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SYSTEM-PROBLEMS IN KANT

1. CLASSIFICATION OF PROBLEMS IN KANT

It often happens that the fundamental concepts of a philosophical system are not made explicit by its creator. This is precisely the case with the Kantian concept of the problem. Although central in his theory of the human knowledge of nature (the only part of Kant's philosophy which will interest me in the present paper), it has not been treated as a separate topic.[1] It may, therefore, be quite helpful to introduce my study of system-problems in Kant by putting together his scattered remarks on the classification of problems in general.

According to Kant, problems can be analysed from various points of view, such as their origin, data, unknowns, structure, solubility, and solution procedures. Kant recognises, of course, that there are problems which *originate*, so to say, from outside ourselves so that it is open to us to try to solve them or to leave them unanswered. Such problems can be called arbitrary or optional. Kant puts, however, a particularly strong stress on his claim that there are problems "prescribed by the very nature of reason itself" (A, VII) and which we are "not able to ignore" (*ibid.*). These natural, unavoidable or necessary problems belong either to the understanding or to reason in the narrow sense. The former are mainly about objective (constitutive) rules of unity, which are natural laws and by means of which appearances are rationally explained. The latter are mainly about complete series of premisses by means of which the entire objective knowledge of understanding is brought into a systematic whole. The following passage from the *Critique of Pure Reason* explains quite well the nature of these two levels of necessary problems of higher cognitive powers:

> The understanding is an object for reason, just as sensibility is for the understanding. It is the business of reason to render the unity of all possible empirical operations [*Handlungen*] of the understanding systematic; just as it is of the understanding to connect the manifold of the appearances by means of concepts, and to bring it under empirical laws. (B 692)

Synthese **74** (1988) 107–140

As to the *data*, problems can be divided, first, into pure and empirical, a division which is based on Kant's well-known distinction between pure and empirical concepts and propositions. (Of course, all kinds of problems with mixed data can also be proposed.) Second, they may be divided into problems the data of which can be expressed by means of objectively valid concepts and propositions and those which cannot.

An analogous twofold distinction between problems can be made from the point of view of their *unknowns*. In some problems they are pure, while in others, they are empirical intuitions, concepts and propositions. Moreover, a problem may ask us to determine a property of a sensible object or an objectively applicable law, or it may demand that we give an explanation of an appearance through the use of concepts and propositions which are not empirically interpretable, for instance, by means of the concept of absolute totality. Particularly important kinds of unknowns are, of course, the objectively valid rules of the unity of the understanding (natural laws), and systems of propositions and definitions generated by pure reason. These characterize the two basic kinds of necessary problems of our cognitive apparatus. I shall call Kantian problems with objective data and unknowns *object-problems* and those with data or unknowns which are objectively interpretable *system-problems*. Solutions of Kantian object-problems extend our intuitive and discursive objective knowledge, while solutions of Kantian system-problems increase the systematic unity of objective knowledge. The extension of knowledge by solving either object- or system-problems is not something which we may care about or not, but a fundamental innate impulse (*Trieb*), passionate desire (*Sucht*) and faith of human reason:

> But we believe that we are able to pass a priori beyond our concept, and so to extend our knowledge. This we attempt to do either through the pure understanding, in respect of that which is at least capable of being an *object of experience*, or through pure reason, in respect of such properties of things, or indeed even of the existence of such things, as can never be met with in experience. (B 792–93)

As things whose properties and existence can never be met with in experience are classified as psychological, cosmological and theological, every necessary system-problem corresponds to one of these classes. From the point of view of that *structure*, Kantian problems can be divided into problems-to-find and problems-to-prove. The former are about particular objective data, while the latter are about truth and falsity of propositions, their proofs and ultimate grounds.

Solubility is another important property of problems and, in fact, is the most important one. For the primary task of the critique of pure reason is to offer a general theory of solubility of all kinds of necessary problems of our cognitive apparatus. Indeed, its leading problem is, how is metaphysics, as natural disposition, possible? This question can, in turn, be analysed into two sub-questions. First, how do necessary metaphysical problems arise from the nature of pure reason? And, second, how far are these necessary problems answerable? (B 22). As it is our reason which generates its necessary metaphysical problems, it must also be possible for it, argues Kant, "to attain to certainty whether we know or do not know the objects of metaphysics, that to come to a decision either in regard to the objects of its enquiries or in regard to capacity or incapacity of reason to pass any judgment upon them . . ." (*ibid.*). It is noteworthy that the theory of solubility of necessary problems of reason also solves the problems of solubility of optional problems. Finally, as to the *solution procedures*, problems considered by Kant can be divided into empirical, mathematical and theoretical. Empirical problems are solved directly from observation of phenomenal objects, mathematical ones from construction of objects in pure intuition by means of transcendental schematism, and theoretical ones from construction of objects of ideas by means of analogical schematism. In the present paper I shall give much emphasis to theoretical problem-solving methods because they are employed in solving system-problems.

2. THE NATURE OF KANTIAN SYSTEM-PROBLEMS

In considering the nature of necessary system-problems of pure speculative reason and how, to begin with, they originate, one notes that the primitive domain of application of our cognitive operations is that of our sensations. I will leave it open here whether the synthesis of sensations into elaborated intuitive data-structures called "appearances" can be interpreted as a solution of a necessary problem of our cognitive apparatus. There is no doubt, however, that given appearances do function as problem-data for our understanding. For any given appearance "demands to be explained" (B 511), which means, of course, that our understanding when presented with appearances must by its very nature try to impose upon them the unity expressible by means of natural laws. In other words, it is a necessary

task of our understanding to provide explanations of every possible appearance by means of general propositional objective knowledge. From the point of view of the understanding, the full explanation is, however, not given by natural laws alone but by natural laws in conjunction with particular empirical conditions. For appearances demand explanation, that is, our understanding is necessarily concerned with them, only in so far, says Kant, "as the conditions of their explanation are given in perception" (*ibid.*). The necessary problems of the understanding are therefore typical object-problems. Yet our reason can and must go further than the understanding and ask for conditions of any particular appearance which are not and cannot be given in any possible perception. Indeed, if we take all that can be given in this way as an absolute whole, we see that this whole itself cannot be perceived (*ibid.*). "Yet", writes Kant, "it is just the explanation of this very whole that is demanded in the *transcendental problems of reason*" (B 512, my italics). This text makes it clear that the necessary problems of reason are not object-problems. In order to understand their nature still better, we must consider the very principle which generates them, the so-called *fundamental logical postulate of human reason*. It asks us *to find* for any particular item of knowledge the totality of conditions from which it can be derived (B 388, 389), whether this item is a concept or a proposition (B 526, for the first, and B 397, for the second). This postulate or demand, which constitutes our reason, can also be given a propositional formulation which is entirely analytic and thus free from any possible transcendental criticism as regards the limits of its application. In this propositional version, the fundamental logical rule of reason says that for any given conditioned concept of proposition there is a complete sequence of conditions, that is, of more fundamental concepts and propositions, from which it can be determined (defined or derived, respectively, cf. B 388, 528).[2] This being the origin of all necessary pure reason problems, it is easy to say what their structure is: they are all of them problems-to-prove, more precisely, *problems-to-define* or *problems-to-explain*. For simplicity, I shall limit myself to the latter. Their data are pure or empirical propositions given or assumed as true, while their unknowns are complete series or unconditioned and therefore absolute totalities of their true premisses (B 389). Once more, such problems are not object- but system-problems, because their unknowns have no objective meaning, strictly speaking. The

concept of absolute totality is indeed not applicable to any object which can be given in the domain of possible experience. This last is a particularly important property of problems of pure reason. It implies not only that all system-problems are pure problems, but also that they are not solvable in the domain of possible experience by means of objective decision procedures; however, this does not mean that they are not solvable at all (B 507). Thus, the *objective* indecidability and thus unsolvability of pure reason problems should not be taken to imply that they can be disregarded, but only that they must be correctly handled.

