) arise almost automatically in the child's mind.

Only the post- modern educators take the time to explain additive quasi-arithmetic to children (the apple and the pear are fruits so that $1+1=1$) and replace names such as chemistry, mathematics and physics with additive quasi-arithmetic. The pupils would not mind. However, those who teach mathematics would. Their role is threatened because if physicists occupied this territory they would think about teaching children simplified quantum mechanics instead of the abstract sets theory. Most supporters of physical reality find themselves in the position to describe this physical reality as the space of sensorial resistance to natural phenomena. Nevertheless, sensorial reality is philosopher's stumbling block: senses together with the extreme states of our conscience often contradict reason. We can easily give other definitions for the concept of reality, both positive and negative.

If we are allowed a bird eye's view, the substance is a passive support for whose occupancy two active principles compete: one of them is unintelligent (energy) and the other is intelligent (information). Within Aristotle's doublet hile-morphe the form had both an energetic and an informational aspect but the relevant means of distinction between these two aspects were offered to us only in the 20th century through the clarification of nature's fundamental forces and through the same century's informational technologies. The model will have to explain the active - passive transformational tendencies, the cooperation between principles and the disposition for autonomy each level has. One model of SEI is applied to the core of reality: the substance unveils itself as a passive of the phenomena, as the score on which the traces different phenomena leave are marked, while information and energy compete for the active part. As long as information is the intelligent active part, one that has a well-ordered and previsionary programme, energy is an unintelligent active.

This is one of the reasons for which we associated mind's philosophy, as a technological area, with artificial intelligence, although we could have chosen to rely, just as successfully, on the theory of complexity, synergetic or "generalized cybernetics" in its different forms. Once we appeal to semiotics we will notice that we need to elucidate from the very beginning the opposition between realism and nominalism: which one should we choose? Does the sign have a strong connection with reality's essence or it's just a simple convention? In any case matter is less suitable for semiosis than the field. Mihail Drăgănescu raises the problem of a vigour less, untouched by information matter and of the matter which is easily attracted in the informational circuit.

In the history of social and artistic knowledge, the SEI model also reflects itself on a social level, shaping the distinction between cultural and social imaginary. Social imagery refers to "phantasms that act on the level of collective psychism"⁶ unlike the cultural imagery which designates the images that are transformed by a form of art. In our cultural space, the Research Centre of the Imaginary in Cluj has analyzed this problem.⁷ Beyond the frail cultural and social distinction, several components of the social imaginary should be mentioned: public space and time (as opposed to the private space and time), visual reality's topics and within them the visual sense, the outcast's image, social stereotypes and few other themes of social psychology. This distinction's components may be found in the attempt to differentiate between realist and fantastic especially in literary theory's area and when strict connection exists with the difficulties we have whenever we place in this dipole literary species and

⁶ Corin Braga, Ștefan Borbély (ed.), *Caietele Echinox [Echinox Notebooks]*, vol. III: *Teoria și practica imaginii [The Theory and the Practice of Image] 2. Imaginarul Cultural [Cultural Imaginary]*, Dacia Publishing House, Cluj-Napoca, 2002, p. 13

⁷ Corin Braga, Ștefan Borbély (ed.), *Caietele Echinox [Echinox Notebooks]*, vol. III: *Teoria și practica imaginii [The Theory and the Practice of Image] 2. Imaginarul social [Social Imaginary]*, Dacia Publishing House, Cluj-Napoca, 2002, p. 13, *Imaginarul Cultural [Cultural Imaginary]*, Dacia Publishing House, Cluj Napoca 2001

genres like utopia, fantastic trips or science fiction.⁸ “Naturalism was born in the same positivist context in which science fiction was born and Emile Zola, among other writers with scientist ambitions, stated that he strictly followed heredity and psychology’s scientific laws in order to create an ethics starting from here”.⁹

Rigor, openness and tolerance are for Basarab Nicolescu transdisciplinary’s main three principles.¹⁰ If we are to allow ourselves a personal interpretation, open-mindedness forces its way into transdisciplinarity while rigor makes us to take into account the metasystem properties of the scientific or religious discourse. This is one reason more not to transform the truth into something relative and to distinguish between sermocinal and real. As regards tolerance, religion has a large space for manoeuvre because scientists are usually intolerant and radical.

From the Included Third Party to Knowledge Unity

The transdisciplinary solution some of the 20th century personalities give (Louis de Broglie, Niels Bohr, Hans Reichenbach) refers to a world of science where there should exist at least one colour except for black and white(true, untrue). The handiest colour is grey and we won’t be wrong if we call it a tolerant colour. Because this constructed colour which is grey becomes through complementarity itself: „grey”= „non-grey” which is not the case for black and white: „non-white”=“black” and „non-black”=“white”. Black and white alternately transform through complementarity while grey becomes itself by means of the same procedure.

