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Cassirer on Neuroscience

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Abstract

The aim of the present study is to determine the possibilities and limitations of the neuroscientific subject description. This provision should be formulated from an epistemological, cultural and scientific perspective. For this purpose, the thesis of the double contextuality of the neuroscientific subject description is developed. Both the research object of some neuroscientists, the subject, and the research itself are embedded in specific cultural-historical contexts. Both are shaped and determined by these contexts. At the center of these representations is Cassirer's philosophy of symbolic forms, because at this point it should also be examined to what extent his philosophy can be made fruitful for the question of the possibilities and limitations of brain research. This article is the summary of a larger and more detailed investigation [1].

Keywords: Philosophy; Cassirer's philosophy; Neuroscientific description

1. Introduction

The subject concept is integrated into concrete contexts of use because the subject-concept belongs to the cultural-historical contextual human testimonies and is therefore necessarily contextual. That which certain representatives of the neurosciences make their subject of research, namely the subject, is shaped and formed in cultural-historical contexts. There simply is not one concept of the subject. Various empirical studies can substantiate this thesis of the contextuality of the subject concept [2]. The cultural philosophy of Cassirer further strengthens this view.

The subject-concept stands in a cultural-historical context, its meaning as well as the contents, which are associated with it, can be highly different and changeable interculturally. It is argued at this point that the neuroscientific description of the subject has a culture-specific research subject and that the contextuality of the subject demands a humanities contribution to its scientific description. The second statement implies the meaning of philosophy for a subject description, the first statement a limited validity of the neuroscientific results to the subject. Some neuroscientists want to clarify aspects of the subject concept that are not interculturally valid. The questions about

the possibility of volitional actions can be cited as a prominent example. Not in all cultures do people take in the manner of being the originator of their actions, as is common in the western part of this world [3]. If the perception of a free authorship of one's own actions is linked to cultural contexts, then it cannot be exhausted in neurobiological processes.

There are basic conditions of possible human knowledge. These conditions also apply to scientific knowledge, because science presents itself with all its consequences as human practice. In order to differentiate this idea, the symbolic forms language, science and technology from Cassirer's philosophy can be used.

2. Cassirer and Neuroscience

2.1 The three functional levels of symbols

Cassirer describes three functional stages of using symbols [4]. He connects these analytically with the three symbolic forms of myth, language and science. The three stages are characterized by a different relationship between phenomenon and symbol, object and concept or particular and general [5]. The expressive function of the symbol describes a purely sensory apprehension of the world, which Cassirer places in the history of development before the emergence of mythical thought, which is presupposed as a condition of possibility for mythical world-opening, but nevertheless continues to function in myth [6]. His characterization of the expression function implies the question of the possibilities of a pre-linguistic knowledge. Sauer calls Cassirer's expression function the original form of perception and the basic way of later developing other functional stages of symbolization [7]. In her eyes, the expressive function is a kind of pre-linguistic, even pre-thoughtful apprehension or objectification. Cassirer himself describes the phenomenon of expression as the basic moment of the consciousness of perception [8]. Symbolization cannot be found only in the linguistic or conceptual comprehension of the world, according to Cassirer: The symbolizing act of the spirit represents the fundamental commonality of all possible forms of human cognition [9].

For Waldow, the epistemological primacy of the process of symbolizing is an almost neglected, but nevertheless extremely central, element of the philosophy of symbolic forms [10]. Lerch, on the other hand, calls it Cassirer's main thesis that every meaningful apprehension of the world corresponds to an interpretation into meaning [11]. For Cassirer, this primacy of symbolization must be established before any symbolizing activity in the human mind [12]. Already in the development of children, it can be seen that the first principles correspond to the perception of an interpretation and order of certain complex stimuli [13]. This argument makes the simultaneity of sensual impression and meaningful interpretation into a presupposition of the cognitive philosophy of Cassirer. For Cassirer, analyzing the irretrievability of symbols is now the overriding task of philosophy, not to describe some sort of reality behind or before symbolization [14]. An essential concept of man can only be formulated for him by a philosophy of symbolizing world-opening.

For Cassirer, the three functional stages of symbolization are not merely a linear evolution of human cognition. Any transition from one level to another implies a qualitative transformation [15]. And this change for Cassirer must correspond to a changed behavior of consciousness. In the representation function, therefore, first distinctions

between symbol and symbolized appear and objectification becomes possible. Language develops into a system that, by convention, provides valid terms of empirical phenomena. Such agreements seem to exist in all cultures. Language is thus a more fundamental symbolic form than science or technology, for example, which are not developed in all cultures. The development to the representation function for Cassirer shows itself already in the first pictorial representations of gods, which is located for him developmentally in the myth. Here can be shown for him a first separation between symbol and the thing which is symbolized. At the same time, the development of language is a condition for the scientific knowledge of the world. For Cassirer it is the presupposition of the recognition in the concept, which for him is accomplished in perfection by the symbolic form of science, but must also be effective in mythic thinking.

