THE PHILOSOPHY OF NATURE, EMPIRICAL SCIENCE, METAPHYSICS*

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What is the relation of the philosophy of nature to empirical science, on the one hand, and metaphysics, on the other? Concerning the philosophy of nature and empirical science, three schools of thought have predominated among North American realists (I am thinking of those realists who recognized the philosophy of nature as a discipline distinct from metaphysics): the school of Jacques Maritain, the school of Laval under the leadership of Charles DeKoninck, the school of River Forest and Vincent Smith. I will not attempt to summarize this complex dispute. For that you can see John N. Deely's introduction to The Problem of Evolution.[1] Instead, I will explain and defend Maritain's central positions concerning the philosophy of nature, responding to the objections of his critics as I do. Specifically, I will discuss dianoetic and perinoetic intellection, ontological and empiriological analysis and the distinction between the philosophy of nature and empirical science resulting from their diverse ways of abstracting from matter.

Concerning the last point, I propose to demonstrate that, according to the traditional, realist criterion for distinguishing the sciences, the philosophy of nature and empirical science constitute specifically distinct modes of knowing since they have different ways of abstracting from matter. The demonstration will make use of principles agreed to by all sides of the dispute. And some of the same principles will allow us to answer the main question that realists have debated about the relation between the philosophy of nature and metaphysics.

Metaphysics is distinguished from natural philosophy by the fact that its objects are able to exist apart from matter. Therefore, some realists have concluded that in order to do metaphysics we must first prove the actual existence of immaterial beings, the separated soul, or God, in the philosophy of nature. This position has been defended most recently by John Flynn in The Thomism of Etienne Gilson.[2] I intend to show that the opposite position, the position of Maritain, Gilson, and others, is the correct one.

To approach the above issues properly, however, we must first consider some fundamental principles concerning philosophy's method of verifying its assertions, principles that constitute the necessary background for the differences Maritain has pointed out between the philosophy of nature and empirical science.

Cahalan, Nature, p. 2

I. Philosophy's Method of Verification

Is there any knowledge to be gained about the physical world, over and above the knowledge acquired by the methods of empirical science? I am not referring to knowledge about the intentional structures of our experience of nature, about the language we use to communicate concerning nature, or about the structure of our scientific theories; I am referring to knowledge of nature in its extramental existence. Is there any method by which we can arrive at knowledge of truths about nature itself in addition to the truths known by empirical science?

To answer that question, we must first ask in what sense it is using the word "method". For method can be looked at in many different ways. There are methods of concept-formation and definition, methods of theory-construction, methods of investigation, methods of systematization, etc. Here I am referring to the method of verification (via judicii) as opposed to the method of discovery (via inventionis). The method of verification is the method by which we determine that a particular statement is indeed true and the opposite false; it provides the control on our assertions. Why is it necessary to approach the question of a philosophical knowledge of nature from this point of view?

The most important reason is that knowledge of the truth of propositions is the goal of intellectual endeavor, since propositions are the means by which we conform our minds to reality. Therefore it is incumbent upon self-respecting philosophers to be able to give an account of how we manage to separate the true from the false in the torrent of beliefs, some of which seem *o*utrageously paradoxical, which unceasingly pour forth from the minds of humans in general and philosophers in particular. It is for this very reason, in fact, that so many believe there can be no knowledge of the physical world other than the scientific. Empirical scientists alone seem to have reliable methods of controlling which statements are to be assigned the value truth.

Nor has the importance of the question of verification escaped Maritain. In chapter six of Réflexions sur l'intelligence, [3] he distinguishes the philosophy of nature from empirical science precisely in these terms. And in The Degrees of Knowledge the distinction between dianoetic and

perinoetic intellection is first mentioned in a discussion of the fact that in science, as opposed to natural philosophy, sensibly experienced facts constitute the "medium of demonstration" which exercises "control".[4]

Well, just how can we separate true assertions from false? One way of showing that a statement is true is by showing that its opposite is impossible. And we show that the opposite is impossible by showing that it violates something's identity with itself, in other words, that the opposite is

contradictory.[5] But how can we determine a statement's truth if its opposite is not impossible? Only by reference to what is actually the case. And how do we know which of two not impossible states of affairs is actually the case? Only by the evidence of experience.

Statements can be verified, therefore, only by one or the other of these methods or by some combination of both: by appeal to the principles of identity or non-contradiction in the case of necessary truth, by experience of what actually exists in the case of contingent truths.

But can a method of verification relying solely on our experience of contingent states of affairs give us knowledge of truths about the physical world other than those available to empirical science? I do not deny that contingent facts enter philosophical arguments. If philosophy verifies its conclusions solely by reference to experience, however, it is hard to see how its conclusions have escaped the notice of scientists. As far as sense experience is concerned, the scientist is given as much information about the physical world as is anyone else. Therefore, in order to give us knowledge of truths other than those of empirical science, philosophy must verify by appeal to truths whose opposites are impossible.