The unknowns of system-problems of pure reason are, as I have just said, unconditioned totalities of true propositions from which a given true objective or synthetic proposition can logically be derived. What they actually demand is therefore *that we search* for *maximal extension* of our true propositional knowledge about appearances. There are only three basic logical relations with respect to which we can try maximally to amplify our objective knowledge, namely: subject-predicate, antecedent-consequent, and part-aggregate relations (B 379). There are accordingly only three basic mutually irreducible a priori necessary problems of maximal extension of our empirical knowledge – the first concerning all predicates of a given subject, the second all antecedents of a given consequent and the third all members of a given aggregate (*ibid.*). Moreover, in each maximal extension or totality of conditions of a given conditioned, several sub-extensions or sub-totalities can logically be distinguished. Thus, in respect to any given consequent which describes an appearance, we can distinguish as many totalities of conditions as there are categorial aspects of description: composition, division, origination and dependence of existence of the appearance concerned (B 443). Thus, the system-problem of finding the absolute totality of antecedents of every given consequent splits into four "natural and unavoidable" sub-problems. Kant explains:

> There are just so many, neither more nor fewer, owing to the fact that there are just four series of synthetic presuppositions which impose a priori limitations on empirical synthesis. (B 490)

General conceptual representations of such maximal extensions of our synthetic objective knowledge are called "ideas" or "transcendental concepts of reason":

The transcendental concept of reason is, therefore, none other than the concept of the *totality of the conditions* for any given conditioned. (B 379, my italics)

The theory of system-problems in Kant is thus in part reducible to his theory of ideas of reason. There are four basic tenets of this theory. First, ideas do not represent universal conditions in accordance to which sensible objects are constituted in pure or empirical intuition, but set us potentially infinite series of empirical problems concerning systematic or ideal aspects of nature. Second, the totalities of conditions, more precisely, the completed, unconditioned or absolute totalities of premisses of any given conditioned proposition, which are referred to by ideas and, as I have said above, play the role of unknowns of system-problems, can be viewed as characterising objects of a special kind, namely, transcendental, intelligible or ideal objects. Third, ideas can be schematised, that is, their objects can be given, if only indirectly, partially and inadequately, in sensible intuition. Fourth, so interpreted ideas are necessary as a priori guidelines for solving problems to which they themselves rise. This manifold role of ideas as sources of open classes of empirical problems, representations of unconditioned entities and heuristic guidelines comes out clearly in the following passage:

The pure concepts of reason – of totality in the synthesis of conditions – are thus at least necessary as setting us the *task of extending* the unity of understanding, where possible, *up to the conditioned*, and are grounded in the nature of human reason. These transcendental concepts may, however, be without any suitable corresponding employment *in concreto*, and may therefore have no other utility than of so *directing* the understanding that, while it is extended to the uttermost, it is also at the same time brought into *complete consistency* with itself. (B 380, my italics).

As to the first tenet, it is clear that the task of solving a potentially infinite series of empirical problems concerning one particular ideal aspect of nature is the same as the task of finding the maximal extension of propositional empirical knowledge in regard to one particular logical relation between the conditioned and its conditions. There are thus as many necessary system-problems as there are ideas. As the test just quoted implies, these extensions have to be internally consistent. This same condition applies of course to the corresponding series of empirical problems: they must all be soluble by one maximal consistent class of propositions. Moreover, an idea does not prescribe to solve any particular empirical problem of the series of problems

which it generates but only indefinitely to continue solving problems which belong to this series. System-problems generated by ideas are therefore not necessary in the sense that we must find out the values of some particular objective unknowns, but in the sense that without violating our rationality we cannot be satisfied with any set of empirical problem-solutions. Thus, the remarkable result is that our reason, in so far as it is the origin of ideas, is the source of a complete program of indefinite empirical research.

An example may be helpful here. Consider the idea of absolute completeness in the origination of any given appearance, that is, the idea of the absolute totality of its causes. This idea leads necessarily, says Kant, to the task of *finding* a maximum series of the empirical conditions of existence of any given experience. Yet, as it can be proven that there is "no maximum of the series of conditions in a sensible world, regarded as a thing in itself" (B 536), the idea actually does nothing more but *set as a task* the constitution of an indefinite empirical sequence of conditions by the ampliative (synthetic) operation called *indefinite empirical regress* (B 527, 537). In that way the cosmological principle of a totality of conditions corresponding to this idea also preserves its validity:

> not indeed as the *axiom* that we think the totality as actuality in the object, but as a *problem* for understanding, and therefore for the subject leading it to undertake and to carry on, in accordance with the completeness prescribed by the idea, the regress in the sequence of conditions of any given conditioned. For in our sensibility, that is, in space and time, every condition to which we can attain in the exposition of given appearances is again conditioned. (G 536)

3. OBJECTIVE UNKNOWNS OF SYSTEM-PROBLEMS

According to the second main tenet of Kant's theory of speculative ideas, complete series or unconditioned totalities of true premisses to which ideas, strictly speaking, refer can be construed as characterising ideal objects. That makes it possible that, in a second step, ideas themselves be applied to such objects.[3] A complete series of true premisses from which a given true proposition can be derived may be of two sorts. It may either "have a *first* member, as its highest condition, or it may have no such member, in which case it is without limits *a parte* a priori" (B 389). In the first case, there is an absolutely or unconditionally true first premiss from which all other premisses of

the series depend. In the second case, all premisses are derivative and it is the entire series itself which must be unconditionally true (*ibid.*). Ideal unconditioned objects presupposed as referents of such series may accordingly also be of two kinds:

> The unconditioned may be conceived in either of two ways. It may be viewed as consisting of entire series in which all the members without exception are conditioned and only the totality of them is absolutely unconditioned .... Or alternatively, the absolutely unconditioned is only a part of the series – a part to which the other members are subordinated, and which does not itself stand under any other condition. (B 445)

The unconditioned thought in the first way is a series "*a parte* a priori without limits or beginning, i.e., is infinite, and at the same time ... given in its entirety" (*ibid.*). That is to say that unconditioned objects of the first kind are actually infinite classes. The unconditioned objects of the second kind are entities which are thought of as not needing any further grounds, as for instance, the temporal or spacial limit of the world, the fundamental force of attraction, and liberty.

Although there is nothing to prohibit us from introducing such unconditioned objects and applying ideas to them (we shall see later on that it is even a priori necessary to posit them), we must pay attention to one condition. The supposition of unconditioned referents of ideas can only be relative and never absolute. This "somewhat subtle distinction" between relative and absolute supposition is however "of great importance in transcendental philosophy" (B 704) and should not be overlooked. The reason it should not is that if we assume unconditioned objects in the absolute sense and ask questions about them, we are led to demonstrably undecidable problems which cannot be answered by yes or no.

Relative assumption consists in thinking of an entity that corresponds to a mere idea as existing, without assuming it, as an absolute supposition would do, "as in itself existing" (*ibid.*). By this procedure, says Kant, we "make the idea real" (*realisieren die Idee*); we "posit (*setzen*) for it a real object (*wirklicher Gegenstand*)", but only "as something which we do not at all know in itself" (B 705).

Posits introduced by relative presupposition are also called "intelligible objects" and "transcendental objects". Ideas, says Kant,

> make for themselves objects for which no experience supplies material, and whose reality is not based on the completion of the empirical series but on pure a priori concepts. Such transcendental ideas have a purely intelligible object; and this object may indeed be admitted as a transcendental object. (B 593)

The objects of ideas are a very peculiar kind of object. It is much easier to say what they are not than to determine what they are. They are certainly not open classes of appearances generable by constitutive procedures, partially a priori and partially empirical, as are all phenomenal objects. Their higher level of fictitious character comes out when we note that according to Kant no question about their possibility, reality or properties is answerable or even meaningful. In other words, no typical object-problems can be formulated about them. Distinct from empirical objects, entities of reason cannot be identified with traditional metaphysical objects either. Traditionally, the formulation of hypotheses about the latter was considered perfectly admissible. Kant, however, prohibits the framing of hypotheses about the entities of reason, and excludes them from any legitimate explanations of actual appearances (B 799).

