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**AXIOLOGICAL AND COGNITIVE  
POTENTIAL OF INTEGRATIVE  
PROCESSES IN SCIENCE**

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**Ключові слова:** методологія науки, синтез, наука, дисциплінарність, міждисциплінарність, природничо-гуманітарна картина світу.

**Манчул Б. Аксіо-когнітивний потенціал інтегративних процесів у науці.**

*Стаття присвячена висвітленню основних інтегративних тенденцій у науці і виявленню ролі міждисциплінарного синтезу у формуванні цілісної системи сучасного наукового знання. Розкрито сутність, історичні різновиди, світоглядні та методологічні засади інтегративних тенденцій, когнітивно-ціннісний потенціал інтеграції та міждисциплінарного синтезу наукового знання.*

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The state of modern science indicates that, along with the differences that exist between social and humanitarian knowledge on one hand and natural on the other, there is a lot in common, which emphasizes the potential for further informative and valuable synthesis of scientific knowledge.

The relevance of this topic is that the differentiation of scientific knowledge is balanced by its integration, which involves not only the coexistence or formal unity of science, but also mutually beneficial exchange of approaches, research methods, concepts and categories that contributed to interdisciplinary synthesis and the emergence of new disciplines.

Therefore the purpose of this article is to analyze the trends in modern philosophy and methodology of science in synthesis of scientific knowledge into a coherent natural and humanitarian world picture. For many centuries, science has tried to follow the standards by which scientific knowledge of the world had to reflect reality. However modern science has rather complex structure with partly interrelated and incompatible elements which have integrative characteristics. This brings us to the main questions: "How will a new integrated science look?" and "What shall we expect from it?"

In the past attempts have been made to create a universal method (or methods) that would be accepted if not by all disciplines then at least by most of them. Emphasis was made on the methodological and narrative unity. This showed the cause of the peculiar dependence of cognitive science on natural science in both methods and content, and its reduction to logical manipulation of symbols. Therefore, it was assumed that it is impossible for a certain discipline to be independent of others. Moreover, as it turned out even basic sciences such as physics may have some internal disputes.

In the subject area of science two knowledge systems singled out -knowledge of the nature – natural science and knowledge of significant individual, group, and state values of mankind - the humanities. Although both of them declared the principle that truth is equal before all levels of researchers that no past achievements are taken into account when it comes to scientific evidence. Science as a distinct culture of human knowledge about the nature and value of social life was also influenced by other areas like spiritual culture, experience, wisdom, traditional medicine, moral system, natural philosophy etc. This fact gives the right to interpret the concept of "nature studies" and "social studies" as the natural and human sciences, but in the sense of a wide range of scientific and non-scientific types of knowledge.

Modern philosophy of science considers scientific knowledge as a social and cultural phenomenon. And one of its objectives is to study how historical changes influence the establishment of new scientific knowledge and mechanisms of influence of social and cultural factors on the process. However if the research strategy and scientific functions in society change, the science starts to raise the following questions. Will science continue to change or will scientific rationality take priority in the scale of values? Are scientific values unique to a particular type of culture and civilization? Can science lose its previous values, status, and its features? Which changes can be expected in the system of the research in terms of its interaction with other areas of culture? As a matter of fact science develops so we should expect both new discoveries and scientific revolutions, the same as increasing trends in

integration processes both within science and beyond<sup>1</sup>.

It is important to bear in mind that the process of synthesis in science was made not only with a purpose to reduce to a common denominator increasing volume of empirical and theoretical knowledge, but also with progressive disciplinary fragmentation and differentiation of science. Certainly at different stages of knowledge development synthesis occurred in different ways. It was subjected to the overall logic of scientific cognitive activity that is evolving from an encyclopedic classical cumulativism to modern science methodological pluralism<sup>2</sup>.

The system of knowledge, since the 11<sup>th</sup> century when first universities were found in Europe and up to nowadays, has been having disciplinary structure or sectoral focus. In the process of development and systematization of the existing production of new knowledge science became more specialized. Later this specialization was called disciplines. Such disciplinary basis gave birth to different faculties in universities. Although obvious is the fact that new disciplines continue to emerge which is the result of scientific synthesis.

The opposite of synthesis in science is the concept of "disciplinarity", understood as "relatively self-contained separate sphere of human experience, which consists of experts of a field of knowledge, pursuing a common goal and developing the relevant concepts, facts and methodology"<sup>3</sup>. Therefore disciplines differ in their approaches to research methods, norms, and values. Disciplinary science is an artificial science because it reflects the world in excerpts, not in its entirety. In other words, disciplinarity is a demarcation of knowledge that does not always correspond to the processes and interactions that occur in reality.

Despite the fact that modern science is disciplinary, the idea of the synthesis of scientific knowledge becomes increasingly relevant today, given the challenges, problems and obstacles faced by science. Although there are critics to this idea such as J.Fodor, J.Dupre. Once science was an integrated knowledge and it was called "philosophy". In ancient philosophy philosophers, scientists were interested in everything – from space up to a man. The first attempt to break science into disciplines was made by Aristotle (no wonder he is now considered the founder of many disciplines), and since then it has been having sectoral focus of science as fundamental.

