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The Psychology of Creativity

At every level there is a phenomenon, and something else is adopted as the essence to explain the phenomenon.

But when we move to another level, the essence and the phenomenon mutually replace their rules. There is no end here. The very nature of our knowledge is of the same nature. But what lies beyond all this is unknown and cannot be grasped by thought.

Any attempt to investigate one's own thought alters it in the same way that measuring an electron alters its course.

—D. Bohm

The main argument of the chapter is that creativity cannot be studied using classical methodology, which is not able to solve dualism. The problem of the subject and consciousness is analyzed in the human and natural sciences. Different aspects of subjective and objective reality are related to human creativity.

Until now we have used a classical theoretical approach that describes mechanistic processes (albeit defined probabilistically). However, descriptions of the creative elements of human behavior or Evolutionary Processes in nature cannot be reduced to purely mechanistic descriptions. It is fundamentally impossible to describe the creative aspect of phenomena in the context of a finite (closed) theory. Therefore we will have to go beyond the scope of classical concepts, both in methodology and theory.

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One of the central problems of classical psychology is the problem of determinism and development. Is it possible to describe the psyche within the framework of a formal¹ classical determinist theory? In such a finite theory, according to Gilbert, from a limited number of predefined initial axioms or rules,² we should obtain, by applying rigorous logical laws, unequivocal corollaries. Since all statements in a formal system are engendered by a finite number of rules, we will call such systems *systems with finite content*.

Within the framework of a formal system we inevitably arrive at a denial of free will. We are not saved by any arguments about the imprecision of measurements, about the existence of “internal” or “external” random processes, since they are all subject to the second principle of thermodynamics and can only support the growth of entropy and regression.

In reality the situation is even worse, since the very category of randomness has no serious substantiation. Indeed, if a certain event occurs with two outcomes *A* and *B*, each with 0.5 probability, what “happens” to the alternative? Physicists have tried to solve this paradox by proposing the model of a “branching” Universe (the worlds of Everett and Wheeler [Wheeler, 1994]), in which each possibility is realized in one of the parallel Universes. True, even this construct of Reality (Universum) does not resolve the question: how does one determine which world a given observer will end up in? Obviously, *the observer himself does not decide this*, otherwise he could always control choice in random events. Certainly the theory makes it possible to conclusively calculate the probabilities of events, but we are still not able to determine precisely which event will occur at a given moment *in our Universe*.

Almost all researchers who are seriously engaged with the problem of creativity and free will arrive at disappointing results regarding the possibility of including these phenomena in classical theory. Indeed, how is one to include in a determinist theory something that may break the unequivocal rules of the conclusion? After all, that is the only way in which free will can be manifested. For all practical purposes, all current psychological frameworks are essentially determinist, but contain a more or less disguised “black hole” that supposedly saves them from extreme mechanistic theory. For example, Sigmund Freud’s framework regards the personality as a structure of three interacting components: the ego, superego, and id (Freud, 1989). Regarding the first two, they are completely determinist and basically make it possible, on the basis of the mechanisms of sublimation, repression, and so forth to causally explain psychic phenomena and an individual’s behavior. The id, however, is not determined. Anything at all can “jump out” of it, and only after this can the psychoanalyst begin to construct his mythologems (Freud, 1989, p. 345).

The situation is no better in regard to behaviorism, which is supposedly a radically mechanistic area of psychology, since the rule that converts a stimulus to a response under this framework is formed under the influence of external “random” undetermined events (operant conditioning [Skinner, 1976]). As a result, the “black

hole” in the theory, which Freud had “within” the personality, is now moved “outside,” but this still does not solve the problem of free will. Free will cancels out any possibility of creating a classical theory, since it will no longer be able to predict (in which case who needs such a theory at all?).

Despite these unsettled issues, psychology has developed as a classical science and quite successfully. For example, psychodiagnostics, which predicts certain characteristics of human behavior, has a right to exist because an individual’s behavior is largely determined and, consequently, predictable. The question arises, Within what limits in psychology can classical determinist theory be used?

Obviously, a solution to this problem requires an analysis of the actual method of scientific investigation of Reality, since any method has its limitations. There is no such thing as an absolutely universal method, since each of them has its own definition, that is, its own boundaries, beyond which it does not work. Only by defining science as a method will we be able to understand exactly what remains beyond the limits of each theory.

The purpose of this work is to expand the classical methodology, which, in addition to describing mechanistic processes, would make it possible to investigate creative and evolutionary processes. A methodology that includes both of these aspects will allow for a more complete description of Reality. This inevitably leads to the logical necessity of including the subject in the scientific paradigm (including the natural-science paradigm) and requires the abandonment of certain classical notions of Reality. In order to understand the subject’s place in the scientific paradigm, in this work, we are intentionally focusing on the “uncomfortable” questions and paradoxes of the “subjective” and the “objective.” Usually classical science either tries to ignore or work around them somehow. In our view, it is these problems that are the cue for constructing a methodology that resolves these contradictions. We believe that a more correct position will be not to work around these paradoxes but to sharpen them as much as possible. This will enable us to understand the essence of these problems and ways of solving them.

The problem of the subject and consciousness in the human and natural sciences

Consciousness in science is regarded as an “attribute” of the subject, and most researchers probably agree with this, and since their definitions are interconnected, we will begin the discussion of the problem by examining the subject.

Semiotic problems in the definition of the Subject

As was already noted, the primary function of a sign is to differentiate meanings; otherwise there are no signs. And meaning, according to semiotics, is defined through opposition: *something* is always defined through *the other*. Consequently, an *object* (that which is investigated by any science) is defined through the “object–subject”

opposition. Therefore, even if we do not include the concept of “subject” in the paradigm of a certain science, it is still implicitly present in it as a necessary element of the definition of the object, and sooner or later we will inevitably have to take its “presence” into account in our logical constructs.

Evidently most researchers will agree that the object-based method of perceiving the world is above all *analytical* and “localizationalist,” since it is already limited by the fact that it is inevitably described in limited semiotic units and is somehow localized in space-time (even the entire Universe is described as a kind of object). Under the object-based approach we “tear up” matter—the “fabric” of Reality—into individual elements and view them as individual components of the Universe. Therefore, the opposition of such an approach is a view of Reality as a single whole. The fact that the analytical approach is provisional is borne out, in particular, by the fact that the artificially “torn-up” world requires, even in order to describe it locally, the introduction of all sorts of forces, fields, and so on, that “stitch” it back into a *single whole*, at least in regard to the properties that are essential for the given science and circumstances. This method of understanding, of course, has a right to exist and makes it possible to solve many practical problems, but it is not self-sufficient, since it ignores the other “hypostasis” of Reality—its unity.

An attempt to describe the Subject³ as a concept in semantic space, similarly to how we describe an organism, an individual, individuality, personality, and so forth, immediately reduces it to an object. But then the “subject-object” opposition itself disappears and the concept of object becomes undefined. If there is no opposition, then an object is anything at all, without exception—it is an Absolute, to which there is nothing to counterpose. But that is precisely why the Absolute cannot participate in any process of semiosis or in any of our discussions based on signs and meanings. The Subject, as a total unity, cannot even be used in plural form. It is not defined in semantic space and, therefore, we cannot differentiate “subjects,” for example, according to “the way their properties are manifested.”

Since any scientific method (in the modern interpretation) is based on a certain sign system, that is, is semiotic, the limitations of semiotics are essentially the limitations of any scientific method. Apparently no one especially disputes the fact that any method has its limitations (conditions for use and scope), since the method has a system of rules that define the conditions of its applicability or its limitations. The logic of a method may be impeccable, but the system of axioms on which the logic is based is by no means unique.

The problem of defining the Subject in physics

An *object-based* description is very often regarded as synonymous with an *objective* one. This stems from the fact that objectivity is derived from the self-existence, independent of the subject, of a kind of Platonic, “true,” transcendental “object space” that is “in another world” in relation to our subjective sensations,” from

where signals come to us in some unknown manner as sensations. The similarity of our mental “reflections” of this transcendental world is what essentially constitutes their objectivity, their supposed independence of the subject. The actual method by which a nervous stimulation becomes a sensation creates a so-called psychophysical problem for which a clear solution has yet to be found. But the substantiation of this similarity does not at all require this *external* “other” world. General *internal* laws for constructing a specific class of mental maps are quite sufficient here. At any rate, operating according to Occam’s maxim, “Do not introduce unnecessary essences,” we will not rely on the “object-based world” in our analysis until it is required by logic “in the most decisive way.”

The natural sciences try every conceivable way to exclude the Subject from their *objective* “determinist” paradigm. Despite all the efforts, however, it is still implicitly present in them. Its first overt appearance was in the special theory of relativity in the guise of an “observer,” without which it was impossible to determine the physical reference system. It behaved there in a rather peculiar fashion: like a “holy spirit,” it could instantly, and without expending any energy, pass from one system to another. Furthermore, in each reference system its perception of the world (of space and time) fundamentally changed according to the entirely “objective” Lorentz laws. But if these laws are objective and real, then the “real object world” itself must also *actually change* with respect to the subject’s position, on which it should not depend according to the definition of objectivity. It also seemed impossible, however, to recognize that objectivity depends not only on the “object world” but arises in some other way, since this was already reminiscent of mysticism.

