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KANT'S CONCEPTION OF THE UNITY OF THE SCIENCES

According to Kant the ideal of the unity of the sciences forces itself necessarily upon us. Reason demands that "our diverse modes of knowledge must not be permitted to be a mere rhapsody, but must form a system."[1] The work of giving systematic unity to all the sciences belongs peculiarly to philosophy, and philosophy undertakes it not only with a view to giving this unity its greatest logical perfection but also in order to relate "all knowledge and every use of reason to the ultimate end of human reason, to which, as supreme, all other ends are subordinated, and must be combined into unity with it."[2]

With Kant's predecessors, Bacon, Descartes, and Leibniz, the unity of the sciences had been established at severe expense to the distinctions between the sciences. Bacon had declared, "And generally let this be a rule; that all division of knowledge be accepted and used rather for lines to mark and distinguish, than sections to divide and separate them; in order that solution of continuity in sciences may always be avoided."[3] Science itself is one and continuous. Similarly for Leibniz the divisions within knowledge exist only for practical convenience. "The entire body of the sciences may be regarded as an ocean, continuous everywhere and without a break or division, though men conceive parts in it and give them names according to their convenience."[4] In breaking down the distinctions among the sciences Descartes had been perhaps the most radical of all. Science is completely undifferentiated by the nature of its subject matters, and the ordering of knowledge within the total system of science proceeds independently of the distribution of things by genus.[5]

In contrast with this, Kant in his writings shows a constant preoccupation with the divisions of the sciences and their definitions. He lays it down as a principle that "Every science is a system in its own right; ...we must... set to work architectonically with it as a separate and independent building. We must treat it as a self-subsisting whole, and not as a wing or section of another building – although we may subsequently make a passage to or fro from one part to another."[6] As an example of the violation of this principle Kant cites the introduction of the conception of God into natural science in order to explain purposive-

[1] *Critique of Pure Reason*, tr. N. K. Smith, A832 = B860.
[2] *Kant's Introduction to Logic*, tr. Abbott, p. 15.
[3] *De Augmentis Scientiarum*, Bk. IV, Ch. I.
[4] "The Horizon of Human Doctrine," *Leibniz Selections*, ed. P. P. Wiener, p. 73.
[5] *Rules for the Direction of the Mind*, Rule I; Letter to Mersenne, 24 Dec. 1640.
[6] *Critique of Teleological Judgement*, tr. Meredith, p. 31.

ness in nature, and then the use of this purposiveness to prove the existence of God. This mixing of natural science and theology means that both sciences are "deprived of all intrinsic substantiality. This deceptive crossing and re-crossing from one side to the other involves both in uncertainty, because their boundaries are thus allowed to overlap."[7] Or again, there is the careless kind of thinking by which logic gets mixed up with psychology, or is allowed to borrow some of its principles from that science; or ethics gets confused with anthropology; or the practical principles of morality are thought to be practical in the same sense that the technical skills based on natural science are practical; or the method of philosophy is thought to be the same as that of mathematics; etc. Only a clear conception of the nature of the different sciences can eliminate confusions of this kind. "It is sometimes difficult," says Kant, "to define what is meant by a science. But science gains in precision by the establishment of a definite conception of it, and many errors from different sources are thus avoided which otherwise slip in when we are unable to distinguish the science from the cognate sciences."[8]

It is, therefore, for Kant one of the functions of philosophy to determine the scope of the various sciences. He considered it to be "of the utmost importance to *isolate* the various modes of knowledge according as they differ in kind and origin, and to secure that they are not confounded owing to the fact that usually, in our employment of them, they are combined. What the chemist does in the analysis of substances, and the mathematician does in his special disciplines, is in still greater degree incumbent upon the philosopher, that he may be able to determine with certainty the part that belongs to each special kind of knowledge in the diversified employment of the understanding and its special value and influence."[9]

The sciences do not exist with their definitions ready to hand. Although a particular science may be fully established it is still not an easy task to define it, and certainly no science begins historically with a clear or adequate definition of itself. The historic originator of any science must, of course, have some vague idea of it, otherwise he would not be able to set it on its way. This vague idea of a science in its early stages is described by Kant as something which lies hidden in reason "like a germ in which the parts are still undeveloped and barely recognizable even under microscopic observation."[10] Hence when looking for the definition of a science we must not adopt the description which is given by the founder of that science. The natural unity of the parts of the science only emerges

[7] *Ibid.*
[8] *Logic*, p. 12.
[9] *Critique of Pure Reason*, A842 = B870.
[10] *Ibid.*, A834 = B862.

