Braun K., Extracts from the book „Kant's Theory of Natural Science" from Peter Plaass

From the Translator's Preface: „*Plaass opened up a new approach to the interpretation of Kant's theory of natural science, which until then had largely been understood from a Neokantian perspective*".

Peter Plaass

Kant's Theory of Natural Science

Translation, Analytic Introduction and Commentary by
Alfred E. and Marian G. Müller

TRANSLATOR'S PREFACE

....Plaass opened up a new approach to the interpretation of Kant's theory of natural science, which until then had largely been understood from a Neokantian perspective. The questions that he raised about the relation of the mathematical to the empirical elements of physics and about the metaphysical assumptions implicitly underlying the foundations of mathematical physics are still pertiment today. Plaass began with the question of what Kant meant by the assertion that a metaphysics of nature is necessary to provide an a priori basis for empirical natural science, in particular physics. Being trained as a physicists, his ultimate intent was to use Kant's analysis to help clarify the foundations of contemporary physics rather than – as has often been done – using the particular results of contemporary mathematics and physics to show the shortcomings of Kant's philosophy of natural science by comparison. This intent permeates his overall approach and his manner of interpretation so that the work remains a valuable contribution to the contemporary philosophy of science even though he did not have the chance to pursue the modern ramifications of the problem. ...

SECTION 4
OVERALL GOAL, STRUCTURE AND CONTENT OF THE
METAPHYSICAL FOUNDATIONS OF NATURAL SCIENCES (*MF)*

4.C. Central Role of the Concept of Matter

The objects that comprise the subject matter of this science (physics) are natural things in general, which Kant equates with objects of the external sense, thus whatever can affect us perceptually. As a whole these make up the „external world" part of what Kant calls „nature in its *material* meaning," which is „the embodiment [Inbegriff] of all things insofar as they can be *objects of our senses*, hence also of experience, thus under which the whole of all appearances, i.e., the world of the senses in understood ..." 15 (S iv, p.3) [No. 1.1]. The most general concept under which these objects of external nature fall is „matter," which therefore includes any „objects of external senses" (S xx, p. 13). As we have seen, however, in order to establish the metaphysical foundations of natural science proper, the *MF* must be primarily concerned with the a priori aspects of matter, i.e., its „form", its necessary and universal determinations and laws that govern (predictively describe) its behavior. This corresponds to „nature in its *formal* meaning," which Kant defines „the first inner principle of everything that belongs to the existence of a thing" (S iii, p. 3). Science is dependent on this sense of „nature," he argues, because „nature" necessarily involves the concept of laws and hence the *necessity* of all the *determinations that belong to its existence*, and therefore natural science must take its legitimacy from its pure part, which consists of the a priori principles that constitute (underlie) those determinations (comp. S vi, p. 4f). Thus it is a *formal* sense of „nature" that must be the primary subject matter of the *MF* and must serve as the basis of analysis for establishing the a priori foundations of natural science [No. 1.2 and 1.3].

In a similar way the „matter" to be analyzed („dissected") and constructed in this work in order to arrive at the necessary determinations and laws of all possible objects of natural science must also be „matter in the formal sense", i.e., matter considered only insofar as it *can be an object of the external senses at all*

and nothing more specific. No properties of particular kinds of matter (particular objects of the senses) and/or particular content of the concept are to be taken into account that can be known only a posteriori. Thus „nature [matter] in the formal sense“ means only what is necessary and universal to „matter,“ what is valid for all matter, and also excludes any particular laws or relationships characteristic of certain forms of matter. Consequently, when we say that the central topic of the *MF* is the concept of matter, we mean *matter* considered only *as such*, i.e., the universal characeristics and laws common to all matter, and thus what can be known a priori about it. This concept of „matter in its formal sense“ is therefore Kant's starting point for analysis in the *MF*; he then uses it to show what other a priori characteristics of matter (so defined) must follow this definition. Plaass likewise argues emphatically [No. 4.] that the „empirical concept of matter“ under which all objects of the external senses fall (and from which metaphysical construction starts) must be determined a priori (i.e., formally) in its content and is „empirical“ only in regard to the proof of its objective reality (see Sec. 6.C).

