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Toward the Interdisciplinary Theory and Research

Oleg Yanitsky

Institute of Sociology, Federal Center of the Theoretical and Applied Sociology of the Russian Academy of Sciences, Moscow, Russia
Email: oleg.yanitsky@yandex.ru

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Abstract

The article represents some thoughts and considerations on an interdisciplinary theory and research based on the relevant scientific works and the author's personal and "big family" experience and research practice during half a century (1969-2919). The author came to the following conclusions. *First*, a degree and forms of the interdisciplinary depend on a historical period of human society. From the ancient times till nowadays the author revealed at least three periods of science integration and diversification. *Second*, in the times of Enlightenment domination, the division of the sciences had been conditioned both by a diversification of human practice and an emergence of an "iron cage" of the bureaucracy. *Thirdly*, nowadays, one could observe a reverse trend toward collaboration and even to integration of the sciences. *Fourthly*, as I indicated earlier, there is an interdisciplinary bridge between natural, social and technical sciences defined by the metabolic processes between them. *Fifthly*, there is a permanent struggle between the adherents of integrative approach in the scientific world and those who gain profit from the conservation of institutional barriers between various branches of sciences. *Sixthly*, the civic initiatives and a science-public researches are in-between the above two. But recently such complex activity cannot be reduced neither to a kind of a bridge between them nor to a "second-hand" science. *Seventhly*, the further the more, the science-public researches are becoming an important instrument of gaining necessary data below and transferring them up at the fundamental sciences level. *Eighthly*, due to a practice of making the research projects with necessary practical recommendations a scientific knowledge began to circulate in two ways: top-down and bottom-up. *Ninthly*, as a result we are now "returning" to the Renaissance time but being much more theoretically and methodologically equipped.

Keywords

Civil Initiatives, Complexities, Ecosystems, Environment, Globalization,

Institutions, Interdisciplinary Research, Metabolism, Practice, Science, Time, Russia

1. Introduction: History of Interdisciplinary Science

Entering the sphere of a methodology of various sciences, I'd been deeply surprised with a gap between an entirely interdepended world and mono-disciplinary structure of a majority of branches of modern science that studied it. Being for years an architect and city planner and then an environmental sociologist, i.e. dealing everyday with various forms of complexities, I couldn't understand why the scientific disciplines are developed separately. And only in the extraordinary cases i.e. under the natural and technical accidents and armed conflicts an issue of interdependence of scientific disciplines and social action came to the forefront (see, for example, Brush & Stabinsky' 1996; Murphy, 2009).

Actually, the interdisciplinary studies have a deep ontological basement because the structures and processes of the entire world are definitely interconnected and interdepended in one way or another. This maxim is related to the social sciences and humanities and their living environment as well. From the ancient times to nowadays a mankind has interrelated all his/her thoughts and activities with a universe.

Let's consider the simplest cases. In all possible cases a scientist or scholar always analyzes an interdependence of a certain pair "stimulus—reaction" that as a rule has interdisciplinary character. Or if a researcher analyzes a certain process of decision-making he/she always takes into account at least three basic factors (or parameters): a time, resources available and a reaction of an affected environment, irrespectively it is natural ecosystems, social institutions or people's reaction on a particular decision. To my mind, every particular decision has its own interdisciplinary character and requires a specific complex response.

And, then, why the Renaissance epoch had been a peak of the interdisciplinary approach whereas (may be in the simplest form) whereas after it the science as a social institution began to transform into a set of separate disciplines? Finally, there are many forms of professional activity which are the interdisciplinary ones by definition such as a construction (building), medicine, archeology, environmental studies, historical investigations, and many others. But it has been my personal observations only.

When I shifted to the studies of the sociology of the sciences, it turned out that the idea of the inter-disciplinary interactions does exist in scientific literature, and first of all in the history of natural sciences and humanities. The scope of this field has been very wide, from the German outstanding poet I. Goethe till world-known Russian scientists Vl. Vernadskiy, one of the authors of the biosphere concept. But all of them do mention an existence of such ties, but nobody has investigated this issue theoretically and practically in detail.