For Cassirer, the meaning function no longer establishes a relationship between symbol and reality [16]. Especially in mathematics, but also in modern science, he saw this fulfilled. The increasing complexity of the symbolization causes a dwindling reference to the symbolized phenomena, if there is any such in certain high scientific languages. Especially in mathematical physics Cassirer attests a loss of the relation between phenomenon and symbol [17]. The scientific concept of function has a purely functional meaning in Cassirer's system. Hartung speaks here of a dissolution of the substantial content of the basic physical concepts [18]. Although Cassirer's symbolic form of language is described in terms of the representation function, it is at the same time related to all three stages, which she herself goes through as stages of development. Cassirer describes the threefold grading of the symbolization process in his essay The Concept of Symbolic Form in the 1921: Here the first level corresponds to a sensual experience, the second to a first distance between the symbol and the symbolized, and at the same time a feeling of subjectivity, and the third stage of the emergence of concepts with purely spiritual contents and references [19]. For Scholtz, Cassirer's examples show that the sequence of steps should be understood as historical development [20]. At this point, it should be emphasized that Cassirer suggests a historical sequence of steps based on various descriptions. Mythical thinking develops for him as well as scientific thinking. The triad of myth, religion and science realizes the sequence described as well as the development of science through the course of the centuries [21]. The development of language leads from a pure expression function in myth to pure meaning function in science.

For the sake of completeness, it should be noted here that Cassirer addresses the problem of basic phenomena in his late writings. Here he is influenced by Goethe [22]: Cassirer understands the basic phenomena as primal phenomena, to which certain symbolic forms can be assigned [23]. They are for him the modes of mediation itself [24]. Ullrich has examined this fact and argues that the respective combinations of the basic phenomena I, Thou, and Es can each be assigned to one of their own symbolic forms [25].

All symbolic forms each behave independently to the categories of space, time, causality, etc. These categories are different in myth than in the scientific symbolization process [26]. Nuyens also associates Cassirer's theory of subjectivity with this mode of analysis, pointing out that subjectivity for Cassirer is the archetype of all synthesis, and of the process that enables the transmission of reality within the symbolic forms [27]. Cassirer analyzes three levels of consciousness, which are exemplified in the symbolic forms of myth, language, and morality [28]. He

shows three different ego-views: whereas in the myth one is almost completely absent because of the lack of distinction between personal and impersonal, the language develops a perception of the self, for Cassirer by naming and deriving gods resulting personalization is possible [29]. The symbolic form of morality then develops a personality that has an ethical connection [30]. The three levels of subjectivity also go through the three functional stages of development of the symbols. The own ego-view, the central instance of personality, is culturally constructed for Cassirer and, in principle, exposed to historically contingent circumstances.

2.2 Symbol form language

Cassirer conceives every form of knowledge as an interpretive and at the same time symbolizing act. Only mythical thinking for him in his initial phase is still characterized by an indifference of word and thing [31]. A difference between the symbol and the symbolized arises only with the language. For the first time, there is a relationship between symbol and symbolized. At the same time, Cassirer's language is an established mode of cultural world inclusion [32]. For him, it is the crucial instrument of man to transform the sensory world into contexts of meaning and to facilitate the interpersonal exchange of these contents [33]. Therefore, it has to participate in all other forms that Cassirer partly represents as historically grown. Language and its meaning for thinking must therefore be understood in Cassirer's conception as already being there. Accordingly, language is the central medium of the human symbolization process and makes possible the symbolization of the world and its objects within the various forms. Only it is functionally developed differently in different forms such as myth, art and science. Göller, too, poses the question of the position of language in the system of forms and also comes to the conclusion sketched above [34]: If language is the fundamental form of objectifying, all other forms must have their share. According to Cassirer's accounts, language is the precondition for any comprehension of the world. This includes the scientific recording and description of the world and the things in it.

In his phenomenology of linguistic form Cassirer designs the core theses of his philosophy using the example of language [35]. Language is the human being's relationship-forming activity and not static [36]. Terms and their meanings are mutable for Cassirer. Language thus, like the other symbolic forms, also connects the sensuous impression of a phenomenon with the meaningful content of a relational sign. Functional development determines the complexity and structural consistency of the respective conceptual or symbol system as well as the relationship between symbol and sensory impression in these systems. In what respect this function of language meets the architectural concerns of the philosophy of symbols cannot be answered conclusively here. Work can easily be found in which the myth is attributed this central position within the philosophy of symbolic forms.

Only within a linguistic form can Cassirer make a generalization or objectification of the world and its objects [37]. For him, the meaning of linguistic expression is what he mediates [38]. This functional meaning of language persists despite its potential changes in content. The changes that experience the meanings of linguistic expressions are fundamental to the understanding of the world and the various phenomena within it. Linguistic references to the subject therefore influence the thinking and contextual connection of the symbol or concept with the symbolized phenomenon. If this is the case, the various content-related occupations of the subject concept are relevant for a description of a subject. In this article, it is the uses within neuroscience research that are believed to have and also

want to have a significant impact on the understanding of their subject matter. For this reason, it is necessary to critically examine these uses and content occupations. Thus, it can be shown that trendsetting determinations for research can already be recognized at this level of neuroscientific knowledge attempts. The neuroscientific subject description is based on a cultural-historical term of the subject. It is only sensible to want to prove or disprove free will if one uses a specific subject-concept. Namely, one which attributes to man the possibility of willfully caused actions and suspects the cause of these actions in specific neuronal states of the brain.