The second appearance of the Subject occurred in quantum mechanics. Here, the solution of the problem of the Subject already influenced the results of an experiment overtly through polysemy by accepting many possible states of one object (see the section on “Quantum Psychology” [not translated here]). W. Heisenberg wrote in this regard: “This must mean that the term ‘happens’ is restricted to the observation. This conclusion is very important, since it seems to indicate that the observation plays a decisive role in the atomic event and that the reality varies, depending upon whether we observe it or not” (Geizenberg [Heisenberg], 1989, p. 24).

In addition, the problem of the semiotic description of an object “in itself” came up in quantum mechanics. We have already stated that any sign is polysemic. In the example involving the analysis of the word “princess” (Appendix D [see this issue, pp. 139–41]), we showed how, under the influence of external conditions (context) there occurs a locomotion (restructuring) of semes—the basic meanings that define a sememe, a change of emphasis and, hence, a change in the sense of a word. Therefore, a full description of an object “in itself” is always a virtual one, since it must consist of all the potential meanings for the Subject in the most varied context (even those that are logically incompatible).⁴ Meanings and senses, however, may be determined only with respect to the Subject (it is for good reason that physicists relate their laws to Nature, Reality, and the Universe and capitalize them

as proper nouns). Eventually, some physicists were forced to link the procedure of wave function reduction to the act of perception by the Subject (the extraction of one meaning from an array) or an act of realization.

The Subject, however, is still associated here with a “living being,” usually a human. The well-known physicist E. Wigner even proposed a theory whose general idea was that all unconscious matter evolves in accordance with purely mechanistic algorithms (e.g., the Schrödinger equations). However, when the quantum state of the system ends up coupled with the state of “some conscious being,” a mysterious physical process comes into play, leading to a reduction. Wigner’s (1983) work contains an even much stronger assertion: consciousness not only must be included in the theory of measurement; consciousness can affect reality. Schrödinger (1944) also put forth a similar idea in the epilogue to the book *What Is Life? The Physical Aspect of the Living Cell*.

However, not everything is fine with this approach, either, because some reduction processes do not involve a “living being” (incidentally, how could it appear at all without a reduction process?). For example, a vacuum fluctuates, and virtual pairs of particle–antiparticles emerge, then they dematerialize again. But if this process takes place on the boundary of a black hole, then one of the particles may fall in and the other may be emitted (the process of black-hole evaporation). This is how a real object emerges from a virtual state. In this case it is quite difficult to link a “living being” to a reduction process. If the Subject is understood, however, as a principle of the unity of the world, as the opposite of the principle of the object-based and analytical, the Subject is *always* immanently “present” in “object-based” Being (true, without being an object).

Another option, the most radical one, for solving the problem of reduction is the already mentioned many-worlds interpretation of quantum mechanics proposed by Everett and developed by Wheeler (DeWitt, Everett, and Graham, 1973). This approach considers a *closed system*,⁵ which includes the subsystem to be measured, the instrument, and the observer (the entire Universe). According to Everett’s interpretation, each component of the superposition describes an entire world, and none of them has an advantage over another one. There are as many worlds as the measurement (observation or perception) being considered has alternative results. Each of these worlds has a system to be measured, an instrument, and an observer. The state of the system, the state of the instrument, and the observer’s consciousness in each of these worlds corresponds to only one measurement result, but in different worlds the measurement results are different. There is no point in discussing this framework here, since in it the Absolute (the Universe) begins to multiply together with “Subjects” and “Consciousnesses,” and in the most radical way. How even two Absolutes can “exist” and in what way they are different—these are already questions from the realm of theology, the divine trinity, and so forth.

From the perspective of modern cosmology the entire Universe originated 13.7 billion years ago as a result of a superpowerful explosion when nothing existed yet. This was some kind of initial state of vacuum. Therefore, thanks to “quantum

coupling,” we cannot posit as separate from and independent of the Subject any object in the Universe, which is a single whole, “an incredibly complicated mess,” in Penrose’s phrase. Obviously, any “subsystems” that are generated by the Evolution from a general state (cell, family, genus, species, ethnic group, etc.), also form a unity in which the Subject has its “representation.” In effect, any such system is the Subject’s reference system. It is quite natural that the possibilities of the Subject’s *manifestation* directly depend on the functional capabilities of those systems. Therefore, the Evolution of the Universe results in a hierarchical system of “pseudosubjects”—reference systems, with various levels of development, of a common Subject.

If the processes are ultimately defined in space-time, their content and meanings can be defined only in Consciousness. Therefore, the Subject’s reference systems are differentiated only by their different limitations of a common Consciousness (by physical, biological, psychological, social, and other contents), and Evolution tends to diminish the rigidity of these systems and increase the functional possibilities of the Subject’s manifestation in these systems. Therefore, we distinguish not among different “consciousnesses,” but among different limitations (boundaries) of a common Consciousness⁶ or reference systems of the Subject. Cosmologists arrived at conclusions similar to those that had been drawn in quantum physics, since a strong anthropic principle in cosmology derives directly from Berkeley’s principle: to exist means to be observable.

In a letter to Born, Einstein wrote: “We want to know not only *how* nature is structured (and how natural phenomena occur) but, as much as possible, *why* nature is as it is, and not something else.” The key question that the anthropic principle must answer is *why* the Universe is as we observe it. If the question of “how” is resolved in the description of the mechanisms, conditions, causes, and effects that produce a certain event, then the question of “why” can be resolved only by comparing the event with some *goal* or *need* (or Natural Principle).

Between the 1950s and 1970s it was ascertained that a number of fundamental physical constants are so delicately aligned with one another that the slightest change in even one of them would result in a different Universe. If the mass of an electron were just 2.5–3 times greater than it is, then totally different types of nuclear reactions would occur in the Universe than is the case now, and it would not be possible to form complex structures. The same applies to other constants: the speed of the Universe’s expansion, mean density, the dimensionality of space, and so on. There is a highly delicate alignment of these fundamental constants to one another. Any change in them would result in a different Universe, in which there just would not be any room for human beings. This is the “razor’s edge” that Evolution has traversed.

Friedmann’s model of gravitation yields an infinite number of solutions for our expanding Universe. Physicists have repeatedly tried to comprehend: Why are there so many of these models? How is one to choose the uniquely correct initial conditions for our Universe? The answer is as follows: they must be chosen so that they

are compatible with the existence of human beings. This immediately “untied the hands” of physicists and cosmologists in discarding unrealistic models. Why? If a theory or model does not allow for the appearance at some stage of an observer (us), then it is unrealistic. And this is quite natural. In other words, the principle, of course, has a certain “screening” value for gravitation theories.

There are actually two approaches to resolving the question of why the Universe is as it is. The first answer: if the Universe were something else, if its properties were a little different than what we observe, we simply could not exist. And there would be no one to do the observing. Many cosmologists and astrophysicists held this view. The other approach: the Universe is as we observe it because human beings exist. We should note that any answer assumes the existence of an imperative: *the Universe must become observable*. If, however, it could have existed without an observer, then it is not at all an imperative any longer, because if “it could have existed,” then it also “could have not existed” as it is. But if there is an understanding that the coin must always have two sides, then the debate over which of them came earlier becomes pointless.

The semantic problems of forming ultimate categories

At an intuitive level the question of whether a subject should be included in a theory has long been discussed in the most varied scientific fields. We believe that the inevitability of including the Subject in any theory may be rigorously substantiated by relying on semiotics, the science of signs.

According to semiotics, any sign has a meaning and is defined only when it *differentiates* the world (Reformatskii, 2002, p. 27) by opposing “something” to “the other.”

A *term* is a two-faced ancient god of the border, which was set down when dividing up land. If there is no opposition, then a sign does not denote anything and is devoid of meaning. For example, if the green light of a traffic signal, which permits movement, is not opposed to a red light that forbids it, it has no meaning. A traffic signal that always shows a green light *means nothing* to a driver.

The identification of certain properties of the world (primary sensations and other signals) is determined by the subject’s need to orient himself in “object-based” reality in order to successfully satisfy current needs, beginning with “vital” ones. Properties are kinds of provisional “parallels and meridians” of Reality, and without the subject himself the world is not marked out, just as there is no coordinate grid on the Earth’s surface. We can identify certain qualities of the world, or not identify them,⁷ but we *must counterpose* the poles of a quality. For example, the world in itself is not ideal and is not material. For certain purposes, however, it may become necessary for us to draw such a distinction. But in defining “the material” *according to the laws of semiotics*, we must counterpose “the ideal” to it *at that very instant*. Debating about what is primary is the same as debating about which side of a coin came first.

Consequently, a definition of *object* and *object-based Reality* has meaning only

when it is counterposed to *Subject* and *subject-based Reality*, which only in opposition define each other.⁸ It is impossible to describe all of Reality through “half” of it in a noncontradictory way. The problem here is also that this *object-based world* essentially matches what we understand as Being, that is, what *exists objectively*, what “unconditionally” is. But the opposite of Being is Nonbeing or Nothingness, to which the existential quantifier is no longer applicable. To say that Nonbeing *is* would be tantamount to including it in Being, and we would immediately obtain a slew of purely logical paradoxes. Precisely the same difficulties lie in wait for us in the semiotic design of categories such as Reality, the Universe, Infinity, the Absolute. It has long been known that such “concepts” are semiotically inexpressible and lead to logical contradictions. For example, the following paradox was already well known in the Middle Ages: can an *almighty* and *omnipotent* God create a rock that He Himself cannot lift? Obviously, an attempt to ascribe to the Absolute any descriptor *even to the ultimate degree of its expression* inevitably limits it. We try to “squeeze” the unlimited into a limited semiotic definition,⁹ that is, to regard it as *an object with ultimate properties*. But it is fundamentally impossible in the space of properties to define an object so that all of the projections of the semantic vector describing it on every axis equal the ultimate values¹⁰ of C_j (see the section on relativist psychology [not translated here]). The same problems arise in Cantor’s set theory, especially in the problem of the continuum. Within the intuitionist school in mathematics, which prohibits infinity from being “put in parentheses” (thereby implicitly limiting it), some of the problems have been solved, since they are working not with “actual” but with “potential” infinity, which is conceptualized as an *infinite process* of an element-by-element accumulation of a finite set. Now, however, *time itself*, as a condition of the possibility of an “infinite process,” is put “in parentheses.” Evidently we should agree with the premise that we can define absolutely correctly only objects in relation to one another, rather than global categories, which are essentially not signs. The Subject cannot be investigated by the analytical methods of an object-based approach, since from the standpoint of object-based Being, it “is” Nothingness (as opposed to Being). The very existential quantifier “is,” however, is nothing more than the Subject’s *testimony* that the given object is *represented in Consciousness* (accessible to awareness at least in some reference system)—after all, someone must “testify” and hand down a verdict—this actually *is* (something exists).

