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The Explicit and Implicit Foundations of the Natural, Social, and Humanitarian Sciences

A comparative analysis of the explicit and implicit foundations of the natural, social, and humanitarian sciences explores the genesis of the foundations of science and their relationship to common sense, everyday consciousness, real-life experience, and human intuition. The analysis takes into account the conventional division of the sciences into theoretical (fundamental) and practical (applied). The main examples selected are physics from the natural sciences and psychology from the social and humanitarian sciences. The article considers the connection between the conformity of the foundations of theory to scientific standards and its survival. It shows that the natural sciences developed by means of the supplantation of initial postulates and paradigms, while the principal external criterion vis-à-vis social-science theories is their survivability. This assertion is juxtaposed with the fact that in the natural sciences applied technologies that change the world are a direct result of fundamental-research results, whereas in the social and humanitarian sciences, this connection is much weaker.

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Introduction

The increased interest in the foundations of science stems, in particular, from the fact that empirical data is produced more quickly than it can be organized, presented graphically, and interpreted (the problems that arise in this regard are discussed, for example, at the websites of Data Documentation Initiative[1] and the Dublin Core Metadata Initiative[2]). The discovery of expected patterns and the forecasting of unexpected trends demands a synergetic approach that makes use of the latest advances of statistics, applied mathematics, informatics, artificial intelligence, and the presentation of knowledge, cognitive science, and disciplines in the area of decision-making, at a time when there is a significant gap between the natural, engineering, and social and human sciences. The need for such an approach was declared when development began in the first decade of the twenty-first century on the convergent (transformative) technologies of NBICS ((N – Nano; B – Bio; I – Info; C – Cogno; S – Socio), which allow us to speak of the start of a new stage of development of nature, society, man, and science that blurs the boundaries between natural and artificial systems and that is capable, from an anthropological perspective, of changing human beings as a species. The study of the foundations of science is a focus of attention of both Russian methodologists (see, e.g., Stepin 2003; Dorfman 2003, 2005) and foreign specialists, who in 1995 published the journal *Foundations of Science*, which discussed fundamental concepts, principles, assumptions, and unresolved problems both of traditional disciplines and of recently emergent interdisciplinary fields.

The purpose of this work is to present a comparative analysis of the explicit and implicit foundations of the natural, social, and human sciences. Since the time of the cultural historian and literary critic Wilhelm Dilthey (1833 – 1911), it has been customary to set off the *Naturwissenschaften* (sciences of nature, nomothetic sciences for the study of patterns) against the *Geisteswissenschaften* (sciences of the spirit, idiographic sciences for the study of unique phenomena). In recent years these terms, due to the diminished status of the German language in the scientific community, are rarely seen, but in methodological terms history, linguistics, psychology, and the social sciences are still unified by the study of empirical data on the basis of understanding (*Verstehen*) or interpretation *(Hermeneutics*), the construal of meanings, and a hermeneutic approach (Lyzlov 2009; Grünewald 2009), in contrast to physics, chemistry, and biology, which are unified by principles of naturalism that assume a study of the laws of nature that do not depend on human will.

We propose to use the conventional division of sciences into theoretical (academic, fundamental, "pure") and practical (applied, "impure") parts, which leads to the identification of four objects of study:

- theoretical natural sciences (theoretical physics, theoretical chemistry, general biology);
- applied natural sciences (engineering, technical, and industrial applications of physics, chemical technologies, applied biology);
- theoretical social and humanitarian sciences (theoretical history, theoretical linguistics, general psychology, theoretical sociology);
- applied social and humanitarian sciences (applied linguistics, applied psychology, applied sociology). The main illustrative examples selected are physics from the natural sciences and psychology from the social and humanitarian sciences, as exploring man's external and internal worlds, respectively.

On April 27, 2009, President B. Obama (1961) made a speech to the U.S. National Academy of Sciences. In it he said that "Science is more essential for our prosperity, our security, our health, our environment, and our quality of life than it has ever been before" (Revkin 2009) and promised to devote more than 3 percent of the gross domestic product to funding for math and natural-science education, the natural sciences, and engineering. The address did not mention social and humanitarian sciences.

Abraham Maslow (1908 – 1970) saw the reason for the negative attitude toward humanistic psychology in *means centering* (tools, techniques, procedures, methods) as opposed to *problem centering* (problems, questions, functions): "Means centering tends strongly to create a hierarchy of sciences, in which, quite perniciously, physics is considered to be more 'scientific' than biology, biology than psychology, and psychology than sociology … From the point of view of a problem-centered science, such a hierarchy would never be suggested, for who could maintain that questions about unemployment, or race prejudice, or love are, in any intrinsic way, less important than questions about stars, or sodium, or kidney function?" (Maslou [Maslow] 2003, p. 251)

The sociologist and scientific rebel C. Wright Mills (1916 – 1962) criticized the technocrats: "Physics, we are told, has arrived at a condition in which problems of rigorous and exact experimentation can be derived from rigorous and mathematical theory. It did not arrive at this condition because epistemologists set forth such an interplay within a model of inquiry that they had constructed," wrote C. W. Mills in criticizing the technocrats (2001, p. 73), and he interpreted their latent objectives as follows: "They are, they suppose, out to do with society what they suppose physicists have done with nature. … if only the Methods of Science, by which man has come to control the atom, were employed to 'control social behavior,' the problems of mankind would soon be solved, and peace and plenty would be assured for all" (ibid., p. 133).

The competitive relationship gets in the way of an objective comparison of the foundations, fundamental principles, methods, theories, achievements, and limitations of the natural, social, and humanitarian sciences and an interdisciplinary exchange among them.

Genesis of the Foundations of the Natural, Social, and Humanitarian Sciences

Theoretical exploration, both of the natural sciences and of the social and Humanitarian sciences, is intended to describe, explain, and predict the processes and phenomena of reality. For a specialized practitioner, such as a psychologist, the methodological triad looks somewhat different: psychological diagnostics — psychological prognostication — psychological control (Sukhodol'skii 2006, p. 351). In both cases academic and applied researchers proceeded from a holistic model that relies on the foundations of science — the ideals and standards of investigation, including ethical ones; a scientific picture of the world and some philosophical (metaphysical, heuristic) ideas, expressed in an explicit, or more often latent, form. The evolution of knowledge may be schematically presented in the form of a ladder (Figure 1).

It corresponds to the theory of the three stages of spiritual development of humankind — magic, religion, and science — that was proposed by the anthropologist and historian of religion Sir James George Frazer (1854 – 1941), who made a major contribution to the study of the transformation of religious faiths. According to Frazer, at the "magical" stage of development people believed in the possibility of arbitrarily changing their environment as they wished, but in practice they became convinced that this was not the case, and began to assume that the world was subject to omnipotent gods and supernatural forces; then the view that the world was controlled by "the laws of nature," which could be controlled once they were understood, became predominant. In the process, the transition from the

Scientific
Philosophical
Religious
Mythological

Figure 1. **The evolutionary ladder of knowledge.**

"lowest" stage to the "highest," according to Frazer, is characterized by a nearly total abandonment of prior ideas: magic almost completely disappears at the "religious" stage," and religion at the "scientific" stage, which allows the stages to be pictured as the rungs on a ladder leading upward (Figure 2).

