Chapter 4
The Riddle of Creativity: Philosophy's View*

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Who Does Not Know What Creativity Is?

The Value of Creativity

Whether in the arts, science, religion, technology, the media, or everyday life, creativity clearly has high value and a positive connotation. This esteem holds across different cultures. Intellectually and aesthetically, creativity is highly prized in persons, processes, and products ranging from an individual's reputation to Nobel prizes. Although—or perhaps because—no one knows what happens as creativity occurs, people take great pleasure in creative persons, processes, and products, indeed, in creativity itself. Creativity is elusive, an intimate stranger, an inscrutable close friend.

Meaning and Sense of the Word

Who does not know what creativity is? Who does not know the difference between creative and noncreative persons, processes, and products? Yet when it comes to spelling out what creativity really is, no one seems to know the answer any longer.

Creativity has to do with bringing something new into being, into the world. It refers not to mere novelty but to something genuinely new, something that did not use to exist. Imagine that I am taking off my watch, putting it on the sheet of paper just in front of me, and writing the prime number 7 on the upper right corner of this sheet. Those acts are probably something new, something never been done before. But it is rather uninteresting and without value (at least for the time being).

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One could produce an infinite number of novelties just like it. That which is *creative* is always something genuinely new, illuminating, subjectively precious, and unprecedented.

This observation makes an initial crucial distinction: the differentiation between (a) creativity as mere novelty (the first appearance of something that results from uniquely combining antecedent elements according to given rules) and (b) creativity as genuine, or radical, creativity (the act of bringing about something fundamentally new). Mere novelties come about by combining known elements according to known rules in a way that has not been done before. The improbability of such combinations signals creative momentum. In fact, psychological tests sometimes use the frequency of such improbable combinations as a measure of creativity.

This combination theory of creativity quickly hits its limits, however. First, it can describe only how given elements of a given system are combinable, not what happens when a person modifies, violates, or even abandons the principles and basic rules of the system itself in creating a unique form of organization with its own new principles and rules. In other words, combination theory cannot effectively account for the point at which radical originality is achieved. Second, reference to a new combination does not illuminate how something radically new was made possible and what exactly it consists in. Combination theory presupposes creativity but cannot explain it.

As for radical creativity, one can think of pioneering and style-setting artists, including Beethoven, Cézanne, Picasso, and Michelangelo, or path-breaking research scientists such as Lobachevsky, Copernicus, Einstein, and Heisenberg. It pertains to generative systems (systems that contain, in a mathematical sense, all possible outcomes). Characteristically, radical creativity transgresses and even jettisons the rules and basic patterns of an underlying generative system in order to usher in new rules and principles and thus organize the material in a fundamentally new way. Well-known examples are the transition from Euclidian to non-Euclidian geometry, from the tonal to the atonal system in music, and from the linear to the ring-shaped concept of the benzene molecule within the carbon ring of Kekule.

Is There a Science of Creativity?

If radical creativity is attributed so basic a function, how does one describe and explain the character of the processes of creativity itself? After all, the cognitively and aesthetically enlightening, inspiring, and style-setting features of creative processes arguably:

1. Cannot be reduced to a set of antecedent elements and their principles and rules (which are violated and superseded in radical creativity)
2. Cannot be deduced (or, hence, forecast) logically, causally, or psychologically from such a given set of elements

3. Are linked more to luck than to reason
4. Are known to be quite spontaneous
5. Are unpredictable, and
6. Are characterized by discontinuities

These six aspects strongly suggest that no scientific explanation of creativity is possible in the narrow terminological sense of "science."

Can the semantics of science change to provide for a *scientific* analysis of creative processes, as when positing that creativity itself becomes inherent in scientific objects such as matter and the universe and thereby becomes a new paradigm in scientific research? The question is challenging. At the moment, an alteration of that sort would eventually modify science with regard to law-likeness, predictability, and the projectability of scientific predicates.

This prospect in no way implies that one must understand creative persons, processes, and products as romanticizing mystifications; the entire phenomenon of creativity must be placed beyond this dichotomy. Nor does it in any way imply that creative ideas occur only by chance, that one just has to wait for them. The opposite is the case. Apparently, intimate knowledge of the given field is necessary for a creative thought to leap out. Moreover, creative minds are usually workaholics par excellence. To cross boundaries, one has to know them. Picasso knew and mastered the dominant painting techniques of his time well before he came up with his own style. Schönberg mastered the mechanisms of tonal music before he started producing atonal compositions. Lobachevsky knew Euclidian geometry before he rejected the fifth axiom and thereby made way for non-Euclidean geometry. The cliché of the "lazy genius" is totally misleading.

Weak, Strong and Moderate (Intuitive) Creativity

Against this background, I distinguish three types of creativity: (a) weak creativity (the act of combining existing elements into new arrangements); (b) strong creativity (the transformation, violation, and replacement of old principles, rules, and patterns with new ones; see Hausman, 1998, p. 454); and (c) moderate, or intuitive, creativity (the phenomenon associated with the constitutive role that human imagination plays in human cognition, perception, language use, and representation). Let me elucidate the aspect of moderate, or intuitive, creativity in greater detail.