As they do not belong either to the empirical or to the traditional metaphysical domain, and are essentially different also from a priori constructable objects in pure mathematical intuition, the Kantian ideal entities (*idealische Wesen*, B 702) are of an entirely new kind in philosophical literature. It is pretty clear that in these negative properties they strongly resemble entities of the kind now classed as theoretical. Kant's ideas of reason, as well as his ideal explanations and definitions, can on the same grounds be approximated to our theoretical concepts, explanations and definitions. For instance, Kant's account of irregularities in planetary orbits by means of the fundamental force of gravity, which is taken as an explication of the basic idea of absolute cause (B 662–63), is just as non-empirical and non-metaphysical as we might want an explanation to be. To give another example, Kant's dynamic definition of matter, which rests on objectively impossible concepts of central force and of the infinitesimal, must also be qualified as theoretical by most contemporary criteria. What distinguishes our theoretical concepts from the Kantian ideas of speculative reason is mainly the fact that the former are not thought of as determined a priori in number and essential notes, while the latter are. There are, according to Kant, just three basic ideas of pure speculative reason, namely, the ideas of simple substance, of unconditioned cause and of highest being, and all of them do possess a priori determined properties. Yet Kant leaves enough room for theoretical disagreement as regards *derivative* ideas. Thus, one cannot argue entirely a priori in favour or against viewing absolute causes as

atoms interacting by contact in the void or as fundamental forces of attraction and repulsion interacting in the plenum. A close analysis of Kant's *Metaphysical Foundation of Natural Science* shows that his decision in favour of fundamental forces is largely based upon historical considerations.

But the most clear case for an approximation between ideas of reason and contemporary theoretical concepts is provided by a common positive property: they are all necessary for maximising the problem solving power of the science of nature. As it is quite accepted today that theoretical concepts are essential factors of the progress of empirical science, I shall limit myself to show that this same heuristic role is played, in Kant, by the ideas of reason. This brings me to the third main tenet of Kant's theory of ideas, namely, that ideas can be schematised, which means that they can be given an indirect, partial and inadequate intuitive meaning by means of a procedure called symbolic interpretation (*Darstellung*) or schematism in accordance with analogy (Fort., A 204). In other words, the objects of ideas can be provided with an intuitive filling which makes out of them "analoga of real things" (B 702). This move is necessary in order both to ensure the control of reason over the operations of the understanding and to give reason additional heuristic effectiveness. Just as categories must be made intuitive by means of transcendental schemata before they can be employed in constituting the unity of objects of experience, the ideas of reason must be provided with some schematic intermediaries if we want to employ them in establishing the unity of operations of the understanding:

> But the operations of the understanding are, without the schemata of sensibility, *indetermined*; just as the *unity of reason* is in itself *undetermined*, as regards the conditions under which, and the extent to which, the understanding ought to combine its concepts in systematic fashion. But, although we are unable to find in *intuition* a schema for the complete systematic unity of all concepts of the understanding, an *analogon* of such a schema must necessarily *allow of being given*. (B 693, final italics mine)

Yet, symbolic or analogic schematism occupies a central place in Kant's theory of solution methods for system-problems not only because intuitive modeling of ideas is a necessary condition of their applicability to the operations of the understanding. It is even more important as the main source of their heuristic power. Fruitfulness in solving problems is not just one additional property of Kantian

theoretical ideas but their very essence. For a speculative idea of pure reason is not at all an "ostensive" but *only* a "heuristic" concept (B 699). That is to say, it

> does not show us how an object is *constituted*, but how, under its guidance, we should *seek* to determine the *constitution* and *connection* of the objects of experience. (*ibid.*, my italics)

When properly used, ideas are, therefore,

> thought *only* problematically, in order that upon them (*as heuristic fictions*), we may base regulative principles of the systematic employment of the understanding in the field of experience. (B 799, my italics)

More significantly still, ideas can be employed to indicate (*anzeigen*) the procedures (*Varfahren*) "whereby the empirical and determinate employment of the understanding can be brought into complete harmony with itself" (B 693–94; cf. B 710). Procedures which Kant is alluding at here are no doubt heuristic procedures, which are weaker than algorithms but stronger than simple trial and error strategy.

Clearly, in order to be able to "indicate" heuristic procedures, ideas must be applicable, which requires, as we have just seen, that they be referred to ideal objects and schematised. It is these objectivised ideas that provide the a priori necessary guidelines for solving system-problems:

> If, then, it can be shown that the three transcendental ideas (the psychological, the cosmological and the theological), although they do not directly relate to, or determine, any object corresponding to them, none the less, *as rules of the empirical employment of reason, lead us to systematic unity*, under the presupposition of such an *object in the idea*; and that they thus contribute to the extension of empirical knowledge, without ever being in a position to run counter to it, we may conclude that it is a *necessary maxim of reason to proceed always in accordance with such ideas*. (B 699; first and last italics are mine)

We recognise in the conclusion at which Kant arrives at the end of this passage the *fourth main tenet* of his theory of ideas. On Kant's as well as contemporary views, the necessity of ideas is due to their heuristic effectiveness. Kant goes even so far as to affirm that to establish this property of ideas is the same as to offer a *transcendental* justification or *deduction* for them. In the sequence of the text just quoted he writes:

> This, indeed, is the transcendental deduction of all ideas of speculative reason, not as *constitutive* principles for the extension of our knowledge to more objects than

experience can give, but as *regulative* principles of the systematic unity of the manifold of empirical knowledge in general, whereby this empirical knowledge is *more adequately* secured within its own limits and *more effectively* improved than would be possible, in the absence of such ideas, through the employment merely of the principles of the understanding. (last two italics are mine)

4. ANALOGIC SCHEMATISM

4.1. *General Concept of Analogic Schematism*

The fact that ideas can be given an intuitive interpretation shows that empirical and transcendental schematism are not, as it is often thought, the only procedures for providing a concept with a sensible interpretation (*Versinnlichung*, hypotyposis, exhibition or *subiectio ad aspectum*). Precisely speaking, there are two more such procedures: the symbolic or analogical schematism itself, and its converse, the procedure of symbolization, although this distinction is not always kept quite clear in Kant's texts on semantics.

What does symbolization of ideas consist in? According to Kant, concepts of reason can be interpreted by means of an intuition:

such that the procedure of judgement in dealing with it is merely analogous to that which it observes in schematism. In other words, what agrees with the concept is merely *the rule of this procedure*, and *not the intuition itself*. Hence the agreement is merely in the *form of reflection*, and *not in the content*. (Ku, A 252; tr. p. 222; my italics)

Pure or empirical intuitions which are employed in this way are called *symbols* of both the concept which they interpret and of the object of this concept. In the *Prolegomena* Kant explains further the nature of agreement between ideas and their intuitive symbols. It is based on analogy, "which means not, as the word is commonly taken, an imperfect similarity of two things, but a perfect similarity of two relations between quite dissimilar things" (*Prol.*, A 176; tr. p. 125). What Kant means is that *relations* which are given in one thing (the symbol) are completely similar to the relations which are thought of in the other (the object of the idea).

When we symbolise concepts, we actually perform a *double task*:

first in applying the concept to the object of a sensible intuition, and then, secondly, in applying the mere rule of its reflection upon that intuition to quite another object, of which the former is but the symbol. (KU, A 253; tr. p. 222)

We see that the whole process of the interpretation by means of symbols consists of two movements in opposite directions: the downward movement of the *subsumption* of a sensible object under the concept that we interpret (symbolization properly speaking), and the upward movement of the *transfer of rules of reflection* from the given intuition (object) to the concept we are dealing with, and to its object (analogical or symbolic schematism). In Kant to *reflect* means to find the universal, that is, "the rule, principle or law" (KU, A XXIV; tr. p. 18; cf. KU, H 15). Accordingly, when by the upward movement of analogical schematism we transfer rules of reflection from the given intuitions to objects of ideas, what we actually do is to transfer rules for discovering ideal (theoretical) rules, principles or laws. Thus, the main point in employing symbolic interpretation is heuristic and the upward part of this method is the decisive one, for it provides guidelines for scientific research.