One can discern personal motives in Frazer's theory: after growing up in a devoutly pious atmosphere, he painlessly lost his childhood religious faith during his university studies (1869–1874). Earlier, in 1830, a ladder of sciences, i.e. a hierarchy of the basic sciences, was proposed in a classification schema by the founder of sociology, Auguste Comte (1798–1857; Figure 3).

Figure 3 expresses in a logical form the historical process of the formation and development of scientific knowledge, its evolutionary trendline, and gradual transition from the simple to the complex, from the lowest to the highest, from the general to the specific. The categorization of sciences on a residual, genetic basis suggests that there is some continuity in the transformation of the foundations of various sciences and the methods they use. In particular, we can point to a parallel (joint) shift of the boundaries of sciences: as a result of the expansion of lower sciences into border areas

Science
Religion
Magic

Figure 2. **The ladder of humankind's spiritual development according to J. Frazer.**

Sociology
Biology
Chemistry
Physics
Astronomy
Mathematics

Figure 3. **The ladder of sciences according to A. Comte.**

of the higher allied sciences, both the upper and the lower boundaries of each science are shifting in the direction of more intricately organized objects (Imianitov 2003, p. 4), and, at the very least, we can affirm that the lower sciences are influencing the foundations of the higher allied sciences. There are more complex classifications, such as in the form of a "tree" of sciences and multidimensional ones, but a sequential, hierarchical model is sufficient for a preliminary analysis of the foundations of science.

Mythological knowledge in primitive culture, the transformation of the facts of daily experience into myth, was based on the principle of anthropomorphism, that is, the attribution of human qualities to inanimate objects, living creatures, and made-up creations, which has persisted, unaltered, in modern language: we say that the rain is coming down,[3] the sky is glowering, and the leaves are whispering. The psychologist and philosopher Jean Piaget (1896 – 1980) at the beginning of his scientific career studied similar characteristics in the concepts of small children regarding their environment: the indivisibility of the world and of their selves, animism (the belief that all of nature is animate), and artificialism (the view that the world was created by human hands).

The mythological foundations of knowledge afforded a holistic picture of the world and a unity between the rational and the emotional, and between knowledge and experience, which were later lost. In modern society, myth, as a rule, is far removed from the world-view center, but is often used as a metaphor. For example, in the late twentieth century in Russia, liberal economists propagated a myth about the revival of ownership, to the effect that private property, in contrast to socialist, "dead" property, in the market economy was "alive," "pulsating," "taking revenge," and "being wrested" from the hands of bad owners in search of proprietors who were capable of utilizing it more efficiently.

The symbolic modeling approach in cognitive science is based on a computer metaphor that likens a personal computer to man: software is compared to human knowledge, and hardware to the neural substratum and work of the brain. The ability to conduct a dialog with a computer, the perception of a machine as a partner that possesses a large volume of knowledge, performs complex tasks and responds intelligently to questions contributes to the personification of the computer, an attitude toward it as a living creature and the endowment of it with human qualities. Myths are rarely included in the foundations of scientific theory. Examples would be the Oedipus complex conceived by the creator of psychoanalysis, Sigmund Freud (1856 – 1939) and the Electra complex by the founder of analytical psychology, Carl Jung (1875 – 1961).

Unlike monological mythological knowledge, religious knowledge in monotheistic religions (Judaism, Christianity, and Islam) is of a personal, dialogical character. The philosopher and theologian Martin Buber (1878 – 1965) contended that any I–Thou relationship is possible only because God exists as the Eternal Thou (Lifintseva 1999). Religious knowledge is based on faith. A person is told to believe, experience, and empathize, rather than reflect and draw conclusions.

A substantial portion of the culture of modern society may be interpreted as the totality of secularized forms of religious faith and practices. In particular, the philosophical and scientific exploration of nature, society, and man was preceded by a holistic religious picture of the world. Adopted by numerous social communities, religious dogmas, as a rule, were expressed in explicit form. Two examples are the golden rule of morality —

do not treat others as you would not have others treat you (*quod tibi fieri non vis alteri ne feceris*) — that underlies various religious and philosophical doctrines in the East and West and the ten commandments (Decalogue), which contain absolute injunctions against certain actions and deeds and the use of certain means of achieving any end and that regard any compromise between good and evil as evil (Lefevr [Lefebvre] 2003a), both of which are objectively aimed at the survival of the human race in new, more complex living conditions. An explicit, detailed description of the original symbols of faith was required in order to efficiently organize the life of religious communities.

The second distinctive feature of the foundations of religious knowledge is the immutability of the basic postulates of faith over an extended period. For example, every employee of Southern Wesleyan University, which belongs to the Wesleyan Church, at the beginning of the twenty-first century, must affirm in writing their agreement with all or at least most of ten statements that are based on a recognition of:

1. the Holy Scripture of the Old and New Testament as the supreme and ultimate authority for faith and practice;
2. the fact that there is one God, eternally existing in three Persons: Father, Son, and Holy Spirit;
3. the fact that God created man and the entire universe, etc.

The physicist and philosopher Albert Einstein (1879 – 1955) expressed the interconnection and interdependence between mutable science and immutable religion with the aphorism "science without religion is lame, religion without science is blind" and believed that the contradictions between them could be eliminated if religion abandoned the concept of an anthropomorphic God created in the image and likeness of man. In this case he visualized the division of functions as follows: science provides knowledge of what is, but not of what should be; it aspires to truth and understanding, while religion provides science with a system of superpersonal fundamental goals, objects, and values, the choice of which cannot be rationally substantiated, but which have behind them the living spirit of mankind and its most outstanding representatives.

The principal distinctive feature of philosophical knowledge as compared with religious knowledge is its rational-theoretical form. According to the theory of rationality of the sociologist, historian, and economist Max Weber (1864 – 1920), its emergence, formation, and development are associated with man's emancipation from magical superstitions, the rationalization of world religions, the minimization of dogma and ritual, and the disenchantment of the religious view of the world.

In lieu of images and symbols, which typified mythology, philosophy proposed rational concepts, categories, and terms. We should note that, as a kind of compensation for the loss of some advantages of the mythological and religious approaches, in modern psychology, based on the fact that "image in the context of modeling is as important as an abstract concept or even supersedes it» (Starovoitenko 2001, p. 11), the creation of *models-in-concepts* and *models-in-images* is regarded not only as a method of investigation but also as a mode of representing existing general psychological knowledge, of creating *psychology-in-models*, and ultimately a single theory of the psyche, based on a synthesis of scientific knowledge with mythological, religious, and artistic knowledge. The methodology proposed in (Starovoitenko 2001) is oriented toward higher education and consists of a range of research, explanatory, and interpretative models based on the history of psychology and interdisciplinary approaches. The models are expected to be used to support experimental, psychocorrective, developmental, and psychotherapeutic practices.