There is another problem—how is the existence of a subject to be understood before the appearance of homo sapiens? After all, we associate consciousness specifically with him, and it is absurd to introduce an indeterminate God into determinist theories, since determinism thereby disappears. We relate the appearance of homo sapiens himself to concepts such as Development and Evolution, which, in the view of many (Khorgan [Horgan], 2001), do not fit into classical determinist theory, either. We will show later that it is the refusal to include the Subject in the scientific picture of the world that inevitably leads to the idea of a totally unrestricted and uncontrolled will.

In order to sort out these issues, we must first find the basis for dividing processes into mechanistic and creative ones.

Mechanistic and creative processes

Two aspects may be identified in the concept of “process”: the realization of a certain content in various forms, which corresponds to mechanistic movement, or the modification of this content, which corresponds to Development.

A mechanistic process may be defined by two methods: as a certain *sequence of forms* of a specific class (quality), the medium for which is an object space, or an overt specification of the *rules of modification* of a certain *original form* that generate this sequence of forms (i.e., the *content* of the process or a computational procedure). The sequence of forms of a certain class (quality) defines a certain process that expresses a concrete content. The rule for the ordering (succession) of forms of a certain class (quality) is the content of this process. Therefore, the unity of form and content is expressed in a concrete process, to which a certain trajectory or line in semantic space-time corresponds. The intuitionist paradigm is better suited to describe it.

As a result, the operationalization of the achievement of a certain finite state (as a condition for realizing the subject’s need) from a certain initial state (the condition of the origination of the need) within the boundaries of a finite content,¹¹ develops for the individual into an ordered, cause-and-effect chain (i.e., a process of object-based modifications in a certain reference system of the Subject) that is developed in time, or a change in the state of the Subject in this reference system. Hereafter, the word “subject” with a lowercase “s” will denote the Subject represented in a concrete reference system.

If the sequence of forms of the given class is generated by a finite operator (a concrete ratio, an inference rule), this process expresses a finite content. In this sense the nonordered infinite set itself that constitutes this class of forms may be matched up with nonfinite content, since an infinite set of processes with different content can take place in it.

Therefore, the content is expressed in the concrete process (sequence of forms). There is no other way for content to exist in space-time. Evidently philosophers have this in mind when they speak of the “indestructibility” of motion.

A creative act, which is a modification of the content, is possible as:

- (1) the generation of a new space;¹²
- (2) a change in the content of the process in the defined set of forms, which generates a new sequence in the same set;
- (3) a transition from one form (quality) of a process (sequence of one class of forms) to another (sequence of another class of forms), since the very change in the form of the process generates a new content (operator, rule) that is not reducible to the one that generated these sequences in each class of forms¹³ (see Figure 1).

Some examples of the first case are: the creation of a metatheory that describes

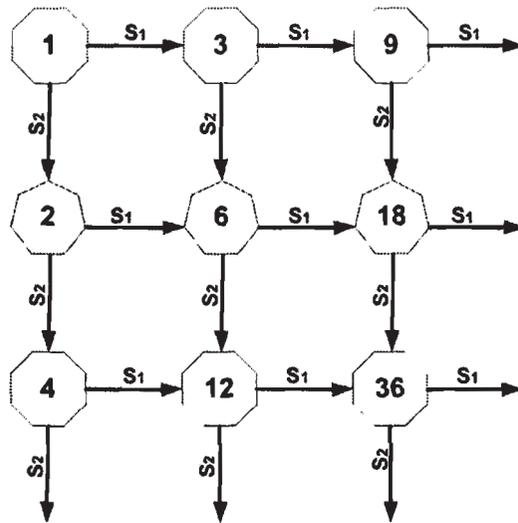
Box 1. The ordering (succession) rules of the forms of a certain class (quality) generate the content of the process. For example:

$1 \rightarrow 3 \rightarrow 5 \rightarrow 7 \rightarrow 9 \rightarrow \dots \rightarrow (2n + 1) \rightarrow \dots$

or

$(a + b)^2 \equiv (a + b)(a + b) \equiv (a + b)(b + a) \equiv a^2 + 2ab + b^2 \equiv \dots$

Figure 1. Transfer Process of Content from One Form to Another



Notes: Operator S_1 , which executes the recurrence relation $X_{i+1} = 3 - X_i$, generates the sequence of numbers: 1, 3, 9, ..., $3 \cdot n$ (from the initial form 1); the sequence 2, 6, 18, ..., $3 \cdot n$ (from the initial form 2), and so on. The operator S_2 performs a transition from one form of process to another ($X_{i+1} = 2 \cdot X_i$): 1→2; 2→4; 3→6; 6→12, and so forth. In theory this process may be multidimensional and include the operators S_3, S_4, \dots

various geometries, the emergence of a new species (as a stage in phylogenesis), a stage in the development of the Universe in cosmological scenarios, and so forth.

The second case, which consists of a change in the content of the process, expresses creativity as the revelation of a new content (a previously potential one). For example, the appearance of a new operator, and so forth.

The third case is the process of the transfer of content from one class of forms to another, which corresponds to the concept of “analogy.” For example, the transfer of the patterns of wave motion from the field of acoustics to the field of electromagnetism, and so on.

Since content (a rule or law of the transformation of a form) cannot change continuously, a change of content is not a temporal process and always takes place as a leap or a change of state (“leaps” in Evolution, an insight in psychology, etc.) and with a *breach of causality*,¹⁴ since the processes that occur are not a consequence of the preceding content. The subsequent process of revelation of a new finite content that appears in consciousness, or the expression of this content, is realized in theoretical or practical activity as a mechanistic process in the classical sense, since in this case cause produces effect.¹⁵

Classical theory, as a method of understanding,¹⁶ is oriented toward the study specifically of mechanistic processes. Obviously, it cannot adequately describe creative processes, since they change the axiomatic of classical theory itself. Therefore, a description of creative processes requires a new type of methodology.

Before moving on to a discussion of the potentialities of studying creative processes, it is helpful to get acquainted with their phenomenology. Appendix E [not translated here] looks at various types of creative processes and highlights their common features.

Evolutionary processes

A creative act that changes the content of a certain process breaches the cause-and-effect relationship, since an effect (new content) is presented to the intellect, but the latter cannot identify or find its cause in its past (old content). In considering Evolutionary Processes, we detect in them the same effects of creativity (“leaps,” a breach of causality, etc.) that are considered in Appendix E.

Attempts to reduce Evolution to random processes cannot stand up to serious criticism.

An interesting dialogue regarding this took place between a biologist, an adherent of Darwinism, and the well-known mathematician von Neumann. The mathematician led the biologist to the window of his study and said:

Can you see that beautiful white house over there on the hill? It arose by pure chance. It took millions of years for the hill to be formed; trees grew, decayed, and grew again, then the wind covered the top of the hill with sand, stones were probably deposited on it by a volcanic process, and by chance they came to lie on top of one another in a certain order. And so it went on. Through the Earth's history, of course, random processes through the eons generally produce different results. But on just this one occasion they led to the appearance of this house, and people moved in and live there at this very moment. (Geizenberg, 1989, p. 236)

This explanation greatly disconcerted the Darwinist biologist. We know from astronomical observations that the Universe (not to mention our planet) has existed at most for several billion years. No one has yet managed to “squeeze” into such a “short” time frame a chain of such improbable events that led to the emergence of highly complex and developed forms of life on Earth.

Anytime we encounter such phenomena, the probability of whose appearance

does not fit into serious theoretical formulations, we look for an external nonrandom factor related to the realization of some new principle or “someone’s” need. For example, if we find a suspiciously large number of sharply sheared rocks in a cave, we do not attribute this to the fact that they *randomly* slid into it from a peak and along the way all became equally well hewn along the edges. First, we conjecture that prehistoric humans lived here, and that a certain need compelled them to cut the rocks *for some purpose*. The presence of a nonrandom, goal-oriented component in this phenomenon immediately explains such a rare “natural anomaly.” The natural-science law of increasing entropy can perhaps explain how a monkey could have “formed” from a human being, *but not the opposite*. Even the Darwinists implicitly categorize the cause of a creative act as a kind of external “metasubject” when they say that we were “created” by Nature or Evolution.

Indeed, the cause of an evolutionary leap may be defined in a consistent way only from outside and corresponds to the “subject”¹⁷ of another order (the “subject” of a concrete evolutionary process or a metasubject). We already mentioned earlier that in a semiotic system it is impossible to logically define the “object world” in a consistent way without the Subject, which is the opposite of objects.