The following example given by Kant illustrates quite well how both procedures of symbolic interpretation are applied. The concept of a monarchical state is certainly not directly schematisable, for, indeed, it is a practical *idea*. However, we can symbolize it in different ways. If, for instance, we think of the monarchical state as governed by constitutional law, we can respresent it as a living body. If, on the other hand, we conceive it as governed by an individual absolute will, we may subsume under it a mere machine, a hand-mill. In both cases, the representation is, of course, merely symbolic. For there is no material likeness between a despotic monarchical state and, for instance, a hand-mill. in other words, the concepts of these two entities certainly do possess characteristic notes which are mutually incompatible. Nevertheless, there is no difficulty in transferring the form of rules of reflection about causal relations from the case of hand-mill to the case of a despotic state. That is, we are permitted to employ in our enquiries about dynamic properties of despotic monarchical states the same methods which we use when we study the dynamic properties of hand-mills (KU, A 253–64; tr. pp. 222–23).

Kant observes that we employ the symbolic interpretation of a wide range of concepts very commonly. Whenever we deal with concepts which cannot easily, if at all, be interpreted in a direct way by means of absolute schemata, we express them only by drawing upon an analogy with a direct intuition, that is, by "transferring the reflection upon an object of intuition to quite a new concept, and to which perhaps no

intuition could ever directly correspond" (*ibid.*). To be sure, this procedure does *not* generate a form of *knowledge* but only amounts to a *mere mode of representation*. It is, however, not always a sign of a lazy reason. Its employment is permissible and even recommended whenever we deal with concepts which cannot possibly be associated with principles of direct schematism, that is, with "principles of theoretical determination of their objects in respect to what they are themselves", as is the case with the ideas of theoretical and practical reason. In considering ideas, we are allowed to employ the procedures of symbolic interpretation as a tool "of practical determination of what the idea of an object ought to be for us and for its final employment" (*ibid.*).

Kant's theory of analogical (symbolical, Fort, A 204) schematism is thus a theory of the constitution, for heuristic purposes, of schemata of concepts and of propositional principles of reason by starting from their symbols (B 702, 725). There is one general negative condition which, according to Kant, we must follow in constituting such schemata: we are not allowed to employ entirely new categorical frameworks. For, he argues,

> our reason can employ as conditions of the possibility of things [*Sachen*] *only* the conditions of the possibility of experience; it can *never* proceed to form concepts of things quite independently of these conditions. Such concepts, though non self-contradictory, would be without an object. (B 799)

In this passage Kant is referring to the objects of ideas as well as to the objects of possible experience. It is clear from the context that he is opposing the former not so much to the latter (although he does so as well) but to discursive representations which are "mere fancies" or "empty figments of the brain" and not "concepts of things" at all.[4] Fictious referents of ideas (*entia rationis rationcinatae*; B 709; KU, A 488; tr. p. 141) differ accordingly from objects of mere fancies (*entia rationis rationcinantis*, KU, *ibid.*), for they must obey some constraints of possible experience (although, of course, *not all* of them) while the latter are entirely unrestricted and possibly even inconsistent, in which case they must be counted as non-entities (*Undinge*, *nihil negativum*, B 348).

There are, in addition, three more specific strategies for building idealized theoretical models for ideas. The first one tells us how to transfer empirical concepts, relations and laws; the second teaches

the constitution of theoretical models by means of constructions and laws of intuitive mathematics, while the third is concerned with the transport of categories from symbols to analogic schemata. I will examine each one of these strategies separately. Kant never treated this topic in a systematic way. It is as if he never ended his struggle with the concept of the ideal object, which was one of the most original and bold of his discoveries and one which has most profoundly influenced the development of the philosophy of science up to the present day.

4.2. *Transfer of Empirical and Mathematical Principles*

Kant is all but explicit about transfer of empirical concepts, relations and laws from empirical intuitions to data representing objects of ideas. Yet it seems clear that he thought of it as an operation of idealization and schematisation of empirical representations. For he observes that the transfer is achieved by omitting "all conditions which might limit the ideal" symbolised (B 706).

An example of this process is the construction of the model (schema) which represents the object of the idea of the supreme being.[5] This construction, called "symbolic anthropomorphism" (*Prol.*, A 175; tr. p. 124), takes our empirical intelligence as one of its symbols and idealizes it (B 726). The relation of the supreme being to the world, for instance, is thought as analogous to the relation between the clock maker and the clock. This last relation is, accordingly, (part of) the intuitive model of theoretical relations which characterizes God. It is said to apply to God improperly and in an idealized form. The same is true of other objective properties and relations. In an analogy "with realities in the world, that is, with substances, with causality and with necessity", etc., we think of the supreme being as a real entity characterised by "the highest perfection" (B 706).

Yet, although idealised, the transferred properties remain intuitive. They can always be traced back to the realities of the world, in other words, to symbols of God. As a result our own empirical intelligence is seen as a faint copy (*Nachbild*) of this theoretical original.

We are confronted here with a particular case of a general effect of the upward movement of idealisation and schematisation which is of fundamental methodological importance: the inverse downward movement may be constructed as an explanation of the properties of

the original sensible object by means of the properties of theoretical entities. Symbols are thus transformed into consequences.

So far as mathematical physics is concerned, and it is Kant's central concern in this context, the domain of pure (empty) intuitions or data is by far the most important for constructing analogical schemata. Therefore, pure or schematic constructions occupy a dominant position. It is by these means that most important ideal objects of theoretical physics, such as infinitesimals, absolute and empty space, and fundamental forces, are given intuitive, albeit only inadequate and symbolic representation.[6]

4.3. *Transfer of Categories*

Finally, all categories and category-based rules are also transferred. In transferring them, we first free them "from the unavoidable limitations of possible experience" and then apply them to the unknown unconditioned:

> This is achieved in the following manner. For a given conditioned, reason demands on the side of conditions – to which as the conditions of synthetic unity the understanding subjects all appearances – absolute totality, and *in so doing converts the category into a transcendental idea*. (B 437; my italics)

Transcendental ideas constituted by extending categories to the unconditioned (*ibid.*) are employed for formulating infinite classes of empirical problems. Yet, in order to achieve progress in solving these problems, empirically unrestricted categories or ideas must be given some objective representation. This is done by positing thought-entities as *analoga of real things*. After having removed

> from the object of the idea the conditions which limit the concept provided by our understanding [category], but which also alone makes it possible for us to have *a determinate concept of anything*,

we go on thinking

> a something, of which, as it is in itself, we have no concept whatsoever, but which we nonetheless represent to ourselves as standing to the sum of appearances in a relation *analogous* to that in which appearances stand to one another. (B 702; my italics)

That is to say that, although we may employ a category free from restrictions of direct schematisation, in solving pure reason problems, we nevertheless "apply" it "to the schema of reason" (B 693). This

implies that categories are applied to schemata of ideas of reason constituted by analogy from empirical and mathematical symbols. In that way we generate unconditioned substances, unconditioned causes (for instance, fundamental forces), and so on.

Summing up, the intuitive representation of (objects of) ideas is provided by data structures, called analogical schemata, generated over empirical and pure data domains by means of empirical and pure laws and constructions. These data structures also obey some conditions expressed by categories. However, they are both partial and inadequate exemplifications of ideas.