Perception and imagination. Whenever people successfully individuate the contents of what they perceive, say, and think, there is more to the process than meets the eye (on this point and the following two paragraphs, see Abel, 1999, pp. 145–168). Every actual situation (i.e., every situation existing at the present moment), also has constitutive nonactual components. Perceiving the person on the other side of the street as Uncle Paul means that one must immediately draw on constitutive former perceptions of Uncle Paul. "Imagination" is taken to mean precisely this individual capacity to bring the nonactual components (without which perceiving, speaking, and thinking would be impossible) into a present process

of perceiving, speaking, and thinking. Without this genuine imagination, a person would only see someone on the other side of the street but would not recognize the figure as Uncle Paul.

Imagination also enters into perception when one concentrates on the conceptual components of perception. Imagination is operant in the processes of (a) perceiving different objects of the same kind (e.g., recognizing a variety of objects as "chairs") and (b) having different perceptions of the same object (e.g., recognizing the book in front of me to be the book I bought in Berlin yesterday). Hence, both the identity of kind and the identity of concepts always presupposes *intuitive imagination*, which is the key element of intuitive creativity and a basically relevant facet of the other two types of creativity as well. Intriguingly, this constitutive role of imagination in perceptual representation is not represented in perception itself. Nothing about the perceived objects (percepts) reveals their dependence on their imaginative, creative constituents.

Meaning, reference, and imagination. Understanding the meaning and reference of a word or expression, whether natural or artificial, includes grasping the propositional attitudes of the speaker (or hearer) and the intended meaning(s) of the word or expression. But attitude and content are not conveyed by the syntactical occurrence of the word or expression alone. Imagination—and, hence, creativity—is necessary in order to assign and understand meaning successfully. Creativity is not entirely restricted to the extraordinary. It begins at home.

So does "reference." Nothing about a table suggests that it is denoted by the word *table* and that that word refers to the table. Establishing and fixing the relation between the intensional and extensional realm of a denoting sign depends on imagination. But this decisive relation is always presupposed when *table* is used to speak about tables and to refer to them. No successful cognition, meaning, reference, or representation is without imagination, without intuitive creativity. It is hidden but intensely relevant for human routines.

In mental representation, this statement holds independently of whether one is a propositionalist (such as philosophers Jerry A. Fodor and Zenon W. Pylyshyn, conceiving representation as a language-, sentence-, and proposition-like phenomenon) or a pictorialist (such as cognitive psychologist Stephen M. Kosslyn or philosopher Ned Block, conceiving mental representations as quasi-pictorial processes). In both views, imagination and, hence, intuitive creativity are necessary ingredients of cognition. Other clear cases of imagination in the developed sense are (a) memory (e.g., speaking and thinking about past events), (b) reference to possible future situations (e.g., mentioning one's birthday next year), (c) fictional discourse (e.g., understanding sentences like "Don Quixote plays tennis with Pegasus and Mr. Pickwick in Wimbledon"), and (d) counterfactual conditionals (e.g., understanding sentences such as "If Peter hadn't bought the car, he wouldn't have had the accident").

This intermediate, moderate, or, more specifically, intuitive creativity goes beyond weak creativity insofar as it does not merely combine given elements in a new way but rather brings presently nonactual aspects into the actual processes of perceiving, speaking, and thinking. But it is not yet *radical* creativity. Intuitive creativity also involves a form of negativity, which plays an important part in creating

something radically new.[1] The questions and problems pertaining to these three types of creativity—weak, strong, and moderate (intuitive)—likewise differ by type. They, too, are about novelties, the nonactual components of actual events, and radically new processes and things.[2]

Creativity in Psychology, Creativity in Philosophy

Psychological Features of Creative Persons

There is a difference between the treatment of creativity in psychology and its treatment in philosophy. To put it in a terribly simplified way, the focal interest in psychology lies in the personality features of creative individuals and in their psychic motivational profiles that are conducive to creative actions. Examples are Wallas's (1926) identification of preparation, incubation, illumination, and elaboration as phases of the creative processes, distinctions that in principle go back to Helmholtz (1884) and Poincaré (1908).

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[1] Creativity does not thereby become a negational act. Creativity is a positive, positioning act. It is *positio*, to borrow a term from medieval philosophy. Creativity is, however, internally tied to a form of negativity (whose broad sense includes more than logical and grammatical negation) as part of its new positioning activity. Thus, one cannot state positivist grounds for creativity in a strict sense. Consider also the aspects characteristic of radical creativity (see this chapter's subsection entitled "From Possibilities to Potentialities"): the violation of established rules, the establishment of differences, the withdrawal from familiar horizons, and the renunciation of hitherto existing worldviews and established norms and standards. The presence of nonactual components within actual processes of creativity is constitutive for all these processes. In addition, the modal connection between creativity and potentialities and the distinction between "nothing" (*Nichts*), "not-yet-being" (*Noch-Nicht*), and "actual reality" (*Aktual Wirkliches*) might be helpful in elucidating characteristics of creativity's processes. For these reasons, a comprehensive philosophy of creativity must include the relation between creativity and negativity in a systematic way. *Positio*, *negatio* and their interaction are characteristic for creative processes, states, and abilities.