Before proceeding with the analysis of the content of the *MF* and the method (structure of argument) that Kant uses, however, it is necessary to make one further distinction with regard to the concept of matter. Kant sometimes speaks of „the empirical concept of matter“ (S viii, p. 6) sometimes of „matter in general“ (S xii, p. 9), and also simply of „matter“ without further qualification (S xx, p. 13). On the one hand, all these terms refer to the same content-restricted concept of „matter in the formal sense“, the only sense of „matter“, with which Kant is actually concerned in the *MF*. On the other hand, within this formal sense it is important to distinguish between the *original* (empirical) concept of matter defined simply as „object of the external senses,“ with which Kant starts, and the *worked-out* (constructed) concept of „matter in general“ that he arrives at through the procedure of metaphysical dissection and metaphysical construction in the course of the four chapters of the work. The worked-out or constructed concept is richer in content because it consists of all the synthetic a priori judgments about „matter in general“ that can be derived from the beginning concept of matter as „object of external senses“ by addition of the determinations derived from the categories (comp. S xx, p. 13). Both the simple (original) and the extended (i.e., fully developed by a priori construction) concepts refer in the final analysis to the same objects. Nevertheless, the differences in the nature and degree of explicitness of their content not only require different analyses of the methods by which their content is attained; different considerations are also required regarding the justification of the *validity* of that content as *knowledge*, i.e., their so-called „objective reality“ (see Sec. 6.C below).

4.D. Matter as the „Movable in Space“ Constructible as Motion

Kant claims that „the fundamental determination of a something [*ein Etwas*] that is to be an object of th external senses“ (and therefore constitutes the most basic characteristic that mus apply to any kind of matter) „had to be motion“ (S xx, p. 13), and that: „Matter is the movable in space“ (S 1, p. 18). He argues for this claim on two grounds: (1) Matter must be characterized by motion bcause „only thereby [by motion] can these [external] senses be affected“ (S xx, p. 14). He gives no further support for this claim, which at face value seems to be a mere empirical generalization. In the context of his argument here, however, it is surely intended as an a priori assertion. Thus, he speaks as if it were self-evident in the framework of his philosophy. There are a number of statements about receptivity and sensation in the *Critique* that seems related to this point, but there is no single place where he brings the various pieces together into anything like a complete argument for the claim. (2) Kant then argues further for „motion“ being matter's fundamental determination with the assertion that „... the understanding also reduces [*führt zu*] to [motion] all other predicates of matter that belong to its nature“ (ibid.), i.e., all other fundamental characteristics that belong to the nature of matter in general, such as the filling of space, exerting of forces, etc., can be reduced to (i.e., constructed out of) its fundamental determination as motion. Again he makes no further effort here (or explicitly elsewhere) to justify this claim, but in effect the arguments of the four chapters of the work itself, i.e., the metaphysical constructions, constitute his attempt to prove exactly this. Thus if Kant's arguments there can be sustained, there is a justification in retrospect for his characterizing matter primarily as „the movable in space“ and hence constructing it as “motion“. This characterization of the fundamental determination of matter, of course, already represents a strong counterposition to the traditional Cartesian (and atomistic) assumption that the primary characteristic of matter was „absolute impenetrability.“ (See Sec. 8 for further discussion of this point.)
...