Nevertheless, in the run of theoretical studies and practical construction activities various versions of the inter-disciplinary interactions and their practical forms have emerged. For example, such forms of their interconnections as an inter-disciplinarity, cross-disciplinarity and trans-disciplinarity had been often mentioned but never newer clearly defined and explained.

Gradually the realms of such studies have been appeared, namely: the sociology of scientific knowledge (SSK); an environmental sociology as an interdisciplinary subject matter for a scientific research; a relationship between sciences and social practices; social constructions of various technologies; science in public; the relationships between social and natural sciences and mass-media; the role of the sciences in a maintenance of sustainable development; an interrelationships between a development of sciences and social institutions, etc. (Irwin & Wynne, 1996; Gregory & Miller, 2000; Irwin, 2001). But only in the mid 2000 the issue in question appeared on global scientific and political agendas.

The force that stimulated such shift has been the process of further and rapid integration of the sciences and practices urged by the STR-4. Created by it the "Internet Galaxy" coupled with environmental transformations and rapid growth of social mobility of billions of the earth inhabitances made our world highly interdepended. But before entering such complex problematics I'd like to briefly reflect on my own experience in the realm of interdisciplinary researches.

2. The Urban Studies Are Necessary but Insufficient

Self-reflection is sometimes very useful instrument for the understanding not only a personal life-story but for a development of thinking and doing in general. Therefore, let me return to my own way toward interdisciplinary studies. It has been not a "mechanical" turn but, first of all, the result of my personal living milieu and contacts within it. I grew in the big family of doctors, psychoanalysts, geographers, polar researchers, military men, and various natural scientists.

But I never thought about a scientific carrier because from early childhood I liked to make the drawings and later to paint from nature. After the secondary school I became a student of Moscow architectural institute not for the reason of my interest in architecture and city planning but because there were an excellent cathedra of painting. Two events in the second half of the 1950s strongly affected my interests. The former has been the struggle with the "architectural extravagances" (with the izlishestva in Russian) and the turn to typical housing industrial construction in which the engineering knowledge had dominated. The second was the meeting with Oskar Niemeyer, the world-known architect who with lucio Costa has designed and created the Brasilia, the new capital of Brazil. Niemeyer for a long time supply us, two students with various materials relate to the Brasilia processes of design and construction. And the third one was the VI Festival of the Youth and Students in the 1957 at Moscow during which I worked as a guide and interpreter. I'd understood that the world is united and indivisible.

Then, more than ten years I've worked as an architect and city planner com-

bining the studies and practical work as a designer. The result was clear-cut: I once more realized that we are all actually living in a global multisided world that required complex i.e. interdisciplinary analysis. It has been a very mighty impulse for my own interest to the interdisciplinary studies.

3. Interdisciplinary Approach Resembles a Complexity of our Dynamic World

I see the following reasons for this methodological turn.

Any idea, intension, action or engineering project has a complex, interdisciplinary character in its essence. Even if we study a very narrow facet of a certain structure or process. Our ultimate goals may have the one-dimensional character but the ideas and thoughts which we use as the instruments for this goal achievement are necessarily contain a couple of scientific knowledges and crafts. More than that, we are always trying to foresee the consequences of our decision or activity. In turn, the immediate and after-effects of our decision or action are always multisided as well. And vice versa, such after-effects are usually exerts one or another reverse effect on the actor and on other elements of the environment. Anyhow, it means that the interdisciplinary approach resembles a complexity and interdependence of our world. For example, even the very notion of a function often used by mathematicians usually mean a certain plural effect.

Then, in the times of Leonardo da Vinci there were two creators of the world: the God and the man. The God created the all but people defined the time-rhythms of their mutual coexistence. From this viewpoint, the Renaissance has been the peak of interdisciplinary approach in the sciences, arts, engineering, and everyday life. Of course, such integration of knowledge and crafts resembled a workshop organization of the mode of production and social reproduction of those times. Anyhow, it seems that in those times a man has been a main creator of the time-rhythms of his/her everyday activity. Of course, he/she took into account a state and possible fluctuations of the environment.