⁸ Sorin Antohi, *Utopica. Studii asupra imaginarului social [Utopica. Studies on Social Imaginary]*, Științifică Publishing House, Bucharest, 1991, pp. 16-44; the same type of considerations are placed within the context of the Romanian culture of the two latest centuries in Sorin Antohi, *Civitas imaginalis. Istorie și utopie în cultura română [Civitas imaginalis. History and Utopia in Romanian culture]* ed. a II-a, Polirom Publishing House, Iași 1999, pp. 60 sqq.

⁹ Sorin Antohi, op. cit., p. 32

¹⁰ Basarab Nicolescu, *Transdisciplinaritatea. Un manifest [Transdisciplinarity. A manifest]*, Polirom Publishing House, Iași, 1999, pp. 141-146

It is not an accident that Stefan Lupascu, the scientist who inspired Basarab Nicolescu's theories on the included third party, except for the dynamic logic of the contradictory (three values) also pleaded for a triple aspect of energy (physical, biological and psychological) when it comes to ethics, conscience and other fundamental spheres. This leads us to Lupascian trialectics that is a more complex transdisciplinary project. This is an approach he applied, without a real success¹¹, to the problem of the psychological vs. physical.¹² Basarab Nicolescu discusses in few of his works the possibility to construct a logic of the included third party for the physical problems. He noticed the way in which the principle of noncontradiction and of the excluded third party are equivalent on the same level of reality. „The logic of the third party included in noncontradictory in the sense that non-contradiction axiom is not broken providing that the notions of false and true are expanded”.¹³ Unlike the macroscopic world where contradictory states are easily distinguished, the quantum superposition principle, when applied to linear systems, accepts the contradictory states' overlapping. The third party included principle is ineffectual when we deal with a propositional calculus having only two truth values (this the way Basarab Nicolescu puts it). The logical- mathematical paradoxes derive from here. Two of the most famous are the Cretan's king statement (one of the false prophets Paul of Tarsus talked about in his letter to Tit) „Cretans are liars, mean and lazy” and the statement „I say that I am a liar”. The Apostle does not explain why the saying of the so-called prophet is disgraceful but it is easier enough for us to see it: „I say that I am a liar” and „I say that am mean”. Instead, he offers us an excellent remark on the truth's immaculacy: „All is pure for the

¹¹ If you are interested in this aspect you may also read George Ceaușu, *Douăsprezece prelegeri de filosofia minții [Twelve Lectures on Mind Philosophy]*, Performantica Publishing House, Iași, 2002, pp. 123 sqq.

¹² Petru Ioan, *Ștefan Lupașcu și cele trei logici ale sale [Ștefan Lupașcu and his three logics]*, „Ștefan Lupașcu” Publishing House, Iași, 2003, pp. 36 sqq.

¹³ Basarab Nicolescu, *Noi, particula și lumea [Nous, la particule et le monde]*, I ed., Rocher, Paris, 2002, p. 130; Polirom Publishing House, Iași, 2002

pure ones." (Ap. Tit, I, 1). The principle of the included third party does not exist even in the case of the conservative extension of the propositional calculus (e.g. the simple calculus with predicates). However, when the propositional calculus is not complete and is only built on implication, the third party included principle becomes effectual in some axiomatic systems.

Together with other commentators of the physical-mathematical models Basarab Nicolescu speaks about guideline aspects of reality's levels.¹⁴ Within these aspects formal arithmetic's incompleteness theories stated by Kurt Gödel appear as inevitable. This type of results transforms the problems with a rigorous binary ramification (as are those specific to Boolean's functions) in much more ramified problems (if we are to use the language characteristic to bifurcation theory). Any physics' system enters under incompleteness's incidence because it comprises arithmetic too. In physics, the discussion over completeness begun around 1920's by agreeing on the demand that only true statements should be systematically derived.

It is known that the noncontradiction principle and the principle of the excluded third party were for Aristotle fundamental properties for the logically constructed discourse. However, in ethics he accepts the principle of the third party included since it considers it to be a way in which we choose the golden mean. If we cannot be heroes we should be at least brave and not cowards (this is the solution given in *Nicomachean Ethics*). Leibnitz adds the identity principle and the principle of the sufficient reason. The consistency or the noncontradiction of a formal system lies in its quality of avoiding the systematic production of false conclusions. Completeness consists in the avoidance of the „tertium datur" when we must choose between answers like true and false. We recommend that in the scientific diagnosis we should choose, whenever possible, between true and false and leave aside any other possibilities of answer. Actually, PNC is a generalization