SECTION 5
METHAPHYSICAL CONSTRUCTION: THE CENTRAL METHOD OF THE *MF*

We now return to Kant's theoretical discussion of the special metaphysics of nature and its method, „metaphysical construction," that he presents in the Preface of the *MF*. In order to maintain continuity and build on our preceding analysis of the content and structure of the chapters of Kant's work, we first present our own interpretation of metaphysical construction in the current section. Then in the following Sec. 6, we provide an overview of Plaass's ibterpretation, for which ours should establish a basic background and hopefully provide a useful contrast for the reader. We remember that the central problem of the MF is twofold (1) to provide a metaphysical foundation for physics in the form of the a priori necessary determinations and laws that characterize „matter in general" and (2) simultaneously to assure the universal and exact applicability of mathematics to these determinations so that they can be formulated as mathematical and hence prescriptively determinative (constitutive) laws of nature (S xiv. p. 10). It is important to be clear that for Kant there are actually two distinct procedures involved in developing the apodeictic (a priori) foundation of mathematical physics. Both are in some way *constructions*; both involve *mathematics* in some sense; both referred to as „*applications*" of one kind or another. These two procedures make up the pure part of natural science (physica generalis) and are the steps (and two „dissimilar types of principles") that „usually are intermingled" and that Kant wants to separate in oder to prevent confusion (S xiii f, p. 10). It is essential to be clear about what is involved in each of the procedures and what is meant by „construction," „mathematics" and „application" in each case. (1) The first procedure is the „metaphysical construction" that comprises the body of the *MF* itself. It enables and constitutes the *application* of the general metaphysics of the *CPuR* (which we argue is constituted by the transcendental principles) to the concept of matter in order to obtain the special metaphysics of nature. As will be seen, it involved mathematics in the sense of depending on exhibition (construction) of concepts in pure intuition in order to demonstrate their universal validity and to extend knowledge about them by drawing further conclusions from the constructions. The result of this metaphysical construction is the set of necessary universal metaphysical determinations of matter (motion, filling of space, exerting forces, etc.) that constitute the conceptual framework and hence the metaphysical foundation of physics. The sense and nature of the „*construction*" involved in this step will comprise the subject of the present section. (2) The second procedure consists of the mathematical construction (comp. The Doctrine of Method in the *CPuR*, e.g., A 712ff, B740ff) of the various a priori forms of forces and motions that constitute pure physics. It takes place *after* the *MF* by further constructing the mathematical laws of these forces and motions on the basis of the metaphysically constructed determinations of matter in general already established there. These *constructions* represent an *application of mathematics* to those determinations and provide the remainder of the pure part of natural science, i.e., the elaboration of the specifc a priori laws of forces and motions beyond those developed in the Mechanics chapter of the *MF*. (However, the form they might take is hinted at to some extent in the General Observation on Dynamics.) Plaass refers to this (in principle limitless) set of constructions as the „physica pura" [No. 6.1] in order to distinguish it both from the *MF* proper and from the empirical physics. We follow his terminology for the same reason.

5.E. The Metaphysical Basis for the Mathematization of Nature in Physics

...

Therefore the principles of natural science cannot derive from mathematics alone since it does not in itself deal with existence but only with the *possibility* of things (S iii, p. 3 footnote). While mathematics is also crucial for the a priori foundation of physics, it is not sufficient; only metaphysics deals with the question of existence. Therefore, the metaphysical foundation of natural science that *simultaneously* includes the basis for the application of mathematics to nature is necessary to assure that mathematics can be applied to what belongs to the *existence* of natural things – and not just their possibility. The mathematizability of nature (which Galileo and Newton simply presupposed in order to ground physics mathematically) is itself dependent on a metaphysics of nature. If the mathematizability of nature is simply hypothesized and left unexamined, the result is to fail back onto uncritical metaphysical assumptions that fail to deal with the underlying problems and hence leave one's position open to the kind of skeptical undermining disclosed by Hume (comp. A 765ff, B 793ff).

Kant therefore proposed an explicit metaphysics of nature based on his critical philosophy that was also to serve as the valid grounding for the application of mathematics to nature. His problem, then, was to

show how the metaphysical and mathematical foundations of natural science could be developed *simultaneously* and integrated into a single system that provides both apodeictic elements of the necessary basis of mathematical physics, the a priori certainty of the fundamental concepts (determinations of matter) and the proof of the applicability of mathematics to them. This is accomplished by grounding science on a priori, metaphysically derived principles that explicitly incorporate the basis for applying mathematics to the phenomena in question. (As we have seen, it is actually only for the concept of motion and the further determinations of matter that are derivable (constructible) from motion that mathematization and existence can be completely and validly integrated into a metaphysics of corporeal nature.)

...

6.B. Plaass's Interpretation of Metaphysical Construction

...

According to Plaass, „metaphysical construction" is the special method (unique to the *MF*) by which the content of the further determinations and laws of matter is produced – although it does not provide the proof of their objective reality. To make the case for this argument, it has to be shown that by using this method the „empirical concept of matter" can be further determined a priori under the categories in such a way that its determinations as the concept of „matter in general" result. At first sight this approach seems to present an internal contradiction since, by definition, an a priori proof can never rest on a empirical basis. This problem is cleared up later (Sec. 6.C), however, when we examine Plaass's argument that the „empirical concept of matter" is only „empirical" as regards the proof of its objective reality while its content can be determined a priori.