But by and large, a dialectical contradiction has emerged between the above integrative worldview and modes of activity, and a necessity of an in-depth development of particular branches of various sciences and engineering activity. There were no risks in this opposition until such division of many particular sciences has not been fixed institutionally. The Third, i.e. industrial revolution has been characterized by the rise of the "iron cage" of a bureaucratic machine. In other words, a mass industrial production coupled with a state and branch bureaucracies have created its own tempo-rhythms of a functioning of industrial societies. And this speeding up of everyday life has been permanently urged on by a mass-media.

The "production—mass-media—consumption" union seems unbreakable. And the transition toward the Fourth industrial revolution with its all-embracing and all-penetrating information-communication networks even has enhanced this time acceleration and compression.

4. From the Territorially-Based Ecosystems toward the Network Ones

In parallel with the Durkheim's idea of a division of labor as the methodological basement of modern sociology the works of the Fathers of Chicago School of human ecology showed us an opposite, an integrative way of development of social and natural sciences. The very term "ecology" borrowed from the natural sciences (mainly used in the biological sciences) has been re-interpreted and applied to the study of the cities and its people and human communities (Park et al, 1926; Park, 1928, 1952). The human ecology and its sister, an urban socio-ecological studies clearly showed to the scientists, scholars and politicians a phenomenon of mutual interdependence of functional and structural transformations accompanied with various *metabolic processes*, that is qualitative transformation of natural processes into social and technical once and vice versa (Yanitsky, 2013).

Herewith, there is a schematic representation of main differences between the ecology of the Third and the Fourth industrial revolutions (hereafter the STR-3 and the STR-4). *First*, in the times of the STR-3, territorial natural and social ecosystems have dominated while in the times of the STR-4 the network ecosystems have prevailed.

Second, it's quite natural that the ties of human communities with the natural ecosystems have dominated. Accordingly, under the STR-3 the natural ecosystems mastered partially, by certain islands, and therefore natural ecosystems prevailed locally and globally. Under STR-4 one could see a double effect. On the one hand, the man-territory ties have strongly weaken, on the other hand, a sharp difference between the mastered and wild territories has become more and more conditional.

Thirdly, until the end of industrial epoch a personal space (family, house with a garden) has been inviolable whereas nowadays this space has widened enormously and at the same time It's under permanent risk (terrorist's and hacker's attacks, etc.).

Fourthly, under the STR-3 the mass human mobility happened very rare, mainly in the times of the invasions or wars. But recently an individual and mass mobility is rapidly growing for many reasons: looking for job and shelter, a forced mobility of the refugees and involuntary migrants, as a result of natural and technological disasters and so on. Besides, it's usually *forced mobility* stimulated by a time pressure or disastrous living conditions. The STR-4 suddenly transforms a local life into a global one.

Fifthly, until the STR-4 a man has been usually tied with a particular local social environment and its way of life. For example, Russia from the ancient till industrial epoch represents itself a myriad local cultures mainly conditioned by a type of local natural environment. And even the socialist revolution in the 1917 and further industrialization couldn't totally destroy the diversity of local cultures in our country. Although, gradually the WWII and then revitalization of

the destroyed industry, giant industrial constructions and a mastering of virgin and long-fallow lands and the like had enhanced inner migration processes. But only after the radical turn to market economy and building information economics a new type of a man has emerged. I mean the appearing of the mass marginal man.

Sixthly, the same has happened with the environmental issues, social and natural ones. The environmental disasters had happened but except the Chernobyl catastrophe they happened mainly locally. After the turn to a market economy and the period of primary accumulation of capital nobody except environmentalists bother about environmental damages and losses. And only in mid2010s and especially after mass protests against ecological politics the environmental problem appeared at the national agenda.

Seventhly, something like the above happened with a diversity of local cultures including nomad people, a national heritage of the multinational USSR/Russia. In the Soviet times many of small towns had been the main carriers of this heritage continued to exist as the administrative and/or cultural centers of the provinces ("oblasti," in Russian).