The early twenty-first century has seen a systematic movement along ladders 1 – 3 not only upward but also downward. The psychologist and mathematician Vladimir Lefebvre (born 1936) has spoken out in defense of his right "to hope to obtain new knowledge about the real world by adopting as a basis certain assertions whose accuracy is impossible to establish" (Lefevr [Lefebvre] 2003b, p. 422). He justified a principled eschewal of empirical data in constructing mathematical models and the use of metaphysical reasoning by citing an article by the "quiet genius," the physicist Eugene Wigner (1902 – 1995), who drew the attention of scientists to the fact that the unreasonable effectiveness of mathematics in the natural sciences is something bordering on the mysterious and there is no rational explanation for it (Vigner [Wigner] 1971). Lefebvre contends that metaphysical thinking "turns out paradoxically to be effective when constructing mathematical models even though it has no visible connections to reality. We can only imagine that both mathematical structures and metaphysical constructs are associated with the archetypal layer of our thinking, which by a means unknown to us today is correlated with the objective laws of the universe" (Lefevr 2003b, p. 425). He is contradicted by the methodologist of empirical psychology L. Ia. Dorfman (born 1951), who maintains that "scientific knowledge must be free from supposedly self-evident intuitive premises, since they give rise to doubts," and metaphysical constructs often "turn into nothing more than exercises in logic" (Dorfman 2003, p. 52). The chief argument of the spokesmen for the incompatible viewpoints may be the existence or nonexistence of models that provide an adequate description of reality and a forecast of its future.

The philosopher Karl Jaspers (1883 – 1969) designed as the "axial age" (*Achsenzeit*) the period in the history of humankind (800 – 200 B.C.) when the mythological world view gave way to the philosophical view of the world (ancient philosophy, Buddhism, Taoism, Zoroastrianism, Judaism, and Confucianism). A radical change of form during the emergence of philosophy was accompanied by minimal changes in content. The books of the ancient authorities, and above all Aristotle, whose writings made up the foundation of the medieval Western world view, "proved" that the earth was immobile and "disproved" the hypothesis of its rotation, "established" that the rate of free fall is proportional to the weight of the body, and motion occurs as long as the "impellent cause" (force) operates, and ceases when it is absent, among others.

Direct observation, real-life experience, common sense, and intuition corroborated and still corroborate (according to data from VTsIOM [All-Russia Central Institute of Public Opinion], in 2011, 32 percent of Russian citizens believe that the sun revolves around the earth) Aristotle's false assertions. The psychologist and methodologist V.M. Allakhverdov (born 1946) rightly contends that "the refutation of Aristotle's assertions constitutes the essence of the natural science of the Modern Age" (Allakhverdov 2003, p. 38), and proposes that psychologists use heuristics based on an avoidance of trite judgments (Allakhverdov 2009, pp. 143 – 146). The inertia of the educational system is illustrated by the fact that one of the creators of classical physics and mathematical analysis, Sir Isaac Newton, (1642 – 1727), studied natural science and philosophy according to Aristotle at Cambridge, even though his notebooks mention the theories of Galileo Galilei (1564 – 1642), Nicolaus Copernicus (1473 – 1543), René Descartes (1596 – 1650), Johannes Kepler (1571 – 1630), and Pierre Gassendi (1592 – 1655).

The inconsistency of the new, rational form of conceptualizing knowledge with its old, traditional content was overcome by the birth, formation, and successes of the science of the Modern Age. Science, like capitalism, is a unique phenomenon of human civilization. Plausible explanations for the genesis of both phenomena can be formulated in ethical terms. The aforementioned Weber did this in the work *The Protestant Ethic and the Spirit of Capitalism (Die protestantische Ethik und der "Geist" des Kapitalismus)*, which was first published in 1905 and based on a juxtaposition of the "secular asceticism" of the Protestant believer and the rational entrepreneur (Weber 2010). In his view, Protestantism contributed to the emergence of capitalist forms of behavior in commercial and everyday life.

A similar analysis regarding science was done by the historian of science and philosopher L.M. Kosareva (1948 – 1991). She proceeded from the premise that "the traditionalist type of ethics of fulfillment of readymade norm-commandments is effective at a time of relative social stability, when there is a well-established way of life. Transitional epochs that destroy a stable order and traditions make a person who is oriented only toward fulfilling readymade moral prescriptions helpless in the face of social uncertainty, disorder, and chaos" and argued that the formation of the science of the Modern Age involved the formation of a new ethic, a Faustian ethic, in contrast to the medieval ethic of Gretchen (Kosareva 1997, p. 20).

The similarity between the ethical arguments of Weber and Kosareva, reinforced by the research of the sociologist of Robert Merton (*née* Schkolnick, 1910 – 2003), does not seem accidental. Science and business have common roots, related to religion (Sperry 1988; Iurevich and Tsapenko 2000). This is rationalism, individualism, the cult of patience, pragmatism, and utilitarianism. The common origin is underscored by the words, still used today, about "the marketplace of ideas" and about the scientist as a "merchant of truth," which have supplanted the image of the scientist who reads "the book of nature." Present-day scientists and businessmen, like politicians and athletes for that matter, are united by a high level of motivation to achieve. There are also differences, such as in their attitude toward an acceptable level and types of permissible risk. However, the accuracy of the dazzling simplicity with which complex phenomena are explained is coming into question. Descriptive theories that explain what happened and do not predict anything new are designated by skeptics as ad hoc theories and are viewed negatively by supporters of the criterion of falsifiability from the theory of the philosopher Sir Karl Popper (1902 – 1994). Finally, even if the analysis is correct in terms of the engineering and natural sciences, doubts remain as to its validity for the social and humanitarian sciences with their specific course of development.

In the view of the social psychologist Serge Moscovici (1925 – 2014), the dualism of sciences (normal and revolutionary) described by the historian and philosopher of science Thomas Kuhn (1922 – 1996) serves as an illustration of the dualism of societies. Moscovici refers "to the contrast between a revolutionary or anomalous society that emerges from social big bangs and a normal, society that is forming, when explosive forces have cooled off and the innovations that brought them to life have become commonplace" (Moscovici 1998, p. 278) The recognition of this kind of connection between science and society makes it possible to formulate hypotheses about revolutions in science that are determined by systems of power and influence (university departments, societies, editorial boards, dissertation committees, funding), by the social-psychological features and social status of scientific communities and by scientific-structural factors.

Aside from the similar aspects between the types of revolutions considered above, there are also fundamental differences: since the time of the naturalist Charles Darwin (1809 – 1882), it has been customary to analyze the evolution of man and humankind in terms of "adaptation," and of science in terms of "progress" (which is discussed in a further section). Besides cultural effects, the interconnection between science and society is increasingly influenced by the succession of basic playgrounds of humankind, which stems from the sum of accumulated technologies and the appearance of new methods of investigation, presented in Figure 4.

From a historical analysis of the genesis of the foundations of science, which is largely illustrative, hypothetical, and speculative due to the remoteness in time of the events being described, we now proceed to a concrete study of the revolutionary changes in the foundations of science that led to unprecedented progress in the natural sciences and engineering technologies and, by way of contrast, to a prolonged crisis in the social and humanitarian sciences.

