

## ***BRUNO BAUCH AND THE COMPREHENSIBILITY OF NATURE***

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**RESUMO** *O propósito deste trabalho é discutir como o neokantismo de Bruno Bauch trabalha o problema da coordenação de conceitos e objetos espaço-temporais. Sustentaremos que Bauch reformula a distinção kantiana de conceitos e intuições mediante uma consideração filosófica do cálculo diferencial e que, assim, explica a possibilidade de tal coordenação, evitando certas dificuldades da doutrina de Kant.*

**Palavras-chave** *Bruno Bauch, Conceito, Intuição, Esquema, Cálculo diferencial.*

**ABSTRACT** *The aim of this paper is to discuss how Bruno Bauch deals with the problem of the coordination between empirical concepts and spatiotemporal objects. We shall argue that Bauch reformulates the Kantian distinction between concepts and intuitions by means of a philosophical consideration of differential calculus and that he thereby explains the possibility of such coordination, avoiding certain difficulties of the Kantian doctrine.*

**Keywords** *Bruno Bauch, Concept, Intuition, Schema, Differential calculus.*

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## Introduction

In this paper we discuss how Bruno Bauch's neo-Kantianism deals with the problem of the comprehensibility of nature, i.e. the problem of the coordination between empirical concepts and spatiotemporal objects. For this purpose, we shall compare Bauch's theory with Kant's doctrine. In contradistinction to the latter, we shall show that the coordination at stake can only occur, according to Bauch, if we abandon the Kantian dualism of concepts and intuitions, yet without eliminating the distinction between intellectual and sensible representations completely. Bauch's theory will thereby enable an alternative answer to the question of the possibility of the subsumption of spatiotemporal objects under empirical concepts, which Kant's doctrine, despite all its efforts, seems to leave open. More precisely, we shall see that Bauch reformulates the relationship between concepts and intuitions by means of a philosophical consideration of differential calculus.

### §1. Categories and spatiotemporal objects

In Kant's explanation of the comprehensibility of nature two different issues should be distinguished: firstly, the explanation of the coordination of *pure* concepts of understanding (i.e., categories) and empirical objects and, secondly, that of the coordination of *empirical* concepts and empirical objects. Let us now consider the first issue. The transcendental deduction shows that categories are not empty concepts, but that they possess objective reality. Kant proves that appearances are necessarily under categories, because otherwise they would not belong to *my* experience, i.e., they would be nothing for me. More precisely, Kant establishes that pure space and time must be unified by means of a synthesis carried out by imagination and ruled by categories. In this way, space and time, which as mere forms of sensibility are pure manifolds, acquire their unity. But along with the unification of space and time by a synthesis according to categories, the matter given in the spatiotemporal form gets unified in a single experience. This must be so because the given matter must observe the conditions the form imposes upon it: otherwise the matter could not be given at all. In this way, the transcendental deduction establishes that appearances must be subsumed under categories precisely because categories rule the a priori synthesis of imagination that unifies the spatiotemporal form of any appearance. Thus, the transcendental deduction proves that appearances are necessarily subsumed under categories. The task of schematism is to determine *how* this necessary subsumption is to be carried out. The peculiar problem of schematism arises with the actual presence of

an appearance in intuition. In this situation, we face the already established demand of subsuming this appearance under the categories, on the one hand, and the complete heterogeneity of sensibility and understanding, on the other. We should then ask: what are the *sensible* features of the appearance that enable its required subsumption under pure *intellectual* concepts? As a matter of fact, it seems that there is nothing in the appearance that may enable its necessary subsumption under the categories of understanding, for receptivity and spontaneity are totally heterogeneous. This makes the required application of pure concepts to sensible objects problematic.

