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Research article

Hermeneutics of Science – Technical Assessments and Hidden Horizons of Meaning

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Abstract

By writing, we inscribe the world around us and carve it into meaning. This idea of Jacques Derrida, which postulates that the function of the written text is not merely to describe but to actively create a new world, has found wide resonance across disciplines. Specifically, the article focuses on writing understood as a performative act of naming and classification – a universal mechanism of world-creation. This raises a critical question: can scientific texts, often seen as neutral descriptions of reality, also construct their own worlds, serving as horizons for creative interpretation and hermeneutic engagement? The article systematically examines arguments against applying hermeneutics to scientific texts, including their presumed transparency, reliance on empirical verification, and the formal rigidity of scientific concepts. Critics assert that scientific statements derive meaning solely from their correspondence to observable reality, leaving no room for interpretive ambiguity. However, the author counters this view by demonstrating how scientific texts, like artistic or philosophical works, generate their own contexts – whether through theoretical paradigms, "hidden worlds" of unobservable entities (e.g., atoms, social structures), or aesthetic criteria like elegance and simplicity. Examples from the history of science (e.g., Kepler's laws, Weber's Protestant Ethic) illustrate how scientific meaning emerges from interplay between formal statements and their interpretive horizons. Ultimately, the article advocates for a hermeneutic approach to science, revealing how scientific texts transform both their subjects and their readers, bridging the gap between empirical rigor and the creative construction of meaning.

Keywords: Science; Hermeneutics; Language; Naming and Classifications

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Научная статья

Герменевтика науки: Формальные критерии и скрытые горизонты смысла

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Аннотация

Путем письма мы выписываем мир вокруг нас и высекаем в нём смыслы. Эта идея Жака Деррида, утверждающая, что письменный текст создаёт новые миры, а не просто описывает существующий, нашла широкий отклик в различных дисциплинах. В данной статье мы рассмотрим письменные высказывания как перформативный акт именования и классификации – универсальный механизм миротворчества. В этом контексте поставлена главная проблема исследования: способны ли научные тексты, традиционно воспринимаемые как нейтральные описания реальности, в свою очередь конструировать собственные миры, становясь горизонтами для творческой интерпретации и герменевтического осмысления? В статье систематически анализируются *аргументы* против применения герменевтики к научным текстам и высказываниям. Эти аргументы опираются на их прозрачность, процедуры эмпирической верификации, а формализованность и строгость научных понятий. Особое значение имеет то, что научные утверждения обретают смысл через их соотнесение с наблюдаемой реальностью, что, как представляется, не оставляет места для интерпретационной неоднозначности. Соглашаясь в целом с этими доводами, автор тем не менее вводит ряд уточнений. В частности, показано, что научные тексты, подобно художественным или философским работам, порождают собственные контексты. К таковым отнесены: теоретические парадигмы, "скрытые миры" ненаблюдаемых сущностей (например, атомы, социальные структуры) или эстетические критерии вроде элегантности и простоты. Так, законы Кеплера, "Протестантская этика" Вебера и ряд других иллюстрирующих примеров показывает то, как научный смысл возникает во взаимодействии формальных утверждений и их интерпретационных горизонтов. В статье отстаивается герменевтический подход к науке. В частности, обосновывается, что научные тексты трансформируют как свои объекты, так и психологические установки читателей, что делает возможным преодоление разрыва между эмпирической строгостью и творческим конструированием смысла.

Ключевые слова: Наука; Герменевтика; Язык; Именование и классификации

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INTRODUCTION

There are good reasons for rejecting the hermeneutic interpretation of scientific texts.

First, it seems that a scientific text does not create its own world but only describes actual reality. If reality (in any of its forms – as a phenomenon, problem, theory, model or law, etc.) is described well, close to the original, and in detail, the task of the scientific text is considered accomplished and does not require additional efforts from the reader–interpreter. All readers extract identical meaning from it. Otherwise, the text simply did not solve its task: either the author failed to reflect reality, or the reader does not have the necessary qualifications.