If creative momentum is required in each individuation of things or processes as such-and-such things or processes (in assigning or denying qualities that do or do not belong to the essence of a thing or process), then an element of creativity appears in Spinoza's famous phrase "determinatio negatio est" (determination is negation), which he communicated in a letter of 1674 (see Spinoza, 1977, p. 210). According to Spinoza, the figure (*figura*) is negation in that mere matter is indefinite in itself and therefore without figure. That is, matter in itself does not possess figure (*gestalt*). Hegel (1832/1975) elevated this momentum to the thesis that negativity is inherent in the form. He saw the inner "ground" of the becoming (*Werden*), of the "unrest of self-motion" (*Unruhe der Selbstbewegung*), and of the "pulsation of liveliness" (*Pulsation des Lebendigen*) as being based on this form of negativity (vol. 1, p. 157; vol. 2, p. 61).

[2] At this point, still finer distinctions are necessary: (a) epistemic creativity (concerning the generation of new epistemic objects); (b) semantic creativity (concerning the "semantic innocence" and the new organization of the semantic features of signs, that is, their meaning, reference, and conditions for truth or satisfaction); (c) agent creativity (concerning the bringing into being by human actions); and (d) cognitional creativity (concerning the changes in cognitive horizons, principles, and rules of individuals or other generative systems).

Creative individuals have a number of psychological characteristics, including a well-developed sense of imagination; advanced problem-solving skills; the ability to construe new structures and find regularities quickly in seemingly chaotic situations; a willingness to challenge traditional assumptions, standards, and norms; and the production of surprising visualizations. To arrive at scientific answers to the types of questions pertaining to this make-up, psychologists have required subtle tests, models, survey procedures, and sound interpretations thereof to provide a basis for an explicit psychometrics of creative attitude—an intense field of research in recent decades (see Lenk, 2000; Sternberg, 1999).

As part of that foundation, one aspect of the psychology of creative persons deserves special mention in this chapter. It is that highly creative individuals, more than other persons, risk becoming overwhelmed by stimulation because they usually expose themselves to a rather unfiltered flow of it. However, they are often able to use this surfeit chaos productively, channeling it into their output. (The fact that this later transfer does not always succeed, as the lives of creative persons show at times, is presumably the ultimate meaning of the observation that being creative can be highly uncomfortable, even mortally dangerous.) Such overflow and the ability to transfer it into acts and products of creativity should be distinguished conceptually and empirically from the kind of overflow evident in cases of clinical psychoses, such as paranoid schizophrenia. That condition is depicted, for instance, in the film *A Beautiful Mind* (2001), the story of John F. Nash, who received the 1994 Nobel Prize in economics for his contributions to establishing the mathematical principles underlying game theory, an examination of the rivalries among competitors with mixed interests.

Psychological and psychiatric models of creativity are sometimes jeopardized by methodological inadequacies stemming from the orientation to "normality" in their tests, models, and survey procedures and by the fact that their authors often unwittingly presuppose the phenomena of creativity rather than explain them. Despite Plato's assertion that genius is a state of divine insanity, Hans J. Eysenck (1993), a researcher in the fields of intelligence and creativity, has clearly shown that a genuinely creative state cannot be equated with a psychotic state or be seen as one of its manifestations. Eysenck has pointed out that schizophrenia kills all creativity. Similarly, Salvador Dalí (1942, p. 349, note) appealingly remarked that the sole difference between him and a madman is that he is not mad.

Philosophical Assumptions About Creativity

The philosophical question of what creativity is does not center on personality traits of creative individuals but rather on phenomenology and the structures of creative processes themselves. This section offers a brief phenomenology of creativity, the elements of which I call "assumptions about creativity"—the set of requirements that one presupposes as given and satisfied in cases where creativity is ascribed

to persons, processes, and products. Possible assumptions about creativity might include the following acts:

- Generating multidimensional associations
- Coupling predicates and subjects to unusual judgments
- Building analogies between remote realms or referents only remotely associated with each other
- Producing metaphors and transferring them from one area to another in order to organize material in a new and informative way
- Simultaneously activating two or more ideas, images, or thoughts and having them interact
- Prompting thought experiments
- Breaking common and established patterns of observation
- Modifying and violating traditional ideas
- Risking discontinuities
- Changing cognitive perspectives
- Raising new points of view
- Juxtaposing methods of one discipline with those of others
- Risking category mistakes
- Switching between different systems of description
- Constructing new epistemic objects as the subjects and entities of cognitive and scientific research
- Modifying hidden collusions
- Modifying, transforming, and violating established rules, principles, patterns, and worldviews

These and other features touch on the phenomenologically and structurally intrinsic features of processes of creativity itself. They also mark the difference between a bounded and a free, creative mind. Of course, merely having some of these features does not guarantee that creativity gets off the ground. They are assumptions about creativity, not criteria of its occurrence. Individually, none of the aforegoing assumptions is either sufficient or necessary for creativity and its ascription. But together they can be sufficient, and each of them can separately be necessary.

Computational Psychology of Creativity

Within computational psychology and cognitive sciences, creativity is usually explained and defined as "the mapping, exploration, and transformation of structured conceptual spaces" (Boden, 1994, p. 84, 2004). From this perspective, "conceptual spaces" can be modeled best in computational terms. Computational psychology pertaining to creativity rests on concepts used in research on artificial intelligence, that is, on the question of what kind of human skills one wants to teach

computers (e.g., perceiving, speaking, thinking, and—in robotics—rudimentary movements).