I have said[7] that ideas are employed for formulating problems of maximal consistent extension of empirical knowledge. We now see that this job is actually done by non-schematised ideas. Schemata of ideas are in turn representations of solutions of such problems. For, although for a schema of an idea "no object, not even a hypothetical one, is directly given", it nevertheless "enables us to represent to ourselves other objects in an indirect manner, namely, in their systematic unity, by means of their relations to this idea" (B 698). Using the term "derive" in a constructional and non-propositional sense, Kant observes that schemata of ideas are employed in deriving objects of empirical knowledge from ideal constructs:

> We..., as it were, derive the object of experience from the supposed object of [the]...idea, viewed as the ground or cause of the object of experience. (*ibid.*)

Perhaps the best example of such a derivation is the representation of the diminishing gravitational effects of the force of attraction of a mass-point by means of a sphere in expansion, which is the analogical schema of the idea of the force of attraction recommended by Kant.[8]

4.4. *Objects of Ideas and the Noumena*

The cognitive function of objects of ideas can be contrasted in an interesting way with that of noumena. Noumena, or entities of understanding (*Verstandeswesen*, B 306), differ from phenomenal entities or transcendental unities of sensations (Kantian constructive classes) in so far as they are thought of as *separated* from sensible data and entirely independent of sensibility (A 252). They are objects "for a quite different intuition and a quite different understanding from ours" (B

344). We may wonder, therefore, what the cognitive function of such objects is and why they are introduced in the critical philosophy.

The point of introducing them is a double one: first, "to mark the limits of our sensible knowledge", and, second, "to leave open a space of which we can fill neither through possible experience nor through pure understanding" (B 345). In the first case, the noumena serve to introduce unsolvable problems for the understanding. As Kant puts it, the concept of noumenon is a "problematic concept", that is, "it is a representation of a thing of which we can neither say that it is possible nor that it is impossible" (B 343). It is therefore "not the concept of an object, but is a problem unavoidably bound up with the limitations of our sensibility" (B 344; cf. Prol., 34). A noumenal concept, accordingly, does not extend the field of possible objects but only the domain of unsolvable problems of the understanding. In the second case, the concept of noumenon plays a positive, albeit a very modest, role: it simply leaves open a place for objects different from empirical ones.

One might conclude that noumena are but a variety of the objects of ideas. The similarity between noumena and a particular kind of objects of ideas, those which are fundamental forces, is indeed explicitly stressed by Kant himself. Neither noumena nor fundamental forces are real objects and accordingly their concepts are not possible concepts. For noumena "cannot be reckoned among the possibilities, although they must not for that reason be declared to be also impossible" (B 347). Fundamental forces, on the other hand, are objects "which though entertained in thought without self-contradiction are yet also in our thinking unsupported by any example for experience, and are therefore not to be counted as possible" (*ibid.*). This problematic character of fundamental forces reflects, of course, the context in which it is introduced: they are transcendental unknowns of empirically insolvable problems. Thus, so far, the introduction of objects of ideas has precisely the same effect as the introduction of noumena.

Yet, in spite of this similarity, fundamental forces and other objects of ideas are essentially different from noumena. For, whereas noumena are characterised *only* by categories unrestricted by the conditions of sensibility, objects of ideas are positively unconditioned and satisfy, moreover, some additional empirical and mathematical conditions. Accordingly, whereas representations by which we think of noumena and *non*-schematised categories, representations by which we think of

ideal objects *are again* these same categories, provided, however, with symbolic interpretation, that is, interpreted over symbols and analogical schemata. That explains the difference in cognitive roles between representations of these two kinds. While the former are essentially problematic, having no precise positive role, symbolised and schematised ideas can be employed for stating theoretical solutions of problems of pure reason and for providing guidelines of empirical research as well as for setting up the transcendental problems of reason.

5. AN EXAMPLE: ANALOGIC SCHEMATISM OF IDEAS OF FUNDAMENTAL FORCES

Kant's comments of intuitive representation of concepts of fundamental forces as given by rational mechanics are good examples of his views about the correct employment of the method of analogical schematism. It may be worthwhile to determine that these concepts are speculative ideas. To start with, these concepts are employed to formulate problems which are unsolvable in the domain of possible objects, which means, according to Kant, that they are purely and simply unsolvable:

> Objects which are given to us by experience are from many points of view *inconceivable* and many questions to which the law of nature leads us, when they are driven to a certain height but still in conformity with these laws, *cannot be solved at all*; for instance, *whence matter has its mutual attraction*. (*Prol.*, 56, my italics)

What is more, the very existence of fundamental forces is for us an unsolvable problem, as can be seen from the following passage:

> In cases in which these empirical causes cease to be sufficient and we are obliged to start inventing material forces which obey unseen laws and are incapable of ever receiving any empirical support, we have already moved beyond science of nature [into metaphysics]; for, in spite of the fact that we continue to consider natural things as causes, we attribute to them forces *the existence of which cannot be proved by any means*, nay, the very *possibility of which is difficult to bring into* agreement with reason. (Gerb., A 126, my italics)

This text is concerned with the fundamental forces of rational mechanics, as they are unconditioned causes of purely intelligible conditions of appearances (B 559n) and thus necessarily situated "beyond science of nature", that is, beyond any possible experience. At first sight, Kant seems to leave it open whether fundamental forces

are possible or not, that is, whether they can be given in the domain of possible experience. Yet Kant's doubts here are obviously only apparent and rhetorical. For no object of thought which is situated beyond possible experience can *per definitionem* be said to be possible. Concepts of fundamental forces are purely and simply without any object, just as all noumenal concepts are (B 347). The unsolvability of the problem of possibility of fundamental forces is moreover the standard doctrine of Kant's *Metaphysical Foundations of Natural Science*. The demand to make comprehensible the possibility of fundamental forces, he says there, is an impossible one (MAN, A 61, 84; tr. pp. 62 and 78–79).

And yet, these fundamental force-concepts are correctly given a partial and inadequate intuitive content by means of the three strategies for schematising ideas explained in the preceding section. They are, in the first place, modelled by purely empirical properties. One of them is the property that fundamental forces act in opposite directions along a line (joining points that represent them) (B 329; cf. MAN, A 123 ff; tr. pp. 107ff). This is, of course, a purely empirical condition on forces and it ensures in a purely empirical way that forces are not mere fancies (B 269, 799). Or, as we may also say, it guarantees the indirect empirical possibility of the idea of fundamental force (B 213, 269).

In the second place, mathematical properties constructible in the domain of pure intuition are also quite correctly transferred over to fundamental forces. In cinematics (phoronomy), for instance, we represent forces acting in opposite directions by points (B 812–13; MAN, A 1; tr. p. 18). This representation, also employed in other parts of mathematical physics, makes the abstraction of the property of extension essential to all intuitions and appearances. Accordingly, it is not a representation of any possible object. It is indeed nothing more than a useful representational device employed in relative constructions of mathematical models of forces.

A particularly interesting example of mathematical conditions imposed on fundamental forces is given by the analogical schematisation of action at a distance, which we think of as being a theoretical property of the fundamental force of attraction. The idea of reciprocal attraction of parts of matter extending itself over the whole material order should of course be sharply distinguished from the a priori

concept of communication of motion which satisfies the third law of Kant's mechanics. Being derivable from the category of community, the concept of communication of motion can, as well as any other concept derivable from categories, be properly schematised and constructed (MAN, A 121ff.; tr. pp. 106ff). The idea of universal reciprocal attraction, on the other hand, is not directly constructible, because it characterises a fundamental property of an ideal object. There is therefore no point in trying a priori to deduce any rule or proposition about it.