Eighthly, another aspect of the issue in question is a space relationships between a worker and the place of his/her work. Until the mid1990s they have been relatively definite and close in a majority of Russian and foreign cities and towns. Russia has many cases built on the principle the "one enterprise—one settlement." I call such principle as a case of "*vertical social ecology*." In any case the departmental i.e. vertical principle of building social institutions has dominated. But later on, especially in the beginning of the STR-4 the national and global horizontal structures of their relationships began to dominate. That is, *the networks and their knots represent now a horizontal structure* of a new mode of production and consumption. It has been entirely new social ecology.

Ninthly, the above structural-functional transformations of the world have been a qualitative turn in the life of global society. For example, the "small may be beautiful" but simultaneously rather dangerous in relation to the world SBT-structure and its functioning. But the new concept of global ecology of the SBT-systems has still not been constructed even by the newest works of well-known US sociologists (Stokols, 2018).

Tenthly, under the STR-4 the relationships between a social organization such as an enterprise, research institute, university, etc. are radically changed as well because a growing majority of them are becoming globally network-structured. Of course, they all have their "brain-and-design" centers but they means nearly noting without an information and logistics networks. Summing up, I may state that the social ecology of the digital age has a predominantly network structure. That is, in the former epochs the social ecology had been mainly locally structured i.e. adapted to local conditions, while recently this ecology has acquired the global structure. It means that it first of all depends on the global SBT-system and its turnover.

Eleventh, accordingly under the STR-3 the threats and risks have mainly local character (the analysis of the global calamities is beyond the frames of this article) while now they mainly have a continental and global character. The accidents of global scale urge the scientists and scholars to consider an interdependence of natural, social and technical processes and structures and various metabolic processes generated by such interactions.

Twelfth, in the first approximation to the truth, the above concept isn't a rigid theoretical construct but very uncertain and wave-like developing quasi-system with unpredictable turns and results. The Noble laureate I. Prigogine thought that a chaos may be transformed onto a certain social order. But the further the more we see a reverse result: the existing social order is transforming into a number of chaotic events, mainly of critical character which never transforming into a predictable certain social order.

On the contrary, we are witnessing the emergence of a kind of secondary, i.e. *discursive social ecology*. I interpret such transformation as *a shaping of a demonstrative social ecology*. In this process the run of an astronomic time plays the key role because in this case an actual natural, social and other events and processes are secondary in relation of their resemblance in the mass-media. But this situation once more repeats the similar one of the STR-3 epoch: we are actually dealing not with the real processes but with their after-effects and their reflection in a professional and mass consciousness.

I'd draw attention of a reader: the discursive (demonstrative) social ecology still has no analytical instruments except the mass public surveys and the conclusions of the politically-engaged experts. Thus, the circle is closed. Considering the above processes and transformations more generally, the tandem of the mass-media and politically-engaged experts creates now *an artificial social ecology*. It means that we return to W. Thomas maxim: our perception of the world resembles it actual state and processes.

Thirteenth, the digital technologies is a new and powerful instrument already widely used in a geopolitics, in the replacement of man by the "smart machines", in the construction of the abovementioned artificial social ecological systems and in many other realms of human activity. But these technologies cannot totally replace the global ecological system shaped in the rum of our earth evolution. Humanity is capable to construct giant artificial social systems but always at the expense of natural resources and evolutionary shaped the earth landscape. The biosphere turnover, this landscape shaping and global social systems are the dependent variables of a cosmic structure and processes.

In sum, as I has pointed out earlier, despite that the environmental approach is the most adequately resembling an interdependence of the structures and processes of different quality, many modern sociologists are still usually accustomed to deal with the stationary subjects which fluctuations (oscillations) can be measured in arithmetical terms like "more or less", "sooner or later", etc. But recently *an entire world including Russia as its inseparable part are experiencing the qualitative transformations* burdened by a speeding up of ongoing events

and changes. For such unstable and unpredictable world dynamics a kind of systemic and transformative analysis should be developed. I stress the word "transformative" because today any social agent has nonlinear and wave-like trajectory of its development. The very notion of the development acquires a probabilistic character (Yanitsky, 2019).