The issue of the relation between a computer's skills and creativity is interesting. On the one hand, every activity of a computer is based on human creativity in the sense that the computer has been programmed by humans. On the other hand, it is possible that computers can be creative in the weak sense introduced above. Boden (1994, p. 85) poses four questions to which common sense would immediately answer "No!" but to which the computational psychologist would answer "Yes!":

1. Can computational concepts help people understand how *human* creativity is possible?
2. Can computers (now or in the future) ever do things that at least appear to be creative?
3. Can computers ever appear to recognize creativity—say, in poems written by human beings or in its own novel ideas about science and mathematics?
4. Can computers themselves ever really be creative (as opposed to offering performance whose originality is merely apparent and due wholly to the human programmer)?

Boden's responses to the first three questions are "*Yes, definitely*; *Yes, up to a point*; and *Yes, necessarily (for any program that appears to be creative)*. In short, computational ideas can help us to understand how human creativity is possible" (p. 85). This is the case because a computer, understood as a generative system, can do only what its program allows it to do. That is why computers are so ideal and interesting with respect to the question of creativity.

I criticize this basic assumption of computational psychology on two counts: (a) the fundamental failure of computer functionalism as a comprehensive theory of mind, especially of the creative mind, and (b) the basic understanding of a generative system. The prevalent idea that the human mind is like a computer[3] posits that mental—hence, also creative—states and processes can be compared to functional and logical states of computers and that they can be described and explained as one would the functioning of computers (Putnam, 1975, pp. 325–451, articles 16–22). In this conceptualization the creative mind is part of the software. Accordingly, it is possible to formulate conditionals. For example, when the generative system and the mind are in a definite state, then a definite input leads to a definite output and therewith to a new definite state. This model is highly attractive because it does not tie mental states and processes to neurobiological realizations and reductions.

But a key objection to it comes from Putnam (1988) himself, the very founder of computational functionalism. He points out that functionalist models of the mind and those based on calculus hit their limits as soon as interest turns to having a comprehensive theory of human cognition, especially of the creative mind. (Though Putnam does not explicitly refer to the *creative* mind, it is clearly implicit in his considerations.) People cannot individuate the contents of their beliefs and ideas

[3]For a more detailed description and critique of this model, see Abel (2005, especially pp. 12–18).

within conceptual space without considering aspects located outside the human brain conceived of as a computer. This impossibility especially applies to the individuation of the contents of creative processes, states, and phenomena. To clarify the semantic and representational features of the creative signs involved in these processes, one must consider many aspects of the relations between signs, time, situations, attitudes, and contexts that are not based on calculus. The creative mind cannot be analyzed or individuated by means of calculus. Above all, computational psychology's model holds that the process of breaking rules and principles, which is characteristic for radical creative thinking, must be regarded as calculable in principle. But obviously, the creative violation of established rules does not follow any meta-rule. That fact is the point of radical creativity. And insufficient intelligence is certainly not the reason for the absence of proof that human creativity is based on calculus.

The second reason for criticizing the basic assumption underlying computational psychology is the concept of a generative system, specifically, the boundedness of creativity to signs and systems. The next section deals with this aspect of my refutation.

Creativity and Signs I: Creative Processes as Signo-Interpretational Processes

Presumably, the most basic characteristic of the human mind, particularly the creative one, is to use and understand symbolizing signs (see Abel, 2005, especially pp. 20–23). Mental creative processes are performed as signo-interpretational processes. The idea is not that mental and cognitive operations are simply operative manipulations of given inner signs (which is the view characteristic of cognitive science and computational psychology). Nor is it that they can be characterized by the new combination of preexisting elements, as claimed in the combination theory of creativity.

It does not mean merely the human mind's dependence on external signs, either—at not least in the sense that a creative mind needs intermediary signs in order to articulate, present, and communicate its forms and contents to other persons. One must take one step more. In the words of Peirce (1960): "We have no power of thinking without signs" (no. 5.265). He even goes so far as to say: "When we think, then, we ourselves, as we are at that moment, appear as a sign" (no. 5.283). Pushing the point, I add that there are no creative minds without signs, with the expression *sign* being understood broadly as including a holistic sense of cognition and intuition. Given the internal relation between sign and interpretation, creative thinking can inherently be described as a signo-interpretational process. People think and are creative by *virtue* of signs, not by means of them. A creative mind is an individual mind capable of channeling these elemental processes in a new, rule-setting, and style-forming way. A creative mind uses given signs in a new way. It invents new signs and interpretations and implements new rules and patterns

for their functioning. These three capacities are the signo-interpretational trio of human creativity.

Generative System and Tacit Knowledge

When it comes to system relatedness in the computational and empirical sciences, a generative system always accompanies tacit knowledge. To me, that understanding of tacit knowledge is insufficient. In this context the term really means something entirely different from the sense it has generally had ever since Ryle (1949) and Polanyi (1958, 1966) distinguished between "knowing-*that*" and "knowing-*how*." According to both authors, tacit knowledge refers to those forms of nonpropositional knowledge that cannot be articulated by a *that*-clause and that refer instead to knowing-*how* (as in knowing how to open a bottle of wine).