In particular, it is impossible to justify a priori the fundamental doctrine of Newtonian astronomy expressed by the rule which says that attraction decreases inversely as the square of the distance from each attracting point (*Prol.*, A 115; tr. p. 83). As this point is of great importance in appreciating the limits of Kant's a priori laid foundations of rational mechanics, I shall take a closer look. Kant grants, no doubt, that this rule seems (*scheint*) to lie necessarily in the nature of things and hence is usually propounded (*vorgetragen zu werden pflegt*) as capable of being known a priori. He points out, however, that it "rests [*beruht*] merely on the relation of spherical surfaces of different radii" (*ibid.*). Yet this ground of the inverse square law provides no proof of it either a priori or a posteriori, and is indeed only a mathematical analogy. Considering other processes of diffusive action upon a point at a distance, such as the process of diffusion of light, Kant observes that of any such process:

> *one can say* that in all spaces through which it is diffused, however small or great they may be, it always constitutes an equal quantum, but that the degree of its action upon that point in this space always stands in inverse proportion to the space through which it has had to diffuse itself in order to be able to act upon that point. (MAN, A 72; tr. p. 70; my italics)

This observation (*Vorerinnerung*) suggests that we can apply the same mathematical models to the action of all diffusion processes. Now the diffusion of light can be quite adequately modelled by an expanding sphere. For it can be mathematically proved that its spherical surfaces "increase with the square of the distance" (*ibid.*) and we can accordingly say that the illumination of these surfaces diminishes in the same proportion, as implied by the empirical observations of light. By

analogy between the diffusion of light and the theoretically thought-of diffusion of the force of attraction, we may say that its action too can be modelled by an expanding sphere, but not that in itself this force behaves in that way.

To be sure, the inverse squares law was regarded by Kant as well confirmed by its consequences. For, he writes,

> its consequence is so excellent in respect of the variety and regularity of its agreement that it follows not only that all possible orbits of heavenly bodies are conic sections, but that they have such a relation to each other that no other law than that of the inverse square of the distances can be invented (*erdacht*) for a cosmic system. (Prol., A 115; tr. p. 83)

This text conveys all the strength of the Kantian dogmatic faith in the correctness of the basic proposition of Newtonian astronomy. Yet it can hardly be interpreted as implying that Kant thought of this proposition as capable of being proved by its consequences. Moreover, according to Kant's standard methodology, no general law can ever be proved a posteriori (KU, A XXXIII; tr. p. 24).

Kant also considers various other mathematical analogical schemata for the force of attraction proposed by contemporary scientists. Yet he gave his preference to the expanding sphere model on the grounds that the alternatives proposed were introducing troublesome consequences regarding the nature of forces:

> It is better to represent the diffusion of a moving force from one point to all distances in this manner than it is to represent this diffusion in the ordinary way, as such representation occurs (being among other such ways) in optics, by means of rays diverging in a circle from a central point. For lines drawn in this way can never fill the space through which they pass.... (MAN, A 73; tr. p. 71)

For similar reasons Kant objects to representing empirically observed lines of direction of the attraction "as rays diverging from the attraction point", preferring them to be modelled "as converging at the attracting point from all points of the surrounding spherical surface (whose radius is the given distance)" (MAN, A 74; tr. p. 71). These and other similar examples which can be found in Kant reveal an important aspect of the analogic constructions of objects of ideas: they are arbitrary to a large degree, and the choice between them is made by methodological considerations (regarding the theoretical unity of the system, etc.).

In the third place, we project correctly over models of forces, which

obey empirical and mathematical conditions such as those which I have just explained, various conditions expressed by the principles of understanding (B 252). We require, for instance, according to the second principle for analogies, that relations between fundamental forces and their sensible effects be that of a continuous succession of events (B 798). By doing so, we apply categories to schemata of reason, i.e., to models of objects of ideas, just "as is the case in the application of categories to their sensible schemata" (B 683).

The models of forces constituted by transferring to intelligible objects of fundamental force-concepts certain empirical, mathematical and categorial properties make them intuitive, although they do not provide them with complete and adequate schemata. For to that end these models should be both constitutable in the domain of possible experience and exemplify all notes contained in fundamental force-concepts. Yet, if they are so constitutable, they are necessarily only partial and inadequate; for, only partial and inadequate representation of an unconditioned entity can ever be given in sensible intuition. And, conversely, if these models are completed and adequate they are necessarily not intuitively constitutable and only conceptual, for only those representations which are not applicable in the domain of possible objects can make models of fundamental forces complete and adequate. The construction of theoretical models, accordingly, does not turn ideas of fundamental forces into possible concepts. These concepts still remain inconceivable (MAN, A 61; tr. p. 62) and are for this very reason inscrutable (*ibid.*, A 158; tr. p. 134; cf. B 641). This explains why Kant never tried to prove a priori any law of fundamental forces and why, in particular, he never attempted to prove the second law of Newtonian dynamics.

6. KANTIAN HEURISTICS FOR SOLVING SYSTEM-PROBLEMS

6.1. *The Heuristics for Rational Psychology*

We have seen that there are three possible maximal consistent extensions of our empirical knowledge which correspond to the three categories of relation. The study of appearances in the light of these relations constitutes the three necessary system-problems of pure speculative reason. Traditionally, these problems have been allocated to rational psychology, cosmology and theology, respectively. Each of

these traditional sciences, even if practiced dogmatically without the knowledge of Kant's results concerning the objective insolubility of metaphysical problems, is, says Kant, "an altogether pure and genuine *product, or problem*, of pure reason", not of the understanding (B 392). The latter is not in a position to yield even the mere project of any one of these sciences.

Moreover, all necessary system-problems of pure reason have their origin in the ideas of reason. There are thus as many such problems as there are ideas. Yet, ideas do not only set us problems. For they can be referred to intelligible objects and schematised. And schematised ideas can be effectively employed for finding solutions of system-problems as well as for representing empirical objects in a systematic manner and explaining them. Actually, the three classes of schematised transcendental ideas (the psychological, the cosmological and the theological) are the basis of three different heuristics applicable to the three basic kinds of necessary system-problems of pure reason.

I shall now submit to a closer analysis Kant's views about ideas and their analogical schemata as guidelines for solving necessary system-problems of pure speculative reason, limiting myself to that part of his metaphysics of nature which is called transcendental philosophy and is exposed mainly in the *Critique of Pure Reason*.[9]

Let our problem be to establish the systematic unity of the thinking subject, that is, the systematic unity of all properties of appearances of inner sense. In order to solve this class of problems, we must of course interrogate experience (B 710). Yet no "empirical concept (of that which the soul actually is)" can carry us far enough (*ibid.*). Reason is therefore obliged to "connect all the appearances, all the actions and receptivity of our mind, *as if* the mind were a simple substance which persists with personal identity (in this life at least)" (B 700, my italics). Now this necessary regulative or *as if* principle (rule) can be schematised. In other words, the idea of simple unconditioned substance can be given an interpretation. This is achieved by relative presupposition of a mere something (cf. B 707) called "I" or "soul", and by attributing to it, through analogical schematism, different properties such as simplicity, personal identity, etc.

In that way we "realise" (*realisieren*, B 705) the idea of simple substance which states the general condition of the necessary *as if* rule for rational psychology. This "realisation", which behaves like a real object, is also the schema of this principle (B 710) and the substratum

of the greatest possible unity of experience in the domain of inner sense (B 706). It is, however, rather difficult to say what kind of representation characterises this schema. The fact that it is called substratum suggests only that it has the role of matter with respect to the idea of simple substance which is its form. However, my description of the method of analogical schematism suggests strongly that the schema of simple substance must have intuitive content. For, as any other schema constituted from symbols, it is characterised exclusively "through concepts which, properly, are applicable only in the world of sense". Yet, while it is rather easy to specify which intuitive representations are used in the constitution of other schemata, as, for instance, schemata of fundamental forces (see Section 5, above), it is difficult to find such representations in the present case.

The lack of precision in Kant's schema of simple substance can be partially explained by noting that, according to Kant, mathematics is inapplicable to the phenomena of the inner sense and their laws "unless one might want to take into consideration merely the law of continuity in the flow of this sense's internal changes" (MAN, A X; tr. p. 8). The reason for this limitation on the extension of psychological knowledge by building mathematical schemata "lies in the fact that the pure internal intuition in which the souls phenomena are to be constructed is time, which has only one dimension" (*ibid.*). This property of phenomena of inner sense prohibits them from being idealised and schematised by means of geometrical figures, which makes understandable the apparent scarcity of intuitive representations in Kant's schema of the guiding idea of psychological research.