As noted earlier in our interpretation of „metaphysical construction," Kant makes only a passing reference to the term (S xiv, p. 10) and provides no clear definition or explication of its meaning or usage (see Sec. 5.A). Plaass arrives at his interpretation of Kant's concept of metaphysical construction by analogous extension of Kant's conception of mathematical construction. *Mathematical* construction of a concept is the a priori exhibition of this concept's content in pure intuition, i.e., in the necessary forms of sensibility that constitute the conditions for the intuition of objects given to the senses. Analogeously, Plaass argues, the metaphysical construction of a concept must be the a priori exhibition of its content in the pure „forms" of the understanding that constitute the conditions of thinking, i.e., in the system of pure concepts of the understanding (the categories). „Thus: not intuitions are produced but concepts ... that determine how this special object must be represented merely according to general laws of thought" [No. 3.2.2.2.] ... It is Plaass's opinion that insofar as the objective determinations of „matter in general" are assumed to be derived from the subjective laws of thinking alone, i.e., from „mere concepts" (S vii, p. 5), they represent a true (special) metaphysics parallel in derivation to the general metaphysics of the *Critique*. His interpretation of metaphysical construction as purely conceptual (establishing the content of the determinations of „matter in general") necessarily leads to its strict separation from the proof of their objective reality since the latter involves exhibition of those determinations in pure intuition. Accordingly, he reserves the concept of „*metaphysical* construction" for this first step alone, while the proof of objective reality has to follow in a separate step as a *mathematical* construction. This methodological structure would parallel the *CPuR*'s metaphysical and transcendental deductions. Since, however, no such division or second step is presented in the *MF*, according to Plaass, the second step (the proof of objective reality by means of mathematical construction) must lie outside the *MF* proper but within the pure part of natural science (physica generalis) (S xiv, p. 10), i.e., in what Plaass calls the „*physica pura*" (see No. 6.1 and our Sec. 5.0 above).

...

In sum, according to Plaass, „metaphysical construction" is the development of the a priori determinations of the concept of „matter in general" from the original „empirical concept of matter," by means of the application of general metaphysics to it. For him this process of „application" does not include any elements of construction in the sense of exhibition in pure intuition. Accordingly, the application yields no proof of objective reality of the metaphysically developed determinations of the concept of matter in general. Such a proof remains to be accomplished by mathematical construction of the newly developed concepts.

...

PETER PLAASS

KANT'S THEORY OF NATURAL SCIENCE

An investigation to the Preface of Kant's *Metaphysical Foundations of Natural Science*

With an Introductory Essay by
Carl Friedrich von Weizäcker

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CHAPTER 3
THE PURE PART OF NATURAL SCIENCE

3.0.2. The Question of the Kind of Pure Knowledge

What kind of pknowledge constitutes the pure part? Are these principles of natural science of mathematical kind? In the two following paragraphs (S vii-ix, p. 5-7), Kant asserts ad proces two fundamental propositions of his theory of natural science:

(1) Natural science proper first presupposes the metaphysics of nature.
(2) Natural science proper is only possible with the assistence of mathematics.

The mathematics is a necessary constituent of pure natural science, but it can be that only on the basis of an explicit metaphysics of nature, which therefore underlies the application of mathematics in this field (and this is *the only* field of *application* of mathematics). *Philosophiae naturalis principia mathematica* (mathematical principles of natural philosophy) are therefore only possible on the basis of the underlying *philosophia naturalis principia metaphysica*, i.e., the metaphysical foundations of natural science.