In connection with generative systems, the expression *tacit knowledge* appears in the sense used by the strand of language philosophy in which language is said to be a generative system—a system that, because of its orthographic symbols, contains, in a mathematical sense, all sentences ever possible (see, for example, Davies, 1986; Dummett, 1973; Evans, 1982; Miller, 1997). Accordingly, a competent speaker possesses the tacit knowledge with which to understand and compose every possible sentence. Ultimately, a quasi-axiomatic structure of language is posited, a structure that defines all possible sentences and inferential relations of that language. Tacit knowledge, therefore, refers to this presupposed structure of a language. It also offers an answer to the question of how it is possible for speakers or listeners of a natural language to produce or understand the infinite number of sentences they have never built or heard before. To put it another way, how is it actually possible to learn a natural language?

The link between a pretended complex of tacit knowledge and the question of creativity is readily apparent. Within formal and ordinary languages the functioning of tacit knowledge and creativity is thought to be about variations of techniques. The character of those languages is thought to be modeled on the patterns of formal semantic theories. The compositionality of meaning, the principle according to which larger linguistic units are composed of smaller ones, is obviously important in this context. It seems that this notion addresses the complex of problems concerning creativity. However, it does so only in the framework of combination theory, the limitations of which I have identified above. If meaning is made up of the elements of a sentence, then it seems as though new combinations of those elements will lead to new meanings and could therefore be called creative.

In my opinion, neither the quasi-axiomatic understanding of language as a system nor the notion of meaning's compositionality is able to explain what radical creativity really comes to. The phenomenon of radical creativity reveals the limits of formal semantics in attempts to explain ordinary creative language. Obviously,

creative speaking, thinking, and acting cannot (Wittgenstein, 1980) be described as the result of a calculus with determined rules. The point is not just to arrange elements in a hitherto unknown way but rather to modify or violate established rules and principles, even to supersede them by setting up new ones.

How Does Creativity Proceed?

Creativity and Signs II: The Space of Arbitrariness and Polysemiosis as the Space of Creativity

I have just advanced three theses: (a) Creative processes can be conceived as signo-interpretational processes, (b) There is no creative mind without signs, and (c) Creativity is not to be understood as a mere operative (i.e., merely instrumental) manipulation of given signs with their own exact and delimited meanings. The additional aspects identified in this section bring out what I call the *potentiality space of creativity*.

Every actual use of signs can be labeled "new" in the sense that using and understanding a sign is not simply a replication or recursion of an established convention. The time interval alone precludes the use of any sign in exactly the same way twice. This fact, too, opens up the space of creativity. Language, like any other network of symbols, is not a conventional system with predefined structures that humans first learn and then apply to given situations and contexts. The codes of natural languages are not guaranteed in advance and once and for all. Their lives are "à la merci du lendemain," at tomorrow's mercy (de Saussure, 1957, p. 72; see also Frank, 1991, pp. 55–57).

Creativity in natural languages and other symbol systems makes use of this openness and of the arbitrariness and polysemous nature of signs and languages. Radical creativity is manifest in transforming, violating, and, if necessary, replacing the previous and established structures determining a use of language and other signs. Wit, irony, and metaphors are examples in this context. The human ability to build new sentences and new chains of signs suggests that the meaning of words and symbols are due to the compositionality principle. As for the semantics of sentences and signs, compositionality can account only for the combining of separate elements, that is, for weak creativity. It cannot appropriately explain strong or radical creativity. Radical creativity is not just a matter of content consisting in a combination of single units. It pertains to content consisting of fundamentally new sign formation (including the assignment of its semantic features) that goes beyond the meanings of its parts. It ranges up to inventing new signs and features and to construing new epistemic objects and states of affairs. Hence, the formation embodies more than the sum of the elements composing it. However, radical creativity typically modifies and violates a sign's hitherto existing form and content, overtakes it, realigns

it, or even replaces it with newly invented signs and their semantic characteristics (meaning, reference, and conditions of truth or satisfaction).

Signs and sign systems have two aspects that are all-important to creativity space. One is their arbitrariness, "the displacement of the relation between the signifier and what is signified" (de Saussure, 1957, p. 6). It opens up a space of noncalculable and indeterministic characteristics and, hence, possibilities of meaning and reference. The other aspect is their *polysemiosis*. The word is derived from *polysemy*, meaning the multiple meaning and reference of a sign or a sign system. I regard it as a term that enlarges and changes Peirce's (1960) and Morris's (1971) notion of *semiosis* as a process of effectiveness in using and understanding signs. Polysemiosis, too, opens up space for determining meaning and reference. Creativity in signs and languages may in some sense be tied to syntactic and grammatical features. But the central thing is that creative processes always have the power to push the established features, rules, and principles beyond their conventionally prescribed ends. Strong creativity uses and fills this indeterminate space of arbitrariness and polysemiosis, which one might call the signo-interpretational space of creativity.

Given the key role that the arbitrariness and polysemiosis of signs play in creativity space and given the fact that a creative mind having no signs has no power either, the relation between a sign and its successor sign becomes pivotal. Signs are usually followed by other signs. And these successor signs either perpetuate the use and understanding of their preceding signs or they interrupt this continuity (as when one has a problem in using and understanding a sign because its interpretation has become disputable). This point is paramount because it dismisses a particular model of creative language and nonverbal signs, one according to which the successful creative use of language and signs involves processes that render implicit structures explicit and places inferential semantics at the bottom.[4] The model can answer neither the question of creativity nor that of many other phenomena (such as the diverging, metaphorical, ironical, or fictitious use of signs).