¹⁴ Basarab Nicolescu, *Gödelian aspects of nature and knowledge*, in: Gabriel Altman, Walter A. Koch *Systems: New Paradigms for Human Sciences*, Walter de Gruyter, Berlin-New York, 1998, pp. 385

of a formal system's consistency while PTE is a generalization of completeness. To a scientific theory one single appreciation as false is fatal due to the property according to which anything can be generated by a false (Petre Botezatu names it productivity). One million of true statements aren't good enough to validate beyond any doubt a scientific theory but a single false appreciation is enough to break it down. That is why Karl R. Popper thinks that theories should always situate themselves within the limits of the criticism's sphere. He considered „reduction ad absurdum” to be a more important method than the method of the direct demonstration. While the former is based on *modus tollendo tollens* the latter is based on *modus ponendo ponens*. The interdisciplinary practitioner who is interested in a new theoretical or empirical construct may inspire himself from another of Karl Popper's ideas. This can be rendered as follows: scientific theories are a kind of conjectures that must respect two conditions. First, they must be probated through experiments and second they must resist any attempt to prove them wrong. The implementation of this theory should not neglect the following aspects: the necessity to look for other ways of approaching problematical issues, the need to discover new facts in the area we study (at least partially, they should be checked), the reinterpretation of some of the facts that were analyzed in previous theoretical constructions and the reinforcement of conclusions. Other global properties truth has are: it can be abridged („It is true that p” can be simply written p), the lack of the obligation to write the quotation signs when the statement is true, sensitivity to guarantees (Nature, Thinking, God, Society), minimality towards hypothesis and maximality towards conclusions.

From Aristotle's syllogistic sentence „human beings are mortal” does not automatically result that some human beings and among these Socrates, are mortal. We should first place an existential assumption. Aristotle build his theory starting from referential notions (that is concrete notions) and therefore by giving it the status of a „general epistemology” of his time. The consequence was that he could not extend it to

the scientific- theological imaginary of the time unless he related his ideas to the concrete notions.

However, the 20th century quantum mechanics confronts us with notions whose status (real or fictional) is not too clear: „point or material wave”, „atom”, „elementary particle” and others. Some realist researchers „offer” them the existential assumption without any whims as opposed to the relativist researchers who attribute to these notions weaker terms such as „model” or „useful fiction”. Nevertheless, Aristotle’s syllogistic itself functions for nonreferential notions: if all men are birds of course that at least few men are birds. This statement’s validity is the result of the fact that the notion of bird in a nonreferential one (e.g. the dragon of the dragons) and may constitute a preliminary for any fictional type – where, let us remember both the necessary and the accidental things happen. This is practically an immediate syllogistic inference that functions in any fantastic text (not realistic). That is why Aristotle feels the need of a modal syllogistics where he refers not only to the sentence “it is true that p” (p is a logical sentence) but also to the following statements: “it is necessary that p” and “it is possible that p” (incontrovertible respectively questionable sentences).

The modal realism itself is one of the greatest conquests of the 20th century and it can give again Aristotelian syllogistics its value. If we consider that the quantum mechanics’ language is oriented towards the description of an S system, we will choose a moment in time when we can define all the instructions that determine the system’s condition. In this way “the system’s condition” becomes language’s only variable and takes its values from the multitude of trajectories in Hilbert space separable complex ks. The question “is there a possibility for the system’s condition to belong to a closed subspace residing in to ks?” is similar to the one asked in the case of Boolean functions (when only two truth-values exist).

As regards the problem of causality, determinist and indeterminist positions also include the principle of the excluded third party: there is no golden path. We have to deal with determinist causality or with an indeterminist one. According to Petre Botezatu causality is one of the evolution’s

qualities, a relation of production and not a quantitative notion. Quantum physics has a non-cosmologic character that makes it inadequate for a discussion on the problem of causality in the universe. So that causality described by our macroscopic senses although seems artlessness at first proves in the end to be quite appropriate for the observance of our universe.

The physicist Tiberiu Toro, reached the conclusion that from the 12 biggest problems of the universe more than half are located at a quantum and sub quantum level (e.g. the cosmic void is populated by neutrinos so that this elementary particle's description is vital in providing the answer to the following question: why isn't the universe more dens?). By looking fifty years back and by making a list with all major questions of the time Lee Smolin opens a new way for the future of the astrophysics. After doing this he tries to predict the way in which these will be solved in the 1st half of the 21st century. Hence only fifty years later will we be able to say which is the correlation between relativist physics and quantum theory together with the energy and dark matter's nature.¹⁵

Futurology (a science in which the near future is predicted on some scenarios basis) builds itself upon the extrapolation and the analogy's principles, keeping in most cases its monodisciplinary character. On the contrary, when futurology enters the scene (global, long term scenarios, prophecies) the transdisciplinary becomes seems to be crucial.