Recki calls it the escalation of thought of language, as Cassirer develops it, that thinking without language is not possible [39]. The way in which we think about the subject and its possible scientific description is therefore essentially influenced by the use of certain linguistic constructions. For Cassirer it is primarily the sentences, not the individual words that play a role in human thinking [40]. Only within such constructions an attribution of certain contents and determinations is possible. The supposed immediacy of language is limited by its contextual uses. Unless the relationship of consciousness and language or of thought and speech is reciprocal and simultaneous, it is impossible to determine which structure that of speech or consciousness, is constitutive of our connections with the world and our expressions for it.

2.2.1 Language and Brain Research: It may be difficult to talk adequately about brains or artificial neural networks or to use adequate terminology. In this regard, critics cite, for example, a mechanization as well as a personification of the brain and its functions [41]. Semantic misses and inadmissible subjectivizations are ubiquitous in literature, leading from a misuse of the term learning to expressions such as, 'The brain does this or that, pursuing this or that strategy' and so on. Also covered are terms such as connection, data transfer or processing power. The computer or machine metaphors are still present. Sometimes the brain or one of its functions is at the same time subjectivized and engineered. Also in the approaches is the talk of pictures or maps in the brain. Of course, it is clear that neither one nor the other exists in the brain. The use of a term like images, like any kind of representation, implies a homunculus principle as an explanation of consciousness [42]. Someone has to look at these pictures, so the argument. It is important how and with what terms certain objects are described, or more generally, how they are spoken about. This combination of language, thought and action, a motive of Cassirer's language philosophy, can give ethical relevance to linguistic expressions.

Representatives of the Conceptual Metaphor Theory assume that metaphors have a fundamental function for the articulation of abstract objects [43]. Here lies the advantage of such metaphors, which are not very misleading for the proponents. In addition, a rich use of metaphors can be diagnosed especially in the early stages of scientific debates - their resilience then shows in the further course. The use of metaphors within neuroscientific explanations of the subject seems unavoidable for the time being. It turns out to be difficult to speak precisely about certain aspects of the respective concepts and ideas without making use of a certain metaphor.

First, the importance of language and the related problem of linguistic inaccuracies can be noted when talking about brains. These inaccuracies then become important when, for example, there is a psychologization or subjectivization of the brain and it is attributed to skills such as learning, thinking, planning or the like. Only then, if one ascribes

such abilities to an organ, one can also search for the neural basis of these properties. The state of the brain and its significance for the debate about the subject can also be traced back to such fallacies. Speech affects thinking, and incorrect or insufficient speech about the brain can affect how people think about themselves, their brains, and the relationship between those two instances. Such ideas can also affect scientists.

Restrictive must be noted here, however, that the linguistic problems are thoroughly reflected in the debate. In addition, the metaphors of brain research can be seen as a way to talk productively about abstract issues. In this context, brain research in this article is not attributed to conceptual confusion, but to conceptual poverty.

2.3 Symbol form science

The functional development of myth and language is for Cassirer the prerequisite of scientific symbolization [44]. The myth is regarded as the genealogical condition for the scientific objectification or symbolization of reality. The symbol form language must be developed in such a way that it realizes the meaning function of the symbol - only this function makes it an abstract scientific high-level language. Science is the only appropriate system of order for Cassirer [45]. It is legitimate to ask to what extent the idea of a substantial goal realization is compatible with Cassirer's claim to present a foundation freed from any metaphysical assumptions. For him, the symbol form of science is the conclusion of a functional development of symbolic forms. These are functionally determined to be the same by the attempt to objectify the world. The unity of all forms is evident in their meaning. They are the mode of objectification or symbolization of the world. The difference of forms is their different functional level of symbolization. This circumstance was presented. It has also already been mentioned that these stages of development do not detach themselves in such a way that any symbolization at the level of the expression function would have disappeared once the meaning function has been attained. Even the scientific age has implications of the mythical. The function levels do not dissolve, they exist side by side. For Cassirer, human cognition is interplay of several symbolically developed forms, also functionally different.

The genealogical structuring of the symbolic forms also seems to be didactically motivated by Cassirer. Nevertheless, it is a difficulty to call the symbolic form of science the completion of a development. For one thing, the field of science itself seems barely lockable. On the other hand, the human symbolization act takes place within several or even all forms and is therefore also not lockable. Nevertheless, the emergence of modern science has fundamental effects on human culture and contributes to the liberation of thought, which first allows for the differentiation of the modern understanding of the world [46].