3.0.4. Heuristic Preliminary Consideration

Suppose we want to ground the physics of the electron. To do this, one must undoubtedly use mathematics somehow. One is declined to say: to construct the concept of the electron. Now, what can that mean? What lies in the concept of the electron that one could present in pure intuition? Which schemata (directions for construction; A 718, B 746) could derive from the synthesis contained in the concept (A 220, B 267)? Of what kind of synthesis of intuition does one have to think when one wants to think „electron"? It's size? It's form? About these we know almost nothing, and perhaps we cannot even give a clear meaning to questions about them. There is, however, a mathematical physics of the electron, isn't there? Then, on what is such a physics based? Now, one sees that nothing can be undertaken if one stops with the mere concept of the electron as such. One must take as a point of departure how the electron appears, how it manifests itself as such. That is to say, one must investigate what the criteria are for judging whether a given appearance is the appearance of an electron. That is to say, one must know exactly what necessarily belongs to the self-manifestation of the existence of the electron as such. And there one immediately remembers that it is indeed necessary to start from its *nature*. The nature of an electron is the first inner principle of everything that belongs to the existence of an electron. Existence means the temporal determination of the apprearance according to the Analogies: causality, substance: action, force (A 204, B 249f). The electron is determinable in regard to its existence as something in an appearance that on its part, e.g., causality determines changes by means of its specific, distinguishing, definite (electrostatic) force and its mass (reaction). And these concepts that I have to combine a priori with its *existence* (not with the mere concept of the electron as *noumenon*), these one can indeed construct and can do so by means of the concept of motion that underlies them all and that offers the key for this construction. One is even obliged to construct them because the „dynamic principles" (the Analogies and Postulates), from which all this flows in the final analysis, are merely *regulative* in respect to perceptions, i.e., they offer only an a priori rule to look for perceptions, which must themselves be given, however. That such perceptions are possible at all must necessarily be proved by providing the intuition a priori that corresponds to each concept in question. By means of such intuitions one demenstrates that at least the condition for the perception's being given is fulfilled a priori.

But how does one find what *necessarily* belongs to the existence of an electron? What is given is only the empirical concept of an electron. Obviously one must designate a path from here, by way of which one can develop a priori and synthetically the entire complex of concepts of what belongs to the nature of the electron. For this one needs to know what belongs to existence in general, and from that one must deduce what, as a consequence, necessarily belongs to the existence of the *special* object that is characterized by a given concept. Through „application" of the concept of the nature in general to the empirical concept of the electron, the concept of nature of the electron is generated, and from it one must then analytically develop the required determinations. Thus, from the mere concept of the existence of this object – insofar as its empirical concept is given – without taking anything more from experience, one gains a rich system of entirely pure physics about the electron. It is this system „which makes the concept" of that object „fit a

priori for application to … experience“ (S xiii, p. 10). It is not easy to see how this pure part can then be the basis of the entire physics of the electron and – in spite of the necessary empirical principles in it – can give apodeictic certainty. We return to this question later.

In this sketch, then, all the problems are bypassed, nothing is proved. Moreover, Kant’s train of thought was only rendered in a watered-down version. We now turn to the actual investigation and begin with the abstract preliminary clarification.

3.2.2.3. Metaphysics and Mathematics

We return now to the point where Kant turns to the role of mathematics immediately after distinguishing between transcendental and special metaphysics (S viii, p. 6) and discuss the proof of his famous assertion: „I maintain, however, that in every spacial doctrine of nature only so much science *proper* can be encountered as there is *mathematics* to be encountered in it“ (ibid.).

Kant’s train of thought that, so to speak, fains linearity can – without thorough preparation – hardly contain the conclusivness that at first glance one suspects in it. Everything said before this last sentence, which draws the conclusion, pertains to special metaphysics just as much as to general metaphysics. In the concluding sentence, however, the contrasting of both branches of metaphysics then follows, and it is only for special metaphysics that mathematics is the necessary.

If we start from this contrast, then according to the preliminary deliberations [No. 3.1.] the assertion follows immediately that for knowledge in the narrower sense, thus of „natural things,“ it is required that the concept used have objective reality, i.e., that one proves the real possibility that is defined by it. Now, the metaphysical construction has indeed produced concepts, i.e., the concept of matter has been more closely determined by these concepts a priori, but with that merely the possession of these concepts [i.e., their content] is explained. The proof of objective reality is missing. This proof must be accomplished in addition, just as the „*Transcendental Deduction*“ (B159) still had to follow the „*the metaphysical deduction*“ of the categories, which explains only their necessary possession. As we demonstrated in No. 3.1.2.3., for the categories (as *transcendental* predicates) very special relationships exist that enable the trancendental deduction *before* the Schematism Chapter, thus without construction.

In special metaphysics there exists *no other* possibility for the proof of objective reality than to add *the* corresponding intuition to the concept. However, only in mathematics can this happen a priori. Here the root of the difference between general and special metaphysics in regard to mathematics is to be seen.