However vague, this schema also has definite methodological advantages. It eliminates inadequate empirical properties, laws, and hypotheses and saves unnecessary principles of explanation. For it ensures that:

> no empirical laws about bodily appearances, which are of a totally different kind, will then intervene in the explanation of what belongs exclusively to inner sense. No windy hypotheses of generation, extinction, and palingenesis of souls will be permitted. The consideration of this object of inner sense will thus be kept completely pure and will not be confused by the introduction of heterogeneous properties. Also, reason's investigations will be directed to reducing the grounds of explanation in this field, so far as may be possible, to a single principle. (B 711)

All this will be best attained by conducting our research in agreement

with the schema of the regulative idea of the soul and, indeed, "it is attainable in no other way" (B 712).

6.2. *The Heuristic for Rational Cosmology*

The second necessary problem of pure reason concerns the absolute unity of conditions of given appearances. This problem, or, more precisely, this infinite class of problems, cannot be solved by considering empirical sequences themselves. In order to make progress in solving it, we must employ the necessary maxim of rational cosmology which enjoins us to regard our enquiry "as never allowing of completion, just *as if* the sequence of appearances were itself endless, without any first or supreme member" (B 700).

Another slightly more complete formulation of this *as if* principle says that:

> in explaining appearances, whether in their regressive or in their ascending order, we ought to treat their sequence *as if* it were in itself infinite, that is, *as if* its proceeded *in indefinitum*. (B 713)

In both formulations of the basic rule of cosmological research, the only condition which is expressed by an idea is that of the infinity of regress. Yet, there is a rejoinder to these two formulations which introduces a condition expressed by the idea of an intelligible cause:

> We need not, in so doing [i.e. in proceeding in accordance with the cosmological *as if* rule as formulated above], deny that, outside all appearances, there are purely intelligible grounds of the appearances; but as we have no knowledge of these whatsoever, we must never attempt to make use of them in our explanations of nature. (B 700)

One of the intelligible grounds we may consider is liberty as the "determining cause" of our moral actions (B 710). Unfortunately, Kant forgets to mention here other basic ideas which may also be considered in solving cosmological problems: the ideas of fundamental forces. Yet, there can be no doubt that fundamental forces are among those unconditioned entities of causal kind which we can legitimately consider theoretically in explaining sequences of appearances. Having examined their schemata (Section 3) we now possess all the primitive ingredients of Kant's second research program.

A sub-problem of the cosmological problem concerns teleological aspects of both organised and non-organised natural beings and of the

nature as a whole. The a priori rule for tackling this problem (class of problems) demands that we treat all connections in the world as if a "systematic and purposeful unity, were everywhere to be met with, *in infinitum*" (B 728). The schema of the idea of systematic and purposeful unity which expresses the universal condition of this regulative *as if* principle is the representation of "one single all-embracing being as the supreme and all-sufficient cause" (B 714). This supreme cause is of course as unknown and unknowable entity which we endow, by analogy with our empirical intelligence and in respect of the cognitive goals we want to favour, "with just those properties which, in conformity with the conditions of our reason, can be regarded as containing the ground of such systematic unity" (B 726). This subtle employment of anthropomorphism, without which we could not think anything whatever in regard to the supreme being and cause (B 728), can be combined with the procedures of idealisation. Its result is a representation which may function as the schema of the best regulative principle for studying the world as a whole. Kant shows that this schema "always benefits reason" and that if properly employed "it can never injure it" (B 715, cf. B 729). The benefits of the schema are so great that even the incorrect physico-theological proof of existence of a supreme being based on the concept of goal-directedness "does more good than harm to the study of nature". For, argues Kant, it

> suggests ends and purposes where our observation would not have detected them by itself, and extends our knowledge of nature by means of the guiding-concept of a special unity . . . , (B 651)

This same schema is no doubt the basis of the fundamental necessary maxim of reflection on organised natural things. Indeed, in order to be rational, the reflection on such things, that is, the systematic attempt to find their universal properties allocated as a task to the power of judgement, must necessarily obey the following principle:

> *An organised natural product is one in which every part is reciprocally both end and means.* (KU, §66)

In such a product, comments Kant, "nothing is in vain, without an end, or to be ascribed to a blind mechanism of nature" (*ibid.*).

Moreover, maxims of the power of judgement for the discovery of principles of unorganised natural things can also be drawn from it. Yet, although these maxims are of great importance in Kant's

methology of physical science, I must refrain here from scrutinising them in more detail, and shall only consider an example of their employment:

> Thus if, in studying the shape of the earth (which is round, but somewhat flattened), of the mountains, seas, etc., we assume it to be the outcome of wise purposes on the part of an author of the world, we are enabled to make in this way a number of discoveries. (B 715)

This assumption allows us to expect that advantages will arise from the shape. And, comments Kant, such advantages have actually been discovered. Thus the "spheriodal flattening alone prevents the continental elevations, as even the smaller hills, thrown up perhaps by earthquakes, from continuously . . . altering the position of the axis of the earth" (B 715 n), which is a wise arrangement from the point of view of our interest in material welfare.

The history of empirical science shows, accordingly, that the schema of a supreme being may lead to real discoveries about theological connections. Furthermore, even if it led us to errors it "cannot do us any serious harm". For "the worst that can happen would be that where we expected a teleological connection (*nexus finalis*), we find only a mechanical or physical connection (*nexus effectivus*)" (B 715–16). But in this case too, we have gained something.

Yet, whatever be the dangers of the employment of the theological regulative rule (and its schema) for mechanical explanations of organised and unorganised bodies, "nothing decisive can be cited against it" (B 854), provided, of course, that "we restrict ourselves to a merely regulative use" of it (B 715). And, although contrary to what the history of science shows us, we might actually discover but little of the perfection of the world implied by it, the search for this perfection would still be imposed upon us by the legislation of our reason (B 728).

6.3. *The Heuristic for the Study of Empirical Totalities*

The third necessary problem of pure reason is to study "the absolute unity of conditions of an object of thought in general". This study is imposed by the idea of a thing in general, called the ideal of reason. In respect to empirical things, this idea represents a special kind of completeness of its conditions, namely, the sum-total of all its predi-

cates (B 600), and is associated with a principle of reason, which, expressed as a proposition and not as a postulate or maxim, says that one of every pair of given contradictory predicates, as well as one of every pair of possible predicates, must always belong to a thing (B 601). We are enjoined by reason to employ this principle as a maxim for the *complete determination* of existing things by means of empirical synthesis, but "without requiring that all this reality be objectively given and be itself a thing" (B 608). There is moreover no "thinkable object" (B 642) which might be said to be given in or to realise the sum-total of all possibilities of a thing conceptually represented by the ideal (B 608). We are therefore forbidden not only to hypostatise this idea by absolute supposition of an object for it, but even to assume the logical possibility of such an hypothesis (*ibid.*). If we take the concept of the sum-total of all possibilities or predicates of a thing as a concept of a thing, we fall into transcendental or a priori semantical errors subreption (B 610). The fact that no thinkable object is given in the ideal of reason does not make the empirical employment of the principle of complete determination of things impossible. For we can follow it directly by comparing objects of senses with all the predicates that are possible in the field of appearance (B 609, 601).

