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# *Fractal Geometry in Psychiatry: The Vulnerable Border between Science and Pseudoscience*

Nomen est numen
To name is to know *(Latin)*

Fashionable theories, among which fractal geometry and nonlinear dynamics – the concerns of this paper – can be included, run the serious risk of being accused of having a pseudo-scientific character, especially when recognized and approved methods of validity in one area of knowledge are indiscriminately transferred to create explanatory patterns laying in an altogether different system of coordinates. Rationalization of the theme that "the new is usually created in the nexus of several disciplines," poses certain pacifying effects – but only until the researcher is directly confronted with the problem of his/her own ignorance in one of those branches in which he/she so optimistically attempted to join.

Explanatory models for reality and reality itself correspond to each other just as poorly as the categories "simple" and "complex." Many theories do not seem bothered or confused by this dilemma, as they are created during the generalization, exception and distortion of an even more chaotic world. In a brilliant comment, Alexander Rueger and David Sharp (4, p. 98) precisely specify the conflict existing between fundamental laws' ability to explain something and their ability to reflect variation in what they actually explain.

The more fundamental a theoretical design is, the better it is capable to explain a reality. At the same time, however, the specific event, the natural object or process, are in danger of being represented distortedly. The boundary between explanation and representation (reflection or description), in the opinion of Alexander Rueger and David Sharp, is filled by an intermediate conceptual space which is carrying out mediating functions between the reflection of a reality and its interpretation (4, p.101). Speech, actually, follows what Duhem calls "mediating models" – schemes, matrices or the patterns corresponding a certain theory and, thus, allowing the placement of concrete phenomena in a corresponding theoretical system. "To explain" something means to find a matrix or model "of suitable size" within the existing current theory, and then to apply its basic principles to an explanation of a concrete phenomenon.

In psychiatry, the gap between a description and an explanation is perhaps impossible to close for the simple reason – with which even the majority of theorists would agree – that theoretical concepts are not universal; the fundamental conceptual bases have not yet definitively been found, and are unpredictable at times even in their approximate mode. The international classification systems of modern psychiatry (ICD-10 and DSM-IV) have been created by a "naming" principle, and, from the point of view of a "pure" science, do not possess at all the necessary and sufficient criteria to qualify as true constructivist designs. The most amusing facet consists in an existing "classification" state of affairs that use only descriptive models, which contradict the natural tendency of human reasoning "to get to the essence," and therefore limits the process of knowledge to the stage of defining a condition by the necessary term definition in the further algorithm of behavior of the doctor with a concrete patient.

The difficulties of introducing ICD-10 in the post-Soviet countries, in our opinion, are due not only to our resistance towards all new things, but also express an "antifundamentality" towards this classification system, irrespective of how valid the explanations were in the previous nosological approach existent in the classical German school of thought. The clear division into "neuroses" and "psychoses," the magic of Snezhnevsky's circles explaining the dynamic transition of one syndrome into another, the concept of a "boundary" pathology – all this has caused quite a natural nostalgia for lost versatility, and a quest for its return.

As to biological psychiatry – which undoubtedly possesses powerful descriptive and demonstrative resources – as of yet it does not show sufficient explanatory force to claim a universal status. Opening in the field of the psychiatry of laws, which claim to be as fundamental as physical laws, its universality is asserted although not yet obtained. Fundamental laws grow out of the maximal generalization and abstraction from a reality. Their appeal lies in their simplicity, and their explanatory force consists in the capacity of organizing knowledge in the most elegant and economical image – by means of creating truly harmonious classification systems.

The methodological problem caused by a dissociation between the explanatory force of universal laws and "reality" is fettered with one further troubles: the world is too complex to be interpreted by means of simple formulas. Nevertheless, the attractiveness of simplicity is so strong that today it is hard to find even one scientific discipline to which the main principles of fractal geometry and theories of nonlinear dynamics have not been applied already, and not in all cases unsuccessfully. The epistemological direction of a vector (in this case opposite to the usual course of proceeding from a concrete phenomenon through generalization to a high level of abstraction) also assumes the testing of models developed in another conceptual territory.

It is necessary to note that the term "testing" is used by us with some assumptions: it inherently involves an original check of the theory according to its "explanatory power" under conditions that play it out in a different domain, with the subsequent estimation of the results. Unfortunately, whatever qualitative studies are tried in a given explanatory paradigm, they are never adequately protected from acquiring a pseudo-scientific character. The famous prestidigitator Houdini has shown that when somebody has strong motivation to get certain a result, the expected result will be received by his unconsciously distorted information processing system. The authors felt it was necessary to use all of the above-mentioned statements in order to demonstrate (1) a full understanding of the dangers of unintentionally producing pseudoscientific nonsense, and (2) an undisguised desire to obtain intelligible results by grafting elegant and modern fractal models onto a psychiatric framework.

Meta-analysis of the structure of humanitarian theories, which also concerns the psychological-psychiatric domain (5, p.101) has allowed the allocation of their stable components, namely: 1) the generalized image (psychological) of reality, 2) the central category, 3) a corresponding phenomenon, 4) a network of the basic concepts and the system defining their interaction, and, at last, 5) basic principles. The first three components can be quite incorporated as the leading metaphor comparing mentality with "mechanism" (the theory of information approaches), "transformation of images" (cognitivism), "behavior" (behaviorism), or " unconscious motives" (psychodynamic).