Second, scientific concepts, unlike words of natural language, are quite transparent and are initially defined within the framework of formal language or as background scientific knowledge. The meaning of scientific concepts does not change depending on the situational context of their use, as is the case with words of natural language. Otherwise, it would have been impossible to achieve scientific consensus (relative to the solution of the problem even if not to the meaning of concepts). If each scientist had understood mass or energy as something special depending on a specific situation, scientific consensus at this level would have been impossible.[1]

Third, the hypothetical referents of scientific descriptions must square (or not square) with empirical data. Their objective meaning (truth or falsity) is determined by the factual circumstances of a state of affairs, not involving the broad communicative and hermeneutic horizons that determine the sense or meanings of artistic texts and works of art: such as artistic styles, the character of the era, the socioeconomic situation, the author’s education.

These horizons or worlds are on the one hand created by the works of art themselves, and as a whole, on the other hand, they hermeneutically determine the meaning of these works.

It is precisely this circular interdeterminacy of some such whole and its parts as manifestations of this whole that constitutes the famous hermeneutic circle.[2] Obviously, in trying to understand an artistic statement, we will not find *a single and unambiguous basis* that would guarantee an unambiguous understanding of the artistic work, whereas such as basis is evidently presupposed in a scientific text in the form of empirical data

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[1] The words of natural language differ from the concepts of science, but this does not hinder understanding but rather launches the process of hermeneutic interpretation: the search for explanatory contexts through questions, clarifications, attempts to resolve ambivalent statements and omissions. For example, if we knew everything that the communication partner really meant, it would soon have become clear that the presenter wants not to help gain insight in the product but just to sell it. The politician does not want to promote the public good but to retain power. The admirer does not want love but sexual fulfilment. Full understanding in everyday communication is impossible, and this is precisely why it prompts communication.

[2] See the first formulation of the hermeneutic circle by Friedrich Ast who also coined the term: “if we can know the spirit of all antiquity only through its revelations in the works of writers, and they themselves possess knowledge of the universal spirit, then how is it possible ... to know the individual, since this presupposes knowledge of the whole?” (Ast, 1808, p. 179).

and formal clearness of concepts. In contrast, to understand the sense of an artistic statement means to understand those distinctions or traces that the artistic text has produced in the reader's own consciousness; "Without a trace retaining the other as other in the same, no difference would do its work and no meaning would appear" (Derrida, 1967, p. 62).

WHAT SPEAKS AGAINST THE HERMENEUTICS OF SCIENCE?

The distinction between artistic and scientific statements seems obvious. However, the assertion that a hermeneutic understanding of a scientific text is impossible simultaneously implies that such research directions as social epistemology and STS lack a disciplinary foundation.

Social epistemology connects the formulation of true scientific propositions not only with actual states of affairs as their causes but simultaneously records a certain additional causality – social contexts and horizons of scientific communication – the horizons that causally participate in the generation of true scientific statements and therefore must be considered for their understanding. This social-world context determines the meaning of the statement and, at the same time, is formed by this scientific statement. After all, a scientific statement always "means" something for the social external world of science.

In general, it is difficult to get rid of the feeling of the paradoxical nature of the question of understanding: a *complete* understanding of a scientific statement is precisely what prevents its hermeneutic interpretation – in the sense that the unambiguously interpreted and formalized concepts of scientific texts, the internal consistency of scientific statements, their integration into some more general theory and paradigm, the given rules of their empirical verification leave the reader almost no room for interpreting what has been read. Simply put, all scientific texts are equally transparent to a competent reader since they are all either true or false, or unscientific, and the (social and other) contexts of their generation, the contexts of discovery, as is known, are not related to the contexts of justification.

Any sufficiently erudite or socialized reader will find in them universally identical information, with which all participants in scientific communication must agree.[3] It follows that the reader does not emerge from the reading process *individually* transformed or enriched since the structure of horizons that determines the meaning of what is read, which is common to all participants in scientific communication, does not change. The scientific text rather standardizes than enriches the recipient's subjectivity. After all, the horizons of the meaning of the text under interpretation (background knowledge, paradigms, methodology, normative and cognitive attitudes of the author and reader, algorithms of understanding) are essentially identical for all members of a given scientific community, in which understanding takes on the character of automatisms.