Crisis and Progress of Science

The foregoing analysis shows that the initial capabilities of the natural sciences, on one hand, and the social and humanitarian

Information society	→	←	Noosphere
Industrial society	→	←	Technosphere
Pre-industrial society	→	←	Biosphere

Figure 4. **The sociotechnological development of society and the succession of its playgrounds.**

sciences, on the other, were roughly identical. For example, the devices and tools that were created and used in psychological research conformed, until a certain point, to the contemporary level of scientific and technical development, but then they began to lag behind the natural and engineering sciences. The gap continually grew wider, and today practicing psychologists are technically far worse equipped not just than physicists, chemists or biologists but also than physicians. The attitude of psychologists toward expensive equipment (its cost runs to the millions of dollars/euros) is mixed: from unconditional acceptance and pride in having it to skeptical (Triandis 2007, p. 240).

To understand the reasons for the differences in development of the natural, social and humanitarian sciences, we will answer a series of three questions: 1) What constitutes the crisis in science? 2) What is meant by progress in science? and 3) What is the role of the foundations of science in its crisis/progress?

According to the American Psychological Association Dictionary of Psychology, a crisis is a concept with multiple meanings: a situation that produces significant stress in those involved in it; a traumatic change in a person's life that often brings about cognitive or emotional stress; a turning point for better or worse in the course of an illness; "a crisis is a phenomenon that is not susceptible to control and must take its own course" (Reber 2003, p. 390); a state of affairs marked by instability and the possibility of impending change for the worse, for example, in a political or social situation; in Kuhn's theory of scientific revolutions, it is a situation that arises when a certain theoretical system is weakened by such a number of anomalies that it is perceived as inadequate and a search begins for a better theoretical system (*APA Dictionary of Psychology* 2007, p. 243).

All of these meanings assume that the crisis has temporal limits and should end with a sudden improvement or sudden downturn. William McGuire (1925 – 2007) offered a facetious assessment of a crisis: “We don’t know whether there was a crisis or not, but it’s a good thing it’s over.” His colleague A. I. Dontsov (born 1949), speaking at the Fourth Congress of the Russian Psychological Society (2007), argued that a crisis is merely a pretext for psychologists to discuss their current professional activities. The world’s first laboratory of experimental psychology was founded in Leipzig in 1879 by Wilhelm Wundt (1832 – 1920), and twenty years later Rudolf Willy’s book *The Crisis in Psychology* (1899) was published in the same city. A crisis that lasts more than a century does not fit into the schema previously described. The crisis in psychology may be viewed as its internal phenomenon and discussed by way of a natural-science approach.

According to the lexicographer V.I. Dal’ (1801 – 1872), “progress is mental and moral forward movement; the force of education, of enlightenment” (Dal’ 2004, p. 796). Dorfman (2005), outlining the methodological principles of empirical psychology, asserts that “the progress of science refers to its overall growth. It proceeds in the form of obtaining new (modified) knowledge, devising more consummate and refined methods of investigation, and a deeper and fuller understanding of the world. Ultimately the growth of science means its movement toward truth, no matter how differently the development of science and truth are understood and no matter how far, deep and endlessly the boundaries of the unknown recede (Dorfman 2005, pp. 21 – 22). Allakhverdov (2003) contends that “indubitable knowledge is not accumulated from epoch to epoch simply because no knowledge is indubitable. The progress of science consists only of continual changes in the descriptions of the real world” (2003, p. 245).

It would be fruitful to conduct a cross-cultural analysis of the problem, beginning with a comparison of the value orientations of the West and the East, of technological progress and spiritual refinement, and leading to the point where, unlike a crisis, the progress of science is a social, historical, cultural construct, whose content changes under the influence of the growing complexity of science as a theoretical and applied discipline, a social institution, and hence the progress of science must be evaluated with the use of both internal and external criteria. The philosopher and mathematician Ilkka Niiniluoto (born 1946) believes that "progress" is an axiological or normative concept, which should be distinguished from such neutral descriptive terms as "change" and "development," and identifies different types of progress of science: economic—the increased funding for scientific research; professional — the rising status of scientists and academic institutions in society; educational — the increased skill and expertise of the scientists; methodical—the use of new methods of research, the refinement of scientific instruments; and cognitive — increase or advancement of scientific knowledge (Niiniluoto 2008).

This article has adopted the following working definition: "The progress of science consists of qualitative-quantitative changes in the description of the picture of the world that has been accepted by the majority of scientists over an extended period of time," a definition that was obtained by adding to Allakhverdov's definition the pragmatic criterion of the philosopher Charles Peirce (1839 – 1914): "The opinion which is fated to be agreed to by all who investigate, is what we mean by truth, and the object represented in this opinion is the real" (quoted from: Meehl 2004, p. 616), and we will agree to regard a period of fifty years as a plausible approximation for a Peircean consensus (the short-term survival of a theory).

The operating definition of the progress of science makes it possible to move from theorizing about such progress to its planning. For example, for the first time in its more than century-long history the American Psychological Association has begun developing a strategic plan, designed for a period of three to five years. It is to take into account a multitude of factors that affect the field of psychology: demographic trends, globalization, changes in the quality of health care, and the funding of behavioral research (Anderson 2008, p. 9). The attainment of the strategic goals is expected to result in the use of tools that are more customary for business communities: marketing, advertising, and PR campaigns. The physicists with the collider and the biologists with the slogan "Senescence is a disease that can be treated" are examples of how this can be done with a carrot ("eternal youth") and stick ("the end of the world").

Foundations of Science of the Modern Age and Common Sense: Ideal Constructs vs. Real-Life Events

In this section, the foundations of modern science and its basic reflected-on (explicit) and unreflected-on (implicit) concepts of how the world is structured and how it can be understood are explored by way of a comparison with common sense and real-life experience, where the progress of theoretical knowledge and applied technologies serves as the criterion for their adequacy (Table 1).

Explicit Foundations of Science That Conform to Common Sense and Real-Life Experience

The most famous example in the natural sciences are the axioms of Euclid (Εὐκλείδης c. 300 B.C.), which operate with ideal constructs (points, straight lines, angles) that have real-life analogs and which played an important role in the origin of the science of the Modern Age. For centuries mathematicians were sure that by using them they were not merely developing an abstract discipline but were also acquiring true knowledge about the three-dimensional physical world. It turned out, however, that Euclidean geometry was not the only kind, and their surroundings did not always obey its laws.

Table 1.

The conformity of the foundations of science to common sense and real-life experience.

Foundations of science	Explicit	Implicit
Conform to common sense and real-life experience	I	III
Contradict common sense and real-life experience	II	IV

In psychology the original basic premise is the explicit and obvious assertion that a person has a soul, an internal world: "there is hardly any adult who doubts that one has a subjective reality: inner experiences, emotions, thoughts, dreams" (*Psikhologiia XXI veka* 2003, p. 7), and the introductions to textbooks for beginners resort to a definition about which they are embarrassed: "Psychology is the science of the psyche" (ibid.) and which they soon "forget" because it is unnecessary (Mazilov 1998, p. 208).