2.3.1 The special quality of scientific symbolization: In order to be able to grasp clearly the special properties of the symbolic form of science, it is necessary to work out the difference between science and the symbolic forms that participate in it in relation to those that are not functionally developed in this way. What is the special quality of scientific conceptualization or symbolization on the third level for Cassirer? According to Paetzold, the physical concepts in Cassirer's system are in series with each other [47]: they do not stand by themselves, but develop their meaning in a superordinate context - they are relational. Cassirer shares Kant's view that the scientific term cannot be derived from the sensory impression associated with it, but can only be determined by its relational sense to the

idea of a superordinate system of concepts. This notion is constituted in the scientific world view, for example, by the assumption of indisputable laws of physics and mathematics, which provide the framework for the conceptual system of physics. The decisive difference of the scientific conceptual language is the quality of its logic or the degree of sophistication of the series function of the concepts. For example, the notion of geometric space is of major importance for the development of human knowledge and cultural development in general. Cassirer describes the perception of space and time as the crucial commonality and difference between the symbolic forms of myth and science. The basic presence of a conception of space and time is the common feature of the two symbolic forms. Their difference lies in the respective functional level. According to Cassirer, the scientific abstraction mode discards all concrete differences of the sensory phenomena. General concepts abstract from the accidental properties of particular phenomena. Without the idea of a universal physical law of space and time, the scientific description of reality would never have been possible for man, according to Cassirer.

The term general and the scientific term in particular have not only a relational, but also a constructive level. The phenomena of the world become accessible to man only in relation to their superior whole. They can become contents of human consciousness only because they are translated into a symbolic language that can only be developed in relation to a particular idea of the cosmos. This represents a construction of the world. The symbol system sets the framework of the possibility of symbolizing certain phenomena.

Although the symbolic form of science achieves a particular quality of consistency, it can only be realized in the event of complete functional development, and therefore, with its descriptions, it must depart furthest from the phenomenal level. The internal consistency of the system is at the expense of its relatedness to the sensory impressions. This primacy of the consistency of the system also allows the logically correct assertion of other theoretical implications. Both science and theory have therefore ceded any empirical content for Cassirer [48]. There is only an internal measure of consistency, and the possible differentiation or modulation of the scientific worldview seems unmanageable for this reason [49].

Cassirer's theses imply a critical attitude towards a claim to truth in scientific descriptions. According to the logic of his philosophy, science must almost completely detach itself from the particular phenomena. For Cassirer, the scientific term is a rule of determination based on mathematical and physical assumptions. Although this rule loses its relation to the outside world - it cannot be found in it - it still has to prove its worth. Their symbolization performance must be appropriate to the respective world view. In this sense, it is independent and at the same time empirically bound. Certain systems, here the system of physical space and the various hypotheses associated with it, first of all construct the world and reproduce it within a certain ordering system. Aspects of reality that cannot be integrated into such a conceptual system will not be part of this symbolic form. This circumstance becomes more important when it comes to inadequately classifying a rigorous physicalism than for a subject description and instead establishing a moderate physicalism for that task. The physicalism of the modern sciences does not allow the existence of nonphysical phenomena, or calls for a return of all phenomena to physical events. Edelmann and Tononi suggest a moderate physicalism. In their eyes, neuronal and cultural or social phenomena influence each other [50]. This argument, to which the author expressly wishes to follow, proceeds in the following steps: 1) The

brain undergoes a benefit-oriented development. 2) This benefit is based on the demands that the environment places on the organism. 3) In the case of humans, the environment is significantly, if not fully, culturally or socially determined. 4) The architectural and functional development of the human brain is significantly influenced by the requirements that culture and social structure dictate. This correlation between neurobiology and the environment necessitates the involvement of humanities disciplines in a description of a subject.

Scientific hypotheses arise within certain framework conditions that include, for example, the notion of a physical space and its possible transfer to an abstract geometric space. This notion allows a more sophisticated symbolizing power than, for example, mythical ideas of the structure of the world. This consistent functional meaning of the term in the total system of the respective symbolic form can be manifoldly determined for Cassirer. Through its symbolic character, it can be described as the power of the human spirit. If this conception is extended to the thesis that the characteristics of the human mind are exposed to cultural and historical influences, the framework conditions for the emergence, modification and rejection of conceptual assumptions within science are also clarified.

The forms are related to each other. This can have a significant impact on the evaluation of the methodological framework and the interpretation of scientific work. The various forms of symbolization are interpenetrated and work together on human knowledge. In this respect, science is not conceivable without artistic, mythical, technical or even moral implications. Behind every scientific action stands a person who symbolizes on different functional levels and within different symbolic forms. Paetzold notes here that Cassirer neither believes that the world is predetermined and merely grasped by man, nor that it is a mere projection of the subject [51]. The innovation of the philosophy of symbolic forms is to locate between these two poles.

Cassirer assigns philosophy the task of grasping the symbolizing activity of world development as such [52]. In this sense, philosophy also has to pay attention to the scientific symbolization of reality and the neuroscientific description of the subject. Absolute claims to truth or objectivity of science are mistreated against the background of the philosophy of symbolic forms. Cassirer assigns cultural studies to recognize the competition between the various symbolic forms and to stand in no competition with them. Sandkühler and Pätzold rightly point out that even before Cassirer there were critical voices against a positivist or empiricist attitude to the problem of knowledge [53]. However, the differentiation of Cassirer's philosophy, which places the symbolizing power of science in relation to other forms of symbolization, must be understood as a special achievement and as a special contribution.