[3] Even if we mean different solutions to a scientific problem among different participants in communication, the opposing sides must agree at least with the index of the *problematic nature* of the statements (as a *truth/falsity* that has not yet been determined). Otherwise, they would simply not participate in the scientific debate.

Concerning the question of understanding a scientific text thus differs significantly from an artistic, political, or poetic text or work. In the latter case, readers experience a certain idiosyncratic impression that changes the structure of their horizons and the character of their personality. They become different persons in and through the process of reading, since the cognitive and normative structures of consciousness themselves change along with the perceived work. Readers build bridges with a new and complex world, so distant from theirs that it becomes necessary to fill the resulting distance between the statement read and its interpretation. These bridges require the interiorization of new psychological attitudes. In different hermeneutic approaches, this distance was supposed to be bridged by different processes. Empathic attitudes provide understanding in Wilhelm Dilthey, and the continuity of tradition ("*Wirkungsgeschichte*") in Hans Gadamer.

In relation to scientific texts "symbolically generalized media" play the role of such an intermediary that bridges the communicative distance between author and recipient. By way of these "symbolically generalized media" of communication (money, power, truth, love, faith, etc.) meaning (information) is extracted from these texts (Luhmann, 1998).

In a modern functionally differentiated society, the role of these communication mediators renders communication technical by facilitating, accelerating, automating, algorithmizing it. In today's fast-paced world, there is no time to think about the true meaning and context of communicative requests and messages. They must be accepted or rejected on the basis of certain programs or algorithms, i.e. a certain technique. Thus, a message in the form of an offer of a product speaks for itself; there is no point in attracting interpretive horizons and thinking about the motivations of the communication partner. The same applies to the automatic acceptance of an order by the authorities. This holds for scientific communication as well which is also extremely technicalized and automated. After all, scientific communication cannot do without a *symbolically generalizing* mediating function (Luhmann, 1992). On the one hand, any scientific text *generalizes* a set of specific situations (for example, in the form of generalizing descriptions, models, laws, or methodologies). On the other hand, it is oriented toward common symbols that ensure a scientific consensus among a given community of researchers who are qualified in a given field.[4]

Thus, an article prepared according to the rules of a scientific journal and provided with scientific affiliation will be reviewed according to the algorithms for assessing contemporary knowledge (design requirements, peer-review standards, editorial board decision-making algorithms, etc.). Scientific editorial boards serve as conveyor belts for

[4] Of course, truth as a symbol of consensus is in itself an empty and meaningless index, a two-sided form of *truth/falsehood*. The meaning of its application consists only in indicating the binary necessity – either acceptance or rejection of the text as a communicative request for contact. However, this index is the result of the previous implementation of a number of methodological procedures for checking and validating knowledge in accordance with the theoretical and methodological *programs* dominant in science. Similarly, in other communicative spheres (economics, politics), the indexes (money, power) that are meaningless in themselves receive a symbolic meaning as providing orientation due to the prior implementation of economic and political programs.

assessing, accepting, and rejecting knowledge. Under such technicalized and algorithmic conditions, appeals to the principles of *exegesis* would only complicate scientific communication. Reference to the author's situation, biography, education, or sociocultural context would hinder the decision on whether to accept or reject the text.

Today, the decision on the acceptance of knowledge is extremely automated and technicalized. The expert has a list of technical criteria for good text which are well known also to the authors of scientific texts. These criteria include the clarity of the thesis, allowing for an unambiguous *yes/no* answer; the formulation of the problem in the form of mutually exclusive solutions; the validity of the arguments; novelty; relevance; transparency; breadth of review; structuring; and the use of the latest literature. In this sense, the assessment of a scientific text is extremely routinized – focused on the *strategic* goal of scientific *success* but not on *consensus* and the search for *mutual understanding*. After all, reviewers and editorial boards do not as a rule share *empathy* in the sense of *Dilthey*, do not show understanding for the position of the author, do not interpret someone‘s article in light of their situation in life, and do not consider texts that have lost their relevance in the context of their “*Wirkungsgeschichte* [Era of Efficacy and Influence]” etc.