5. The Steps and Forms of the Interdisciplinary Relationships

As I've stated earlier, there are at least three steps (and simultaneously forms) to reach it. *The first one is a complexity*, i.e. the technically-constructed aggregates made by different professionals. They are constructed by various mono-disciplinary specialists together with experienced engineers and then these parts (constructions or functions) combined with each other. But even in this case it should be well understood whether these qualitatively different parts are could be combined with each other. It signifies that initially this step requires a hypothesis or for-project making which should show whether these qualitatively different parts do combinable or not?

The second one is the hybridization, i.e. the method of combination of the efforts of different specialists together with experienced men in one way or another. It's very ancient method of joint efforts which is practiced not only by men but by some animals as well. Recently, the hybridization method is widely used in all forms of economy and political competitions or in military maneuvers and operations. In this case the main interdisciplinary instruments are a tactics and strategy of combination of actual and falls deeds and efforts. In a manner, the hybridization is one of the subject matter of the combinatorics science. It doesn't mean that in two above cases the metabolic processes are not existed. They do exists but in a subaltern forms defined by each actor or their cluster. The roles of particular actors are defined by their resources in hand, on the one side, and by a permanently changing situation at the "battlefield", on the other side.

The third case is actually interdisciplinary one. It means that the actors involved in any local-global processes act as a united whole i.e. as *the living organisms*. And the various metabolic processes are their cornerstones. It doesn't mean that two abovementioned forms are neglected. An overall global (or even cosmic?) trend is a combination of all three of them burdened with their growing interdependence. Let me remind that nowadays the differences between the close and far, the front and rear, and the weak and strong are quickly becoming relative. The construction of global information network allows to the individual hackers to generate mass destructive processes. It confirms the maxim that the weakness is a power.

I often hear the accusations: if the state of matters is so threatening, where you have been before? My answer will be the same with that of recently given by the Noble laureate Prof. J. Stiglitz: the world is needed in a new form of capitalism. The existing one coupled with an irresponsible politics is the deadlock because it widening the gap between the US and other world. More than that, the econom-

ic and other spheres of the US social life are at risk (from the interview with J. Stiglitz to the Euronews, 02.01.2020).

The same answer may be given to those who accused the scientists that they didn't warn humanity about the threat of global warming. The designers and backers of an ideology and practice of the consumer society never bothered concerning their negative natural and social consequences. And therefore they were deaf to the many warning made by the scientists, scholars and by environmental movement participants. The consumer society adherents never paid the slightest attention to such warning. The mass environmental movements and protest action across the world is the best indicator of mass concern related to the coming global warming.

The last but not the least note is related to the ongoing transformation of the biosphere. The world is now in the process of transformation of the biosphere into the sociobiotechnosphere (hereafter the SBT-system) the regularities and dynamics of it still requires are still unknown. We all, the scientists and ordinary people are living in an environment of side-effects, as U. Beck rightly stated (Beck, 1992).

6. How to Organize an Interdisciplinary Team?

At first, some preliminary remarks are needed. My childhood and teenager experience has been confirmed many times, and is at work just now. I mean the child's being in a diversified social and cultural milieu. The quality of this milieu is very important to a further life-story of a man or woman. My personal experience as a sociologist and social psychologists confirms this statement. It's the most important if it's going on about future scientists or creators of very complex systems like the aircrafts or the spaceships. The diversified social and cultural milieu is important today when child of three-four years age begin to use the smartphones and other modern devices.

For many years I watched bitterly how a child's interests to a diversity of the world's events have been systematically suppressed by the educators and teachers by means of very primitive instructions and commands. I once more remind an excellent international research project guided by Prof. Dorris Büchler-Neiderberger (2010, 2010a) from the University of Wuppertal, Germany. The main outcome from this international project is openly clear: the modern child isn't a pupil only he is an actor.