as the science develops. It is to the principle of this natural unity that we must look for the idea of the science, not to what the father of the science says. "For we shall then find that its founder, and often even his latest successors, are groping for an idea which they have never succeeded in making clear to themselves, and that consequently they have not been in a position to determine the proper content, the articulation (systematic unity), and limits of the science."[11] In the initial stages of the development of a science materials are collected together in random fashion, but nonetheless under the direction of a vague idea. This directing idea attains clarity gradually as over a long period more and more materials are amassed and begin to assume the character of a system. "Systems seem to be formed in the manner of lowly organisms, through a *generatio aequivoca* from the mere confluence of assembled concepts, at first imperfect, and only gradually attaining to completeness, although they one and all have had their schema, as the original germ, in the sheer self-development of reason."[12]

In the purposes determining the development of a science Kant distinguishes those which are occasioned by the purely contingent circumstances of the individual inquirer, i.e., his private reasons, and those which are based on a certain "universal interest." Reason has essential ends of its own which express themselves in the same way for all inquirers, and it is these ends which give to the sciences their systematic character, or what Kant calls "architectonic unity." The kind of unity based on the individual's historically conditioned purposes is only a "technical unity," and it is not to this that we must look in order to attain the conception of a science.

The one science for which Kant was above all concerned to reach a definition, or clear conception, was metaphysics, and his discussion of this matter serves to illustrate the points which have just been made. He makes two apparently contradictory statements: (1) "The idea of such a science is as old as speculative human reason," and (2) "... the philosophers failed in the task of developing even the idea of their science...."[13] On the one hand the disposition to metaphysical speculation is intrinsic to human reason. Man as rational is compelled to take an interest in his ultimate destiny, and there is no rational being who does not speculate about what lies beyond sensible experience. "Indeed," says Kant, "we prefer to run every risk of error rather than desist from such urgent inquiries on the ground of their dubious character, or from disdain and indifference. These unavoidable problems set by pure reason itself

[11] *Ibid.*
[12] *Ibid.*, A835 = B863.
[13] *Ibid.*, A842 = B870; A844 = B872.

are *God*, *freedom*, and *immortality*. The science which with all its preparations, is in its final intention directed solely to their solution is metaphysics...."[14] But though the idea of such a science arises directly out of a universal interest of reason, and inevitably directs inquiry toward a set of problems which Kant calls metaphysical, because they transcend the realm of sensory experience, nevertheless the idea of the science is still only a vague one. An exact distinction has never been made between what belongs within metaphysics and what does not.

Kant cites two confusions which have served to prevent the attainment of a clear view of metaphysics, and his account implies in addition a radical criticism of the conceptions entertained by Bacon, Descartes, and Leibniz of the unity of the sciences. The first of these confusions is found in the definition of metaphysics as the science of the first principles of human knowledge. Such a definition fails to distinguish metaphysics as a special *kind* of knowledge and gives it only "a certain precedence in respect of generality." If knowledge is ordered only with respect to degrees of generality of principles, then one may ask where the dividing line is to be drawn between principles which are to be considered first and those which are to be considered subordinate. "Does the concept of extended body belong to metaphysics? You answer, Yes. Then, that of body too? Yes. And that of fluid body? You now become perplexed; for at this rate everything will belong to metaphysics. It is evident, therefore, that the mere degree of subordination (of the particular under the general) cannot determine the limits of a science; in the case under consideration, only complete difference of kind and of origin will suffice."[15]

This mode of determining the nature of metaphysics in terms of its degree of generality was employed by Bacon, but Kant's criticism applies not only to Bacon's metaphysics, but also to his conception of the unity of the sciences as comprising a pyramid of knowledge, in which there is an unbroken and uniformly graded ascent from particulars to the summary law of nature. If the only difference among the sciences in this pyramid is difference of degree of generality in their axioms, then it remains a matter of arbitrary decision to say where one science ends and another begins.

The other source of confusion arises from the seductive influence exercised by mathematics upon philosophers. If metaphysics and mathematics have this in common, that both are *a priori* in their origin, then it is very natural to suppose that metaphysics can attain the same remarkable successes that have characterized the advance of mathematics, by adopting the method of the latter. The assimilation of philosophy to the

[14] *Ibid.*, B7.
[15] *Ibid.*, A844 = B872.

type of mathematics is the subject of Kant's criticism in the longest and perhaps the most important section of his Transcendental Doctrine of Method. It is significant with reference not only to Descartes' and Leibniz's conception of metaphysics, but also to their conception of the unity of the sciences, in accordance with which the different sciences can be ordered in relation to one another in the same way as the truths of mathematics. If philosophy is a different kind of knowledge from mathematics, then the principle of organization relating the sciences to one another cannot be the same as that found governing the parts of a mathematical system, for the ordering of the sciences is for Kant a philosophical task and must consequently proceed in accordance with the method of philosophy. The sciences taken together as an organized whole will not form a single axiomatic or deductive system.