Does this mean that the realities of the life world of the author of a scientific text have ceased to serve as a basis for understanding the scientific text?

HORIZONS OF HIDDEN WORLDS AS A CONDITION FOR THE HERMENEUTICS OF SCIENTIFIC STATEMENTS

Despite all this we are not inclined to completely deprive scientists of that self-transformation and hermeneutic empathy that is characteristic of the perception of artistic and other nonscientific texts.

Often, interpretations of data and their theoretical context unexpectedly appear in the format of a gestalt switch. As a result of a change in theoretical context otherwise identical data become subject to the same “*Wirkungsgeschichte*” that is characteristic of artistic statements. Thus, Tycho Brahe and Kepler, standing on a hill, seem to perceive the same thing. However, Tycho Brahe sees the sun rising over the horizon, while Kepler sees the horizon descending (Hanson, 1958, pp. 5-24).

At the same time, the formal theories themselves also have their own “history of action.” Having lost the status of true and being recognized as false, theories change their interpretive meaning and context, limiting themselves to the framework of their “applicability,” but are also interpreted for their significance for the history of science, for the social determinants of their creation, etc.

Another circumstance, connected with the contexts of hidden reality as a condition for the hermeneutic understanding of scientific statements, has even greater hermeneutic significance:

Formulas describing the correlation of certain variables (for example, temperature, pressure, and volume) do not appear to require hermeneutic empathy or reconstructions of hypothetical horizons for their interpretation since the said variables are already formally defined in the language of science and have well-known sensory empirical correlates (temperature can be felt). At the same time, however, it turns out that a change in temperature is explained not only at the phenomenal-data or human-dimensional level, allowing for sensory verification. Reconstruction of deep contexts is required and, as a consequence, a "deeper" understanding of the hidden reality, one might say, the hidden world, structures hidden from the eye (Harré, 1970). The scientist seeks to understand the correlations of variables, turning to the "hidden world," the opaque world of atoms and molecules, theoretical entities, not directly accessible but requiring "existential" interpretation. They are the hypothetical "generative mechanisms" of human-dimensional phenomena.

Accordingly, Rom Harré declared that "scientific explanation consists in finding or imagining plausible underlying generative mechanisms for the patterns amongst events, for the structures of things, for the generation, growth, decay, or extinction of things and materials, for changes within persisting things and materials" (Harré, 1970, p. 125).

These underlying generative mechanisms help us "understand" a formalized statement since they visualize the connections of variables, whether we are talking about a planetary model of an atom or a cloud of molecules that behave according to the ideal gas model. Note that a formal statement describing a reality hidden from the eyes can include quantities that are in no way correlated to processes of measurement, quantities for which no instrumentally measurable correlate is found in reality at all, thus significantly expanding the interpretive horizons. [5]

These hidden visualizing hypothetical mechanisms for generating phenomenal reality as a condition for interpreting a scientific statement represent a special world, hypostatized for explanatory purposes. This world is constructed by scientists to fill the distance between a scientific statement and the reader's ability to understand this text.

In the social sciences, for another example, the scientist is not satisfied with formal connections between variables. Thus, Max Weber searches for deep foundations for the mutual dependence of "Protestantism" and "capitalism," therefore reconstructing "hidden" causal mechanisms at the microlevel. According to Weber, these "hidden causal mechanisms" consist in the influence of the doctrine of Protestantism, generating the psychological attitude of "innerworldly asceticism." This psychological attitude itself, in turn, causally generates mass economic actions, leading at the next step of causation to the formation of macrostructures of the capitalist system.[6]

Here too, an opaque world of mental attitudes is postulated, a world hidden in the inaccessible locality of consciousness. The psyche is just as opaque and inaccessible to the perception and understanding of the scientist as is the invisible cloud of molecules in kinetic molecular theory. This reconstructed mental world is the result and condition of the interpretation of global historical dependencies. Mental "generative mechanisms,"

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[5] As Campbell noted, dictionary entries can be assigned only to some terms of a theory. According to Campbell, it is not necessary to associate each hypothetical term with experimentally verifiable statements to achieve empirical significance for the theory as a whole. Thus, in kinetic theory, relationships are established between the masses and velocities of individual molecules. However, the variable that has individual molecular velocities as its physical correlate has no empirical values or "dictionary entries" of its own (Campbell, 1956, p. 122).