This application should be performed by the power of judgment. This faculty carries out precisely the task of subsuming a case under a rule. Therefore, we should leave the analytic of concepts and enter into the analytic of principles, which teaches how to apply to appearances the concepts of understanding.<sup>1</sup> In the schematism, the power of judgment must subsume a sensible object under a conceptual rule. Since the rule is already provided by understanding and need not be found first, the power of judgment acts determining and not reflecting.<sup>2</sup> On the one hand, the object to be subsumed is present in intuition, while, on the other hand, the subsuming rule is a certain category. Thus, while the transcendental deduction established the necessity of the subsumption of spatiotemporal objects under categories in general, the schematism must show how this subsumption is verified for each category, when an object is given. To achieve this goal, the schematism must establish for each category which features of the given appearance make it a case of such rule. This is the very information contained in the schema of each category. For example, the permanent in the appearance will fall under the concept of substance; or the real upon which, whenever it is posited, something else always follows, will be subsumed under the concept of cause.

The schematism makes the application of categories to appearances possible since it determines the *universal but sensible* conditions of the latter, which enable their subsumption under each of the pure concepts of understanding. Those conditions are the schemata. The demand that the condition mediating between concept and intuition be at the same time universal and sensible is satisfied if that condition is an a priori determination of the sensible form of all appearances in general, both internal and external.

1 KrV, B171.

2 KU, AA 5: 179.

But this form is time. Thus, schemata are transcendental determinations of time.<sup>3</sup>

Whereas the transcendental deduction proves that the subsumption of appearances under categories must be carried out by the synthesis of the pure spatiotemporal manifold within a single space and a single time,<sup>4</sup> the schematism establishes the a priori determinations of that single time which enable the necessary subsumption of appearances under categories.<sup>5</sup> These transcendental determinations of time, being imposed by imagination upon the sensible form of all appearances in general, must be observed by the latter, because otherwise appearances could not be apprehended in one consciousness.<sup>6</sup> These determinations refer to the *time-series*, to the *content* of time, to the *order* of time and to the *sum total* of time.<sup>7</sup> In summary, by means of these determinations the schematism of understanding carries out the task whose possibility and necessity have been established by the transcendental deduction of the categories: namely, to bring the manifold given in empirical intuition under the unity of apperception.<sup>8</sup> Thereby, the appearances of sensibility are finally objects also thought by the understanding, according to the categories.

3 See: Bauch (1917, pp. 236f).

4 “But space and time are represented *a priori* not merely as *forms* of sensible intuition, but also as *intuitions* themselves (which contain a manifold), and thus with the determination of the unity of this manifold in them (see the Transcendental Aesthetic). Thus even unity of the synthesis of the manifold, outside or within us, hence also a combination with which everything that is to be represented as determined in space or time must agree, is already given *a priori*, along with (not in) these intuitions, as condition of the synthesis of all *apprehension*. But this *synthetic unity* can be none other than that of the *combination* of the manifold of a given *intuition in general* in an original consciousness, in agreement with the categories, only applied to our *sensible intuition*” (KrV, B160 – B161).

5 “Now one sees from all this that the schema of each category contains and makes representable: in the case of magnitude, the generation (synthesis) of time itself, in the successive apprehension of an object; in the case of the schema of quality, the synthesis of sensation (perception) with the representation of time, or the filling of time; in the case of the schema of relation, the relation of the perceptions among themselves to all time (i.e., in accordance with a rule of time-determination); finally, in the schema of modality and its categories, time itself, as the correlate of the determination of whether and how an object belongs to time” (KrV, B184). On this issue, see: Caimi (2012).

6 “We have *forms* of outer as well as inner sensible intuition a priori in the representations of space and time, and the synthesis of the apprehension of the manifold of appearance must always be in agreement with the latter, since it can only occur in accordance with this form” (KrV, B160).

7 KrV, B184 – B185. See: Caimi (2012).

8 “From this it is clear that the schematism of the understanding through the transcendental synthesis of imagination comes down to nothing other than the unity of all the manifold of intuition in inner sense, and thus indirectly to the unity of apperception, as the function that corresponds to inner sense (to a receptivity)” (KrV, B185).