Kant's insistence on a clear-cut division of the sciences is complemented by his equal insistence that all the sciences taken together have the unity of a single organized whole. Kant's definition of science is that it is any doctrine constituting a system: "... systematic unity is what first raises ordinary knowledge to the rank of a science, that is, makes a system out of a mere aggregate of knowledge...."[16] In common knowledge, as opposed to scientific knowledge, there is a mere aggregate of cognitions, the parts precede the whole; whereas in scientific knowledge the system comprising the science rests on the idea of the whole which precedes the parts. Historically, Kant's definition marks a new departure. It is also, as Lalande points out, the one that is classic today.[17] The Cartesian definition which identifies science with apodictic certainty, and the Aristotelian definitions of science as knowledge of causes, and knowledge of the necessary, are not abandoned by Kant, but they are made subordinate to the requirement of systematic unity as the principal distinguishing mark of science. The Cartesian definition of science as "true and evident cognition" is, where Kant is prepared to be strict, retained within his own definition. Thus he says, "That can only be called science (*wissenschaft*) *proper* whose certainty is apodictic: cognition that can merely contain empirical certainty is only improperly called science."[18] But the possession of systematic character is so much more important than certainty of cognition, that Kant allows that we may speak of natural *science*, even though natural science contains laws which are empirical, and which do not therefore possess apodictic certainty. Nevertheless, where the knowledge of nature, including what is empirical, does not rest ultimately on purely rational, and therefore apodictically certain, principles, Kant will not extend the name "science" to it. For science, as a connection of cogni-

[16] *Ibid.*, A832 = B860.
[17] *Vocabulaire*, art. "Science." André Lalande, 1926
[18] *Metaphysical Foundations of Natural Science*, tr. Bax, p. 138.

tions in a system, is, he says, "a system of causes and effects." That is to say, it is, in accordance with a classic definition of science, knowledge of what is *necessary*. If the principles of a systematic body of cognitions "are in the last resort merely empirical, as, for instance, in chemistry, and the laws from which the reason explains the given facts are merely empirical laws, they then carry no consciousness of their *necessity* with them (they are not apodictically certain), and thus the whole does not in strictness deserve the name of science; chemistry indeed should be rather termed systematic art than science. . . . As the word nature itself carries with it the conception of law, and this again the conception of the *necessity* of all the determinations of a thing appertaining to its existence, it is easily seen why natural science must deduce the legitimacy of its designations only from a *pure* part of it, namely, that which contains the principles *a priori* of all remaining natural explanations; and why only by virtue of this portion it is properly science, in such wise, that, according to the demands of the reason, all natural knowledge must at last turn on natural science and there find its conclusion."[19]

There are, then, two elements in Kant's conception of the nature of science: (1) it is a systematic unity of cognitions, and the name science may be extended even to such systems as include empirical, and therefore not apodictically certain, knowledge; (2) such a system must, however, even if it includes empirical knowledge, rest on principles which are themselves necessary and certain. An organized body of merely empirical knowledge would not be science, nor at the same time would knowledge of causes, or of what is necessary, be in itself sufficient to constitute a science, for common knowledge can be knowledge of what is necessary, yet as unsystematic it remains unscientific. Two things appear to follow from the definition of science as any doctrine constituting a system. First, the total system of the sciences would itself be a single science, containing the other sciences as the subordinate parts of an organic whole. These subordinate sciences might in turn be comprised of still lesser wholes. Secondly, the logical principles determining the unity of the sciences in a single system would not be different in character from those determining the unity of cognitions in any one of the sciences taken individually.

The unity of science has its foundations for Kant in the nature of reason itself. It is not, as with Bacon, the reflection of a unity found in nature. Its origin is purely subjective; it is prescribed *a priori* to the objects of science, not empirically determined. In speaking of the unity of nature and the relation of the unity of science to it, it is necessary, however, to keep distinct two ways in which Kant, in different contexts, refers to the unity of nature. In the first place Kant refers to nature as a unity

[19] *Ibid.*, 138 ff.

insofar as it is a system of necessarily interconnected phenomena. Unless the sum total of phenomena comprised such a system there would be no nature at all, either for ordinary knowledge or for scientific knowledge. The laws governing these necessary connections and giving nature its unity are imposed by the understanding upon the manifold of appearances, and they have their source in the synthetic unity of apperception. The necessary connections are those of substance and accident, cause and effect, and the interaction of substances. The three principles, the "analogies of experience," which express these connections, taken together "declare," says Kant, "that all appearances lie, and must lie, in *one* nature, because without this *a priori* unity, no unity of experience, and therefore no determination of objects in it, would be possible."[20]