There are still two possible objections to this: First, we had started expressly from the empirical concept of matter. With that starting point, one might think that the objective reality is assured a posteriori; thus one cannot be dealing with a mere figment of the mind. However, we had shown abstractly in No. 3.1.2.4. that although this certainly holds for the wider (content-poorer) concept from which one starts, it does not therefore follow for the more closely defined concept that special metaphysics produces. Secondly, if the objective reality is already proved for the categories and nothing is added in the special metaphysics except what stands as determination under each such category, then one might think that the objective reality of these determinations (i.e., that really relate to objects) is thereby proved at the same time. However, for the same reason that we have just given, this objection is groundless. The objective reality does not transfer a priori from the category to the special concepts that stand under it, i.e., that contains it as content.

With this it is proved that „knowledge of natural things“ requires intuition – if it is to be knowledge of „determinate natural things,“ namely, insofar as they are thought by a concept that is not the concept of a single thing (since the latter would require complete determination and therefore is not possible for finite knowledge) but is narrower (more determinate) than the concept of an object in general. Such knowledge requires intuition since the real „possibility of determinate natural things … cannot be known from their mere concepts“ (S ix, p. 7). Knowledge a priori is therefore only possible here when the required intuition can be given a priori, i.e., by mathematical knowledge by reason.

We see further, however, in accord with what was noted in No. 3.1.2.4. that the possibility of such knowledge also stands under the condition that the concepts that arise in the metaphysical construction contain in themselves *nothing else* but determinations of pure intuition. Otherwise, the construction could not provide a proof of the possibility because one could not succeed in suplying a priori *the* corresponding intuition to the concept. In No. 5. we show how Kant accomplishes that be referring all these determinations back to motion.

At the same time, it is now clear that metaphysics must precede mathematics in this procedure – and thus underlies it. For without metaphysics mathematics has no basis at all for relating to things since it can only construct concepts and thereby further determine them – concepts that are given to it from somewhere else, be it arbitrary as in pure mathematics or in some other way. As already mentioned, some polemic weight lies on this point in the Preface to the *MF*. Hopefully it has become clear from our presentation that in demonstrating the reason for the necessity of mathematics in natural science Kant has simultaneously demonstrated in his theory that mathematics can only be brought into play *as a means for knowledge of nature* when an explicit metaphysics has already supplied it a priori with the concepts to be constructed. Mathematics does not produce concepts but rather can only construct concepts that are given to it. These constructions only relate to possible things if one already knows in advance „that there are things that allow being presented to us *only* in accord with the form of that pure sensible intuition“ (B 147, Plaass's italic). This means: these constructions only relate to possible things if the concepts have not originated through arbitrary thinking of possibilities but rather are deducted a priori in a necessary metaphysical construction as necessarily belonging to the existence of a thing.

The emphasis that Kant places on this part of his theory must have seemed necessary to him in view of the fact that the powerful breakthrough of modern natural science, which was a fascinating thing for him, rested on an expressly anti-metaphysical turn to mathematics in the self-understanding of natural scientists such that mathematics was viewed as the foundation of all genuine natural science. In this regard Kant doubtlessly must have shared without reservation Galileo's arguments against the metaphysics that he found extant and that he had to overcome. He could only consider his „*instauratio magna*“ of metaphysics as successful, however, if he could demonstrate that he had simultaneously replaced the bad metaphysics, which Galileo had rightly fought, with one that Galileo would not only have wanted to fight but – beyond that – even had implicitly used without knowing it.

Finally, he had to consider his work as completed in this respect when even the role he now had to allot to mathematics was surprisingly similar to the role that it also had for Galileo. With all the admiration that Kant felt for Newton, he had to fight against his fixed position on the fundamentality of mathematics although it seemed to him much less inappropriately posited by Newton than by Descartes. Thus, it is easy to understand that, beyond the previously mentioned polemic that already lies in the title of the treatise, Kant so to speak immediately opens up the juxtaposition of metaphysics and mathematics in the first sentence of the Preface and its accompanying footnote. In the last sentence he expressly emphasizes the relation between the two as having been set right in his way. In the middle (S xiii f, p. 9f), however, he expressly emphasized the relation between the two as having been set right in his way. In the middle (S xiii f, p. 9f), however, he expressively lays out the ground for this correction in the framework of his theory. By positively and concretely demonstrating the exact (and as we will see singular) point of the mutual dependency of mathematics and metaphysics, he delivers what he could only delimit negatively in the Transcendental Doctrine of Method, namely, the full content of the assertion, „that the art of measuring [*Meßkunst*, i.e., applied mathematics] and philosphy are two completely different things, *although in natural science they do indeed shake hands with each other*“ (A 726, B 754, Plaass's italics).