An interesting fact is that Greeks themselves for the first time began to consider scientific synthesis. The first attempts were made pre-Socratics. In particular there was an important issue of singular and plural, as well as the question whether the world and our knowledge of it matches. Ancient thinkers had tried to define the principle on which they proceeded to form their views. These principles had a unifying character (Pythagorean numbers, Democritus' atom, Plato's

idea, and Aristotle's categories). It should be noted that this synthesis had inside knowledge and external displays. Greeks made attempts to combine science, mythology, and culture. Even such "pillars" of rationality and logic, as Plato and Aristotle in their works often turned to mythological characters, events, scenes and characters. With the emergence and consolidation of Christianity the idea of knowledge, which was the main content of Arabic science, was based on the mapping of the law of the Creator, the center that controls and directs all. It is this tradition that gave impetus to the creation (or attempt to produce) the first encyclopedias. In the Middle Ages the realities of being determined system of values and their relation with the divine perfection, their attachment to grace. The definition of values met hierarchy of knowledge, ranging from theology up to other sciences.

One of the most prominent supporters of the synthesis of knowledge was the Catalan philosopher and theologian Ramon Llull. He believed that it is possible to make a complete fusion of philosophy and theology. He also attempted to systematically explain the structure of science in general and its particular areas (law, medicine, theology, logic). The combination of this system of knowledge of God's creation with a single language of science has given impetus to the synthesis of knowledge in the Middle Ages<sup>3</sup>.

There was a complete revolution in attitudes to science in modern times. The first science is defined not by its object, but by its method. This epistemological revolution has its axiological source that is associated with the over vision of the concept of "hierarchy". However, during this period a value terminates its link with the truth, it changes its direction. Previously it (truth) was associated with an object of science, but now it was focused on method. The correct method is to guarantee the truth. That was an attitude of science in modern times. Another feature of the New Age philosophy is that a man, his mind, his needs, his life began to be perceived as the only true and undoubted existence (as opposed to the Middle Ages). The founder of the rationalist culture of the West R.Descartes believed that there can be doubt whether there is an objective world, God, nature, other people, even our own body, but one cannot doubt, that if he thinks, therefore he exist (cause he exists through thinking).

The 16<sup>th</sup> century was a starting point of the rapid process of establishment of the natural sciences, with mechanics as its core. Social cognition has been developing within the history of philosophy, the philosophy section relating to the interpretation of the historical process and

historical knowledge. Contemporary science promotes the new vision of the whole system of science. It is not afraid to raise issues and problems that are ambiguously interpreted by scientists. Moreover there are increasing talks about the possibility of combining sciences, but not yet clearly singled out, on what basis such a union can be based.

Post-non-classical science continues to evolve and expand its borders, and also change its methods. We can clearly speak about a reconstruction of knowledge in general. It seemed to be returning to the first "beyond-disciplinarily" knowledge, which has always been the aim of philosophy. In the late 20<sup>th</sup> century such concepts as "united research", "hybrid research area", "comparative science", "scientific holism", "unification prospects" acquire a completely new meaning compared to their traditional vision. On one hand increasingly it comes to the interpenetration of sciences with no boundaries between disciplines, on the other, the underlying epistemological crisis that took place in the late 20<sup>th</sup> century. That's why most of research areas acquired integrative nature<sup>4</sup>.

In the second half of the twentieth century representatives of the philosophy of science understood that both subjects and their interaction have great research potential. This approach enabled the transfer of methods from one discipline to another. The result of these experiments was the formation of so-called binary subjects (biophysics, biochemistry). However, it is extremely important to note that most disciplinary synthesis combine scientific methods that are inherent in each of them, but not mechanical unification of all disciplines. In other words, specific knowledge remains within a particular discipline, and these disciplines are in no way disappearing or transforming.

Cognitive and axiological potential of integration of science, which reconsidered such concepts as "ideals", "normal", "value", "rationality", "objective", "intersubjectivity", etc., is the basis for interaction and synthesis not only within the natural sciences and the humanities, but also between them. Thus cognitive and axiological potential of integration of scientific knowledge is seen from several positions.

The new interpretation of classical meaning of "objective" and "subjective" in science is given. The possibility of achieving objective knowledge by "rigorous" sciences is questioned. The role of the subject is analyzed in the study and the idea that social science and the humanities are less objective than natural sciences is rejected.

The question of true knowledge, on the one hand, is the key to all areas of science, on the other – there are different criteria of truth, according to the understanding of the final result of the study. Also, it is assumed that the truth is endowed with axiological aspect; therefore, socio-humanitarian knowledge claims it is not less truthful than natural. This also

shows moral aspect of scientific knowledge, which indicates the general rules of conduct of "universal scientist" in scientific research.