Although Terry Marks-Tarlow (4, p. 323) considers the above-mentioned metaphors as undoubtedly remaining useful within the confines of their limited theoretical designs, he has settled on explanatory potential. He suggests that mental activity be considered through a fractal prism, logically giving reason for the similarity of approaches and indispensability of the transition from artificial patterns to natural – to complex spontaneous systems. Offering a new metaphor, Terry Marks-Tarlow speaks about the indispensability of changing the leading paradigm in psychology and offers as the central category the concept of "a psychological fractal."

The term "fractal" is connected with a name of French mathematician Benois Mandelbrot (2, p. 28) and comes from the Latin "frangere" – "to fracture; to break up or split." A complex spatial object composed of similar parts is referred to as a fractal. The basic characteristic of a self-similar structure is a dimension which, simultaneously, is a parameter of complexity. Unlike traditional, Euclidian geometry, in which dimension can accept only whole values, or integers, fractal dimensions can be expressed by fractional numbers. When the dimensionalities of a set of natural objects and processes are studied, we learn that the dimensionality of a coastal line of Norway is equal to 1,52, while that of a river network of the USA equals 1,83; the dimensionality of a social macrospace, as shown by A.A.Davidov's research (6, p 128), is concluded to reside in an interval of 1,237 – 2,236, averaging 1,618, which conforms to something known in the arts and sciences as the "gold section." Fractal geometry displays one of the fundamental principles of natural objects' ability to live: a small number of parameters, interacting according to rather simple mathematical equations, underlies the existence of extremely complex systems.

Following from the previously-stated assumptions, an attractive conclusion follows, namely that behind the complexity and unpredictability of mental processes and phenomena, a small number of simple laws can appear. Being formulated, these laws can become universal, based on the parameters of simplicity and explanatory power. We should add that numerous studies in the most varied spheres of knowledge constantly show that principles of fractal geometry operate similarly in the social domain, the natural realm, and – we shall venture to continue enumerating – in mental dynamics as well.

Our research shows that the application of principles of fractality can be useful for a wide range of practical problems. One of them is creating spatial-structural patterns for the classification of mental disorders (P. M. Koga, 2007), by reorienting the current mental pathology and showing the possible direction and vectors of the most probable forecasts. Another application would be the study of the dynamics of the parity of intensity between opposingly directed mechanisms of ego defenses in normal states and pathologies (E. Molchanova, 2006). While the comprehensive results of such studies are beyond the scope of this paper, we shall however note that the initiative of the first study and the analysis of the second study would have been impossible without employing the main principles of fractal geometry.

Perhaps common sense would dictate us to choose practicality over a foundation that is impossible to find. As bizarre as it may sound, medicine is not driven primarily by science and its inherent need for objective understanding, but by the sheer pain and suffering of the patients and the ethical professional mandate to alleviate distress. Half of the disorders listed in Harrison's Principles of Internal Medicine state under the heading Etiology: unknown. The truth is that we do not know the exact cause of schizophrenia, multiple sclerosis, lupus, etc., but certainly this does not prevent us from trying everything we can to alleviate suffering. In the empirical process of designing symptomatic treatments, we sometimes get lucky enough to find the root cause of a disorder, and progress from symptomatic to etiopathic.

To propose fractal geometry as the newest and ultimate paradigm for medicine or psychiatry would be neither historically nor scientifically correct, as will be explained later. But the dilemma proposed by this article's rhetorically-intended title may be a false dilemma. The problem is not one of having to choose between science and pseudoscience, but of choosing between practical and impractical, between reasonably valid and invalid, and ultimately between helpful and not-so-helpful. When medical scholars get lost in philosophical debates, like in the middle ages, the patient looses. The issue of an ultimate, universal paradigm for science is perhaps the most important debate in philosophy, gnoseology, and spirituality, but it should not dominate medicine.

Let us take a new look at the Latin quotation that opened our discussion. *Nomen est Numen.* Naming is knowing. Knowing, of course, implies prediction and control – a most tempting invitation for labeling systems and taxonomies. Moreover since *numen* actually means the divine essence of things, naming (interpreting, constructing, etc.) would actually mean to arrive at the innermost knowledge of things by means of an external judgment such as inductive reasoning.

But is that really so? Indeed, for Babylonians, naming and being were one and the same word. Adam of the Old Testament is given by God the power to name all beings, and by doing so Adam is given dominion (control) over them. Yet, the same Jews, returning from the Babylonian captivity, interdict the naming of God. Naming, and implicitly constructing, would disconnect Israel from the ineffable essence of God, place them in an artificial construct (image), and thus violate the First Commandment, which prohibits the worshiping of idols (constructs, illusions). We can see here in this warning about the dangers of constructivism in making dichotomized, polarized statements about the process of knowing that humanity was aware of the principles of fractality from early on in our history.