The relation between a sign and its successor sign is neither an inferential nor a deterministic relation (logically or causally). It is a *free* relation that, in cases of successful communication, is nonetheless characterized by the fact that the "right" or "fitting" successor sign is directly understood. Take, for example, a successor word in a conversation or a successor line or successor image in a poem. Or think of a flash of inspiration in mathematics that solves a heretofore unsolvable problem. Obviously, the creativity of inventing new and directly understood successor signs is essential in such cases. It is relevant above all when the rules of using signs have been revised, violated, or even replaced by new ones. This matter touches on the question of the relation between creativity and rules.

[4]This understanding of the functioning of languages, especially that of creative languages, differs fundamentally from Brandom's (1994) view, which is being widely discussed at present.

Creativity and Rules: Rule-Following, Rule Violation, Rule Invention

Logical or causal determination is absent not only in violating a rule but also in customary rule-following in normal language.[5] Hence, intuitive creativity is at work even in normal rule-following creativity. The operating rules of actual speaking and thinking do not determine the future use of a word, sign, or thought, just as past usage does not determine the current one. These two aspects are part of the space of linguistic and nonlinguistic creativity (e.g., pictorial, graphic, musical, gestural, or mimic creativity) as well.

This concept of rule-following reinforces the manner in which the determination and reorganization of the semantic characteristics of signs depend on interpretation. As already underlined, creativity with regard to language and signs consists essentially in using this space or scope of indeterminacy. And radical creativity consists in reorganizing this space by implementing new rules or principles, changing, and, if necessary, violating the established ones. Instances of these processes are wit, poetic language, and the creation of metaphors. Another example is the diachronic semantic characteristics of the words and signs used, say, for epistemic objects—such as the terms *atom*, *galaxy*, or *gene*.

It may be that only the *conscious* violation of established rules bring something genuinely new into the world. But creative rule violations are not intended to achieve a state of chaos at all. Kant stressed this point when he emphasized that the ability to create and set new rules is to be called *ingenious* and is crucial for art. The creative mind is rule-setting, not a mind of self-satisfying rule destruction. Nietzsche had a name for those who destroy rules but who lack the power to create new ones: "decadents."

To characterize an ingenious mind as a rule-setting mind (or, in the arts, a style-setting mind) means much more than to say that it grasps concepts. Rules cannot be modeled as concepts. In the arts, for instance, even a newly established rule or style cannot be used as a principle for the production of future works of art, although imitators and mannerists would have people believe otherwise. The point about *creative violation of rules* is twofold: (a) rule violation does not follow a meta-rule, and (b) one opens up new and deep insights by establishing new and revealing rules with the greatest of ease. Something of the deep correlation between truth and creativity flashes in this realization (see Abel 2009, in press). Truth (in the broad sense of the word) is located in this open space of indeterminacy, and creativity is instrumental in ferreting out truth.

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[5]This idea of linguistic rule-following must be extended to the entire field of *nonlinguistic* signs. It contradicts the view that language is a quasi-axiomatic system having rules that a speaker first acquires and then applies to given cases. That concept misses the central point of what it means to speak a language and be in relation to other persons and to the world by virtue of a language. The sense of "rule-following" that I address here is the one Wittgenstein elaborated (see especially Wittgenstein, 1980, nos. 198–242).

This view has a bearing on the relation between creative thinking and the concept of "rule." Given the difference between strong and weak creativity as introduced at the beginning of this chapter, one must also distinguish between different kinds of rules. Hintikka (1997) has distinguished two types: (a) definitory rules, which in chess, for example, establish what counts as an allowed or as an unallowed move with the pieces; and (b) strategic rules, which, as developed in game-theory, "specify what a given player should do in every possible situation that can arise in the course of a play of the game" (p. 68). In Hintikka's view, the definitory rules are not linked with creativity. To him, creativity "is a matter of strategic rules" (p. 68).

Unsurprisingly, I argue for broadening the types of rules: (a) definitory rules, (b) strategic rules, and in cases of radical creativity (c) regularities that build up in the indeterminate openness, arbitrariness, and polysemiosis of signs and their successor signs and interpretations. Works of art, pioneering scientific theories, and individual forms of life emerge from and move toward this space.

From Possibilities to Potentialities

The fact that new things come into being shows that they are possible. Philosophically, the relation between creativity and possibility is fundamentally relevant. It transcends the combining of given logical possibilities (weak creativity), including the idea of possible world semantics; it encompasses creative dispositional potentialities (strong creativity). The realm of potentialities is much more extensive than the realm of logical possibilities, which consists in the principle of avoiding self-contradictions in biconditional yes–no alternatives. Radical creativity has to do with dispositional potentialities. Obviously, there are possible and real things and events (not to mention forms of life and mental states) that have to be classified as impossible by the criteria of what is logically possible in the narrow sense of possibility. The form and content of paintings by René Magritte or drawings by M. C. Escher, though logically impossible, are directly grasped, pretty real, and not nonsensical. The modal element, understood in its deep sense as potentiality, comes into play within creative processes, persons, and products. More precisely, it is an essential working part of the picture.