Two years after completing *The Principles of Psychology*, the philosopher and psychologist William James (1842 – 1910) wrote that psychology is based on "a strong prejudice that we have states of mind, and that our brain conditions them" (quoted from: Hunt 2009, p. 190). Yet, in the early twenty-first century, there is a continuing debate about where the internal world is and where the boundary between the external and internal one is (Veresov and Agafonov 2004). The questions are reasonable and not idle, unlike the problem of the homunculus, the receiver of information watching a little television screen in the brain (an example given by the biologist Francis Crick (1916 – 2004), but in form and content they are reminiscent of the medieval questions about Aristotle's cosmology: "What is outside the world?" "What would happen if we were to push a stick through the surface of the ultimate celestial sphere?" (Koire [Koyré] 1985, p. 17). The discussants in search of an answer turn to physicists (Copernicus, Galileo, and Newton) and do not notice the mathematician John von Neumann (1903 – 1957), who cut the

Gordian knot of problems and destroyed the boundary between the "internal world" of the computer (software) and the "external world" (represented by input data) that has provided, with the proposed architecture of computers, unprecedented progress in information technologies.

The creator of transspective analysis, V.E. Klochko (born 1943), clarifies the problem: "The sciences are overflowing with categories that record objective sand subjective phenomena, but there are virtually no concepts that could adequately record the reality that is discovered in mental attempts to penetrate the space that exists between spirit and matter, between the objective and the subjective" (Klochko 2005, p. 103). Additionally, he explores the multidimensional world of a given person, which is hidden from him so as to enable him to see the world separately from himself, and in the process "the opposition between the former internal and the former external disappears, and their absoluteness is eliminated" (ibid., p. 107).

Today Variant I is associated with the period of the emergence and development of natural science, which ended in revolutionary changes to it, and with irreconcilable disagreements between social scientists over the legitimacy of certain scientific problems and methods for solving them (Kun [Kuhn] 2001, p. 16).

Explicit Foundations of Science That Contradict Common Sense and Real-Life Experience

The economist and philosopher Friedrich von Hayek (1899 – 1992) denied that the "ideas" of things "possess some transcendental reality, and that by analyzing ideas we could learn something or everything about the attributes of the real things," (Khaiek [Hayek] 2003, p. 34) and during World War II he formulated a paradoxical notion: "Science's concern is not what men think about the world and how they consequently behave, but what they ought to think" (ibid., p. 39). At first glance, this deprecates the subject matter of psychology and other social sciences. However, he is echoed by Michael

Polanyi (1891 – 1976), the creator of the theory of personal (or tacit) knowledge: of two forms of knowledge, we should consider as more objective that which relies to a greater measure on theory rather than on more immediate sensory experience" (Polani [Polanyi] 1985, p. 21).

The origins of this area of development of natural science in terms of a world view trace back to the creation by N. Copernicus of the heliocentric system of the world (one of the monuments to him reads: "He stopped the sun and moved the earth"). The author of a theory that contradicted people's real-life experience understood how preposterous his teaching had to seem to his contemporaries, but he was confident that he had proposed not merely a convenient mathematical model for astronomical calculations but a true description of the real world. The shattering of speculative metaphysics and the abandonment of the search for "essences" (substances) endowed with certain properties and for the "original causes" of natural processes were continued by Galileo. He is regarded as the founder of experimental physics, but a revolutionary effect on the development of science came from an idealized experiment in which Galileo mentally eliminated friction, which later enabled Newton to formulate his law of inertia: "A body remains in a state of rest or in a state of uniform motion in a straight line unless it is compelled to change that state under the influence of external forces." This assertion, which is learned by heart in school, contradicts everyday experience. The novelty of the idea that made it possible to understand motion lay in the fact that "the law of inertia cannot be derived directly from experiment but only from speculative thinking consistent with observation" (Einshtein [Einstein] and Infel'd [Infeld] 1966, p. 16).

Newton introduced the concept of a force into physics, used it to formulate three laws of mechanics, discovered the law of universal gravitation, and explained the motion of celestial bodies and many other things. Copernicus demoted the earth to the level of one of the planets in the solar system, whereas Newton showed that the earthly and celestial laws of nature are identical. For his contemporaries, including those who were educated, his claims were akin to magic. Yet, he calmly answered their questions: *Hypotheses non fingo* (I am not offering hypotheses). The critics' arguments could be divided into two groups: applied and theoretical. The former were based on the premise that calculations based on the "correct" models of Copernicus, Galileo, and Newton did not immediately prove that they were superior to the old, "incorrect" ones based on the ideas of Aristotle and Ptolemy, but over time they were withdrawn. The gist of the second group was that there was no explanation of the nature of the gravitational force. In his *Mathematical Principles of Natural Philosophy*, Newton expounded the formal framework and left open the questions of the cause of gravitation and its material medium. The core of the theory consisted of the concept of action at a distance, according to which physical bodies act on one another without mediation, through a vacuum, at any distance, at an infinitely high speed. The counterpart in psychology would be the interaction of people's internal worlds and mind-reading at a distance. As an experiment by David Rosenhan conducted in the United States in 1973 showed, a single communication to psychiatrists about aural hallucinations ("voices") is sufficient to make a diagnosis of "schizophrenia" (Rosenhan 1973).

The further development of the natural sciences was associated with the ideas of the physicist and philosopher Albert Einstein (1879 – 1955), who in his general theory of relativity explored space-time with variable metrics, created a relativist theory of gravitation, and discarded Newtonian action at a distance from physics. His scientific opponent, Niels Bohr (1885 – 1962), who proposed the complementarity principle, which in addition to physics is used in the social sciences, asserted, half in jest and half seriously, that physics had reached a degree of development such that a correct new theory had to be crazy. For example, the highly complex equation that Erwin Schrödinger (1887 – 1961) proposed in 1926 and that was one of the fundamental laws of quantum physics, the equivalent of the equation of Newton's second law in classical mechanics, is accepted by modern physicists without a direct proof of its validity. It may be assumed that the dramatic gulf between everyday experience and the scientific theories that contradict it contributed to the proliferation of the legends that Galileo dropped objects of different mass from the Tower of Pisa and that Newton discovered the law of universal gravitation by observing an apple falling from a tree. "Newton's apple" was first mentioned in passing by his biographer, William Stukeley (1687 – 1765), and the story became popular thanks to Voltaire (1694 – 1778). We can add to this set, Einstein's answer to the fundamental question: "Why have all the electrons the same charge?" "Well, why are all the little balls in goat dung of the same size?"

The progress of astronomy, mechanics, physics, and the natural sciences as a whole involves the consideration of ideal objects known to be nonexistent (e.g., physical points that have no dimensions but have mass; smooth surfaces on which it is possible to move without friction), unobservable micro-objects, extremely distant macro-objects, and postulates that associate them with one another and contradict common sense, real-life experience, and intuition (e.g., a heavy body in the absence of resistance from a medium falls at the same rate as a light one; two bodies not connected to each other in any way gravitate to each other). The process of accepting new foundations for science was painful and lengthy, and their validity was evaluated solely by external criteria, above all by the technological efficacy of the natural science that created nuclear weapons, computers, cellphones, and genetic engineering.

Many scientists regard the approach of Copernicus, Galileo, Newton, Einstein, and Bohr as universal, generally valid, and applicable to more than physics. The appeal by the psychologist Kurt Lewin (1890 – 1947) for a shift from the Aristotelian to the Galilean mode (Lewin 1931) was heard by psychologists, understood, but for various reasons was not accepted and to this day has not been implemented. Yet, Lewin's arguments were simple and logical. For example, the Aristotelian mode of thought was marked by dichotomous classifications (oppositions), while the Galilean mode was characterized by unbroken, continuous classifications. According to Galileo, an object manifests its properties only in interaction with other objects. Therefore, a property is a characteristic of the interactions between objects. For example, the weight of a body is not a property immanently intrinsic to its nature but a characteristic of its interaction with the earth's gravitational field. Far away from it, in weightless conditions, the body loses this customary property.