## §2. The possibility of empirical concepts and the comprehensibility of nature

The foregoing might lead us to think that the application of the categories to appearances is sufficient to guarantee the thoroughgoing connection of appearances in one experience that determines these appearances as actual objects. However, this conclusion would be hasty. On this issue, Kant maintains:

Thus the schemata of the concepts of pure understanding are the true and sole conditions for providing them with a relation to objects, thus with *significance*, and hence the categories are in the end of none but a possible empirical use, since they merely serve to subject appearances to general rules of synthesis through grounds of an *a priori* necessary unity (on account of the necessary unification of all consciousness in an original apperception), and thereby to make them fit for a thoroughgoing connection in one experience.<sup>9</sup>

The subsumption of appearances under categories just turns the former *fit* for a thoroughgoing connection in one experience and not appearances *already connected* in that way. This fitness of appearances for their thoroughgoing connection in one experience is nothing but the *transcendental* truth of our cognition, i.e., the objective validity of our empirical knowledge. To the contrary, only the actual (and not merely possible) thoroughgoing connection of given appearances in one experience will guarantee the *empirical* truth of such knowledge.

The fitness of given appearances for a thoroughgoing connection makes their actual connection possible and therefore the transcendental truth of our knowledge is a condition of possibility of its empirical truth.<sup>10</sup> The categorical subsumption is a necessary condition of empirical truth. However, this condition is not *sufficient*. Rather, the issue of empirical truth remains open in the transcendental analytics. Only in the appendix to the transcendental dialectic does Kant deal with this problem by means of his doctrine of the regulative use of the ideas of reason.<sup>11</sup> The categorical subsumption accounts for the transcendental truth of our knowledge, but the empirical truth is only

9 KrV, A145-146/B 185.

10 "All of our cognitions, however, lie in the entirety of all possible experience, and transcendental truth, which precedes all empirical truth and makes it possible, consists in the general relation to this" (KrV, A145-146/B 185).

11 "For the law of reason to seek unity is necessary, since without it we would have no reason, and without that, no coherent use of the understanding, and, lacking that, no sufficient mark of empirical truth; thus in regard to the latter we simply have to presuppose the systematic unity of nature as objectively valid and necessary" (KrV, A 651 = B 679).

attained by the subsumption of appearances under *empirical* concepts in an experience thoroughly connected. Thus, even though the schematism of the categories enables the subsumption of given appearances under pure concepts of understanding, it leaves open the question concerning their subsumption under empirical concepts, and it thereby does not fully solve the problem of the coordination between concepts and spatiotemporal objects.<sup>12</sup>

In order for the subsumption of appearances under empirical concepts to be possible, not only their subsumption under categories is necessary, but also a condition which cannot be guaranteed a priori. This condition is that the matter of appearances (which can only be given a posteriori) be homogenous enough for the understanding to discover certain common features and to form with them empirical concepts. For this reason Kant maintains:

If among the appearances offering themselves to us there were such a great variety - I will not say of form (for they might be similar to one another in that) but of content, i.e., regarding the manifoldness of existing beings - that even the most acute human understanding, through comparison of one with another, could not detect the least similarity (a case which can at least be thought), then the logical law of genera would not obtain at all, no concept of a genus, nor any other universal concept, indeed no understanding at all would obtain, since it is the understanding that has to do with such concepts.<sup>13</sup>

Without the homogeneity of appearances in regard to their matter “no empirical concepts and hence no experience would be possible.”<sup>14</sup>

Our understanding thus faces the following problem: the homogeneity of appearances is necessary for the formation of empirical concepts, but the fact that this sameness of kind of the appearances actually obtains is contingent. In other words, the homogeneity of the matter of appearances cannot be established a priori, because it concerns that aspect of the appearance which can only be determined a posteriori. In that situation, reason “prepares the field for the understanding”<sup>15</sup> by *presupposing* such homogeneity as a subjective condition for the use of the understanding. Such presupposition consists in the representation of nature as if appearances (regarding their matter) were

12 Although it is true that the chapter on schematism does not deal with transcendental schematism only but with the schematism of empirical concepts as well, in the latter discussion the empirical concept is taken as a *given* rule. Thus, the power of judgment acts determining. We shall now see that the problem of the comprehensibility of nature arises when the very possibility of an empirical concept is considered. Then the concept is not taken as given but rather searched for. In such case the power of judgment is reflecting.