The brain is associated with meanings whose conditions and possibilities are set by cultural and historical conditions. If the not physical but cultural, social and spiritual levels prove to be constitutive for what is called the subject, a scientific or neuroscientific description of the subject is a reduction. Whether and to what extent such a reduction allows a sufficient description of the subject matter is controversial between disciplines of natural sciences and humanities. In Cassirer's philosophy, scientific terms are symbols that have no relation to sensory experiences. To visualize this basically symbolizing function of the human mind is Cassirer's task to philosophy. A consideration of this symbolizing function of the mind makes a corresponding restraint regarding the attempts of concluding

descriptions appear appropriate. An attempt was made to list the reasons why a description of the subject is also a humanitarian task. It turns out that not only cultural or social, but also epistemological arguments can be found.

2.3.2 Scientific Theory Restrictions: The scientific production of knowledge necessarily builds on assumptions whose validity can be critically evaluated. At this point Cassirer's theoretical studies provide some material for an in-depth presentation and analysis. Here, the meaning of scientific symbolization as well as the series in it are relevant. According to Cassirer, scientific conceptualization or symbolization has the greatest distance between the symbol and the symbolized or the term and the signified. This applies to him because of the internal principles of the scientific system. The meaning of theories and concepts is relational. This is relevant for a subject theory as well as for a subject concept. Both can only be evaluated against the background of their own assumptions. In this context, it can also be found that the contextuality of the neuroscientific subject description is based not only on epistemological limitations, but that there are quite practical, social, economic, political and technical conditions in which the research activity stands.

A reduced subject concept ultimately offers some neuroscience subject descriptions. While Paul Churchland's theory suffers from a reduced understanding of subject matter and a fascination with technology that lead him to serious semantic fallacies, Edelmann and Tononi are incapable of making meaningful statements about constitutive factors such as volitional acts and autobiographical self-perception, but could be comprehensible Systematization of the Qualia deliver. Antonio Damasio further develops the approach of the two and presents a multi-level consciousness theory. Although he is able to base his approach on the autobiographical self-perception, the moral change of perspective as well as the volitional actions neuroscientific, but could also be made with regard to these points a few restrictive comments. Especially with Damasio can be shown which assumptions a neuroscientific subject description has. Both the idea of homeostasis and the concept of evolution, decisive instances in Damasio's approach, can be described as functional concepts with reference to Cassirer's philosophy. Although the concept of evolution is already significant in Edelmann and Tononi, it does not function as the central explanatory body of the approach. The limitations resulting from the fact that the two terms are characterized as functional terms essentially concern the understanding of what kind of knowledge science produces. For Cassirer, no object that becomes content of human consciousness is description-invariant in the world. The concepts are not about things, but are set in a creative act by the human mind. This epistemological condition can be considered authoritative, because science does not produce irrefutable knowledge, but rather highly contextual positing. These settings are based on functional concepts for Cassirer in modern science. For him, the world is accessible only within functional contexts for modern science. The functions do not exist in the world, but are, as far as possible, in the human mind and are transferred to reality in a creative act.

2.3.3 Moderate physicalism: A philosophical anthropology does not necessarily mean negating the importance of biological factors. Some of the best-known proponents of philosophical anthropology, such as Plessner, Scheler and Gehlen, have included biological data and determined man both physically and mentally. In this article, therefore, an attempt should be made to represent an inclusive position. Both biological and material as well as mental or immaterial factors must be included in a subject description. In order to achieve this, a moderate physicalism must

be developed, which includes not only the biological basis of human consciousness, the brain, but also cultural or social factors in the description. The factor culture was highlighted in this article and it could be shown that all three neuroscientific approaches presented here have a reference to this factor - even though the authors sometimes expressly strive for a materialistic or physical description. Only represented in Churchlands latest book, Edelman and Tononi have assumed the cultural imprinting of the brain in their theory from the beginning. Both relate culture and consciousness to one another and attribute their effects on how the brain works. Culture enters there theory as a defining environmental factor. Although Damasio also integrates the cultural factor, he ultimately attempts to explain man's cultural activity on the basis of biological or physiological assumptions. The consequence of his remarks is the reduction of the cultural level to biology.

Scientific descriptions need not be free of metaphysical presuppositions. The assumption of a causal closure can represent a productive research perspective. However, this only applies until indications can be found that certain relevant aspects have to be excluded here. In this sense, science is not necessarily able to deliver better results than the humanities. Natural sciences and humanities deliver results based on certain assumptions.

2.4 Symbol shape technique

Sandkühler and Pätzold describe the technique in the philosophical system of Cassirer on the one hand as its own symbolic form between a) science and b) art and on the other hand as a consequence of toolmaking [54]. How can such an assignment be understood? 1.) a) Certain technical advances make certain scientific theories possible. Here only the special relationship between medicine and technology is pointed out. For example, the invention of the heart-lung machine made a new death criterion necessary. It is also readily possible that certain scientific theories or approaches will cause the development of certain technical equipment. Either because its structure has certain scientific preconditions, be it because the need to prove certain theoretical approaches requires the invention of certain technical devices and their use. The relationship between science and technology can be described as a mutual working and conditioning. In this sense, the technique becomes an actant in the network of experimental research no later than the 19th century [55]. b) Cassirer sees a creative statement by the builder or inventor of technical artifacts. This creative act does not only play a role in the practical level of science. In his philosophy of science, he argues that the theoretical concepts of space and time, as well as their various implications, should also be regarded as spiritual settlements [56]. This is a crucial commonality of the symbolic forms of myth and science.