Within this one nature of necessarily interconnected appearances experience reveals an endless variety of substances, causal sequences, and causal interactions between substances. What distinguishes scientific knowledge from common knowledge is the effort made by the scientist to reduce this multiplicity to unity so far as he is able, by bringing particular substances under species, species under genera, and these in turn under still higher genera, thereby showing in what way the differences among them are merely variations of the same fundamental substance. Similarly with the infinite variety of ways in which phenomena are causally determined, the scientist will seek to reduce the multiplicity of causal laws to an ever smaller number of laws. In proceeding in this fashion the scientist is assuming that there is in nature an identity underlying the seeming heterogeneity. This second conception of the unity of nature in terms of the identity underlying differences is the one which is relevant to the discussion of the unity of science as contrasted with ordinary knowledge. Without the first kind of unity there could, of course, be no nature at all for the scientist to investigate. It is constitutive of nature. But the second kind of unity is not regarded by Kant as constitutive of nature, but merely as regulative of scientific inquiry, and he denies to it the objective validity which must be accorded to the first. It is true that the scientist is compelled to impute it to nature, whether he realizes that he is doing so or not, for if science is to have the unity which reason by its very nature demands, he must suppose that this unity actually exists in nature, and that it is there to be discovered. But he cannot empirically derive his conception of it from nature, for since this conception directs all his inquiries into nature, and indeed gives rise in the first place to those inquiries, it must precede them. If science, then, in contrast with ordinary knowledge, is a systematic unity of cognitions, the nature of its unity is not derived empirically from nature, but is antecedently

[20] *Critique of Pure Reason*, A216 = B263.

determined by a certain demand of reason. It is therefore to the nature of reason that we must look for the basis of the unity of science.

In his theory of the nature of reason Kant assigns to it two distinct functions. One is the merely formal or logical use of reason, by which it draws mediate inferences. In its logical use reason abstracts from all content of knowledge, and in this respect stands contrasted with its other use, which is, or at least claims to be, cognitive, and which Kant calls its "real" or "transcendental" use. Here reason is the source of certain concepts or principles which it possesses independently of experience. Of these two it is the logical employment of reason which is initially decisive for Kant's theory of the unity of science. He asserts that there are three essential elements in all inference:

(1) a universal rule, which is entitled the major premise;
(2) the proposition which subsumes a cognition under the condition of the universal rule, and which is entitled the minor premise; and lastly,
(3) the conclusion, the proposition which asserts or denies of the subsumed cognition the predicate of the rule.

Thus, according to this theory, the universal rule, or major premise, connects the predicate with a condition. The minor premise states that its subject fulfills the condition, and in the conclusion the subject is determined by the predicate which has been connected with the condition.[21] Where the conclusion is something still to be established there I have to discover whether or not it stands under certain conditions according to a universal rule.

This account of what takes place in inference shows, Kant says, what reason in its logical employment is aiming at. It is trying to reduce the variety and multiplicity of knowledge got through the understanding to the smallest number of principles or universal conditions, and in that way to give it its highest possible unity. This unity is its necessary goal. It must by its very nature try to advance toward it.

> ... reason, in its logical employment, seeks to discover the universal condition of its judgment (the conclusion), and the syllogism is itself nothing but a judgment made by means of the subsumption of its condition under a universal rule (the major premise). Now since this rule is itself subject to the same requirement of reason, and the condition of the condition must therefore be sought (by means of a prosyllogism) whenever practicable, obviously the principle peculiar to reason in general, in its logical employment, is: – to find for the conditioned knowledge obtained through the understanding the unconditioned whereby its unity is brought to completion.[22]

[21] To contrast Kant's principle of the syllogism with the *dictum de omni* or the *nota notae* it can be given Joseph's conveniently succinct formulation: "Whatever satisfies the condition of a rule falls under the rule." Joseph illustrates the principle in the following way: "In the rule 'Whatever is *B*, is *A*', being *B* is the condition, the fulfillment of which involves being *A*; and to a given concept *C* fulfilling the condition the rule will apply, and it will be *A*." *An Introduction to Logic*, p. 309. Kant intended his principle to apply to the disjunctive and hypothetical syllogisms as well as to the categorical.