13 KrV, A 653 = B 681 – A 654 = B 682.

14 KrV, A 654 = B 682.

15 KrV, A 657 = B 685.

homogeneous enough to make the formation of empirical concepts possible.<sup>16</sup> This transcendental presupposition is necessary for the understanding to search for the conceptual unity under which a manifold of appearances is brought, for without such presupposition reason “would set as its goal an idea that entirely contradicts the arrangement of nature.”<sup>17</sup>

The problem of possibility of empirical concepts may also be approached from the perspective of the third critique.<sup>18</sup> The task of *finding* empirical concepts, under which given particulars are to be subsumed, is that of the reflecting power of judgment.<sup>19</sup> This task depends on transcendental conditions that go beyond those of pure understanding. For, in order to build empirical concepts not only are the categories to be applied to appearances, but one must moreover presuppose that, given a certain appearance, it has some *empirical* features common to other appearances, too:

Now of course pure understanding already teaches (but also through synthetic principles) how to think of all things in nature as contained in a transcendental *system in accordance with a priori concepts* (the categories); only the (reflecting) power of judgment, which also seeks concepts for empirical representations, as such, must further assume for this purpose that nature in its boundless multiplicity has hit upon a division of itself into genera and species that makes it possible for our power of judgment to find consensus in the comparison of natural forms and to arrive at empirical concepts, and their interconnection with each other, through ascent to more general but still empirical concepts.<sup>20</sup>

Without the presupposition that such common features *can* be established, the reflecting power of judgment would not even commence its activity, since it would not attempt a task which is considered to be impossible. Thus, “the principle of reflection on given objects of nature is that for all things in nature empirically determinate *concepts* can be found.”<sup>21</sup>

16 Along with the principle of homogeneity, the principles of specification and continuity of forms are presupposed as well. KrV, A 657 = B 685.

17 KrV, B 679.

18 On the relationship between the appendix to the transcendental dialectic and the *Critique of the Power of Judgment* see: Thöle (2000).

19 KU, AA 5: 179.

20 EEKU, AA 20: 213.

21 EEKU, AA 20: 211. Kant explains: “On first glance, this principle does not look at all like a synthetic and transcendental proposition, but seems rather to be tautological and to belong to mere logic. For the latter teaches how one can compare a given representation with others, and, by extracting what it has in common with others, as a characteristic for general use, form a concept. But about whether for each object nature has many others to put forth as objects of comparison, which have much in common with the first in their form, it teaches us nothing; rather, this condition of the possibility of the application of logic to nature is a principle of the representation of nature as a system for our power of judgment, in which the manifold, divided into genera and species, makes it possible to bring all the natural forms that are forthcoming to concepts (of greater or lesser generality) through comparison” (EEKU, AA 20: 211-212).

However, the problem is that there is no guarantee for the success of that search for empirical concepts. Whether appearances have *in fact* these common empirical features or not cannot be *a priori* determined, because, as empirical, these features must be given *a posteriori*. By means of the presupposition of the homogeneity of appearances no determination of appearances as homogeneous is made. Rather, we just assume a maxim for our reflection upon them. The sameness of kind is not necessary for the object but just for the subject, in so far as the latter searches for empirical concepts. That we are indeed able of forming such empirical concepts and that we can subsume a manifold of appearances under them is a mere coincidence between a subjective requirement and an ultimate fact in regard to which the subject is completely passive: the sensible matter as a homogeneous empirical content. Thus, according to Kant, the possibility of empirical concepts cannot be established *a priori* and we are rejoiced when we can form them, “as if it were a happy accident which happened to favor our aim.”<sup>22</sup> But, while this reference to a lucky chance may be considered a valid way to *formulate* the problem of the coordination of empirical concepts and spatiotemporal objects, by no means does it express a satisfactory *solution* to it.<sup>23</sup>