[6] For more detail on this microfoundation of the macrolevel of science, see Coleman, 1987.

invisible to the external observer, form that very hypothetical, phenomenally inaccessible world and context that is imagined by the scientific interpreter as a condition for understanding the movement of history. These deep causations – invisible to the naked eye – open new horizons for the interpretation of formalized statements of science.

THE AESTHETIC DIMENSION OF SCIENTIFIC STATEMENT

Such speculation about hidden external world correlates of transparent mathematical formulas, among other factors, introduces an additional context – the aesthetic dimension of scientific texts. One speaks, for example, of an "elegant solution to the problem," when certain heterogeneous realities or variables reveal a deep unity or integrity, as a homogeneous world basis for interpreting heterogeneous relationships. Thus, Newtonian theory elegantly reduced to unity the phenomena of tides, falling bodies, planetary orbits, pendulum oscillations, etc.

A theory is beautiful if it provides a generalized description of phenomena that seemed unrelated but are now united within one aesthetically appreciated whole. And this presentation and explanation of the part through the whole is a typical procedure of the hermeneutic circle. Thus, Kepler's discovery of his third law became, from his point of view, a striking testimony to the universal divine mathematical connection of things, the so-called "Pythagorean principle" (Harré, 1965), as a general explanatory context for astronomical correlations. This law asserted a mathematical correlation between planetary distances and orbital velocities. Through a reference to the *invisible* elliptical orbits of celestial bodies as the physical meaning of this formula, the law had as its basis the unity of divine mathematical design, the hidden causal mechanism of causation, and was perceived as aesthetically elegant.

The self-vindicating mathematical form of the third law, confirmed by astronomical observations of celestial bodies, namely the reference to an invisible physical correlate (some hypothetical universal plan of the Creator), makes possible an additional interpretation through the explanation of heterogeneous phenomena (planetary distances and planetary velocities) within the framework of a single world. This world acts as an interpretative context for the formalized statements and texts of Kepler himself.Accordingly, the philosophy of science is also developing formal–aesthetic *criteria* for evaluating a good scientific theory (McAllister, 1996) as additional grounds for evaluating a scientific statement. Visualizability, symmetry, explanatory simplicity, ontological economy, and other criteria of the aesthetic canon complement the classical "logical–empirical" criteria for validating formalized statements, which supposedly eliminate the need for a hermeneutic interpretation of the text. In this regard, James McAllister, but also Thomas Kuhn[7] record a certain set of expectations that are equally applicable to both theoretical descriptions and phenomenal descriptions of nature, society, and man. These expectations bring scientific and artistic texts closer together, affirm the unity of science and the life world, which represent, aesthetically connected, even if

[7] McAllister divided Kuhn's standards for assessing a good theory into invariant logical–empirical criteria and ─ revised during scientific revolutions ─ standards of aesthetic perception.

separate, parts of the *integral* world, and therefore, in turn, require the implementation of the hermeneutic circle.

AMBIVALENCE OF THE LANGUAGE OF SCIENTIFIC CONCEPTS AS A BASIS FOR APPLYING THE HERMENEUTIC METHOD

In the discussed dilemma of *transparency/hermeneutics* of scientific language, famous philosophers of science sometimes express ambivalent judgments. Thus, Thomas Kuhn, it would seem, categorically maintains that we understand each other because we are speaking the same language. Nevertheless, in other contexts, Kuhn is much less categorical. The language of science, in his opinion, has not yet reached a sufficient stage of maturity and generality, which means that translation (a kind of hermeneutic interpretation) of scientific terms is required.