In acting in accordance with this principle of its logical employment, reason is entirely non-cognitive. It is the understanding in conjunction with sensibility which alone gives rise to knowledge. It is reason which demands that this knowledge be brought into systematic unity. Its sole function is "to prescribe to the understanding its direction toward a certain unity of which it itself has no concept, and in such a manner as to unite all the acts of the understanding in respect of every object, into an *absolute* whole."[23] It is important to emphasize that the unity of science is a purely methodological and subjective principle arising solely out of reason in its logical employment. We have no basis whatever for asserting that such a unity exists in the objects of our knowledge. It is necessary to emphasize this because reason compels us to think of this unity as existing objectively. We are not free to entertain the supposition that possibly nature is ultimately heterogeneous, and may not possess a systematic unity. "Reason would then run counter to its own vocation.... The law of reason which requires us to seek for this unity is a necessary law, since without it we should have no reason at all, and without reason, no coherent employment of the understanding, and in the absence of this, no sufficient criterion of empirical truth. In order, therefore, to secure an empirical criterion we have no option save to pre-suppose the systematic unity of nature as objectively valid and necessary."[24]

The systematic unity of nature has not always been acknowledged by scientists, but nevertheless, says Kant, we find it "covertly implied, in remarkable fashion, in the principles on which they proceed." Here Kant enunciates three principles which govern scientific inquiry and which rest on this supposition of the unity of nature.[25] First, there is the principle that principles must not be unnecessarily multiplied – *entia praeter necessitatem non esse multiplicanda*. This principle presupposes that unity is to be found in nature; that behind the infinite variety of nature there is "a unity of fundamental properties – properties from which the diversity can be derived through repeated determination." There can be no reasoning at all unless it is supposed that among individuals there is the identity of species, and that the species are only determinations of certain genera, and these in turn of still higher genera, and that, in short, our concepts have a systematic unity; for reasoning consists in concluding

[22] *Critique of Pure Reason*, B364.
[23] *Ibid.*, B383.
[24] *Ibid.*, A651 = B679.
[25] In the *Critique of Judgement* these principles are attributed to the reflective judgement.

from the universal to the particular, and that is only possible insofar as universal properties are ascribed to things as being the foundation upon which the particular properties rest.

This demand for identity which governs scientific inquiry can be illustrated in chemistry. Chemistry made a great advance, says Kant, when all salts were reduced to two main genera, acids and alkalis. Chemists found themselves, however, still compelled to try to show that the difference between these two is only a variation of one basic material. The same attempt has gone on to find a basic identity in the different kinds of earths, but, even more, the chemists are unable to banish the thought that there is even a common principle for both the earths and the salts.

Kant insists that this principle – "the logical principle of genera, which postulates identity" – is not regarded by the scientist merely as a device for economy in explanation to save himself unnecessary trouble. He must think of it as having objective validity. The unity in variety is not supposed as an hypothesis, which may prove to be successful. Reason does not ask us to try it out, but insists that the unity is there to be found; it "does not here beg but command."[26]

The logical principle of genera is balanced by a second principle, that of species, to which Kant gives the formulation, *entium varietates non temere esse minuendas*. Where the first principle compels the scientific inquirer to seek identity, the second compels him to seek diversity. The aim of the first in ascending to the genus is to secure unity in the system of our knowledge. The aim of the second in descending from the genus is to secure completeness in the system. It sets a goal which, of course, can never be reached, for in the descent from genera to species no species can be regarded as the lowest. "For since the species is always a concept, containing only what is common to different things, it is not completely determined. It cannot, therefore, be directly related to an individual, and other concepts, that is, subspecies, must always be contained under it."[27] Although the principle of specification is merely a logical principle governing scientific inquiry, nevertheless, as with the principle of parsimony, the inquirer is compelled to regard it as having its foundation in nature. To return again to chemistry, the discovery that absorbent earths are of different kinds could only have been possible if we made the prior assumption that such differences do actually exist in nature and are there to be discovered. This assumption functions as a rule directing the understanding to the task of seeking out these differences, and without such an assumption there would be nothing to occasion the exercise of the understanding in scientific inquiry.

[26] *Critique of Pure Reason*, A 653 = B681.
[27] *Ibid.*, A656 = B684.

The third logical principle directing inquiry toward the goal of systematic unity prescribes that we proceed from each species to every other by gradual increases in degrees of diversity. This principle of the continuity of forms arises out of the union of the other two, for the systematic unity reached by the ascent to higher genera and the descent to lower species requires that the progression be unbroken. It compels us to deny that there can be a plurality of original first genera existing in isolation from one another, "separated, as it were, by an intervening empty space." We have to suppose that the various genera are simply divisions of one single highest and universal genus. This implies that there are no leaps in the transition from one species to another, but that the differences between species are mediated by intervening smaller differences. As with the other two, this principle, although it has its origin solely in the logical employment of reason, cannot be regarded by us as merely a methodological device or as a useful hypothesis. We have to think of this affinity of forms as actually existing in nature.