In the following, we shall reconstruct Bauch’s explanation of the coordination of concepts and spatiotemporal objects and we shall see that according to his theory the possibility of a radical heterogeneity of appearances regarding their content will no longer remain open. In particular, we shall see that Bauch’s proposal consists in a reformulation of the Kantian relationship between sensation, existence and reality by means of a philosophical consideration of differential calculus.<sup>24</sup>

22 KU, AA 5: 184.

23 See: Bauch (1917, pp. 413ff).

24 It is worth noting that the perhaps most complete study on Bauch’s philosophy written so far does not analyze this relationship: González Porta (1990). Herrschaft, Savi and Zeidler point out the central character of the problem of the particular natural laws, but they do not pay sufficient attention to the role of differential calculus in it. See: Herrschaft (1995, pp. 116ff), Savi (1992, pp. 163ff), Zeidler (1994) and Zeidler (1995, pp. 181ff). Zeidler maintains that Bauch connects the logical and the empirical only in a terminological way, without giving a satisfactory explanation of the harmony between the empirical material and the laws of understanding: Zeidler (2006, p. 163). However, we shall see that such harmony is not merely declared but it is rather founded on Bauch’s philosophical consideration of differential calculus. Marck, Krijnen and Flach do not seem to do justice to this role of calculus either: Krijnen (2008, pp. 316ff), Krijnen (2014, pp. 342ff), Flach (1987, pp. 158ff), Levy (1927, p. 76ff). Dewalque argues for an interesting connection between Bauch’s conceptualism and contemporary “content” conceptualism (especially in McDowell’s version), but no analysis of Bauch’s philosophical interpretation of differential calculus is made. See: Dewalque (2010). The most recent investigation on the role of infinitesimal calculus in neo-Kantianism does not discuss Bauch’s position: Mormann and Katz (2013). Thöle indicates that Salomon Maimon already saw that the problem of the possibility of empirical concepts was not fully answered by the first critique: Thöle (2000, p. 124) In this connection, it should be remarked that Maimon put forward a solution to this problem by means of his theory of differentials. However, a comparison between Maimon’s and Bauch’s



### §3. Category, concept and sensation

The first moment of Bauch's theory<sup>25</sup> is his distinction between a subjective and an objective aspect of sensation.<sup>26</sup> From a subjective viewpoint, sensation is a mere modification of the state of the subject. On the contrary, from an objective viewpoint, sensation is a determined qualitative content. Thus, e.g., the sensation of red, as a modification of my state, should be distinguished from the property of red, which as a determined content possesses objective validity. Bauch makes thereby a distinction between the perception of a quality (*Qualitätsempfinden*) and the quality perceived (*Empfindungsqualität*).<sup>27</sup> The first one is the subjective aspect, while the second is the objective one.

By means of this distinction, Bauch's theory aims at avoiding the aforementioned possibility that sensible data may not be apt for subsumption under any empirical concept. Sensation, objectively considered as qualitative content, will necessarily turn out to be apt for conceptualization. Of course, sensible content may be thought without contradiction as separated from any concept whatsoever. But in such a case, sensation is represented as a complete vacuity and not as the matter of knowledge, which is what sensation should be.<sup>28</sup> In other words, in order for sensation to be "material condition of experience,"<sup>29</sup> it has to be understood objectively as an already determined content: the absolute absence of determination cannot fulfill such task.<sup>30</sup> In fact, even if the sensible content were expressed by the mere verb *to be*, such content would already be determined by the concept *being*. And since anything that *is*, is in a certain way, the content will be conceptually determined in a certain manner.<sup>31</sup> For this reason, the famous Kantian statement according to which "intuitions without concepts are blind" is not to be understood as if there were blind intuitions. Rather, what we would call blind intuition is just an abstraction carried out by reflection, which remains irrelevant for knowledge precisely because of its lack of determination.<sup>32</sup>

position goes beyond the limits of this paper. For a recent analysis of Maimon's theory of differentials, see: Duffy (2014).

25 We shall focus on: Bauch (1917), Bauch (1924) and, specially, Bauch (1923). In Bauch (1926), Bauch refers to Bauch (1923). See: Bauch (1926, p. 188).