2.) A developmental relationship of engineering to toolmaking seems to refer to the field of application. Thus, between a hammer and a computer tomograph there are only gradual and no fundamental differences. Both serve in a highly specific way as instruments that beyond the biological possibilities of man make certain things perceptible and changeable. According to Müller, toolmaking, alongside Cassirer's language, is the primary means of world development [57]. In terms of developmental history, Cassirer himself locates the emergence of toolmaking in myth. For him, the tool in this phase still come to mythical powers that cause a tendency inherent in the technology [58]. The technique thus also carries a mythical aspect in itself. Cassirer establishes a relationship between toolmaking and the evolution of human consciousness, implying an interaction between mind and tool that could be beneficial for evaluating experimental research.

Cassirer also sees a relationship between technology and science. By placing technology as a symbolic form permeated by myth in relation to the symbolic form of science, it implies two views: 1.) Technology is not only a functional support to science, but also influences its methods and results. Reference has been made to this fact with reference to the role of technology for the development of the brain death concept. Only certain technical developments make certain scientific findings possible. In this regard, science loses its dominant role over technology and is also impacted by technological advances [59]. 2) The magical aspect of the tool or the technique, which may express itself in fascination, awe, etc., affects the symbolic form of science. The view that the technical prerequisites of experimental research, which Cassirer classifies as magical or mythical in this respect, has no effect on the researchers and thus on their work can be rejected. Knorr-Cetina is of the opinion that tools, especially in the laboratory situation, are crucial for the researcher's work [60].

For Müller, technology at Cassirer not only leads to increasing world domination and an increase in self-esteem, but also to objective intuition [61]. The world and its components increasingly appear to humans as objectivizable or malleable. Technique is therefore to be regarded as an important aspect of the functional evolution of symbolization. The world is no longer perceived as the uncontrollable givenness of certain conditions. The use of the tool allows for the development of the mythical world view and yet, as noted above, is influenced by its implications. According to these specifications, technology becomes an autonomous symbolic form. According to Cassirer, the possibilities of technical development seem unlimited due to their connection to the human mind, and therefore humans see a boundless and therefore uncertain future in this regard [62].

Cassirer, in his reference to a possible alienation of man from his nature by an emerging mechanization processes this trend of negative implication of technology. For him, technology creates needs, from which a mechanization of the world follows and which opposes a conception of the tool as a passive object. There is evidence that Cassirer assumes a similar functional development, which he states for the language, also for the technique [63]. While the hammer still has a direct relation to humans, it serves only as an extension of certain bodily possibilities, and also has a direct relation to the world, since it is used for their immediate processing, leaving particularly advanced phenomena of technology the sphere of the biological or physical apparently perfect [64]. It does not seem plausible that Cassirer is formulating a fundamental critique of technology here. Like all symbolic forms, technology is the result of the free activity of the mind. Under the presuppositions of the philosophy of symbolic forms, the contribution of technology is exhausted as a symbolic form to be an interdependent mode of human cognition. Such a share can certainly be rated ambivalently.

For Cassirer, the human mind itself is increasingly determined by technical aspects [65]: Perhaps this development cannot be stopped, but a consciousness of this power, which the technology itself exercises on pure thinking, is indispensable, according to Cassirer. This allows him to come to a negative assessment of the technique in various places, but especially in The myth of the State. His analysis of National Socialism shows that technology can be both ethically and politically relevant to him. The deliberate use of technical means for political propaganda and the

associated relapse of the masses into an unreflective mythical thinking bear witness to the ethical relevance of technology [66].

In Cassirer's philosophy, technology is an autonomous symbolic form that specifically symbolizes reality as a world. This does it in a functionally different way. Modern technology is on a functional level with science. Cassirer attributes to both an interaction which rejects the autonomous and universal claim of modern science in general and of natural science in particular. For Cassirer, the theoretical concepts of science are ultimately also problem-related tools and in this regard, the comparison between hammer and computer tomography abstract and can talk of a development of the tool towards a mathematical-scientific symbol and conceptual world [67]. The mathematical concepts can also be understood as tools.

In a philosophical study of the neuroscientific subject description, it is obvious to mention such aspects of Cassirer's understanding of technology. At least an ethical relevance of the technique seems to exist here. Without the ability to capture structures, functions, and processes in the human brain with ever greater temporal and spatial precision, questions of neural determinism or the scientific description of the Qualia would not arise. Such descriptions become ethically relevant when they are accompanied by demands for the modification or abolition of certain social or cultural institutions.

The problems and limitations of such access must be viewed critically. Overall, it can be said that with increasing technical possibilities, especially in medicine, the ethical issues increase qualitatively and quantitatively. A broad scientific discourse on technology assessment follows this development [68].