A successful example of the Galilean and Newtonian approach in the social and humanitarian sciences is the sociometry of Jacob Moreno (1889 – 1974), which in the view of the sociologist Leopold von Wiese (1876 – 1969) elevated the social sciences "from the position of social scientific astrology to astronomy" (Moreno 2001, p. 8). Moreno's social universe is structured in the image and likeness of the Newtonian world on the basis of the analogies "attraction–sympathy" and "repulsion–antipathy" and the concepts of "social atom" and "tele." For people deprived of interpersonal relationships, Moreno introduced the concept of "social death," meaning not the death of the soul or the body that comes from outside but dying inside.

Moreno's personality and writings made a powerful impact on his contemporaries. For example, Lewin (1931) said: "If it had not been for Moreno, I would not have gotten involved with group processes" (p. 9). Like Lewin, Moreno harmoniously combined theory and practical applications by creating a psychotherapeutic triad, in which, in addition to sociometry, he included psychodrama and group psychotherapy. In current textbooks, however, sociometry is described more often and in more detail in courses in sociology than in social psychology. The degree of acceptance of Moreno by Western psychology is illustrated by the fact that a dictionary containing carefully selected information about 500 scientists who made a significant contribution to the development of psychology between 1600 and 1967 did not include Moreno, unlike physicist

Bohr, even though the term "sociometry" turns up in it (*Psikhologiia: Biograficheskii bibliograficheskii slovar'* 1999).

Lewin wanted to make use of the achievements of the natural sciences and inscribe psychology into the overall scientific picture of the world, but he felt that Galilean and Newtonian thinking was inadequate and mapped out a transition from the atomistic mode of thinking of Galileo and Newton to the field thinking of Bohr and Einstein. He developed a theory of a "psychological field" and enlisted the framework of topology and vector representations to solve psychological problems, but came under well-founded criticism and, it must be acknowledged, failed to achieve persuasive results in this area. Moreover, the links between Lewin's theoretical views, his conviction that "there is nothing more practical than a good theory" — which comes from the physicist Gustav Kirchhoff (1824 – 1887) — and the applied school of group dynamics that he created are less direct than they are in Moreno's work. Lewin's followers today include the psychologist Jaan Valsiner (born 1951) and the mathematician Lee Rudolph (Valsiner and Rudolph 2008; Rudolph and Valsiner 2013).

Even if this project or some other one, for example, that of Lefebvre (1991; 2004) achieves theoretical success, the possibility of acceptance by the international psychological community of new rules of the game seems unlikely for the reason that was cited by one of the first, Kuhn, and that led him to the paradigm theory (Kun 2001, pp. 16 – 17).

Having failed to achieve socially significant results within a natural-science framework, social scientists invoked the complexity of problems related to man and society, and pursued a quest for a special path. One of its ideologues, W. Dilthey, argued: "Man does not apprehend what he is by musing over himself, nor by doing psychological experiments, but by history" (Dil'tei [Dilthey], 1996 p. 71)

Implicit Foundations of Science That Conform to Common Sense and Real-Life Experience

This variant predominates in the social and humanitarian sciences and is practically nonexistent in the natural sciences. As a result, the translation of works written under this approach from scientific jargon into everyday language often show how trivial the formulated theories are. At the beginning of his career, the aforementioned C.W. Mills, after analyzing a number of textbooks, showed that the concepts of their authors — sociologists and social psychologists — about socialization were based on the morality of a small American town (Mills 2001, p. 7). At a mature age, in analyzing the works of the head of the school of structural functionalism, Talcott Parsons (1902 – 1979), Mills contended that the concepts in them supplant reality, and he "translated" lengthy excerpts from his book into everyday language, finding the judgments to be trivial (ibid., pp. 36 – 45).

The systematic use of implicit foundations in psychology makes it difficult to distinguish between ideal constructs and real-life events (phenomena). It is possible that the question of the relation of the soul and the body (like other well-known dualisms and parallelisms in psychology) is not a scientific problem but a culturally conditioned one, pertaining to the connections between an ideal construct (the soul) and a real thing (the body) and based on belief in the possibility of the development of science, based on an analysis of analogies — the synchronously running clocks of Gottfried von Leibniz (1646 – 1716); the optics of Benedict Spinoza (1632 – 1677); the chemistry of John Stuart Mill (1806 – 1873); the holography of Karl Pribram (born 1919); and the aforementioned metaphors and myths, as opposed to concrete events. Moreover, it is worth addressing the question of whether a psychology constructed on this basis provides anything new as compared with common sense and real-life experience.

The first argument "in favor" of the importance of psychological results follows from the fact that, unlike the natural sciences, psychology develops not into a "tree trunk" but into "shrubbery." This fact enabled Noel Smith to propose a hierarchical model of a system of postulates for ten different systems of psychology. The hierarchy is based on protopostulates — overall guiding assumptions regarding science as a whole. Above them are metapostulates — assumptions relating to a specific science; and postulates — assumptions relating to the object of inquiry. The latter are divided into implicit, semi-explicit, and explicit (Smit [Smith] 2003, pp. 350 – 355). As a rule, the authors of psychological theories do not explicitly state their postulates, so Smith derived them logically and conjectured that his postulates may be challenged by adherents of the respective psychological systems (ibid., p. 24). Previously, a method of metatheoretical reconstruction of the history of psychology, supplemented by its quantitative assessment, was proposed and developed by the Danish psychologist Kristen Madsen (1922 – 2003; Madsen 1988).

The second argument "in favor" is provided by practice, when it comes into conflict with considerations of common sense and real-life experience. The social psychologist David Myers (born 1942) contends that psychology is needed in order to separate hindsight bias (the "I-knew-it-all-along" phenomenon) from reality (Maiers [Myers] 1996, pp. 40 – 46).

Despite the fact that the psychological "shrubbery" is rapidly growing, the "soul-body" dualism and the attempts to synthesize scientific objective knowledge with mythological and literary sources have yet to bring about effective psychological technologies, such as the development of a device that "reads" human thoughts and explores unconscious regions of the human and animal psyche. The ethical issues related to its use and to negative consequences are similar to many that have been created by already extant inventions of the human mind.

Implicit Foundations of Science That Contradict Common Sense and Real-Life Experience

The author was unable to find examples of theories that rely on such foundations in academic science. They may exist in the fields of pseudoscience, junk science, parascience, and quasiscience, which postulate the existence of supernatural phenomena and forces; "torsion," "subtle," and "bioinformation" fields, "aura energy," extrasensory abilities that are not recognized by modern science.

We will now consider the transformation of psychological knowledge in terms of survival and risks, in contrast to the natural sciences, whose evolution is adequately described in terms of a succession of paradigms, which do not play a significant instrumental role in the formation of scientific psychology.