26 Bauch (1923, pp. 241ff).

27 Bauch (1923, p. 251).

28 Bauch (1923, p. 259).

29 KrV, B266.

30 Bauch (1923, p. 239).

31 Bauch (1923, p. 202).

32 Bauch (1923, p. 267).

The consideration of sensation as an objective qualitative content (and not as a subjective modification) is nevertheless just the first step towards the solution of the problem of the comprehensibility of nature. The mere affirmation that objectively considered sensations will be conceptualized does not explain how sensible data are brought under concepts. In this regard, Bauch argues, his theory offers a better explanation than Kantian schematism, because it distinguishes concept and intuition without thereby falling into the Kantian dualism of faculties. In fact, Kant himself acknowledges that a separation between concept and intuition cannot be maintained and articulates them by means of the schema.<sup>33</sup> Therefore Bauch considers that the schematism puts forward a solution to a pseudo-problem: the one created by the artificial separation and isolation of understanding and sensibility. For Bauch, concept and intuition are indissolubly united by the concept of the transcendental and the concept of synthesis, so that their isolation is a product of reflection and abstraction.<sup>34</sup> But, despite this negative aspect, the chapter on schematism also contains important elements for the theory of knowledge. Bauch finds in the schematism the key to a proper understanding of the relationship between the rule thought by the concept and the case given in intuition.<sup>35</sup> He underlines that the Kantian investigation shows the pre-eminence the relationship bears on the related terms, so that these can only be distinguished in view of the specific epistemological task that each of them carries out. The schematism would then deal with this transcendental distinction between concept and intuition, rather than with a metaphysical difference, based on a mysterious diversity of cognitive faculties. From the viewpoint of Bauch's idealism, the analysis of the application of intellectual concepts upon sensible intuitions does not amount to the investigation of the cooperation of two distinct and autonomous cognitive faculties, but it rather shows that the function of the concept is already present in intuition. This issue is dealt with by the chapter on schematism, although in a still dark and confused way. Only in the system of all principles of pure understanding does it become clear and distinct.<sup>36</sup>

In this respect, Bauch's interpretation of the postulate of actuality plays a central role in his theory. Kant maintains: "that which is connected with the material conditions of experience (of sensation) is *actual*."<sup>37</sup> Bauch accepts this characterization of the actual, but he points out that it is, nevertheless,

33 Bauch (1923, pp. 270ff).

34 Bauch (1917, p. 234).

35 This key is the schema of reality, as we shall see immediately.

36 Bauch (1923, pp. 270-271).

37 KrV, B266.

insufficient for two reasons. Firstly, the character of the connection with sensation should be established more precisely. Not any connection would determine an object as existent, but just a connection according to the categories.<sup>38</sup> Secondly, Bauch argues that not only the object must be connected to sensation in order to be represented as actual, but the very sensation is possible just if it is incorporated in a context of categories. Only in that case may the sensation function as matter of knowledge.<sup>39</sup> According to Kant's doctrine, sensation is brought under categories because the pure forms of intuition (which condition sensation) are unified by categories. Along with the unification of space and time through a synthesis guided by the categories, the empirical matter given in those forms is incorporated into a single experience.<sup>40</sup> On the contrary, Bauch maintains that the subsumption of sensations (as matter of knowledge) under categories does not just require the consideration of concepts of objects *in general*, but concepts of *determined* objects as well.<sup>41</sup> Only under this presupposition will it be possible to satisfactorily account for the problem of experience, explaining not only the possibility of experience in general, but also the possibility of experience of determined objects.

Bauch puts forward a theory of the concept according to which a concept is a complex of categories (*Kategorienkomplex*). Categories are relations of validity (*Geltungsbeziehungen*) that are arranged in a system. But this system of categories is not like the one Kant describes, for the structure that the Kantian system acquires from the table of judgments is *external* to the categories themselves. This rigid and finite table of twelve categories must be replaced by an open and infinite system, based on the reciprocal reference of the categories.<sup>42</sup> In this system there are centers of convergence and intersection points of multiple categories. Such nodes of the network of categories are, precisely, the concepts.<sup>43</sup> In this sense, e.g., the categories of quantity, reality, substance and causality combine in the concept of free fall (of a body). Thus, this concept is not the result of a process of comparison,

38 On the contrary, in a dream there is a connection which is not sufficient to guarantee the existence of the represented objects. Bauch (1923, p. 206).