Synthesis of knowledge in classical science is carried out by keeping up to scientific criteria which are contained in the fundamental scientific disciplines that united them in a scientific system, while the humanities, because of its specificity, could not keep up to those criteria that is why they were considered as non-scientific. Classical methodology of science tries to answer the question: Can there be humanitarian ideals of science? Firstly, the humanitarians always presuppose the unity of science and art. This response is a result of the identification of natural model of science, the construction of any science to knowledge of objective reality. Secondly, the legal recognition of the existence of the phrase "human sciences", "human knowledge" requires a reconsideration of the nature of modern science<sup>5</sup>.

Non-classical paradigm of science, cultivating relative thesis that one and the same reality can be explored by various methods, gave a chance to the humanities to establish a scientific status and the real possibility of integration with the natural sciences. Non-classical methodology of science perceives science and humanities in a new way. It highlights the feature of the humanities and scientific ideal, which is a broader interpretation of subject knowledge, which should be not only the bearer of "pure reason", but also a man with all its abilities, capabilities, feelings, desires and interests; the role of this entity is not confined to participate in the cognitive process, but also extends to assess cognitive outcomes. Thus, social and cultural interests belong to the same scientific standards. In the contemporary scientific and methodological discourse synthesis of scientific and non-scientific knowledge becomes important. It is determined not only by the growth of potential of the heuristic moral, aesthetic and religious values in the worldview of modern man, but also with awareness of the fact that "positive" science cannot formulate or solve any problems concerning the sense and purpose of human life.

Thus, the trends towards synthesis of scientific knowledge are becoming more relevant in modern philosophy and methodology of science. The progressive differentiation does not turn science into chaos due to integrative processes that occur spontaneously or as a result of conscious systematizing of subordinated philosophical and methodological guidelines. If the Aristotelian classification numbered up to 20 scientific disciplines, which also were internally undifferentiated, now there are, according to statistics, more than 15 thousand of them. The synthesis of the entire array

of modern scientific knowledge is indeed an extremely complex problem that requires a specific setting and professional solution. Trying to create a single scientific picture of the world is closely connected with the realization of two major trends of science, attempts to understand the world as a single integrated system and the need for its specific (discrete) study, clarifying the identity of structural elements and connections between them. Most scientists are inclined to believe that no specific scientific discipline has all the means to guarantee acquisition of full knowledge, holistic explanation of the world in which we live, and our place in it. Hence, there is an urgent need for understanding the nature of integration and synthesis of interdisciplinary science, clarifying in this process the role of methodological philosophy.

Potential role of integrative worldview of science is that it defines the style of modern scientific and rational thought in general, considering the fact that under the influence of post-modern theories subjectivism and relativism are currently spreading. The only truth as the ideal of scientific knowledge is considered fictional and non-realistic and as the source of many problems existing today. Not only culture in general, but science has become multipolar. This attitude is very common in intellectual circles, including scientific. Relativists believe that limits of universal knowledge do not prove that pluralism is a good thing and that knowledge should be acquired in thousands of different ways (R.Rorti).

However, today there are many supporters of the "old" ideas of rigorous science, who try to oppose relativism in its belief of building a universal system of knowledge that can unite all the sciences and provide the key to a holistic understanding of man and the world. They are convinced that culture cannot exist as a plurality of truths which are in conflict without universals; it leads in the end to moral degradation, and ignores any persistent moral principles<sup>6</sup>. Of particular importance is the question of the single foundation that could support the deployment process of synthesis in science. Different scholars have different interpretations of foundation on which to build a single, integrated system of modern scientific knowledge.

Therefore, all these processes require a thorough study of the problem of integration of scientific knowledge, identification of key trends, methodological principles and forms of actualization of cognitive and axiological potential.

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#### **Manchul B. LE POTENTIEL AXIO-COGNITIF ET LES PROCESSUS D'INTEGRATION DANS LA SCIENCE.**

*L'article est consacré aux tendances d'intégration de base en sciences. On identifie le rôle de la synthèse interdisciplinaire dans la formation d'un système intégré des connaissances scientifiques modernes. On a révélé les variétés historiques, les principes idéologiques et méthodologiques de tendances d'intégration, le potentiel de l'intégration interdisciplinaire et la synthèse des connaissances scientifiques.*

**Mots-clés:** *méthodologie de la science, la synthèse, la science, disciplinarité, l'interdisciplinarité, la vision du monde naturelle et humanitaire.*

#### **Манчул Б. АКЦИО-КОГНИТИВНЫЙ ПОТЕНЦИАЛ ИНТЕГРАЦИОННЫХ ПРОЦЕССОВ В НАУКЕ.**

*Статья посвящена освещению основных интегративных тенденций в науке и выявлению роли междисциплинарного синтеза в формировании целостной системы современного научного знания. Раскрыта сущность, исторические разновидности, мировоззренческие и методологические основания интегративных тенденций, когнитивно-ценностный потенциал интеграции и междисциплинарного синтеза научного знания.*

**Ключевые слова:** *методология науки, синтез, наука, дисциплинарность, междисциплинарность, естественно гуманитарная картина мира.*