The process of Evolution may be conceptualized as the creation of a hierarchical structure of reference systems of the Subject that become increasingly complex. The emergence of each reference system is accompanied by the appearance of new, more flexible qualities (through a decrease in rigidity U_H —see the chapter “Relativist Psychology” [not translated here]) and new principles (goal-oriented vectors) within each system. The new principles define the laws of the evolution of objects in each reference system, and the diminution in the rigidity of new properties speeds up the evolutionary processes. The condition for theoretical substantiation of a reference system is that it originates from a single state. For example, the entire physical Universe that originated from one singularity is, of course, one of the basic reference systems¹⁸ (and the most rigid one) of the common metasubject. It has its own principles, which are universal with respect to subsequent reference systems. The properties of each previous level are the basis or condition for the existence of properties of the following level (physical → biological → psychic → etc.). We will match up the appropriate metasubject with each reference system (bearing in mind that in actuality it is the Subject represented in the given reference system). Examples of various reference systems in biology are: all flora and fauna, since their origin is defined by one common genetic code; family, genus, species, individual, since it also has one cell as its source, and all the cells of the organism have the same marker—a specific set of chromosomes.

In this aspect, the evolution of objects may be viewed as a process of the creation by the “metasubject” of the necessary conditions to realize its needs, in which the content of Evolution itself is indirectly revealed. A sequence of creative acts is actually a creative process. The content of each stage of Evolution is the condition for each subsequent stage, which reveals the meaning of the preceding stage.

The diversity of evolutionary processes (cosmological, physical, chemical,

biological, psychological, social, etc.) forms a hierarchy of the relevant “metasubjects.” Through the hierarchy of evolutionary processes generated by the principles, goal-oriented functions, or needs of the “evolutionary subjects” of various levels, we can sequentially determine the semantic component of Development at any stage of it.

The nonfinite quality of the content of Development in this case is obvious—each stage is defined by the entire, infinite chain, the infinite semantic redefinition of “subject.”¹⁹ If the number of reference systems (defined by finite content) were finite, then as a result the content (definition) of Development and the Subject would also be limited, and the Subject would be reduced to an object, while Development would be reduced to mechanical motion.

Therefore, the stages of Development are concretized in evolutionary processes, which may be viewed as stages of the concretization of subject-based space and the appearance of new qualities (physical, psychological, social, etc.). These qualities are realized in new reference systems that define concrete subjective realities. In other words, *the Subject always existed as the opposite of object-based reality*, and we are its “representatives.” Hence, it was not the mechanical world and mechanical randomness that gave rise to Development along with wits biological frame of reference—the organism—but vice versa. A mechanical system always remains mechanical, since it is always, by definition, “closed” in finite content. Two types of processes are concurrently under way in the world: one related to the growth of entropy (a mechanistic one) and the other related to its diminution (an evolutionary one). Semiotics require equality here as well. For example, according to astrophysical observations, the Universe originated from vacuum fluctuation. Consequently, all of the cumulative quantitative changes in it at any point in its development must in aggregate equal zero (including the fact that the processes of entropy and negentropy must be equal). Hence it follows directly that evolutionary processes are required for the very existence of the *physical* Universe.

The semantic analysis method formalizes the stages of the creative process, applying the only recurrent method for sequentially discovering in finite concepts the “nonfinite cause” of creativity, which, just as in classical science, extends to “bad infinity.” But while the infinity of knowledge for classical science is defined by the infinite heterogeneity of objects,²⁰ in semantic analysis it derives from the heterogeneity of content—the multiplicity of “subjects” of various levels of concretization. In this case, the task of semantic analysis is not an infinite process of mechanistic discovery through *meanings* (concepts) of the “finite contents” of the world as an open system, but the discovery of the *sense* of each creative act of the evolutionary process through a system of goals (“values”) of the “subject” of each level of concretization. Science interprets these goals as principles: “the principle of least action,” “the principle of natural selection,” and so on, implicitly (or diffidently?) “anthropomorphizing” “inert nature” by attributing goals and practicality to it.

Therefore, one should distinguish between mechanistic and evolutionary processes. An evolutionary process takes place in a sequence of creative acts (atemporal

“leaps”) that generate finite content. A mechanistic process is a way for this finite content to exist in object-based space-time, which takes place in a specific sequence of the forms (intensities of object properties) that express this content.

We have done a qualitative analysis of creative processes. Is it possible to formalize them in a theory? Obviously, regardless of the type of theory, we will have to use semiotic systems. As a result, the question arises: how can we describe indeterminate creative processes in the context of a fundamentally limited semiotic system? We will analyze our options in this aspect.

The categories of development, being, and nothingness

In space-time, any process expresses a certain content, which in language is recorded in concepts. In this sense, any theory²¹ (framework) is based on a certain limited content, which is defined in a certain set of forms. If its content changes (if the axioms or rules change), in that case we go beyond its scope and construct a new theory that describes the new content.

The result of a creative act may be described in the context of a formal theory, but creativity itself cannot. Each creative act redefines subject-based Reality. The cause of this change may be ascertained only in a new content “from the future,” and therefore the consequence outdoes the cause. If a creative act in certain conditions generates multiple potentialities, then a cognitive determination of the future is possible only on a probabilistic basis (multiple potentialities may be defined in the future).

The theory of probability enables us to calculate, in general, the probabilities of any events and states with absolute precision. It does not tell us anything, however, about *how* a specific state *is chosen* in the process of experimentation or observation. In classical physics we could assume that this choice actually resulted from many factors of a classic type, which at least in theory could be taken into account, and clearly determine the concrete occurrence of a “random process.”²² In quantum mechanics, we finally encountered a true random event, whose occurrence could not be predicted in theory. Incidentally, when people encounter random events in their lives, they never ask themselves, for all intents and purposes, “*How* did it happen that I won the lottery or that person fell in love with me, and so forth?” The question usually sounds like this: “*Why* did this happen to me, *what* did I do to deserve it (or *what* transgression did I commit)?” This is not a question about the *meaning*, but a question about the *sense* of an event, and it is addressed not to the object-related mechanisms, but to the Subject (Nature, God) and its “motives.” In this formulation the question indeed makes sense, since it corresponds to the “goal-related vectors” (“needs”) of the metasubject, that is, the principles of the given reference system. In subject-based space we are already working not with the meanings of signs but with their senses. And the sense of a sign changes fundamentally in each context, in each reference system. The question of why the principles of our system are as they are already pertains to the meta-metasubject.

Therefore the choice of an alternative in a truly random event is made in a concrete reference system by the Subject (metasubject) and within the bounds of any finite hierarchy of reference systems, in general, may have a specific *semantic* basis. This means that, although the probabilities themselves of events are not determined by the Subject (their underpinnings lie in object-based reality), the choice of the alternative is still up to him. From the standpoint of the object world, however, this “nonrandom” sequence of extremely rare events, which is called Evolution, is simply a random artifact. It does not require any expenditure of energy and does not change the actual probabilities of random processes. True, entropy diminishes here, but its balance with information in the Universe needs to be maintained, since entropy, according to the principles of thermodynamics, continuously increases. So from this standpoint Evolution is an absolutely essential and “natural” phenomenon in the Universe.

In the section on the semantic problems of forming ultimate categories, we already discussed the problem of a semiotic definition of Being. Since the content of the object-based mechanistic world does not contain new content that results from a creative act, its emergence always disrupts causality (“localness”) and cannot come from Being. Nonbeing, however, is what by definition does not have a right to exist in Being. In the semiotic definition, however, Nothingness or a void actually appears to us in the form of an object. This is no longer absolute Nothingness. Moreover, it may represent for us a certain value and have a dimension. In any case, the amount of our apartment rent is determined precisely by the volume of that void. A physical void—a vacuum—is not an Absolute, either, but is regarded as a certain kind of physical state. Nothingness in Being acquires a specific form of existence in object-based reality—the form of *potentiality*. “Nothingness” in Being is *potential Being*—its future.

Werner Heisenberg, a Nobel Prize laureate in physics, discussing N. Bohr’s principle of complementarity and the paradoxes of quantum states related to it, writes: “On the other hand, if one considers the word ‘state’ as describing some potentiality rather than a reality—one may even simply replace the term ‘state’ with the term ‘potentiality’—then the concept of ‘coexistent potentialities’ is quite plausible, since one potentiality may involve or overlap other potentialities” (Geizenberg, 1989, p. 117).

Indeed, should we deny “future” and “potentiality” the status of “Reality?” At every moment in time in our *present* we actually change our potentialities with respect to our *future*. For example, by training at a sports school, one can *objectively* increase the probability of becoming an Olympic champion in the future. These potentialities are just as measurable in quantitative form as any other actual processes and, in essence, are a kind of “wave function” of the individual. A potentiality is also reality, given in a different form.

In effect, the reduction of multiple potentialities to a single one is what realizes the “transition” from the future to the present. An example of the reduction of potentialities is the reduction of a wave function in quantum mechanics. It is obvious

that an electron, defined as the superposition of potential states, is presented to us not as the present, but as a set of potentialities, that is, in the form of the future. This is what enables it to interfere at the two slits in the famous experiment.