These three logical principles, by which all scientific inquiry is regulated, show that the attitude of reason to any body of knowledge is to secure its systematization, i.e., to show the interrelation of its parts in accordance with a single principle. To achieve that end for any particular science, reason must presuppose an idea of the form of the science as a whole, a whole which is prior to the parts, and which contains the conditions that determine *a priori* the position of each part and its relation to the other parts. It is only if such an idea is presupposed that a body of knowledge can constitute a science, that is to say, be a system and not a mere aggregate of knowledge. This presupposed idea, however, like the three principles enunciated above, has no objective validity. Although reason inevitably hypostasizes it, its sole significance is that it represents the complete unity of the science for the purpose of directing the understanding. No empirical derivation is possible for the idea of the science, for the empirical investigation of nature gets its very direction from the idea. Although the idea appears to signify something objective, it is in reality only a schema – or more accurately the analogon of a schema – by which reason can represent the systematic unity it demands for our empirical knowledge.

In calling an idea the analogon of a schema Kant is attributing to the idea a function in the organization of a science analogous to that performed by the schematism of the understanding in bringing the manifold of intuitions under the unity of concepts. The concepts of the understanding and sensible intuitions are heterogeneous. If sensible appearances are to be brought under the categories, some factor is required to mediate between the two, something which is homogeneous on the one hand with the category and on the other with the appearances. It is the transcendental

imagination which performs this task of mediation by providing a schema of the concept, and thereby making possible the application of the concept to what is given in intuition.

The unity of a science stands in the same relation to the knowledge provided by the understanding as the concepts of the understanding do to the manifold of appearances. Like a category, the unity of a science is, when taken in itself, undetermined – it is simply the unity of a manifold *in general*, and as such empty and meaningless. Just as the schemata provide the rules of procedure for unifying the manifold of intuitions under the categories, so the ideas provide the rules for bringing the manifold of knowledge provided by the understanding into systematic unity, thereby transforming this knowledge into *scientific* knowledge. The idea may therefore be called the analogon of a schema. It is, however, only an analogon, and not an actual schema. No sensible schemata can be supplied by the imagination for the unity of science, for this unity is incapable of having any object in sense experience corresponding to it.

But if it is not possible to provide a schema for the unity of reason, it is, nevertheless, possible to symbolize this unity, or represent it indirectly by means of an analogy with what is given in experience. By symbolizing the unity we acquire a rule of procedure for attaining it. This may be illustrated in connection with the last and highest degree of formal unity under which natural science is brought, namely the purposive unity of things. This unity is symbolized by means of an analogy with human art, the latter being something with which we have acquaintance in experience. By means of this analogy nature as a whole can be regarded as the work of a supreme intelligence. This idea of God will now serve to direct scientific inquiry, by providing a rule of procedure for attaining the highest degree of systematic unity. It is able to function as a rule, because we shall then proceed in our inquiries *as if* the world were the work of a supreme artist. Unless the unity of a science is in some way symbolized by an idea, scientific inquiry remains undirected. It is not enough for reason simply to demand unity in what is known, for "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."[28]

The question of the role of reason in the scientific organization of knowledge is raised by Kant in connection with his chief problem, the possibility of a science of metaphysics. The principal branches of metaphysics in the scheme he took over from Wolff were psychology, cosmology, and rational theology. Kant's immediate concern with the function of reason was to show how, in fulfillment of its purely logical employment,

[28] *Ibid.*, A665 = B693.

reason gives rise inevitably to three transcendental ideas of the unconditioned, corresponding to each of the three kinds of syllogism, categorical, hypothetical, and disjunctive. The three transcendental ideas are (1) the idea of the absolute (unconditioned) unity of the thinking subject, (2) the idea of the absolute unity of the series of conditions of appearance, and (3) the idea of the absolute unity of the condition of all objects of thought in general.

"The thinking subject is the object of *psychology*, the sum total of all appearances (the world) is the object of *cosmology*, and the thing which contains the highest condition of the possibility of all that can be thought (the being of all beings) is the object of *theology*. Pure reason thus furnishes the idea for a transcendental doctrine of the soul (*psychologia rationalis*), for a transcendental science of the world (*cosmologia rationalis*), and, finally, for a transcendental knowledge of God (*theologia transcendentalis*)."[29] The whole argument of the Dialectic is designed to show that these sciences are pseudo-sciences, and that the true function of the idea of the soul, of the world as a whole, and of an *ens realissimum*, is to direct the understanding in scientific inquiry into nature. They are ways in which reason pursuing merely its logical function prescribes a systematic unity for our knowledge. The implication of this doctrine is that the only theoretical science is natural science, and that this has two branches, psychology and physics, the one regulated by the idea of the unconditioned thinking subject, the other by the idea of the cosmos, and that these two sciences are finally unified in a single science under the transcendental idea of God.[30]

A difficulty, however, emerges here in connection with Kant's use of the word "idea." Although the three ideas of the Dialectic are schemata for the three *natural* sciences of psychology, physics, and the science which is a systematic union of psychology and physics, nevertheless they are not conceptions of these sciences, and we do not look to them for the definitions of these sciences. On the contrary they are conceptions of three *metaphysical* sciences, rational psychology, rational cosmology, and transcendental theology, which are, moreover, pseudo-sciences. Thus it would appear that "idea" in the sense in which it is used by Kant to signify the schematic representation of the systematic unity of a science, and "idea" as synonym for "conception" of a science are not equivalent uses of the word in the Dialectic. The idea of cosmology is the conception of cosmology, but it is the schema for physics. In the Transcendental Doctrine of Method, on the other hand, the idea of a science signifies both

[29] *Ibid.*, B391 = A334.