39 Bauch (1923, pp. 206-207).

40 Otherwise, matter would not be given at all.

41 In this sense, Bauch maintains: "Und darauf beruht es auch, das er [Kant] bei aller Betonung der erfahrungsbedingenden und gegenstandskonstituierenden Bedeutung der Kategorien diese Bedeutung nicht auch von den Begriffen betont, die nach unserer Erklärung ja selbst Kategorien und Kategorienmaterial zur Einheit umfassen" (Bauch, 1924, p. 73).

42 Bauch (1923, pp. 209ff). More precisely, Bauch claims that such system of categories must be conceived of as „actually infinite“, in the sense of „transfinite“ introduced by Georg Cantor. In this connection, Bauch criticizes Natorp for having overlooked the distinction Cantor makes between the actual infinity understood as absolute and as transfinite.

43 Bauch (1923, pp. 235-236).

reflection and abstraction, obtained from a manifold of representations. Such abstracted representation could not acquire the character that a concept possesses. According to this neo-Kantian theory of the concept, the sensible content will not be brought under categories in the way Kant explains, i.e., by means of the categorical synthesis of the spatiotemporal forms in which sensations are to be given. As we have seen, such doctrine would leave the possibility of nature *in her concrete configurations* undetermined. On the contrary, it will be rather the subsumption of sensible data under concepts of *determined* objects what will enable the subsumption of such data under concepts of objects in general (i.e., categories). We shall now turn to this issue.

#### §4. Intuition, concept and differential calculus

In our example, the concept of free fall, as law of the free fall of bodies, does not include the qualitative content of sensation in the same way a concrete free fall phenomenon does. Nevertheless it does include such content in so far as the law wholly determines the possibility of any concrete free fall phenomenon: the concept is the general law of formation of all particular phenomena.<sup>44</sup> However, for Bauch, the inclusion of the sensible matter into the context of categories according to the conceptual law is nothing but the *intuition*.<sup>45</sup> Bauch underlines that the necessary compliance of intuition with the law of the concept does not amount to an identification of intuition and concept. There is rather a distinction between the legislation of the intuition and the legislation of the concept, both of which are however correlated in the determination of the object. In other words, space and time are neither categories nor concepts, but, like the latter, they are determined by a complex of categories. The difference is to be found in the way this determination is carried out. Concepts, as already said, are the nodes of the network of categories and they are in this sense directly determined by them. On the contrary, space and time are determined by categories only indirectly, as far as they are determined by concepts. In turn, this conceptual determination does not only reach pure space and time, but also the spatiotemporal content. More specifically, such determination is a necessary condition for this content to be given. Let us consider this problem more closely. Bauch assumes the Kantian schema of reality as the “continuous and uniform generation” of reality in

44 Bauch (1923, p. 256).

45 “Die Einbeziehung des mannigfaltigen Materials in den kategorialen Geltungszusammenhang nach dem Gesetze des Begriffs ist die Anschauung” (Bauch, 1923, p. 259).