Potentiality is a category of the future, a *mode of existence of the future in the present* (or of Nonbeing in Being). Potentiality is calculated absolutely objectively; it can be measured in the present, and its measure is probability. Under this approach, it is an object, although in somewhat specific form. For example, a vacuum can generate any virtual particles, which under certain conditions may become quite real. This constant “bubbling” of the vacuum may be linked to the uncertainty relation in quantum mechanics. A vacuum is the medium of formation that “permeates” all reference systems; the process of reduction of a wave function takes place through it, and the future ultimately comes to us from it. Any mechanical or nervous activity of the organism also begins at the quantum and biochemical level. So a void is “the door to the future.”

Now we should discuss *the mode of existence of content* in object-based reality. Unlike psychologists, physicists do not ask questions about *how* an electron stores within itself the laws of electrodynamics and quantum mechanics, how it “computes” its trajectory (or potential trajectories) in various conditions and so forth. The laws of nature are not recorded in objects but belong to Nature. Objects merely execute them in space-time—and this is the only mode of existence of content in the object world. So the psychophysical problem exists only for psychologists. Any organism is simply an object, and we can discern in it all the mechanisms for the realization of a certain class of psychic states. But no one has succeeded yet in discerning in it the mysterious homunculus—the subject. There are not even any approaches to understanding how a stimulus becomes a sensation. There is not even any coherent theory of memory. Experiments on age regression show that a person remembers absolutely everything from childhood on. One patient who was a bricklayer remembered every brick that he laid in a wall a few years ago. People with an eidetic memory are able to memorize forever the entire text of a book merely by leafing through it. Hypotheses have been put forth that memory is coded through the transformation of ribonucleic acid (RNA). However, in order to store, “pixel by pixel,” such monstrous amounts of visual information alone, toward the end of one’s life, changes in RNA would make it absolutely alien to the given organism. Most likely, just as in the situation with the electron, the brain, as a “file drawer,” stores only “coordinates of places” where semantic (conscious) information is stored and represented not in an object-based but in a subject-based space. Shannonian “quantitative” information in object-based space has no semantic content. Only what is contained in Consciousness can have sense. Without the Programmer, all information issued by a computer is gibberish.

The perception of object-based reality by a subject always proceeds from a concrete reference system. Despite the fact that different subjective perceptions do not match, we can calculate these “distortions” quite objectively. For example, space-time distortions in physics are determined completely by the reference

system and are calculated by using the Lorentz transformation. We should note that the reference system itself *is not a material object*, although it is defined through physical descriptors.

What takes place in space-time successively, as a process, is represented in consciousness simultaneously, as understood content. Therefore, the process of perception has two aspects: an object-based one, which involves the processes of transmission, coding and decoding of information in the “organism-environment” system, and a subject-based one, which involves the understanding of the content of information, its comparison with other reference systems and the translation of meanings into sense.

The process of coding information that varies in structure and quality is essential to the organism in order to represent it in a single, universal semiotic form, without which it is impossible to properly compare, process, and use it. This process takes place with the aid of a system of receptors and the nervous system. Naturally, each level of the organism—the physiological, the biochemical, and the genetic—has its own system of codes and its own coding and decoding principles. Obviously, the last link in the “transmission of information” to the Subject must be the quantum level, which is directly “connected” to the vacuum—that physical Nothingness. The reader will recall that the source of Development is only the future that *is not determined by the past content of Being*.

A breach of causality and “leaps” in Evolution have been detected very often lately in various fields of science. To attribute each individual case to a rare chain of improbable events is equivalent to brushing off snowballs when an avalanche is under way. Obviously some goal-oriented principle of Nature is behind all this. The point lies not only in natural selection but in the targeted program of Nature.

It was noted long ago that new brain structures appear in terms of evolution not gradually but all at once in entire, readymade blocks, together with a new class of behavioral responses of the organism.

The bipedalism of humans was long considered to be a consequence of the development of the intellect: an upright posture left their hands free to make tools. In 1974, however, the paleontologist D. Johanson found, in the Afar Basin in Africa, the skeleton of a hominid that was named *Australopithecus afarensis* (among themselves paleontologists call it Lucy). It turned out that Lucy, who *lived 3 million years ago*, walked on two legs. But the first stone tools are *not more than 2.5 million years* old. The volume of Lucy’s brain was not greater than that of today’s anthropoid apes. Moreover, to bear “intelligent” children with larger heads, Evolution first had to change the female pelvis: an upright posture required that the pelvic ilium be turned inward, in the process the pelvis becomes narrow, like Lucy’s, which makes it impossible to bear children with large heads. Evolution enlarged the female pelvis of *Homo sapiens* after making women more helpless than men. Therefore, Nature first changed male behavior and sexual reflexes, making men take care of the females, which in general is not characteristic of hominids.

An examination of Development requires going outside classical theory, in which cause always comes before effect, whereas all mechanistic processes (the results of Development) can be described in classical theory. The experiments testing the so-called Einstein–Podolsky–Rosen (EPR) paradox²³ (the tests of Freedman, Clauser, Aspect, and others) point to a breach of the classical notion of causality. Moreover, the theorem proven by J. Bell (Bell’s inequality) shows that “localness” and causality are logically incompatible concepts²⁴ (Bell, 1964). The breach of causality shows that not only does the present determine the future, but the future can also determine the present. This opens up a fundamental potential for instantaneous “teleportation” of quantum states (Brouwmeester et al., 1997).

Creativity and Development relate not to objects (“inert matter”) but to the Subject, so we are obliged to consider the question of a noncontradictory inclusion of the Subject in the theory. Since scientific theory must be objective, we must sort out what is meant by the “principle of objectivity” in the natural and human sciences. In the natural sciences this principle requires a total exclusion of the subject from the scientific paradigm, since it is assumed that the object world must not depend on a subject’s volition, because free will violates the determinism of the theory. Since it is generally accepted that the appearance of a “subject” is tied to the appearance of “living matter” (human beings), its presence in the theory precludes an investigation of the world before the appearance of *Homo sapiens*.²⁵ In effect, objective reality in the natural sciences is understood to mean the object-based Reality (the “world of things”) that exists “on the other side” of our sensations. It defines the objective (common to everyone) component of the various subjective realities. The human sciences, for example, psychology, in effect describe not the subject but its various reference systems: the individual, individuality, personality, identity, and so forth. They are effectively represented as objects described by a certain finite set of characteristics. In the introduction we showed the paradoxes to which a mechanical inclusion of the phenomenon of creativity and free will in classical theory can lead. Therefore, within the framework of classical theory, the evolutionary process ends up detached from the “subject” itself as the only “form” in which the process can take place. Since the object world is determined, it turns out that Evolution in classical science is “factored out” of object-based reality and acts as the undetermined, uncontrolled Creator of this world. In this concept, Evolution cannot become the subject matter of any analysis, and is, with respect to the object and to the “subject” itself, the source of absolute, totally unrestricted, and unknowable will. In this case, classical science, in studying the object-based world, is fundamentally unable to investigate either the subject or Evolution.

In order to investigate Development, what needs to be the subject matter of scientific study is the “living” subject rather than the “dead” object, and in this sense the subject must be “primary” with respect to objects. Therefore, the object world must be the result of Development, that is, the result of the objectification of subjective Reality by the Subject.

Subjective and objective reality

We proceed from an existential definition of subjective reality—this is an obvious fact that does not require proof (“I am!”), unlike object-based reality, whose existence no one has yet managed to prove. In any case, without *subjective sensations* there is *no Reality whatsoever*.

The common components of all subjective realities are, by definition, objective. For example, when different people understand each other, this means that common (objective) elements are present in their perceptions. We will call the objective components of subjective reality *subject-based Reality*.

Classical theory interprets a subject’s sensations as the signals of a certain object world that is external to subject-based Reality. Persistent “sets of sensations” that the intellect identifies as “external” conditions (factors) for satisfying a need are presented to the percipient in the form of images—a real, image-based sign system for “internal use” (the first signal system).

By using them the intellect constructs a “layout” of subject-based Reality for the specific individual—a mental map. It takes the object world that is external to subject-based Reality as the source of these images.

The image-based sign system is the instrument for fulfilling a need that arises from the necessity of becoming oriented in the conditions for satisfying it. An image should be understood not as a static aggregate of sensations but as a sign, a “hieroglyphic” that is constructed by the intellect from sensations to designate specific conditions. What corresponds to an image, as well as to a sensation, is the content of a process of a certain duration, not an instantaneous form of it.²⁶

Actually, many primary sensations are inaccessible to consciousness directly, since in the primary zones of the cortex of the large hemispheres (and even in the peripheral nervous system) they are already organized according to certain rules into elementary perceptions (lines, angles, tones, pitch, etc.). In order to construct an image it is necessary, at a minimum, to “compress” sensations in time. For example, in order to identify an elementary tone one must construct a sign for its “frequency,” which requires a Fourier transform of an acoustic process that lasts at least two periods. Obviously, the perception of a musical phrase or speech requires an even more complex and longer operation to process the flow of sensations.²⁷ Therefore an image is not an instantaneous “set of sensations” but a sign of a certain ongoing process that is “constructed” from “pre-sensations.” The experiments of Benjamin Libet and his colleagues (Libet et al., 1979) studied the temporal relationships among the sensory aspects of consciousness. Volunteer test subjects had electrodes affixed to the region of the brain that receives sensory signals from certain areas of skin. In addition to direct stimulation by electrodes, the corresponding area of skin was sometimes also stimulated. The outcome of the experiment was this: approximately half a second elapsed before the test subjects became aware that they felt something.