Let us begin with the antipodal categories of the ancient Greek philosophers: PHENOMEN (what appears to the eye, what is seen – Heraclites of Ephesus) and NOUMEN (what it really is, in essence, unchangeable – Zenon of Elea). Heraclites (540-475 B.C.E) believed that the universe is in a ceaseless state of flux and motion, as he asserted in the statement, "all things flow." Consequently, nothing in the world ever stays the same, hence the dictum, "one cannot step in the same river twice." Yet, this truncated Latin translation of his words – *Bis in idem flumen non descendimus* – failed to capture Heraclites paradoxical satatement: "*We both step and do not step in the same river. We are and are not.*" It appears that the metaphorical river represents time and that the stepping in the river stands for the split-second of the present moment. Heraclitus gives a new solution of the Milesian school of philosophy's problem of identity and change. This philosophy postulated a binary existence: things and processes either exist as totaly identical to themselves or do not exist at all. X is X; it cannot be equal to non-X

or to both X and non-X. Heraclites affirms that X is simultaneously both X and non-X, and with this statement he wipes out the change dilmma raised so powerfully by Zeno's antinomies. According to Heraclites, there is no need for a solution when the problem actually does not exist. Heraclites's flow is continually and simultaneously forming and dissolving.

According to Milesians and to Zeno of Elea, everything in the universe has two states, the "on" state (X) and the "off" state (non-X). Since the movement or transformation from X to non-X would require a transition through a middle state that is not X, and not non-X, and since there would be an infinite number of divisions, forming an infinity of middle states, Zeno says that movement actually cannot posibly exist. The arrow dows not fly. Nothing really changes.

Heraclites affirms that things can be both off and on: a middle state of existence that is to some degree off and to some degree on. The middle state is not a given, immutable quantity, but one derived from the simultaneous formation and dissolution of the on and off states. It is exactly in the middle state, says Heraclites that the extreme states are present simultaneously. "The way up (fractal progression) and the way down (fractal regression) are one and the same."

It would be impossible not to recognize in Heraclites "the upward-downward way," a brilliant foresight of fractal geometry preceding Benoit Mandelbrot's work by twenty-four centuries.

This Greek philosopher often stated his position in deliberately contradictory, paradoxical, "crazy" formulas, desiring to mirror the chaotic structure of the human mind, which in turn is mirrored by the non-linear, dynamic character of the universe that surrounds and embeds human beings. Heraclites' model proposes that nothing can be really perceived as it is, because everything flows ad infinitum and changes constantly; all we can do is to interpret the flux and therefore to construct.

Zeno, said "nothing ever changes. Our observations of any apparent change and any corollary interpretations are only an illusion..." Of course these extremes lead to a false dichotomy, dissociation between inductive and deductive reasoning! That's why we should step in with a unifying paradox.

We should conclude our inquiry with a thought on the fundamental dilemma of gnoseology... In Democritus' own words, "By convention sweet, by convention bitter, by convention hot, by convention cold, by convention color: but in reality atoms and void." Democritus used to say that he would prefer to discover a causality rather than become the king of Persia. Of course, he meant the ultimate, original causality. Unfortunately, or fortunately, such an ultimate beginning cannot be found. If there was such an ultimate beginning, there might be also an ultimate end. Fractal geometry can never capture the ultimate manifestation of complexity, because its expansion is infinite. It can neither describing nor name the ultimate, original, fundamental causality of things (i.e. cosmology, human mind, etc.) because it regresses at infinitum. The only thing fractal geometry can do for scientists is provide an accurate image of a process. Perhaps the most fundamental and universal process of how everything works. In practical terms, that should be a good enough and valid enough process to be applied in clinical work. What the authors are proposing here to the reader is to consider the principles of fractal geometry not as the ultimate truth, but as a powerful and useful paradigm. Whether this is a science or pseudoscience is not the issue.

And if "science" is ultimately pseudoscience, then it must be said that the Cartesian-Newtonian reductionist model of our biomedical scientific thinking does not come even close

to the much more profound reductionism offered by the infinite regression of fractal geometry. Mirroring the paradox of fractality, such elemental reductionism actually turns out to be a holistic vehicle for process modeling with very useful applications in psychiatric care.

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# *Нормативно-правовое поле двухсторонних внешнеполитических отношений Кыргызстана и Федеративной Республики Германия через призму лет*

Изучая нормативно-правовую базу сотрудничества Кыргызстана и Федеративной Республики Германия, приходишь к заключению, что идет непрерывный поиск оптимальных путей развития данной системы. Законодательная база призвана обеспечить качественное функционирование системы на межгосударственном уровне.

Подписание руководством страны ряда документов в начале 90-х годов стало возможным лишь в результате обретения Кыргызстаном независимости и ратификации уже независимой Республикой Кыргызстан ряда международных документов в сфере прав человека. Среди них: Всеобщая декларация прав человека (1948 г.), Конвенция «О предупреждении преступления геноцида и наказания за него» (1948 г.), Конвенция «О ликвидации всех форм расовой дискриминации» (1966 г.), Конвенция «О правах ребенка» (1989 г.), Конвенция стран СНГ «О правах и основных свободах человека»,