However, in order to secure the greatest possible extension of application of this principle we must necessarily also take into account an as-if principle which corresponds to the ideal of reason and according to which

> we must view everything that can belong to the context of possible experience *as if* this experience formed an absolute but at the same time completely dependent and *sensibly* ordered unity, and yet also at the same time *as if* the sum of all appearances (the sensible world itself) had a single, highest and all-sufficient ground beyond itself, namely, a self-subsistent, original, creative reason. (B 700)

Yet, the creative reason or archetype of all things should not be taken as a direct referent of the ideal. For this would require, as I said, that we commit a series of subreptions, namely, that

> we substitute dialectically for the *distributive* unity of the empirical employment of the understanding, the *collective* unity of experience as a whole; and then think this whole of appearance as one single thing that contains all empirical reality itself; and then again in turn, . . . substitute for it the concept of a thing which stands at the source of the possibility of all things. . . . (B 610–11)

Creative reason does not symbolise therefore the ideal of reason itself

but a derivative idea generated from the ideal by a series of transcendental or a priori semantical subreptions. The archetype of all things must not be posited either as a thing which supplies the real conditions for the complete determination of all other things (B 611) or as the sum of all things from which each single thing can be obtained by limitation or division (B 607). The idea of a supremely wise cause can only be employed in order to obtain from it "*the rule* according to which reason in connecting empirical causes and effects in the world may be employed to best advantage" (B 701, my italics).

Summing up, there are three Kantian a priori heuristic guidelines for solving system-problems based on analogical schematism of ideas. This procedure allows for the employment of both empirical and a priori conditions of empirical objects beyond the limits of possible experience without committing the error of transcendental (mis)employment of our cognitive powers.

6.4. *Metaphysics Turned into Methodology*

By now I have examined the basic necessary problems of pure reason and their a priori available solution procedures. Yet, besides searching for the unconditioned, which is its basic goal, human reason also tries to achieve some other cognitive goals, such as maximal simplicity combined with the greatest possible manifoldness. The attainment of more particular and, in the last analysis, optional goals is favoured by corresponding equally optional rules.

Some of these more specific principles have already been formulated by traditional philosophers as "logical", i.e., purely methodological principles (B 679–80). These are principles of homogeneity, specification and continuity of forms of species and genera or, more generally, of concepts and laws.

Kant has given these principles a transcendental interpretation by *suggesting* that they "possess, as synthetic a priori principles, objective but indeterminate validity, and serve as rules for possible experience" (B 691). It might be supposed, observes Kant, that the procedure based on ideas of homogeneity, specification and continuity in the domain of concepts

> is merely an economical contrivance whereby reason seeks to save itself all possible trouble, a hypothetical attempt, which, if it succeeds, will, through the unity thus attained, impart probability to the assumed principle of explanation. (B 681)

However, continues Kant, such a "selfish purpose" can very easily be distinguished from the purpose of an idea-based principle, for, he argues,

> in conformity with the idea everyone presupposes that this unity of reason accords with nature itself, and that reason – although indeed unable to determine the limit of this unity – does not here beg but command. (*ibid.*)

And it is precisely this objective but indeterminate validity of the principles in question that ensures that they can be employed "with great advantage in the elaboration of experience, as heuristic principles" (B 691). In substance, we have here principles of reason whose main characteristics are "that they seem to be transcendental" and that "they contain mere ideas for guidance of empirical employment of reason ideas which reason follows only as it were, asymptotically – i.e., ever more closely without ever reaching them" (B 691). Objective validity or applicability to objects of empirical research cannot, however, be a priori justified:

> The transcendental deduction of them cannot, however, be effected; in the case of ideas . . . such a deduction is never possible. (B 692)

Kant also considers the heuristic usefulness of correctly interpreted traditional *transcendent* metaphysical principles. These principles are formed from objectively interpreted ideas. Such an interpretation, as based on "a *natural* and *inevitable* illusion" (B 354), has to be criticised. None of them is satisfiable in the domain of possible objects and, accordingly, none of them is provable as objectively valid. All are nothing other than more or less interesting rules of synthesis "of that which perception may give a posteriori" (B 748; cf. B 555). Their only rationale, that is, their only possible "transcendental deduction", consists in saying that by these means empirical knowledge is more adequately secured within its own limits and *more effectively* improved than would be possible, in their absence, through the employment of principles of understanding (cf. B 699). By this reinterpretation of traditional metaphysics, the philosophical methodology of the empirical sciences is substantially increased. It contains, from Kant on, the entire traditional metaphysics turned into methodology, a move which Popper was recently still attempting to complete.

Kant seems to have thought that his concept of metaphysics as a *project* (B 675) of a systematic unity of empirical knowledge was

anticipated by some Greek empiricists, in particular by Epicurus. It is an open question, he says, whether the Epicurean criticism of dogmatic Platonism is based on "objective assertions" about the world of sense considered as a thing in itself, or on "maxims for the speculative employment of reason" in "physical investigation" (B 499–500). If the latter were the case, the empiricist Epicurus "showed in this regard a more genuine philosophical spirit than any other of the philosophers of Antiquity" (B 499). Indeed, that:

> in explaining the appearance, we must proceed as if the field of our enquiry were not circumstances circumscribed by any limit of beginning of the world; that we must assume the material composing of the world to be such as it must be if we are to learn about it from experience; that we must postulate no other mode of the production of events than one which will enable them to be regarded as determined through unalterable laws of nature; and finally that no use must be made of any cause distinct from the world – all these principles [proposed by Epicurus], though seldom observed, still retain their value for extending the scope of speculative philosophy . . . . (*ibid.*)

If these principles reflect the view on metaphysics held by Epicurus, then he may be considered a forerunner of the Kantian revolution in metaphysics, for this revolution consists in establishing that direct objective interpretation of traditional speculative metaphysical principles is impossible, and in giving these principles the role of fallible heuristic rules for solving empirical problems which belong to one of the three fundamental necessary system-problems of pure speculative reason.

NOTES

[1] Philologically oriented commentators, who work exclusively on Kant and never with Kant, have neglected this subject almost completely. It is no surprise that one of the rare recent studies of it comes from somebody like N. Rescher (cf. Rescher. 1981), who is a general philosopher and not a Kant scholar.

[2] The fundamental logical postulate of pure reason can also be given a propositional formulation which is synthetic and which says that, if an appearance is given, the absolute totality of its conditions is also given (B 364). This formulation is not only itself transcendent but also gives rise to a number of other transcendent propositions about absolute totalities which cannot be given in any possible experience. In the light of Kant's transcendental or a priori semantical criticism this formulation must of course be entirely eliminated from the theoretical philosophy of nature.

[3] There is one exception, however. The ideal of reason cannot be directly applied to any thinkable object. See below, Section 6.3.

[4] In reference to this point, Kant's position seems to be analogous with his position regarding whether more than one concept of possible experience can correctly be constructed. Kant took the view that only one such concept is legitimate, on grounds which do not seem to have been presented as an entirely conclusive proof. Kant appears to take the same conservative *attitude* with respect to the ontological framework for theoretical research. We should not forget, however, that Kant recognised the necessity of ideal mathematics, a move which was certainly a major concession to the liberty of theoretising of the founder of the constructivist theory of knowledge.

[5] Other examples will be given later on.

[6] Examples of analogical schemata of the mathematical variety will be given in Section 5 below.

[7] See above, Section 1.

[8] For more details, see Section 5 below. A more traditional but stimulating treatment of analogic schematism can be found in Chapter VIII of Lebrun (1970).

[9] I am approaching Kant from a point of view which was given (by Vaihinger) a well known but highly controversial formulation. I stand very near Vaihinger in considering heuristic as-if principles as essential for Kant's theory of pure speculative reason. But I do not follow him in his analysis of the structure and role of these principles, which is not well balanced and which has given room to Adickes' partially justified criticism (cf. Adickes, 1927).

[10] There is no direct a priori argument against indulging in these subreptions. What is more, as regards theological as well as psychological ideas, "there is nothing whatsoever to hinder us from *assuming* these ideas to be also objective, that is, from hypostatising them" (B 701). A transcendental argument against supposing that intelligible referents of these ideas exist in the absolute sense can only be given in the context of a systematic discussion of the whole dialectic illusion of pure reason, and by considering, in particular, "the case of the cosmological ideas where reason, in so proceeding, falls into antinomy" (*ibid.*).

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