In effect, sensations are not represented at all in consciousness. We can examine

only the mechanisms of the construction of the increasingly complex Gestalt images. Only an image has meaning and sense, and it alone can be presented to Consciousness (i.e., be understood). The actual mechanism of “compression” of the process into a “sign” belongs to space-time, that is, to the “object world.” But the sign is “read” only by the Subject (has sense only in Consciousness). In other words, the construction of a sign and the reading of the sign are the two hypostases of Reality. The question of how sensations generate an image is in essence equivalent to the psychophysical problem: how does a stimulus (the process) turn into a sensation (an elementary perception, image, or state), that is, it is incorrect. An image is not constructed in Consciousness, it “appears” to Consciousness.²⁸ A sensation, meanwhile, as a process, is in essence no different than a stimulus.

The meanings of the images of the first signal system are concretized to the utmost by the conditions of satisfying a need. These conditions, however, are perceived differently from the different reference systems of a certain subjectness²⁹ and, therefore, the second signal system of signs (language) loses its former monosemy. Meanings³⁰ in it represent a superposition of possible variants of interpretation (or a superposition of possible states of an object; see the section “Quantum Psychology”), are determined probabilistically and depend on the position of which mentality and in what conditions they are considered. These meanings are recorded in concepts—the signs of the second signal system—and are treated as objects in object-based reality. In this framework, the “external” object is the “source” of sensations and has specific properties. This in turn leads to the next question: “How do we manage, without knowing all of the properties (including physical ones) of any single object, how do we contrive to construct finished theories and to describe reality in a noncontradictory way and with such precision?” This question is answered automatically if we accept the premise that we construct objects ourselves by separating out from the “receptive field” only those properties that are related to satisfying our needs.³¹ In other words, it is finite information that organizes an individual’s behavior in order to achieve a certain goal. For example, a physicist and a chemist describe various substances from different directions and in terms of different properties, and each of these descriptions is fully valid in its own field.

When studying an object, we continuously redefine it.³² In effect, we are trying to make the definition of the object identical in the most varied conditions (including incompatible ones). There is nothing surprising about the fact that over time it becomes extremely contradictory and abstract. It begins, more and more, to manifest its “virtual” semiotic essence in the notional dismemberment of a unified Reality.

A mental map emerges and is clarified as an image of the conditions for achieving and fulfilling needs as a result of subjective activity within the framework of a concrete subject-based Reality. The conditions on the mental map are represented in the form of the means of fulfilling needs, which we call objects. These conditions are achieved through action (activity).

The mental map is our representation of the “external world” and is formed on

the basis of components that do not directly depend on us in the overall flow of sensations. The direct, steady experiencing of the set of these sensations corresponds to the object on the mental map. This is the objective part of our inner experiences, since it is not directly related to will. Individual consciousness³³ correlates with itself the sets of sensations that are directly related to volitional functions and defines them as the subjective component of our reality. The set of sensations that is not related directly to a volitional act is interpreted as external to the subject, is matched up with the source of these sensations and is correlated with the “external” object of “external” (essentially virtual) “object-based reality.”

The conditions for awareness of oneself and of the world consist of not only the objective principles of subject-based Reality but also the “genetically predefined” elements of the mental map, which we understand as unconditional reflexes. They form the already established connection (a model of actions to satisfy certain needs in specific conditions) between classes of sensations. The “internal” means of satisfying needs are defined as instincts and are the primary instruments for fulfilling needs.

If a subject uses only instinctive resources to fulfill its needs, this type of need fulfillment is defined as *direct*. If the satisfaction of a need requires creating preliminary conditions, this type of need fulfillment may be called *instrumental*. An instrument in this sense is a means for creating preliminary conditions for direct need fulfillment. Therefore, based on mental construction, the means emerge for creating instruments of various kinds—both physical and social. Actually, the intellect and the mental map itself are also such instruments.

We can track in detail how a stimulus occurs, is propagated and transformed when the organism interacts with the environment. The subject, however, does not have and cannot have any “sensory organs” that transform a stimulus into a sensation or the physical into the psychic. Under the canonical approach we find ourselves sealed in a “cocoon” of sensations, which appear to us as markers of our absolutely incomprehensible “interaction” with the “real, external object world” as the source of these sensations. As for our own, solitary, directly given existence—the subjective reality in which we exist—we are compelled to declare it to be “virtual,” derivative, and unreal. We proceed from the reverse proposition: object-based reality is derivative with respect to our subjective reality. The question of where images actually come to our consciousness from is essentially a question of faith rather than science.

We determine the fitness of a mental model of the world (map) by how well we can orient ourselves in it (in our subject-based Reality), that is, the extent to which we are able to effectively satisfy our needs—and this alone is what matters. In terms of the canonical approach, this shows the degree of our adaptation to the “external source” (the “environment,” the “surroundings,” etc.). According to semantic analysis, science studies not the world itself but the objective (common to everyone) components of mental maps.

The meanings of objects in the second signal system are determined not by a specific individual but by mentality as a whole. Since mentality describes the essential components of subjectness, as the aggregate of subjective realities, the meanings of objects must be revealed probabilistically based on their possible interpretations in this aggregate. Therefore, mentality includes all possible semantic interpretations of the common elements of mental maps.

A representation of the “subject” itself on the mental map is possibly only in the form of an individual—a reference system with a specific set of properties (organism, temperament, personality, identity, etc.). The possible reference systems may be interpreted as certain conditions that are compatible with other reference systems that generate other interpretations of subject-based Reality. Other “subjects,” in this meaning, constitute other possible mental systems.

Each subjective reality is defined as the Subject’s “view” of subject-based Reality from a local point in it or reference system. Different reference systems can be described in a certain subject-based space and correspond to different subjective realities. Any evolving system can represent the Subject’s reference system with functional abilities at various levels.

The transition from one subjective reality to another involves a conversion of the “system of coordinates.” All reference systems that are equivalent in terms of functional abilities are, in principle, mechanistically reducible to one another by a certain class of conversions³⁴ and correspond to equal subjective realities that form subjectness. The rules of these conversions are also objective and reflect quantitative conversions within the framework of the subject-based Reality in question.

Therefore, “subjects” (in the classical meaning) appear on the mental map as a result of *conditional attribution*. An element of the mental map is deemed equivalent to a certain other reference system of the Subject and is represented in subject-based space as a new subjective reality. In this case, constituting part of subjectness, in essence, is equivalent to “animateness,” to the presence of consciousness, to the ability to construct a mental map from this reference system.³⁵ In effect, the Subject is simply an attribute of the unity of the world, that is, of any subjective or subject-based Reality. Classical science initially “tore up” all Reality into objects, representing it as a “scrap heap” of individual items, and then spent a long time laboriously trying to prove the connection between everything, introducing forces, fields, and so on. Under this approach, indeed, it is difficult to understand such paradoxes of Reality as the EPR,³⁶ since this is a manifestation of precisely the unity of Reality.

The concept of objectivity can be revealed through the original, general principles of the organization of subject-based Reality rather than be classified under the original existence of external, “object-based Reality.” By revealing its subjective reality in concepts based on objective principles predefined by Evolution, the intellect inappropriately “alienates” it from itself as object-based Reality. As we see, objective reality is implicitly replaced by object-based reality.

Any concept has sense and exists not in and of itself but only in a comparison of an object being defined with the need of the subject defining it. The existential quantifier itself is a subject's testimony that a certain phenomenon (object) is represented at least in one individual consciousness (or in a concrete class of reference systems). Essentially, Consciousness is an integral attribute of the Subject itself under any limitations (in any reference system). In effect, it establishes the "presence" of the "percipient" of a certain level of concretization in the given reference system. Then the expression "the object exists" represents a simple statement (testimony) by the percipient that a given phenomenon is represented in a concrete subject-based Reality or is accessible to Consciousness in the given limitation. Similarly, existence may also be defined with respect to an entire subjectness. This means that *something* must be "present" on all mental maps that are obtained as a result of permissible conversions of the reference systems (physical, biological, social, etc.) of this subjectness. Consequently, the boundaries of individual consciousness coincide with the objective limitations of subject-based and subjective Reality. So one does not necessarily have to look for other worlds outside our Universe. Our sensations are born not from an incomprehensible "interaction" with a hypothetical "object world" but are projects of a kind from preceding levels of concretization of subject-based Reality. The properties of quarks or spinors are inaccessible to us in sensations, but they are what determine the physical sensations of the "macro-world" that are accessible to us. Therefore, subject-based reality is objective by nature and does not require the postulation of an "otherworldly," effectively ideal (Platonic) world of objects.

The separation of any concept from a subject's motivations and needs, which gives rise to this concept, effectively deprives it of sense and transforms any term into an ordinary marker of a factor of a connection between properties or simply into a meaning. The *sense* of a concept may be revealed only as a *meaning for the subject*. Understanding the sense of reality per se while removing the subject is analogous to removing the Cheshire cat's smile from that animal itself. If it separated the sense from concepts or introduced concepts that do not have sense, science would have to degenerate into an abstract, pointless game with dice rather than construct something with sense (useful and necessary for the subject). Classical science implicitly ascribes real existence to concepts per se as a "material" expression of the "virtual" world, which "exists" without the subject itself.³⁷ As a result, the concepts themselves replace direct Reality, which can only be subject-based.

Awareness is reduced to the notion that in the process of Development the boundary (definition) of subjective reality changes. Objective phenomena that are "external" to the previous limitations of this Reality become accessible to Consciousness within the framework of the new limitations.³⁸ For individual consciousness, then, what defines it "from without" can become accessible to it as awareness "from within," as an objective, previously unperceived, principle of its determination (a new law). The objectivity of subjective realities is a corollary of the fact that all of them are various limitations of a single, subject-based Reality.