The point of a language is not that it consists of the letters of an alphabet and that various combinations of these letters are possible in order to form words, sentences, and whole discourses. The point is rather that language is a potential: "La langue est quelque chose de potentiel, la parole est du réalisé" (de Saussure, 1957, p. 20). The distinction that Aristotle drew between potentiality and actuality can help make decisive differentiations between kinds of creativity, namely, Nothing, Not-Yet-Being, and Actual Reality. Inasmuch as people are not up to considering creativity only as a *creatio ex nihilo* (creation from nothing), this demarcation can be helpful. Technological artifacts—technical machines and systems—are invented and tangibly brought into the world. Technical creativity, artifacts, and technology

itself would all be miracles if they were looked upon as *creationes ex nihilo*. Artifacts do not come from nothing.

But I wish to emphasize a critical point about Aristotle's concept of *actus* (actuality) and *potentia* (potential). To Aristotle, the concept describes ontological movement, a transformation of potentiality into actuality. With a rock, for instance, this transformation could be the move from potentiality into a statue by an artist, that is, into the reality of being a statue. But an ontology in which something's unfolding is predisposed threatens to divest strong creativity of its radical character. For strong, or radical, creativity becomes challenging the moment it breaks into ontology, into the assumptions of metaphysics themselves. Neither radical creativity nor radical temporality, which are internally linked, figured in classical metaphysics.[6]

Creativity as Emergence

How does the creative mind fit into a naturalistic and scientific worldview? I propose that creativity can be conceived of as a phenomenon of emergence, a "surprising coming about," with emergence being understood as a given in both the philosophy of mind and the systemic sciences of complexity, such as synergetics, self-organization theory, and chaos theory (on emergence, see Beckermann et al., 1992; Krohn & Küppers, 1992; on the history of emergentism, see Stephan, 1999). Emergent phenomena and creative processes share key characteristics, particularly three to which I have called attention in this chapter to describe the features of creativity: (a) radical newness, (b) unpredictability, and (c) nonreducibility to antecedent elements.

A second response to the question of the relation between the creative mind and a naturalistic, scientific worldview is today's mainstream meta-theoretical perspective on emergence in synergetics, self-organization theory, and research on chaos theory. The central point is that the genuine process character of creative events cannot be described in terms of either the starting or the ending situation. Phenomena of this kind are usually called emergent phenomena. This component of creativity raises the question of how creative processes can be described, characterized, and

[6]Unlike Plato, who saw divine inspiration as the root of creative minds, creative processes, and products, Aristotle conceived of creative processes or acts only as new instantiations of preexisting forms. According to him, creative production can result only in whatever was already predisposed in the antecedent form. In this sense Aristotle's philosophy provides instruments for weak creativity only; it does not suffice for a satisfying treatment of radical creativity. Whereas Plato ultimately jumped too quickly to the idea of divine and irrational inspiration (of course, this assessment is a simplification of Plato's thought), Aristotle came close to reducing the nature of creative processes to little or nothing more than the act of updating antecedent forms. The challenging problem of creativity becomes paramount with the insight that creative processes and products are not reducible to antecedent elements and forms.

interpreted at all when the vocabulary of neither the initial nor final situation is able to articulate the specifically new and creative character of these processes. The problem of describing, presenting, and representing creativity thereby becomes one of the language used to communicate about creativity.

To grasp the difference between a "philosophy of creativity" and "research on the systemic theory of creativity," one must first understand that both fields deal with (a) the relation that the phenomenon has to a generative system and its systemic properties and, more important, (b) the phenomenon's newness cannot be ascribed to systemic properties in a reductionist way. Thinkers engaged in system-based scientific research emphasize the first of these two aspects. Those engaged in philosophical research accentuate the second aspect and try to elucidate creativity in terms of phenomena and concepts, including creative processes, persons, and products. This interface between philosophy and science is intriguing, especially when radical creativity modifies, violates, and even replaces the principles and patterns of the underlying generative system. Theories of systemic complexity will therefore not have the last word in the elucidation of radical creativity. Shifting from complexity theories to creativity theories could make creativity a new paradigm of scientific explanation, too. Such an explicit step has yet to be taken as far as I can see. But something of the sort is already going through people's minds.

The question and phenomenon of creativity is currently felt to be a challenge for science itself. I do not mean only the possibility that "science" may have to surrender in the battle to explain the phenomenon of creativity, be it in neurobiology, modern brain research, or computational psychology. The challenge goes deeper than such renunciation as soon as it becomes necessary to grasp the processes of nature itself as being internally creative. Discussion about creative universes in astrophysics is not the only discourse that goes conspicuously in that direction.

But philosophy is no better off than science when it comes to explaining the phenomenon of creativity. The enormous impact and challenge that the question of creativity has on what philosophers themselves understand philosophy to be is obvious. Ultimately, the phenomenon of creativity leads directly to the question of whether the character of "what there is" is one of metaphysical determinacy or indeterminacy, of permanent pre-established being or radical processual becoming, of an a priori order or of unpredictable and incalculable processes. The entire issue exists within both the smallest and the biggest worlds, ranging from the events among elementary particles to astrophysical processes, from the creativity of human individuals to their interactions with other persons and the world.