Conformity of the Foundations of Theory to Scientific Standards and Its Survival

In an interview with the journal *Znanie—sila*, V. Lefebvre (2010) said that "in the social sciences the criterion for accepting a theory is its survivability." Many Russian and foreign researchers agree with this assertion. For further analysis, we will designate two parameters of scientific theory: conformity/nonconformity of its foundations to scientific standards and its use/absence in current scientific practice (Table 2).

According to logic and common sense, out of the four identified variants, the first one, I (theories conforming to scientific standards are used in scientific practice), and the fourth, IV (theories that do not conform to scientific standards are eliminated from scientific practice), seem normal, while the third, III (theory conforms to scientific standards but is not used in scientific practice), and especially the second II (theory does not conform to scientific standards but is used in scientific practice), seem undesirable. For the natural sciences, this assessment is

Table 2.

The conformity of the foundations of theory to scientific standards and its survival.

Foundations of science	Used in scientific practice	Absent from scientific practice
Conform to scientific standards	I	III
Do not conform to scientific standards	II	IV

correct, but for the social sciences, as their history shows, it is wrong.

An example of variant II is psychoanalysis. Freud's success as its founder, like that of the first naturalists, derived from the introduction of nonexistent ideal objects (the ego, the id, and the superego) and a reliance on postulates that contradicted common sense (the Oedipus complex and infantile sexuality). As was previously shown, a successful science that is accepted by society aggressively imposes its viewpoint on the majority and contradicts everyday notions and stereotypes. It would not be an exaggeration to say, however, that Freud's achievements set psychology against the other sciences. An experienced naturalist, Freud significantly deviated from commonly accepted scientific procedures: "looked for data that would support his theory and discarded everything that ran counter to it" (Gleitman et al. 2001, p. 830), avoided statistical testing of hypotheses, drew on confidence in his intuition and in conflicts invoked his seniority by age. Today many tenets of Freud's theory have been refuted, and some have come under question, but his approach remains appealing to researchers and fruitful. The survival of psychoanalysis, experts believe, has been aided by support from the creative intelligentsia that is unprecedented for science; the personality of Freud, whom S. Moscovici as one of the mosaic leaders who care more about disseminating their doctrines and beliefs than about seduction with their persona

(Moskovichi [Moscovici] 1998, pp. 324 – 326); and the creation of a scientific school and the departure of the best-known disciples from it.

Variant III is illustrated by the scientifically validated theory of W. Wundt: "introspectionism as an approach to the study of the psyche no longer exists" (Reber 2003, p. 326). Moreover, it turns out that his innovations "were social rather than intellectual in nature" (Likhi [Leahey] 2003, p. 95). There is no question that Wundt, who was phenomenally hard-working, would have answered the critics, overcome the crisis in the psychology of consciousness and would have preserved his international scientific school. The decline in interest in his experimental psychology in the West is attributed to the fact that he was an academic psychologist and resisted the transformation of psychology into an applied science (ibid., p. 107); to the intellectual and social atmosphere in the New World and to pragmatic principles; to Wundt's nationalist position during World War I, which set foreign scientists against him and his psychology; and to the collapse of the Germany economy as a result of the defeat (Shul'ts and Shul'ts [Schultz and Schultz] 1998, p. 102).

A host of scientists worked within the framework of Soviet psychology, which was based on the Leninist theory of reflection and for decades was under the influence of the party's ideological diktat (hence, Peirce's criterion is inapplicable to it). They included B.G. Anan'ev (1907 – 1972), N.A. Bernstein (1896 – 1966), L.M. Vekker (1918 – 2001), L.S. Vygotsky (1896 – 1934), P.Ia. Galperin (1902 – 1988), A.N. Leontiev (1903 – 1979), A.R. Luria (1902 – 1977), S.L. Rubinstein (1889 – 1960), and D.N. Uznadze (1886 – 1950), all of whom directly or indirectly made a contribution to world psychology and founded scientific schools (Bogdanchikov 2009). With the breakup of the USSR it turned out that the significance of the dialectical- and historical-materialist saturation of the principles of Russian psychology (Akopov 2004) should not be overestimated, but "what disappeared along with Marxism was the common in which psychologists conversed with one another"

(Allakhverdov 2003, p. 9). The paradoxical picture of the disappearance of Soviet psychology, which did not fulfill its potential, is augmented by the persistence in unchanged form, to a large extent, of the previous organizational structures.

Finally, the Gestalt psychologists Max Wertheimer (1880 – 1943), Wolfgang Köhler (1887 – 1967), and Kurt Koffka (1886 – 1941), who changed the scientific view of the world and had an influence on Kuhn, who compared the change of a paradigm to a switch in Gestalt, lost to their principal competitors — the Freudian psychoanalysts and Skinnerian behaviorists, not due to the weakness of the theory or unpersuasive empirical data but as a result of World War II, which prevented them, after they moved to the United States, from creating a scientific school.

We will conclude the section with Mills's (2001) words: "Were the rise and fall of doctrines and methods due altogether to some purely intellectual competition among them (the more adequate and fruitful winning out, the less adequate and less fruitful falling by the wayside), grand theory and abstracted empiricism would not have gained such ascendancy as they have" (p. 92).

Conclusion

This comparative analysis of the natural and social sciences has explored the genesis of the foundations of science and their relation to common sense, everyday consciousness, real-life experience, and human intuition.

It showed that the natural sciences developed by means of the supplantation of initial postulates and paradigms, while the principal external criterion vis-à-vis social-science theories is their survivability The fact that Kuhn's major work, *The Structure of Scientific Revolutions*, has gone unchanged through three editions (from 1962 to 1996) serves as an indirect proof of the fact that the concept of "paradigm" is entrenched in industrial society and, in the transition to an information society, needs to be replaced, at least in the social and humanitarian sciences, by the concept of "syntagma," which assumes convergent, mutually built-in economic, legal, social-psychological, mathematical, natural-science, and technological knowledge based on explicit premises. In the natural sciences, the applied sciences that are changing the world are a direct consequence of fundamental-research results, while in the social and humanitarian sciences this connection is much weaker.

Notes

1. http://www.ddialliance.org/
2. http://dublincore.org/
3. [The Russian phrase for "It is raining," *dozhd' idet*, literally translates as "rain is walking" or, more colloquially, "rain is coming down."—*Translator.*]

References

Akopov, G.V. 2004. *Problema soznaniia v rossiiskoi psikhologii*. Moscow; Voronezh.

Allakhverdov, V.M. 2009. "Soznanie—kazhushcheesia i real'noe," *Metodologiia i istoriia psikhologii*, vol. 1, pp. 137–150.

Allakhverdov, V.M. 2003. *Metodologicheskoe puteshestvie po okeanu bessoznatel'nogo k tainstvennomu ostrovu soznaniia*. St. Petersburg.

Anderson, N.B. 2008. "Toward a Strategic Plan for APA." *Monitor on Psychology*, no. 6, p. 9.

APA Dictionary of Psychology. 2007. Washington.

Bogdanchikov, S.A. 2009. "Sovremennye otechestvennye avtory o nauchnykh shkolakh v sovetskoi psikhologii 1920–1930-x gg. (opyt detal'nogo kriticheskogo analiza)," *Metodologiia i istoriia psikhologii*, vol. 2, pp. 7–31.