Thus, in the second edition of *The Structure of Scientific Revolutions*, regarding his understanding of the language of science, Kuhn largely departs from the ideas of Nelson Goodman and draws on Willard van Orman Quine's concept of the indeterminacy of translation. Kuhn describes this hermeneutic procedure in some detail:

"…what the participants in a communication breakdown can do is recognize each other as members of different language communities and then become translators. Taking the differences between their own intra- and inter-group discourse as itself a subject for study, they can first attempt to discover the terms and locutions that, used unproblematically within each community, are nevertheless foci of trouble for inter-group discussions. (…) Having isolated such areas of difficulty in scientific communication, they can next resort to their shared everyday vocabularies in an effort further to elucidate their troubles. Each may, that is, try to discover what the other would see and say when presented with a stimulus to which his own verbal response would be different" (Kuhn, 1970, p. 202).

In this new interpretation of the language of science, concepts lose the unambiguous certainty and transparency of their semantics. Now, external-world correlates of scientific concepts are not localized by Kuhn in the other-referential objective world. Kuhn calls the meanings of these concepts "stimuli" and localizes them in the mutually *inaccessible consciousnesses* of scientists. For an adequate interpretation and understanding of the speech of another scientist, a procedure of "empathy" is now required, which ensures the desired understanding of the Other. Now, in accordance with Quine's behaviorism, a stimulus hidden in consciousness or the experience of an object in the perception of an observer acts as a semantic correlate of scientific concepts.

INSTEAD OF A CONCLUSION: HOW SCIENTIFIC TEXT TRANSFORMS SCIENTISTS

Kuhn's psychologization of the referents of scientific concepts makes it possible to clarify the answer to the question whether a scientist is transformed by encounters with scientific texts Now we can object to the argument that scientists are "impersonal knowing subjects.” From our point of view, scientific texts can significantly transform the character of the personalities of scientists, who are often far from mentally and emotionally indifferent or merely objective observers of nature.

Of course, from the point of view of Popperian falsificationism, the researcher must react indifferently to the experimental confirmation of a theory which does not prove anything. At the same time that researcher must stoically endure, and even positively welcome, its falsification. However, it seems that this ethos of falsificationism prescribes rather than describes the actual behavior of the scientist.

The history of science provides many examples of scientific controversies which seriously affected at least the emotional structure of the psyche of scientists – remember, for example, Einstein’s lambda and his disappointment in this idea[8]. This shows that the development of an important hypothesis or a breakthrough idea, and especially their subsequent theoretical or experimental refutation, polemical counterarguments, nonrecognition in the scientific world, can become a deep personal experience and disappointment that remains with the scientist for life.

In general, the idea of a scientist as an objective and indifferent observer of nature contradicts the motivational attitudes of the scientist’s consciousness. In his lecture “Science as a Vocation” Max Weber beautifully describes the nature of scientific passion:

“Without this strange intoxication, ridiculed by every outsider; without this passion, this ‘thousands of years must pass before you enter into life and thousands more wait in silence’ – according to whether or not you succeed in making this conjecture; without this, you have no calling for science and you should do something else. For nothing is worthy of man as man unless he can pursue it with passionate devotion” (Weber, 1922, p. 531).

As we have shown above, the scientist is looking for the “hidden causal mechanisms” that do not lie on the surface of the empirically accessible world. This brings the production and analysis of scientific texts closer to reading a detective story, to fiction. The scientist emerges from the scientific text as a different person, no longer believing in what lies on the surface of human-dimensional space-time, the realities of everyday life, where the sun revolves around the earth, mass does not increase with speed, and time does not slow down. The meaning of the scientis‘s work lies in the fundamental distinction between “What is the case [*Was ist der Fall*]” and “What’s behind it? [*Was steckt dahinter*]” (Luhmann, 1993). A scientific text, like a work of fiction, is guided by the communicative code of novelty and uncertainty, creates intrigue to resolve it, reveals the surprising and unexpected. However, while fiction immediately declares itself as fiction, science, on the contrary, asserts its constructions and models, its electrons, dark matter and energy, or superstrings, as a deep and mysterious, the only possible and actual reality.

[8] Einstein introduced the cosmological constant (Λ) in 1917 to maintain a static universe, as prevailing scientific thought at the time suggested. However, after Edwin Hubble's 1929 discovery of the expanding universe, Einstein reportedly called Λ his “biggest blunder” (Gamow, 1970, p. 44), as it seemed unnecessary.

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