2.4.1 Technical limitations of imaging techniques: The blood oxygenation-level-dependent signals form the basis for the identification of those brain areas that are considered to be relevant for certain activities. Here, the measurement of the oxygen content in the blood determines which brain areas are particularly active in which mental states. Active areas have a higher oxygen consumption and therefore oxygen accumulation in the blood occurs at these sites. These areas are then attributed a special or constitutive meaning for the qualitative state. Changes in red cell oxygen levels are measured by functional magnetic resonance imaging (fMRI). Using PET (positron emission tomography), an increased glucose consumption can be measured. This is also an indication of increased activity. Two implicit presuppositions are to be mentioned in such a procedure: 1.) The particularly active brain areas are at the same time the areas responsible for certain qualitative states and 2.) the BOLD signals or the glucose level or its rise can be reliably determined and localized.

1.) In principle, such an approach is an indirect approach in which, due to a measurable shift of certain parameters, certain non-measurable functional changes such as increased activity are inferred. It is a problem for the time being that the most perfused brain areas, or those where larger amounts of glucose accumulate, are also considered to be the crucial areas for this task [69]. It does not seem empirically verifiable whether increased oxygen or glucose consumption implies increased activity and whether these areas are then in fact constitutive of certain qualitative or mental states. In addition, a reference value is necessary if a specific oxygen or glucose content is to be said to be

elevated. Such a value should not arise from a hypothetical resting state of the corresponding area, since such a value can hardly be assumed. Rather, a logical contrast to the examined activity would have to be assumed or defined. Only in this way is a reference or mean value to be calculated. The difficulties of such an endeavor can be illustrated by a simple example: If one wanted to know what is going on in the brain of a nun when she is praying, then an activity that opposes prayer should be found. The mere non-prayer does not represent this.

2.) Regarding the reliability of such measurements, some restrictive remarks can be made: Although the fMRI is considered to be one of the most modern and effective variants of the measurement of neural activity, there is a high spatial resolution in contrast to a relatively low temporal resolution. Furthermore, Dale and Bruckner recommend that the trials or the individual sections of a test procedure, with greater time intervals to prevent an overlap of the signals [70]. They suspect that the neural processes may require a recovery period [71].

The spatial resolution is also limited. So one is not able to capture individual nerve cells with the imaging techniques [72]. In addition, depending on the used contrast medium not only the actual blood vessels, but also adjacent cell vessels can be supplied with more blood and thus cause the BOLD effect [73]. If the spatial grid of the measurement is undercut, certain vessels can cause a BOLD signal and be misinterpreted as a neural activity [74]. There are also works that provide evidence that minor head movements or normal breathing activities can alter the circulation in the brain [75]. A direct localization of certain areas is considerably more difficult against this background.

In the case of neuroscience, there is a close relationship between theory formation and experimental research. Most neuroscientific models of consciousness require a localization of certain areas of the brain or knowledge of the anatomical and structural structure of the human brain and reliable data on the activities of these areas (see: Curchland, Edelmann and Tononi, Damasio). Theories about the systemic structure of the brain require assumptions about which areas and properties are relevant for which functions. The lesion studies and neuroimaging associated with behavioral psychology are the only sources of such localization for ethical reasons. Most invasive studies of the brains of living humans as well as a repetition of the lesion studies are excluded. Every lesion of the brain must be considered unique and therefore the functional limitations of injuries are highly diverse and individual [76]. In addition, every lesion of the brain leads to compensations and thus to structural changes in other parts of the brain [77]. The problems of accuracy of such localizations should therefore not be neglected when it comes to evaluating the possibilities and limitations of neuroscience theories about human consciousness.

In this context, it is also necessary to point out the complexity of the brain and the associated problems and limitations. Every neuron in the brain is connected to every other neuron in the brain in less than six steps. An unambiguous assignment of certain neurons or neuronal associations to specific tasks is hardly possible against this background.

2.4.2 Technology and brain research: The technique is omnipresent in neuroscientific subject research. Even the theoretical approaches cannot be clearly separated from the influences of technology. In the case of brain research,

there is an interdependent relationship between theory and practice. Theories are interspersed to a large extent by experimental data.

For Cassirer, the tool has a tendency to have a life of its own, which is particularly strong for him in the myth. The technique represents for him a consequence of the tool making. The tool and also the technique can therefore be attributed an independent meaning with reference to Cassirer's statements. Technological developments and the associated investigation methods have decisive influences on the formation of concepts and theories and can therefore not be described as objects but as actors.

But there are also limits to the technology. At this point, a first basic restriction can be formulated, as far as the possibilities of a neuroscientific subject description are concerned: The evidence of the data underlying the descriptions must be critically evaluated. On the one hand, the technical possibilities for error-free and unambiguous data collection are not given. On the other hand, it should be noted that there are also considerable problems with regard to the uniform evaluation of these data.

Cassirer spoke of a fascination of technology, which can ultimately result in a self-alienation of the subject. In this regard, it is argued that this self-alienation manifests itself in the reduced subject-terms arising from a physicalist standpoint. The neuroscientists, as well as the experts and lay people who receive their results, are to a great extent fascinated by the technical possibilities: This is also shown by the fact that the technical restrictions are barely communicated or not at all.