CHAPTER 4

THE EMPIRICAL CONCEPT OF MATTER

4.0 EMPIRICAL AND PURE CONCEPTS

The *MF* takes as a basis the „empirical concept“ of matter (S viii, p. 6). We must ask ourself what „empirical concept“ means. This seems to be quite an artificial problem: After all, isn't it clear that this is a universal representation obtained from empirical intuitions by comparison, reflection and abstraction (comp., e.g., *Logik* (Jäschke) §§ 3f, AA IX 92f)? In this way the empirical concept is juxtaposed to the pure concept and distinguished from it according to the *origin* of its content. Then one would understand Kant here in such a way that the concept of matter is drwn from experience by abstraction, etc.

We shall show that one cannot understand the structure of proof of the *MF* if one stops with this conception, which to be sure is not false but inexact and insuffient. In order to clarify this we make three preliminary remarks and then show which conception we must take here as our basis.
....

4.2. CONSEQUENCES FOR THE PROOF STRUCTURE OF THE *MF*

On the basis of what was shown just above, we can develop an important addition to the earlier results concerning the structure of proof. Kant emphasized repeatedly that the *MF*, which is to ground the pure part of natural science, consists purely of knowledge that can be obtained entirely a priori. At first this had to be astonishing since, after all, this all comes about only on the basis of something empirical, namely, by starting from the empirical concept of matter. On page 6 (S viii, Plaass's italics) Kant says „that besides what lies in this concept *no other* empirical principle is needed for knowledge of these [the things],“ thus indirectly indeed implying that the *MF* is built on an empirical principle. On the other hand, the limit of the pure part is to determined precisely by showing exactly what „reason can accomplished by itself and where its capacity begins to require the assistence of principles of experience“ (S vii, p. 5).
.....
Our approach to interpretation completely solves the problem, then. What has to be taken from experience as a basis is not the concept of matter in regard to its content. That this is an empirical concept means solely that its objective reality cannot be ascertained a priori. Since one cannot know a priori that this concept can be related to its *Object*, one must let oneself be taught empirically that there is indeed an object of this kind in order to infer the fact of its real possibilty from the actuality. Therefore one does not need the assistence of the principle of experience in order to prove the truth of the propositions of pure physics but rather for guaranteeing the *possibility of their truth* (or falseness) at all (comp. No. 3.1.1.3.), thus in order to assure oneself that one is dealing with knowledge at all.

Thus, this approach of Kant's demonstrates only that regarding the question of the presuppositions of existence [*Existenz*] of judgments, exactly like Frege (comp. No. 3.1.1.3), he does not think that the assertion of existence [*Existenz*] is implied in the assertion of the truth of the proposition but rather that the assertion of existence [*Existenz*] is the presupposition for being able to assert anything at all.
....

CHAPTER 5

PURE NATURAL SCIENCE
AS PURE DOCTRINE OF MOTION

5.0 CONCERNING THE CONTENT OF THE EMPIRICAL CONCEPT OF MATTER

...

5.0.1. Matter and Bodies

...

Thus, the issue is the construction of concepts of actions, and in comparison with that, the concept of shape of body is something entirely secondary, something derived.

The word „doctrine of body“ is actually misleading, and when one thinks of gases or „magnetic matter“ (A 226, B 273) or the ether (S 103, p. 92), then on can realize how abstractly the concept of matter is conceived in the *MF*.

...

5.1. MOTION AS THE MOVABLE IN SPACE

...

5.2. MOTION AS EMPIRICAL CONCEPT A PRIORI

...

Thus, the empirical concept that underlies the *MF*, the fundamental determination by means of which matter is to be conceived, is the predicable „*motion*“.

...

By contrast, in the merely empirical concept of motion „*reality*“ (comp. A 282, B 338) is conceived as objective thinghood (*Sachheit*). Here one speaks of „motion as an accient (*Akzidens*) of matter“ (A 186, B 230), thus not of a mere act (*Actus*) of the productive imagination, i.e., motion as description, the describing of a space (comp. B 155 footnote) (moreover, where time, specifically as quantity, is not taken into consideration at all; comp. S 8, p. 30).