[30] In the *Metaphysical Foundations of Natural Science* Kant denies that psychology can ever be scientific. It must remain merely descriptive. Psychology was not a subject to which Kant devoted systematic attention, and his views on it are uncertain.

the conception of that science (or that by which the science is defined) and that which determines the systematic unity of the science (or its schema).

Kant has accounted for the origin and development of the natural sciences, as well as their unity in one comprehensive science of nature, in terms of an interest of reason, an interest which belongs to reason in its logical employment. But reason also has certain moral interests which belong to it in its practical employment as governor of the will. The pursuit of philosophy with a view to the attainment of systematic unity in its merely logical perfection, Kant assigns to the "scholastic concept" of philosophy. It is to be distinguished from a *conceptus cosmicus* of philosophy, i.e., a "science of the relation of all knowledge to the essential ends of human reason." The mathematician, physicist, and logician are declared to be only artificers in the field of reason, since they merely seek the systematic unity within their respective sciences which is required by reason in its logical employment, although reason employs them all the time in the fulfillment of its essential ends without their knowledge.

It is characteristic of reason, not only in its logical employment, but also in reflecting on its own essential ends, to demand complete systematic unity. In the case of the logical employment of reason Kant was at pains to show how this demand arises from a certain interest of reason. But if one asks why reason demands a systematic unity of its own ends or interests, Kant is no longer concerned to explain this demand in terms of an interest. The demand that principles should not contradict one another is "necessary for the possibility of any employment of reason at all," and "constitutes no part of its interest."[31] Reason would not be reason if in reflection on its own essential ends it did not seek their unity. If the essential ends of reason have a systematic unity, then one of them, Kant argues, must be an ultimate end and the others be subordinate to it as means. This ultimate end of reason is "no other than the whole vocation of man, and the philosophy which deals with it is entitled moral philosophy."[32] If the highest aims of reason have a systematic unity, then we may suppose that the sciences which exist in order to fulfill these aims must also have a systematic unity, and that therefore both theoretical knowledge and practical knowledge must ultimately belong together in one philosophical system. It is to this final synthesis of knowledge that we now turn.

Reason in its speculative employment was shown in the *Critique of Pure Reason* to be by its very nature compelled to seek the unconditioned for the conditioned knowledge which it obtains through the understanding.

[31] *Critique of Practical Reason*, tr. Abbott, 6th ed., p. 216.
[32] *Critique of Pure Reason*, A840 = B868.

In its practical employment reason is governed by the same necessity. "As pure practical reason, it likewise seeks to find the unconditioned for the practically conditioned (which rests on inclinations and natural wants), and this not as the determining principle of the will, but even when this is given (in the moral law) it seeks the unconditioned totality of the *object* of pure practical reason under the name of the *Summum Bonum*."[33]

In the Analytic of the Pure Practical Reason and in the *Grundlegung* Kant had argued that the good will is the only thing which is unqualifiedly good, and that all the things which appear most desirable and which go to make up happiness, can only be considered good conditionally upon their being found united with a good will. The good will, i.e., a will determined by the moral law, is the indispensable condition of being worthy of happiness. But while the good will or virtue is the *supreme* good, it is not by itself the whole or perfect good. Persons are ends in themselves, and if they were to deserve happiness, but yet not enjoy it, the situation would be one which falls short of the whole or perfect good. Hence Kant concludes that it is virtue and happiness taken together which constitute the *summum bonum* of the individual person, and "the distribution of happiness in exact proportion to morality (which is the worth of the person, and his worthiness to be happy) constitutes the *summum bonum* of a possible world."[34]

This peculiar characteristic of the *summum bonum*, that it is made up of two distinct but necessarily connected elements, virtue and happiness, has profound consequences for Kant's ultimate synthesis of theoretical and practical knowledge in a unified system. Man finds himself in a situation in which only one of the two elements of the *summum bonum*, virtue, lies within his power, for the goodness of the will is not affected by the success or failure of its actions. The other element in the *summum bonum*, namely happiness or the state of affairs in which everything goes according to man's desires, does not lie within his powers, but is dependent upon the course of nature. Man, though acting rationally in the world, "is not the cause of the world and of nature itself." We have, nevertheless, a duty to promote the *summum bonum*. Only that can be a duty which is possible, and therefore the attainment of the *summum bonum* must be possible. It is possible, however, only on the condition that God exists. It becomes, then, "morally necessary to assume the existence of God." There must be a being distinct from nature itself, capable of harmonizing the whole physical order with man's ends.