Any my own human and professional experience clearly showed that the existence in the highly diversified social and cultural milieu is very important throughout all life of those who want to be a researcher or constructor. I've changed many places and professions of my work but not for looking a higher salary or social position but for the possibility of being in a diverse scientific, social and cultural milieu. By the way, in the 1950-60s the comparative studies of the time budgets had been very popular in the former socialist countries. I took part in one of them but very soon realized that a half-an-hour talk with Russian academics like Piotr Kapitza, Alexander Prochorov or Vitaly Ginzburg (all of

them were the Noble laureates) is incompatible much more useful for me than tens of ours spent for processing of giant amount of sociological information gained in the run of mass survey. My choice for individual talks has been rather simple: the above laureates explained the fundamental laws of the universe and of our social world while the time budgets of a mass of ordinary people were highly dependent on political decisions of the Communist Party's leaders.

Actually, it's unbelievable: in the run of last 50 years the radical social transformations have occurred in my country: it turned from a socialist to a capitalist mode of production, all social institutions were periodically changed but the new economic and social system is still not enough sensitive to the above global transformations. To be on the same level with them we should make a "triple jump": to create modern industrial economy, to build a "digital economy", and to reorganize our institutional system with their requirements.

For resolving these problems our country is needed in a corps of interdisciplinary specialists supported by the civil society activists. But for the production of the schoolchildren and students quite another system of a secondary and higher education is needed, and in it a class-lessons systems is not the main instrument. The schoolchildren and students are needed in understanding of a complexity and interdependence of our world as well as an understanding of how its macro and micro levels are interdepended.

A very efficient mean to organize interdisciplinary communication is a research project which presupposes not only theoretical but practical outcomes. After my conduction of three international and many national research projects with the abovementioned qualities, I came to the following conclusions.

First, a human compatibility is a very important precondition of a success of such projects because of their complexity and interdisciplinary nature. *Second,* therefore better if a project leader will be well acquainted with all possible project participants in advance. *Third*, it will be better if in the project team will be only one leader. *Fourth*, of course the proportion between the aged and young participants should be kept. *Fifth*, one of the most difficult tasks of the project leader is the maintenance a permanent interdependence between a theoretical basement and empirical research. *Sixth*, in order to overcome this difficulty, I'd recommend to conduct one or two pilot field-researches. *Seventh*, it's necessary as well to organize at least twice a year a seminar to summarize the achievements and shortcomings. *Eighth*, at the same time our proposals and recommendations should be tested in the audience of practitioners and independent experts. *Ninth*, the other testing ground is the civil organizations both the voluntary and state-organized. *Tenth,* at all stages of the project the publications on the same topic should be carefully analyzed.

7. Does an Interdisciplinary Scientific Language Possible?

The global situation is aggravated day by day because all societies and their environments are becoming more and more integrated while this fact isn't resembled in the structure of scientific knowledge. The science as a social institution

remains mainly mono-disciplinary.

From the viewpoint of humanity survival this gap is very important challenge, but it deserves a special investigation.

Therefore, let me return back to the Renaissance times. Why such giant persons as Leonardo da Vinci had been a "universal" man? It seems that there were a set of necessary preconditions. *First*, he had been a free person built in the culture of creativity with minimal religious preconditions. *Second*, all cultural atmosphere in which he lived in favored him. *Third*, he had an access to numerous libraries and other cultural institutions of his time. *Fourth* and the most important, he has enough time for thinking and doing what he counts necessary.

Fifth, summing up, Leonardo da Vinci had simultaneously been "built in" the Renaissance culture and a creator of it, and it had been exclusively favorable position for him. Besides, for the making a kind of an interdisciplinary scientific language a concentration of various figures like Leonardo in the same place and time had been another necessary precondition. In sum, he had a lucky chance to live and work in the most favorable conditions for a multisided creative activity.

Recently, we are gradually returning to the above integrative approach in our researches and developments but on an entirely hostile and uncertain background. Its main features are as follows: a deep differentiation of the sciences and practices; a permanent emergence of new challenges and threats; a necessity to take into account a phenomenon of permanent and tough and tough competition of all with all; and a shift of all abovementioned processes into the global "Information Galaxy" (Castells, 2004). This shift deserves more detailed analysis.

In sum, under such global circumstances we are dealing with a gird of old and new challenges. The old is a global market competition but under conditions of growing deficit of necessary resources such as drinking water and food. All that is aggravated by global warming and there for the necessity of mass rescue operations, resettlements, mass migrations, etc. is growing. The further the more the global SBT-system is becoming unstable and therefore unpredictable.