The intellect and space-time perception of reality

As was noted above, we link any content in object-based reality to the space-time changes in which it is expressed. Since creative processes do not fit into mechanistic notions of space and time, we must consider these categories in a new aspect, especially since no physical theory of time currently exists. Moreover, time for us “flows” only because we have consciousness. From the standpoint of the theory of relativity, there is only “static,” four-dimensional space-time without any “flow.” Space-time simply *is*, and time in it is no more able to “flow” than space is. The flow of time seems to be necessary for some reason only to consciousness, and I will not be surprised if the relationship between consciousness and time suddenly prove to be strange in every other respect as well. (Penrouz [Penrose], p. 586)

A sign-based representation of the world makes it possible not only to formulate concepts “here” and “now” but also to represent oneself in the past, future, and outside the conditions existing in the present. A mental map becomes the first sign-based “space,” a model of subject-based Reality,³⁹ in which the needs of the given subjectness are satisfied. This model makes it possible to record space-time relationships as representations of the past and future *in the present*, since the Subject is always “located” in the present. All this leads to the point where the intellect begins to identify cause-and-effect relationships on the mental map, that is, causal thought and linear (sequential) perception of time take shape. Time begins to be perceived as an “index” that orders the chain of forms that expresses a certain content, which is essential for adapting an individual in specific conditions.

A subject always “senses” its identity in time. Since the intellect can record any changes only with respect to something limited, these changes can be discerned only in the context of a certain limited reference system—individual consciousness. A subject cannot be reduced to any finite content or finite form, therefore quantitative changes cannot be determined for it (as for something nonfinite),⁴⁰ and therefore it is always identical to itself.⁴¹

A condition of the concept of “the present” as self-identity is Consciousness itself—the whole or the nonfinite, to which the concept of time as a change in the particular or in something finite (limited) is counterposed. All changes on a mental map may be compared sequentially with one another and generate the concept of causality. In this context causes correspond to the past and effects to the future. The point of their division on the “time axis” is always relative and does not coincide with the “real” Present, which is defined only for the Subject (outside the “object-based world” or the mental map).

In this sense, the present is nonfinite and “defined” for the Subject rather than for the object, that is, in essence, it is not time and cannot be expressed in the finite. Conceptually on the mental map, the present corresponds to a point, that is, to something that has no duration, and hence “time.”⁴²

The present does not exist in time for a subject; the latter may define it (or itself) by any method. Any segment of time may correspond to its “present” (for

example, as is reflected in syntagmas of the following type: “I am doing,” “I am speaking”—in the present-tense verb form we categorize *the entire process* (its past and future) of our action or utterance as “the present”).

For individual consciousness, its past, as a time continuum, is no different from a spatial continuum, and any “segment” of the past may be relived (under certain conditions) as the present, since at any point a subject is always identical to itself. The subject “moves”⁴³ through its past as through space. The intellect arranges the psychic states⁴⁴ that are defined within the bounds of the predefined time intervals on the mental map (each of which describes a subject’s “present”) as temporal sequences or psychic processes.

The mental map is a method of representing not only where “I am now” (in what conditions and in what relation to the goal defined by a need) but also where and when “I” “could be.” The mental map is essentially a way of representing the past and future in the present.

The psychological mechanism of retaining and transposing the past to the present (to Consciousness) (the method of the existence of the past in the present) is memory, and that of transposing the future to the present is a representation. The past and future, in this sense, constitute different forms of the existence of the present (the future in a representation and the past in memory).

The present relates to the Subject as something nonfinite, while the past is defined by the intellect on the mental map as finite. The future, meanwhile, arises from the intellect’s ability to mechanically predict all forms of a certain finite content in specific conditions, an ability to establish cause-and-effect relationships. In this sense such a “mechanistic” future, in essence, is already the past, since it can be clearly predicted,⁴⁵ and will therefore inevitably (or with a calculated probability) occur.

Consequently, thinking as a process of forming knowledge acts here as a method of experiencing the future in the current form of the present (as an effect—in conceptual or other form). In this regard, thinking links the past or a cause (inner experiences that currently exist in memory) with the past or an effect (that currently exists in a representation). For all practical purposes, the past and future act for the subject as different forms of the “present.” The future is represented by the intellect in the form of *potentialities* that exist in the present and have their own quantitative determinateness (probability) and objectively changes according to changes in current conditions.⁴⁶

Therefore, the foundations of the present, the past, and the future turn out to be different. Creating a “unified” theory of time on a single foundation will not work.

A subject may be concretized in the context of reference systems or conditions of “existence” (physical and genetic norms of responses, social, economic, and others) that are permissible and possible for it. The set of such permissible reference systems is what limits the scenarios of the modifications of its mental map. The

sequences of these “reference systems” in the past and future define the potential *lines of life* (a kind of counterpart to the “world line” in the theory of relativity). The mental maps that “belong” to this line are interpreted by the intellect as a modification of the same mental map (life journey) of the always unalterable, self-identical, concrete subject. On the other hand, this may be viewed as a process of active adaptation to the changing external conditions in the object-based world and related to one’s development.

Therefore, the intellect performs the following functions:

(1) conditional cognitive alienation and comparison of what is “internally alienated” (needs, since they do not depend on its volition but are determined by Evolution) with what is “externally alienated” (the means of their fulfillment or objects); and

(2) the subsequent execution of an act of cognitive appropriation in the process of satisfying a need.⁴⁷

In this sense the intellect is one of the Subject’s adaptive mechanisms in the context of a concrete subjective Reality.

Since the boundaries of individual consciousness coincide with the limitations of the intellect, *the intellect, in defining the limitations of consciousness as its own boundaries, “postulates” itself as the cause of these boundaries, and therefore it “considers” itself the cause of Consciousness*. This leads to the illusion that Consciousness is a function of thinking (is generated by thinking).⁴⁸ *Consequently, the mental map is a “map of Consciousness” within the concrete limitations of subjective reality, constructed by the intellect according to the general, objective rules of subject-based Reality*. And the intellect does not generate Consciousness but only “limits” it.

The intellect defines itself through the objective (logical) principles of the organization of subject-based Reality. With respect to a subject it is an “external” instrument for constructing a mental map. The intellect denotes the objective aspects of sensations and inner experiences that are accessible to the limited Consciousness. In this regard the objective components of sensations are alienated in the form of “external” objects of “object-based reality” as the source of these sensations. The intellect relates the objective component of emotional inner experiences to an individual’s needs, although they are actually the tools of the “Subject of Evolution” (i.e., objects of a “metasubject”). By using them (through the individual) the “metasubject” fulfills its “metaneeds.”

Let us sum up the results of our logical constructs.

Subjective reality is the reality of an individual consciousness that is directly given in a certain form (e.g., emotions, sensations, etc.). The limitations of individual consciousness are determined by a certain set of conditions of presentation of Reality to the Subject (physical, biological, social, etc.). We relate these conditions to a certain reference system (e.g., an individual), which is predefined in a certain subject-based space that describes a corresponding subject-based Reality, in which

the subjective realities of individual “consciousnesses” are defined. *Subject-based Reality* is limited both by the accessible forms of the processes occurring in it and by the principles of the construction of mental maps in the given subjectness. *Subjectness* may be defined as a set of reference systems that are equivalent within a specific class of conversions in a subject-based space.

Any permissible reference system defines subjective reality as the Reality “experienced” by the Subject from the concrete conditions (limitations) of subject-based Reality. In the paradigm of classical science it is interpreted as the first signal system, which informs us about the object-based reality “external” to it.

Object-based reality is defined by a subject in the second signal system cognitively (by the intellect) as the external source of any subjective reality.

Classical science can define in a noncontradictory way only “semiotically closed” systems that describe processes limited in content by “isolating them” from Development. Since Development takes place in “leaps,” which result in new finite contents, the classical scientific method is most suitable for describing these contents. This is the analytical (object-based) method of describing any stage of Development. A subject-based (holistic) approach applies systemic principles of investigating Reality. Under this approach we do not decompose systems into objects but explore the “target” relationships between holistic systems at various levels. Obviously, it is impossible to mechanically combine these two approaches simultaneously into a single theory.⁴⁹

In effect, classical science investigates Reality at the level of *meanings*, while the “semantic analysis” method examines it at the level of sense. It is therefore absurd to consider “subject–object” relationships, let alone “subject–subject” relationships. We can only recurrently analyze, in a noncontradictory way, the “target” relationships in the hierarchy of the Subject’s various reference systems.

From the standpoint of classical science, the Absolute (the Subject, Development, a continuum) is *fundamentally unknowable*. The “semantic analysis” method makes it possible to concretize, stage by stage, the semantic definition of the Subject (the world as a single entity), which is equivalent to investigating Development, although the process of understanding on this path is infinite.

In conclusion, we should say that the arguments made in this chapter are certainly not sufficiently rigorous, since the conceptual apparatus in this field is extremely poorly developed, and a number of so-called maximum concepts that we were forced to use are not signs at all and require that the “user” handle them with extreme care. Nevertheless, we hope that in terms of framing the problem of the Subject in science and the methods of investigating creative processes, our examination may prove useful.

In the next chapter we will attempt to use semantic analysis to explore ideas that were formulated more than 2,000 years ago in Buddhist and Daoist philosophy. In our view, it would be interesting to compare these approaches to an understanding of Reality. Such a comparison will make it possible both to refine our position and to reveal it more fully by using concrete historical material. One of the most interesting

schools of Buddhism was chosen for this purpose—Zen. We will consider the most difficult aspect, which has been presented in the modern scientific literature in an extremely contradictory manner—the analysis and interpretation of koans.