Dal', V.I. 2004. *Tolkovyi slovar' zhivogo velikorusskogo iazyka. Sovremennoe napisanie: V 4 t. T. 3*. Moscow.

Dil'tei, V. [Dilthey, W.] 1996. *Opisatel'naia psikhologiia*. St. Petersburg.

Dorfman, L.Ia. 2003. *Empiricheskaia psikhologiia: istoricheskie i filosofskie predposylki*. Moscow.

Dorfman, L.Ia. 2005. *Metodologicheskie osnovy empiricheskoi psikhologii: ot ponimaniia k tekhnologii*. Moscow.

Einshtein [Einstein], A., and L. Infel'd [Infeld]. 1966. *Evoliutsiia fiziki: Razvitie idei ot pervonachal'nykh poniatii do teorii otnositel'nosti i kvantov*. Moscow.

Gleitman, G. [H.], A. Fridlund, and D. Raisberg [Reisberg]. 2001. *Osnovy psikhologii*. St. Petersburg.

Grünewald, B. 2009. *Geist—Kultur—Gesellschaft. Versuch einer Prinzipientheorie der Geisteswissenschaften auf transzendentalphilosophischer Grundlage*. Berlin.

Imianitov, N.S. 2003. "Po 'lestnitse nauk"—k iskusstvu," *Filosofiia nauki*, no. 4, vol. 19, pp. 3–17).

Iurevich, A.V., and I.P. Tsapenko. 2000. "Nauka i biznes," *Naukovedenie*, no. 4, pp. 13–17.

Khaiek [Hayek], F.A. 2003. *Kontrrevoliutsiia nauki. Etiudy o zloupotrebleniiakh razumom*. Moscow.

Khant [Hunt], M. 2009. *Istoriia psikhologii*. Moscow.

Klochko, V.E. 2005. *Samoorganizatsiia v psikhologicheskikh sistemakh: problemy stanovleniia mental'nogo prostranstva lichnosti (vvedenie v transspektivnyi analiz)*. Tomsk.

Koire [Koyré], A. 1985. *Ocherki istorii filosofskoi mysli. O vliianii filosofskikh kontseptsii na razvitie nauchnykh teorii*. Moscow.

Kosareva, L.M. 1997. *Rozhdenie nauki Novogo vremeni iz dukha kul'tury*. Moscow.

Kun [Kuhn], T. 2001. *Struktura nauchnykh revoliutsii*. Moscow.

Lefevr [Lefevre], V.A. 1991. *Formula cheloveka: Kontury fundamental'noi psikhologii*. Moscow.

Lefevr, V.A. 2004. "Mentalizm i bikheviorizm: sliianie?," *Psikhologicheskii zhurnal*, no. 2, pp. 116–127.

Lefevr, V.A. 2010. "Nedetskie igry refleksivnogo upravleniia," *Znanie—sila*.

Lefevr, V.A. 2003a. *Algebra sovesti*. Moscow.

Lefevr, V.A. 2003b. *Refleksiia*. Moscow.

Lewin, K. 1931. "Der Übergang von der aristotelischen zur galileiscen Denkweise in Biologie und Psychologie," *Erkenntniss*, Bd. 1, pp. 421–466.

Lifintseva, T.P. 1999. *Filosofiia dialoga Martina Bubera*. Moscow.

Likhi [Leahey], T. 2003. *Istoriia sovremennoi psikhologii*. St. Petersburg.

Lyzlov, A.V. 2009. "Polemika G. Ebbingauza s V. Dil'teem ob opisatel'noi i ob"iasnitel'noi psikhologii," *Metodologiia i istoriia psikhologii*, vol. 2, pp. 87–95.

Madsen, K. 1988. *A History of Psychology in Metascientific Perspective*.

Maiers [Myers], D. 1996. *Sotsial'naia psikhologiia*. St. Petersburg.

Maslou [Maslow], A. 2003. *Motivatsiia i lichnost'*. St. Petersburg.

Mazilov, V.A. 1998. *Teoriia i metod v psikhologii: Period stanovleniia psikhologii kak samostoitel'noi nauki*. Yaroslavl.

Meehl, P.E. 2004. "Cliometric Metatheory III. Peircean Consensus, Verisimilitude and Asymptotic Method," *British Journal for the Philosophy of Science*, vol. 55, pp. 615–643.

Mills, Ch.R. [C.W.] 2001. *Sotsiologicheskoe voobrazhenie*. Moscow.

Moreno, Ia.L. [J.L.] 2001. *Sotsiometriia: Eksperimental'nyi metod i nauka ob obshchestve*. Moscow.

Moskovichi [Moscovici], S. 1998. *Mashina, tvoriashchaia bogov*. Moscow.

Niiniluoto, I. 2008. "Scientific Progress," *The Stanford Encyclopedia of Philosophy*.

Polani [Polanyi], M. 1985. *Lichnostnoe znanie. Na puti k postkriticheskoi filosofii*. Moscow.

Psikhologiia XXI veka. 2003. Moscow.

Psikhologiia: Biograficheskii bibliograficheskii slovar'. T. 1 (A–O). 2003. Moscow.

Revkin, A.C. April 27, 2009. "Obama's Call to Create, Not Just Consume," *The New York Times*.

Rosenhan, D.L. 1973. "On Being Sane in Insane Places," *Science*, Jan 179, pp. 250–258.

Rudolph, L., and J. Valsiner. 2013. "Introduction: Mathematical Models and Social Representation." In *Qualitative Mathematics for the Social Sciences: Mathematical Models for Research on Cultural Dynamics*, pp. 1 – 36.

Shul'ts [Schultz], D.P., and S.E. Shul'ts [Schultz]. 1998. *Istoriia sovremennoi psikhologii*. St. Petersburg.

Smit [Smith], N. 2003. *Sovremennye sistemy psikhologii* St. Petersburg.

Sperry, R.W. 1988. "Psychology's Mentalist Paradigm and the Religion/Science Tension," *American Psychologist*, vol. 43, pp. 607–613.

Starovoitenko, E.B. 2001. *Sovremennaia psikhologiia: formy intellektual'noi zhizni*. Moscow.

Stepin, V.S. 2003. *Teoreticheskoe znanie*. Moscow.

Sukhodol'skii, G.V. 2006. *Matematicheskaia psikhologiia*. Kharkov.

Triandis, G.K. 2007. *Kul'tura i sotsial'noe povedenie*. Moscow.

Valsiner, J., and L. Rudolph. 2008. "Who Shall Survive? Psychology That Replaces Quantification with Qualitative Mathematics," *29th International Congress of Psychology*. Berlin.

Veber [Weber], M. 2010. *Protestantskaia etika i dukh kapitalizma*. Moscow.

Veresov, N.N., and A.Iu. Agafonov. 2004. "'Vnutrennee'—eto gde?," *Zhurnal prikladnoi psikhologii*, no. 3, pp. 64–71.

Vigner [Wigner], E. 1971. "Nepostizhimaia effektivnost' matematiki v estestvennykh naukakh" In *Etiudy o simmetrii*. Moscow, pp. 87–103.

Willy, R. 1899. *Die Krisis in der Psychologie*. Leipzig.