Then, there is a growing competition between the scientists, scholars and so-called techno-science themselves for a leadership in the processes of mastering a macro and micro worlds including a cosmic space.

The reverse side of the same coin is the issues generated by the global warming. Recently they came to the forefront, and this is an all-embracing and all-penetrating threat. But it's practically unresolved problem because it both affects the interests of majority of global stakeholders, the global market at large and a majority of the scientists and scholars especially those who are involved in a creation of the cosmic programs.

After then, the issue of global wastes and their back influence on natural and social ecosystems and individuals is on line. The politics and scientists are still has not the strategy and tactics of how to cope with such global threat. The reason of such state of matters is rather simple: the issue of the wastes is directly interconnected with the basement of modern society named a consumer ideology and similar way of life. Besides these current issues nobody knows what kind of

new ideology we are needed. In any case, the interdisciplinary scientific language will highly depend on a type of an ideology of desirable future.

Finally, the further the more the extra rich are concerned only with the means of self-protection and survival, may by on the other planet. They already have accumulated the giant capitals, and now the majority of them are interested in a personal safety and wellbeing only.

8. Conclusion

All current natural and social processes which are in essence have a systemic that is an integrative character. Currently shaping global sociobiotechnical systems (the SBT-systems) are the best example of systemic character of all minor structures and processes within it. A global character of human activity produces global risks and it's the new dialectics of our times. Besides, one could observe a permanent process of an ad hoc emergence and dissolution of the SBT-systems of various scales. Such ad hoc processes and structures lead to a shaping of the different kinds of the "as if" ecosystems in the form of temporary geopolitical alliances and unions, periodical shifting of the interests of the nation-states, transnationals, etc.

Nowadays, one could observe a reverse trend toward collaboration and even to integration of the sciences. There is an interdisciplinary bridge between natural, social and technical sciences defined by the metabolic processes between them. There is a permanent struggle between the adherents of integrative approach in the scientific world and those who gain profit from the conservation of institutional barriers between various branches of sciences. The civic initiatives and the science-public researches are another form of such bridge but recently such complex activity cannot be reduced to a kind of a "second-hand" science. The science-public researches are becoming an important instrument of gaining necessary data at the "bottom" and transferring them "up" to the fundamental sciences level. Due to a practice of making the research projects with necessary practical recommendations a scientific knowledge began to circulate in two ways: top-down and bottom-up. Thus in a manner, we are now "returning" to the Renaissance time but much more theoretically and methodologically equipped.

Translating such transformations into political language, we observe the double process of gradually dissolution of political parties and raise the social and environmental mass movements across the world. Or using the sociological terminology, we are witnessing a struggle between these two social institutions. But the shaping of the global social and environmental movements is an entirely new socio-political phenomenon.

Under these unstable and risky conditions a permanent oscillation between differentiation and integration of sciences is becoming a "normal" mechanism of a development of modern sciences. In other words, the science as an institution has to develop in line with the above processes. It's true especially now when integrated scientific end-product is simultaneously becoming a driver of the world

economy and of the sphere of competition and struggle between particular scientists, their groups and the global transnationals.

From this viewpoint, the US, the EU, China, India, Brazil and Russia may be considered as giant open socio-political ecosystems which are competing with each other. It means that humanity as a certain wholeness steps on a very shaky ground that makes our life is even more uncertain and risky. The racing ahead the curve is always a very risky enterprise. The reverse side of the same coin is a tough struggle between the adherents of integrative approach within the scientific community and those who gain profit from the maintenance of institutional barriers between various branches of sciences.

The civic initiatives and a science-public researches are in-between the above two trends. But recently such complex activity cannot be reduced neither to a kind of a bridge between them, nor to a sort of "second-hand" science. The further the more, the science-public researches are becoming an important instrument of gaining necessary data "below" and transferring them "up" at the fundamental sciences level.

To my mind, under above existing global trends and uncertain future the issue of the construction of interdisciplinary language may be resolved only partially and temporally.

Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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