Here it is necessary to refer once more to the function of ideas in furnishing the conception of a science and in regulating the pursuit of

[33] *Critique of Practical Reason*, p. 203.
[34] *Ibid.*, p. 206.

that science. The idea is a schema, or rather the analogon of a schema, for the systematic ordering of what belongs within the science. Both natural science and morality are governed by an idea. In the case of natural science the last and highest degree of formal unity is "the purposive unity of things." The demand of reason for unity compels it "to regard all order in the world as if it had originated in the purpose of a supreme reason. Such a principle opens out to our reason, as applied in the field of experience, altogether new views as to how things of the world may be connected according to teleological laws, and so enables it to arrive at their greatest systematic unity."[35] This idea of a teleological system of nature governed by a supreme intelligence has its counterpart in morality in the idea of a Moral World, or Kingdom of Ends. The Kingdom of Ends is the union in a systematic whole of all rational beings, considered as ends in themselves, together with the special ends which each individual proposes to himself. This conception of a Kingdom of Ends functions as a practical idea. It provides a means of formulating the moral law in such a way as to bring it "nearer to intuition (by means of a certain analogy), and thereby nearer to feeling."[36] As the analogon of a schema it supplies an "as if" mode of formulating the moral law for directing action in acccordance with that law. The law can be stated thus: "Every rational being must so act as if he were by his maxims in every case a legislating member in the universal kingdom of ends."[37]

The problem originally stated in terms of the *summum bonum* can now be restated in terms of the kingdom of ends. The kingdom of ends would be capable of realization only if, in addition to men's acting in accordance with the moral law, nature also harmonized with human ends, i.e., were teleologically organized with respect to those ends. This in turn could only be possible if both the kingdom of nature and the kingdom of ends belonged together in a single system under one supreme ruler. Thus the inescapable fact of duty involves the necessity of postulating the existence of God.

In this moral theology there resides the unity of theoretical and practical knowledge. Reason in its theoretical employment compels us to regard nature as a single teleologically organized system, but it is only moral theology which can show what final end this system is teleologically directed toward, namely, man as a moral being. This unity of theoretical and practical knowledge is not, however, one which is of the slightest significance for natural science. It is significant only for morality. The practical reason, however successful it may be in establishing that which lies beyond the competence of theoretical reason, nevertheless does not

[35] *Critique of Pure Reason*, A687 = B715.
[36] *Fundamental Principle of the Metaphysic of Ethics*, tr. Abbott, 10th ed., p. 65.
[37] *Ibid.*, p. 68.

lend its principles to the directing of natural science. Kant is emphatic on this point. The conception of man in his moral capacity as the end of physical nature cannot be applied to the cognition of nature. "*The only possible use of this conception* is for practical reason according to moral laws."[38] Speculative reason is able to pursue its ends without borrowing any concepts from the practical reason. Practical reason, on the other hand, is only able to fulfill its end by postulating the unity of the world of nature and the moral world under a supreme ruler. The conception of nature, and in particular a nature exhibiting purposive unity is contributed to the practical reason by the theoretical judgment. Without this contribution, moral philosophy would remain incomplete.

To say, however, that natural science contributes to the fulfillment of the ends of practical reason, is to say that it derives its ultimate significance for philosophy from the fact that it does make this contribution. The natural scientist, seeking only the logical perfection of his science, is, Kant has said, a mere artificer. The *conceptus cosmicus* of philosophy requires us to view all knowledge in terms of its relation to the essential ends of human reason. From this point of view the natural scientist is seen to be merely an instrument, however unwitting, in the furthering of these ends.

Kant's doctrine may now be summed up. All systematic unity takes place in accordance with ends of reason. It is always an idea which directs this unification. As we have seen, the various ends of reason must themselves possess a systematic unity under one ultimate end – "the whole vocation of man." Such a unity, like all others, is directed by an idea – the moral idea of God, and the sciences which answer to the various ends of reason attain a corresponding unity under moral theology, for it is moral theology which, Kant says, "enables us to fulfill our vocation"[39] or attain our highest end. Thus the ultimate unity of the sciences is attained for Kant in moral theology.

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[38] *Critique of Teleological Judgement*, p. 124 (italics not in text).
[39] *Critique of Pure Reason*, A819 = B487.