In our discussion about the movement from physical causality to the mental one, we should take into account physics' most simple effects. One of them is that of the two doublets, particle and antiparticle which conform to Einstein – Podolski – Rosen effect (they spring simultaneously from the same atom and have a mirror like “trajectory”). Once they are formed, no matter the distance that separates them, what happens to one pair has a reverse effect on the other pair. If one of the identical particles is polarized in certain direction,

¹⁵ John Brockmann (ed.), *The Next Fifty Years*, Weidenfeld and Nicolson, London, 2002, pp. 50-7

the other one, even when at a distance of thousands of kilometres, is instantaneously polarized in the opposite direction. Teleportation, the modern man's dream is strongly connected to this problem. Lab events that are made when teleportation is studied situate themselves at the physical and mental border. Let us go on by looking for a distinction (when compared to the physical causality) between the previously mentioned phenomena. Tim Crane organizes in one of his works¹⁶ the latest suppositions on mental causality problem:

- A) There is an inherent property which determines each cause to have an effect.
- B) We can speak about the existence of such a thing as mental causality and about its different forms of manifestation (different
- C) Only when consistent physics is complete.
- D) There is no such thing as supervenience and by this supposition we attack a religious type of causality which differs from the physical one
- E) Mental and physical causality are homogenous

By going back to Descartes' famous aphorism "I think, therefore I exist, therefore God exists", we notice that the second and the third person of the pronoun are improper for the introduction of an existential perspective. This is mostly due to interiorization of the thinking process (in our conscience) and of the poor possibilities of communication. When it is said that "you think" existence becomes something remote for me. If we use the third person, "he thinks", we make nothing more but to generalize (in the best way we may put it) or to transfer automatically an opinion (from me to you). At the very outside we may say: "We think, therefore we exist (humankind exists), therefore God exists". But in this case we are in the preliminaries of a collective existence which can be defined as an average of the social values. It is not by chance that existence has a powerful cultural dimension too. Besides "physical reality" appears a "median reality", the latter being the product of a

¹⁶ Tim Crane, *Cauzalitatea mentală [Mental Causality]*, in: Angela Botez (coord.), *Filosofia mentalului. Cauzalitate și experiment [Mental Philosophy. Causality and Experiment]*, Științifică Publishing House, Bucharest, 1996, pp. 89-116.

culture or of a civilization. We call it median because in the interior of a community this represents the average at an individual level.

However, many epistemologists do not want to recognize it as such because its effect is an extraordinary dispersion of physical reality that is dependent upon the existent number of cultures and civilizations at a certain point. How is that possible for the Dacians and the Romans to perceive space and time in different ways? Historians and sociologists are not uneasy at all when they talk about a different perception of time and space in different civilizations. For externalists, culture or civilization doesn't create any inflationary problems when it comes to designate reality. They list few of the rules that generate the fusion of more median realities in a single one. John Rogers Searle's presentation of this problem is very clear. In one of his works he investigates the institutional fact, the realist tendency in science philosophy and establishes several principles. First of them is that the world (whether reality or universe) exists independently of our representations.¹⁷ Such a supposition leads us to "external realism" as well as to the "representational" one because it gives precedence on the world's representations the way they appear in our mind. The psychological notion of representation - although its meaning in the triangle sensation- perception- representation is quite limited - extends itself on other categories of the human psychic while it creates an acceptable framework for our relationship's study with the surrounding nature.

We can describe "physical reality" from both cognitive and sensorial points of view and define it as a state of tension between the subject (the observer) and the object (the observed). The result of this tension is the establishment of certain relations with the environment. Other perspectives on reality could have been more generous but in the same time they would have had stratum of "implicit (which is very hard to detect). We could mention them but it's not the case.

¹⁷ John R. Searle, *Realitatea ca proiect social [Reality as a social project]*, Polirom Publishing House, Iași, 2000, pp. 124-136

Addenda

IA = artificial intelligence

Engl. = English

LN = natural language

SC = the society of knowledge (a concept which was taken from European Community's political strategy 2000- 2004)

SI = informational society (a concept which was taken from European Community's political strategy after 2005; also utilized in Romanian Academy's grant politics)

TI = the information technology

CLF = fundamental logical categories

CLD = derived logical categories

CN = Boolean calculus (from George Boole's name)

CP = Boolean propositional calculus

CP = calculus with predicates (usually there is no symbol for it)

CZU = Universal Decimal Classification

IPM = the model question- problem- method

QI = Intelligence Quotient

PI = Identity Principle

PNC = Noncontradiction Principle

PA = Anthropic Principle

PR = Resolution Principle

RT = Transitivity Law

PRS = The Principle of Sufficient Reason

PTE = The Excluded Third Party Principle

SEI = physical reality's model Substance- Energy- Information

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