time<sup>46</sup> and extends this characterization of the process of production of the real as intensive magnitude also to the extensive magnitude of intuition. Such continuous and uniform generation is mathematically represented by means of differential calculus.<sup>47</sup> The generation of the real which fills up time occurs according to a differential equation. For instance, in the case of free fall, velocity (as intensive magnitude) increases from zero to a certain value in accordance with the law of free fall, which is Newton's second law specified in the case where the only acting force is the body's weight. This law states that the acceleration ( $a$ ) is equal to a constant ( $g$ ). This *law* of free fall is the *concept* of free fall. The continuous and uniform generation of velocity is the integration of its differential ( $dv = g dt$ ) from zero to a value  $V$  at time  $T$ . The so generated intensive magnitude will be  $V = gT$ ,<sup>48</sup> i.e., time  $T$  will be filled up with a reality of grade  $V$ . This continuous and uniform generation of the real in appearance (velocity) occurs in accordance with the concept (the law of free fall). But besides the generation of the intensive magnitude of the real in the appearance, the concept of free fall rules the generation of the extensive magnitude of the appearance. The extension of the free fall, i.e., the falling distance  $S = gT^2/2$ , will be obtained from the velocity by integration, just as the velocity was obtained from the acceleration.<sup>49</sup> The extensive magnitude will be obtained from the intensive magnitude in accordance with the law of the appearance. Thus, this concept determines both the intensive magnitude (velocity) and the extensive magnitude (falling distance) of the appearance.<sup>50</sup> This determination does not imply an a priori deduction of the matter of appearance, as if this could be gained from the conceptual form. Rather, the sensible matter is always to be given a posteriori. However, this matter is necessarily fit for being subsumed not merely under categories but under the concept of a determined object, because the *possibility* of the sensible content is completely determined by the concept. This necessary fitness of sensible

46 KrV, B183.

47 At this point the reference to Cohen's investigations is unavoidable. See: Cohen (1883) and Cohen (1902). However, Bauch criticizes Cohen because Cohen maintains the uniform and continuous generation of matter from form, while one should rather affirm the simultaneous generation of both form and matter, so that neither intuition nor concept may have an isolated existence: Bauch (1923, pp. 272-273). A discussion of Cohen's position goes beyond the limits of this paper. On this issue, see: Giovanelli (2011). Kuntze is not satisfied with Bauch's argumentation and he indicates that Bauch should have made use of Graßmann's *Ausdehnungslehre*: Kuntze (1928, p. 146). Schlotter gives a brief overview on the relationship between mathematics and philosophy in Bauch's thought in Schlotter (2004, pp. 49ff). In the most recent discussion on the influences of the Marburg school on Bruno Bauch, the philosophical interpretation of the differential calculus is not mentioned: Flach (2014).

48  $V = \int_0^V dv = \int_0^T g dt = gT$ .

49  $S = \int_0^S ds = \int_0^T ds/dt dt = \int_0^T gt dt = gT^2/2$ .

50 For an alternative analysis of Bauch's treatment of the concept of free fall see: Klee (1957, pp. 64ff).

matter cannot be accounted for in Kant's doctrine. In our example, all possible trajectories are established by the concept. The actual trajectory cannot be singled out a priori, but it can a priori be maintained that the actual trajectory will be one of the trajectories established by the concept.

The analysis of free fall shows in a particular case how the continuous and uniform generation of the real in space and time takes place. But we should not understand that this generation can itself be exhibited in intuition. This generation is the purely logical, non-sensible condition of the intuitive or sensible. This condition relates to the conditioned just as a function relates to its values. The function determines the values, but reciprocally the function is in itself "non-saturated" and needs to be filled by the determined values. Analogously, concept and intuition are in mutual dependence. They cannot be separated from each other, even though we can distinguish them by reflection. This interdependence of concept and intuition is the ground for the way in which sensation, understood as qualitative content, is determined by the concept and becomes included in the network of categories as an element of the construction of the intuited object.

### **Conclusions**

For Bauch, the concept is the building law of the intuitive manifold that such law unifies. The manifold is thus not given independently from the concept, but rather by means of it. We insist that this does not amount to any attempt to deduce the sensible matter from an intellectual form. The sensible content cannot be gained a priori. In agreement with the Kantian doctrine, Bauch holds that the fact that there is sensation can only be ascertained a posteriori. But, for Kant, the sensible manifold might be so heterogeneous that it could turn out not to be fit for subsumption under any empirical concept. This possibility is in Bauch's theory no longer open. According to the latter, we can only know empirically that there is sensation. But we can a priori maintain that, if there is sensation, it will necessarily be fit for subsumption under empirical concepts. Therefore and in contradistinction to Kant's position, the comprehensibility of nature is not a "happy accident" any more.

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