Notes

1. “In order for F to qualify as a formal system—so that one may always check, by means of a preassigned computational procedure, that a purported proof of some proposition is indeed a proof according to F’s rules—it is necessary that its infinite axiom system be expressible in finitely based terms. In fact, there is always some freedom about the way in which a formal system is represented, whereby its operations are designated as either ‘axioms’ or ‘rules of procedure’” (Penrouz, 1994, p. 219) [translation from Roger Penrose, *Shadows of the Mind: A Search for the Missing Science of Consciousness* (Oxford: Oxford University Press, 1994), p. 92].

2. “Some formal systems are presented as having *infinitely* many axioms—described in terms of structures known as ‘axiom schemata’—but to qualify as a ‘formal system’ in the sense that I mean it here, such a formal system would have to be expressible in finite terms, the infinite axiom system being generated by a finite set of computational rules. It is indeed the case that this is possible for the standard formal systems that are used in mathematical proofs—such as the ‘Zermelo-Fraenkel formal system’ that describes conventional set theory” (Penrouz, 1994, p. 148) [Penrose, *Shadows of the Mind*, p. 88].

3. The Subject construed as a principle of the unity of the world will be spelled hereafter with a capital letter.

4. It is still difficult to agree that “steak” from the perspective of physics, chemistry, and cooking is the same object, especially after an electron was both as “not a wave and not a particle” and as “a particle and a wave” even from the perspective of physics alone.

5. In other words, the Universe is regarded as an object.

6. Consciousness, as a “space” of meanings and senses.

7. The identification of certain properties has a genetic or evolutionary determination.

8. The concepts of “object-based Reality” and “objective reality,” as well as “subject-based Reality” and “subjective reality,” are not equivalent.

9. Any definition is in essence limited.

10. A single vector in a space of two or more dimensions cannot have single projections along all axes.

11. See a definition of *finite content* at the beginning of this chapter.

12. Its content is described by a formal system from whose axioms one can link, in a finite process (according to Gilbert) causes and effects by using a certain clearly predefined set of rules of derivation. The sequence in which the rules of derivation are applied reveals the content of the process. Objects in our theory are defined through the perception of the Subject, who is counterposed to these objects. Perception is determined by rules or operators that separate out certain holistic Gestalts from the receptive field. It is therefore more convenient for us to define objects not through object-based space but through subject-based space, in which these rules rather than the objects themselves are represented. Objects in our paradigm are derivatives of “operators of perception.” For example, in quantum mechanics the possible variations of states accessible to perception are determined through the actual meanings and actual functions of the relevant operators of energy, momentum, and so forth.

13. “The world thus appears as a complicated tissue of events, in which connections of different kinds alternate or overlap or combine and thereby determine the texture of the whole” (Geizenberg [Heisenberg], 1989, p. 62) [translation taken from www.naturalthinker.net/trl/texts/Heisenberg,Werner/Heisenberg,%20Werner%20-%20Physics%20and%20philosophy.pdf].

14. An example of insight is the discovery by D.I. Mendeleev of the periodic table of chemical elements, whose patterns and explanation (cause) were found much later, only with the creation of nuclear physics.

15. "In particular, the allotment of a separate place to a sense of free will stems from the fact that situations in which we encounter free will are incompatible with psychological situations in which well-grounded attempts at causal analysis are made. In other words, when we say the words "I want," we are thereby rejecting logical arguments" (Bor [Bohr], 1971, p. 398).

16. Any method, unfortunately, has its limitations. In this sense, science is a method of building various semiotic models of reality and is therefore limited by the principles of semiotics. Otherwise, science degenerates into a game without rules, similar to the "Queen's croquet" described by L. Carroll in *Alice's Adventures in Wonderland*.

17. In general, when provisionally defining any concrete reference system of the Subject that is included in the evolutionary process, including a species-based system—homo sapiens—it would be more correct to relate it to a *pseudosubject* (a *meta-* or *protosubject*). However, because the concept of a subject has become firmly attached to homo sapiens, we have decided to assign this term to homo sapiens, and with regard to any other reference systems we will write it in quotation marks. We will relate the entire Universum, as a totality, to the Subject of Development and write it with a capital letter.

18. In the process of the formation of physical Reality there have certainly been other reference systems as well, but identifying them is a job for physicists.

19. In semantic analysis, unlike objects, there is always one Subject of a creative process. It may have different levels of concretization that form a hierarchy and are differentiated by us through the intellect. It is only in this sense that one should interpret the expression "meta- and protosubjects" (the Subject's set of levels of concretization). In essence, the Subject is an attribute of the unity of Reality at any level of concretization. The actual idea of the multiplicity of "subjects" leads nowhere. A subject cannot be *defined* in any concept of the classical type. A classical type of theory should investigate the "subject-object" relationship (the interactions of the *defined* objects with an *undefined* subject, which is absurd). However, the principles of a holistic (subject-based) and analytical (object-based, multifaceted) understanding of Reality complement each other and cannot be applied simultaneously. This renders the very formulation of the psychophysical problem pointless.

20. No matter what the philosophers say, physicists have always sought a finite theory of "everything in the world," and this is fully in keeping with the classical approach. In this paradigm only the infinite number of objects and forms interferes with an absolutely unequivocal understanding of the content of the world.

21. A deductively closed set of propositions.

22. We have put the phrase "random process" in quotation marks since in this interpretation it is essentially not random, because it most probably stems from our laziness, an unwillingness to delve down to the truth or the impracticality of precise knowledge of this event.

23. The gist of it is that two quantum objects separated by an arbitrarily large distance can instantaneously "interact" with each other, that is, change as a single object.

24. In other words, quantum indeterminism turned out to be tied to the principle of measurement independence. It means that a physicist performing measurements of the energy of particles on Earth can be confident that the results of his measurements are not affected by the operation of the same device on Mars. Any attempt to construct a strictly causal quantum mechanics will require acknowledgment that this principle has been violated.

25. In the natural sciences the idea of God is also excluded from scientific consideration.

26. For example, in order for a sensation of tone or color to occur, there must be a spectral analysis of a signal of a certain duration, defined by the Nyquist frequency.

27. Actually, it is unclear whether we have the right to call these temporary signals a “flow of sensations.” It is more of a flow of “pre-sensations,” from which perceptions are “constructed.” The classical interpretation of a sensation is an instantaneous act, that is, nothingness.

28. Acquires meaning and sense.

29. A class of equivalent reference systems.

30. The reference is to common ones for all subjective realities, that is, “objective” ones, as the philosophers say.

31. The other properties, in effect, determine the initial rigidity of the object U_H .

32. The concepts of electrons now and at the beginning of the twentieth century are completely different.

33. Consciousness limited by a specific reference system.

34. Genetic, social, and others.

35. The conditions of attribution may be quite arbitrary for a subject, which plays the role of a demiurge with regard to the mental map that it generates. For example, certain races of ethnic or social groups may be denied subjectness, so then acts are permissible toward them within the framework of the class of “objects” in which they are defined (“a slave is a speaking tool,” in ancient Rome). It is possible to attribute subjectness to animals, such as in the depiction of reality from the “perspective” of a horse (*Kholstomer* [Strider] by L.N. Tolstoy); one can “award” subjectness even to inanimate objects (“Five Peas from a Pod” by Hans Christian Andersen). In mythological thinking, subjectness is normally attributed to forces of nature (Zeus, Helios, Demeter, Hephaestus, and others as the animated forms of the elements of nature).

36. The Einstein–Podolsky–Rosen paradox, which was discussed in the previous chapter.

37. In this context the world itself is posited as material and the concepts as ideal.

38. For example, orientations of which we are unaware are, in effect, objective principles that organize our behavior, which may become objects of consciousness in the context of a new subjective reality that arises in the process of a creative act or insight.

39. Subject-based Reality contains every opportunity to define object-based reality. In terms of semantic analysis, an object first stands out (is perceived) as the conditions for satisfying a certain need within the bounds of a given mentality, is defined by the intellect on the mental map and is alienated to object-based reality as the “source” of the relevant mental image. We use the concept of “object” in two senses: as an element of a mental map that conforms to certain conditions of satisfying a need (a means) from the perspective of semantic analysis and as the “source” of a mental map from the perspective of classical science.

40. In mathematics, the addition to an infinite set of any finite set does not alter it.

41. This is how the concept of the identity of one’s ego in the past and the possible future forms.

42. Many well-known paradoxes, dating back to antiquity, stem from this. For example, Zeno’s well-known paradoxes.

43. To be more precise, there is a change in the limits of the perception of Reality by a subject resulting from the “movements” or changes in the corresponding reference system in subject-based space.

44. Each state corresponds to a certain finite content.

45. In some languages there is even a verb form—“the future in the past.”

46. An electron, as a reference system, represented in the form of a “potentiality,” actually can (and simply is “obligated”) to interfere in the two slits.

47. In effect, the social mechanisms of private ownership are based on the operation of the cognitive, intellect-generated appropriation of what was alienated by the same intellect. In other words, a formal legal rule determines what is “not yours” and under what conditions it becomes “yours”—for example, in a purchase and sale transaction.

48. For example, Descartes's postulate "Cogito ergo sum."

49. The subject-based and object-based methods of describing Reality are supplementary, since they define various (mutually exclusive) aspects of the Universum.

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