At this point, even the sometimes questionable research methods play a crucial role. Boekel et al. report in an essay on questionable practices within neuroscientific research. Thus, an optional stopping of the data collection as well as the selection of favorable data and results can be proven [78]. The selective publication of such data is also described as a widespread phenomenon within research [79]. Wolf Singer acknowledged in an interview that immense financial pressure on the researchers and that it can therefore lead to exaggeration and misrepresentation of possible results [80]. Even a partnership between science and industry can certainly be assessed critically against such a background. In addition to technical limitations in neuroimaging, which are hardly articulated, targeted falsifications within the research can be shown. With regard to the demand for scientific honesty, this can already be regarded as problematic. However, if one realizes which ethically relevant consequences neuroscientific descriptions have and can have, the aforementioned distortions increase to actual dangers. The neurosciences sometimes call for a new image of man, but base their findings on data whose evidence can be severely limited.

Ultimately, the seductive power of an endeavor, which seeks to explain the most intimate levels of human existence by means of technical processes, especially neuroimaging, becomes apparent here as well. The researchers outbid their claims and sometimes do not shy away from tolerating artificially distorted data.

3. Methodological limitations

There are noteworthy methodological differences between the different sciences. Scientific disciplines have no access to contextuality and thus not to the contextual levels of the subject concept.

When it comes to the methodological limitations of neuroscience, the methodological limitations of philosophy and the humanities must also be mentioned. A determination of both factors provides an answer to the question of the possibilities and limits of a neuroscientific subject description. There has never been any doubt in this article that philosophers or humanities scholars are unable to make profound statements about the biological properties of the brain. If, as assumed here, there is a material and a mental level of the subject, then both levels must be described by different disciplines and then be brought together by a joint work of these disciplines.

4. Limits and Possibilities of Brain Research

Aside from the technical constraints that underlie research, the limitations of a neuroscience subject description run along the cultural and social levels of human life. The subject concept proves to a considerable degree as a cultural-historical construction. A description of the subject and his consciousness therefore requires a reference to culture. Because culture is the level that sets the contextuality of the description. An analysis of these circumstances is denied to the natural sciences for methodological reasons. Since, in the case of a scientific subject description, both levels are relevant, even mix or overlap, an interdisciplinary discourse can be emphatically demanded in this regard.
The functional foundations of the brain are important for human behavior and abilities. Neuroscientific research is predestined to describe these basics. There is little doubt about that in the debate. The level of organization of the human nervous system is a necessary condition for the cultural activity as well as the mediation between world and knowledge through symbols. The frequently mentioned lesion studies can be regarded as sufficient proof for this. The relationship between culture and brain is mutual. The subject as well as his abilities and activities are made possible to a considerable extent by neural processes. To explain the biological conditions of these processes is to be understood as an original task of the brain research.

5. The Ethical Meaning

A central motive for the question of the possibilities and limits of neuroscientific research on the subject or on the basis of its validity arises from the question of which ethical relevance subject descriptions can have. Under the impact of the results of brain research, do we have to revise all or part of our moral judgments? Must certain social institutions be reformed or even abolished? Is our ethics meaningless because its central premise, the autonomously acting subject, does not exist? These questions can only be answered as a matter of course.

There are many limitations that neuroscience is subject to. Against this background, it is not certain that their explanatory competence corresponds to what the scientists sometimes suggest. The self-confident habitus, with which some protagonists appear, does not seem to correspond to the situation. Against this background, for the time being there is no reason to change our self-image or our cultural institutions. Ultimately, it turns out that many scientists also consider this problem more differentiated. Although Antonio Damasio claims to deliver a universal theory of man.

An ethical relevance of the neurosciences is to be determined, because it can come to influences in many political, social as well as scientific fields. Foucault's work was devoted to this inclusion and exclusion through social practices. Subject descriptions can affect people's lives in this way. In summary, it can be stated that a comprehensive social reform cannot be regarded as an appropriate response to the statements of brain research on the subject.

6. Conclusion

For Cassirer, philosophy must be related to the lifeworld. The philosophy of symbolic forms implies a principled and comprehensive shaping of the world by man. Terms are constructed. This happens in a social and cultural context. According to Cassirer, the task of philosophy is to show the infallibility of the symbolization process. The brain cannot be the sole starting point of a subject description. The subject concept is determined to a large extent by cultural and historical factors. By exploring isolated brains, one does not have the opportunity to integrate the dynamics of a cultural or social situation into one's research, thus losing sight of a constitutive level of the subject-concept. Due to the changing circumstances in which concepts are formed, a subject concept can only claim contextual validity. This applies equally to natural and humanistic educations of the subject concept.

Regarding a truth in the humanities Gadamer writes that the task of philosophy is to bring up the questionable and thoughtful [81]. The attempt to make irrefutable statements is therefore not one of the tasks of a philosophical investigation. Again, no conclusive findings should be provided in this study. Rather, the goal here was to work out worth considering aspects of a neuroscientific subject description.

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