The Smallest Contains the Biggest

Ontologically, what one states to be the components or building blocks of nature or the world is crucial. Thus, it makes a key difference whether components or

building blocks of nature are posited as things in the sense of material objects occupying space–time–places or rather as processes and events.

I share the view held by those who understand the world as a world of processes, of process things (see Abel, 2004, pp. 222–235). This view is consistent with thinking in modern physics. Indeed it is consistent with the dominant idea within the sciences in general, which is to understand physical objects as sequences of processes or events, which for their part are no longer seen as having the categorical status of "things" (with their paradigm of material objects). Hardly anything is proper for comparing microphysical structures ("particles") with macroscopical objects, which had been the major paradigm of *thing*-ontology. In modern physics, a thing is conceived of as a series of processes or events that are linked in time and identical in type. The physical identity identicalness of individual objects across a time interval is based on the type-identicalness of the processes or events involved.

The assumption that there are process things is required also by the logical form of many kinds of linguistic sentences. In the field of analytic philosophy and after the preliminary work of Reichenbach (see 1947), Davidson (e.g., 1967) showed that the logical form of many of the sentences of our natural language cannot be construed without the assumption regarding processes or events as genuine individuals. Examples of such sentences are those expressing the relations of order in terms of temporal succession, causality, explanation, and action. Take the following sentence, for example: "The creativity conference opened in the main lecture hall of the university and then spread out over different rooms and lasted several days." A person understanding that statement casts processes or events as genuine individuals (in this case, "conferences" spreading out over different spaces and times) and not merely as things to which something happens (e.g., a wooden desk occupying a space–time–place and getting darker in color) (see Abel, 1985, 2004, pp. 222–231).

The shift from this kind of process philosophy to creative processes (and, for instance, to the idea of a creative universe) is readily accomplished. The processes mentioned can be characterized as processes of dynamic variations, of creative development, of dynamic reorganization and new organization—in short, as processes of perpetually creating something new. They can therefore be described as *creative* processes in a broad sense. Every natural process of transformation into a newly organized flow and figure may be understood as a formation of something new (as thought by Whitehead, among others). The spectrum of these processes, then, extends from elementary particles to the formation of new stars in the universe, including the emergence of creative ideas in the minds of individual persons.

How the processes of the continuum between, say, the Big Bang and the creativity of the human mind can be understood is a thrilling question. The relation between creative elementary particles or universes and creative individuals or human minds is *not* that of the relation between the universal and the particular. It is not a discursive relation of having the universal subsume particular cases. It might rather be about the relations in which the universal and the individual were once considered to be of the same nature in principle, as in the tradition of

philosophy especially in Cusanus (1440/1977) and Leibniz (1720/1998). From that kind of viewpoint, the universal is conceived of as being determined through infinite degrees down to the individual; and, reciprocally, the individual is conceived of as being determined up to the universal. To elucidate this type of internal relation between the universal and the individual, I offer two phrases from Cusanus (1440/1977) along with my own translation:

- "In qualibet enim creatura universum est ipsa creatura" (for in each creature the universe is this creature itself) (Book 2, Chap. 5, p. 36)
- "Individua vero sunt actu, in quibus sunt contracte universa" (only those individuals are real within whom the universe is present in a contracted way) (Book 2, Chap. 6, p. 46)

In a contracted way, each individual, each finite being, contains the whole universe. The smallest contains the biggest.

If asked today, here and now, astrophysicists would be apt to say that humans would not even be here and that the human mind would not work the way it does if it had not been for the Big Bang. Conversely, one hears that there is a continuum between the lone individual and the universe, a continuum from which the individual issued and to which that individual's perceptions, actions, thoughts, and theories refer. How people see themselves as human beings, as individuals, within that picture and how they do fit into it are two of the most challenging issues at the interface of current philosophy and modern sciences or the scientific worldview. Thus, whatever is brought into existence by an individual in a creative way can be seen as a creative modification of the universe at the same time. And reciprocally, the universe manifests itself within the creative individual and, in turn, is conceived of by that individual as he or she sets up a creative theory of the universe. The creative human mind specifies the whole by casting itself as something different from the universe, that is, in a relation of negation to the whole. It adopts the status of negative, selective attention, which is a precondition for every concept formation (see Kant, 1781/1968, B 156, footnote) and which one may call a creative attitude. This self-recursive or Möbius-strip-like structure is fundamentally relevant, given the position of human beings in nature. The creations of individuals contain the universe, and creative individuals can create new things in the universe. And they do so with remarkable success!

The idea that the universe is a "creative advance into novelty" was developed especially by Whitehead (1929, p. 222). Today this notion is far from being tied solely to his name. One encounters it in the present concepts of astrophysics (see also Kanitscheider, 1993). The difference between Whitehead's approach to the question of creativity and the one put forth in this chapter is that I have not directly assumed an ontology of "actual entities." Instead, I have focused on the presupposition that people's sentences, actions, and thoughts make logical sense. In the context outlined above, one also comes to conceive of nature as process nature and subsequently to conceive of these processes as creative processes in the broad meaning of the term. Creativity is not only an option, it is also a condition of vital truth.

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