But can we expect to have this kind of knowledge about nature? Philosophers like Aristotle, Aquinas, and Maritain thought so. Maritain's position on philosophy's method of verification is well known and is in the background of whatever he says about philosophy as a mode of knowing. Failure to keep the question of verification in mind, however, is the source of some of the criticisms of Maritain's views on the philosophy of nature. In his essay "Does Natural Science Attain Nature or Only the Phenomena?" Benedict Ashley states that in the view of Maritain philosophic knowledge of nature is to be distinguished from the empirical, because its premises contain "essential definitions which are immediately evident and certain."[6] Taking it for granted that Ashley means to describe as immediately evident, not definitions but the propositions asserting them of their definienda, he could be read as referring to philosophy's method of verification. For "immediately evident" describes the self-evidently necessary truths which provide the principles

needed for philosophy's arguments. If Ashley had meant that, he would have made a fair statement of Maritain's views on the difference between the philosophy of nature, and empirical science.

But when Ashley returns to the question of immediacy, it becomes clear that he does not at all have this kind of verification in mind. The descriptive definitions arrived at by scientists, sometimes after "years of patient investigation and extremely complicated experimentation" are not

> seen to be true by some simple process of inspection… They are, said to be "immediately evident," however, in the sense that they rest not on deductive

> reasoning, but on direct contact with the facts. They are seen by 'the scientist to be true not by a reasoning process but by intelligent observation.
>
> As for their certitude, this rests on the objectivity of the observations.[7]

But propositions whose verification is made through observation are not immediate in the sense required for the verification of necessary truth: their opposites are not self-evidently impossible.

The reason Ashley appears to ignore this aspect of Maritain's position seems to be that he is little concerned with the problem of methods of verification as opposed to methods of discovery. For the bulk of his excellent descriptions of the scientist's work is from the point of view of discovery. Thus after coming to what he incorrectly calls "the crux of the problem: Can the scientist pass from a descriptive definition to a genuine insight into the nature or essence of a natural unit,"[8] and after extended discussion intended to show that what scientists achieve amounts to what Maritain refers to as dianoetic intellection, he brings up the question of verification almost as an afterthought without even attributing the view he criticizes to Maritain:

> I am sure that there are some philosophers who will still be dissatisfied with this sort of knowledge… Perhaps they are touched with that Cartesian angelicism which Maritain long ago so brilliantly exposed as characteristic of the modern mind. For such a mind knowledge is true only when it has the clarity of mathematics, a clarity sufficient to be the basis of a deductive system.
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> It is the unconscious influence of Cartesianism on modern scholasticism, I believe, which accounts for the uneasy differences of view on this question found today among Thomists.[9]

But to say that philosophy is able to resolve conclusions into self-evidently necessary principles is not to say that philosophy can do this with the ease, regularity and freedom from mistakes with which it is done in mathematics. And although mistakes with respect to self-evident principles can only occur per accidens, that is, through misunderstanding their terms, I plan to show in a forthcoming work that this kind of misunderstanding is to be expected to occur much more frequently in philosophy than in the other disciplines, mathematics and logic, that deal with self-evident truths. For the analogical concepts out of which philosophy constructs its statements

abstract only imperfectly from the differences between their analogates. This creates the risk of identifying the meaning of the analogical term with the difference that affects the analogue in one of its analogates, rather than understanding the term in its more general sense.

II. Dianoetic and Perinoetic Intellection

Now, how does discussing philosophy's method of verification help us understand what Maritain means by dianoetic and perinoetic intellection? To see this, let us go more deeply into realism's analysis of necessary truths. That analysis stands in sharp contrast to the analysis that other schools of thought have derived from Hume, so much so that it is often difficult for those conditioned to post-Humous ways of thinking about necessary truth to comprehend what realists are even trying to say about philosophical method. In the first place, necessary truths can give us information about extramental existents, not simply about our concepts, words, and their logical relations. When it is said that the necessary truth of self-evident propositions can be known solely by understanding how their words are being used, the reference is not to understanding the contingent facts that certain language-forms happen to be used in certain ways. And when self-evident truths are described as known through an understanding of concepts, the reference is not to the mental dispositions by means of which we cognize things. The reference is to our acquaintance with the objects that we cognize by means of mental dispositions, the objects which constitute that which certain language-forms happen, contingently, to be used for. This is traditionally known as the objective as opposed to the formal (meaning mental or psychological) concept. (Henceforth this is what I will have in mind when speaking of concepts.) There is self-evidence when our acquaintance with conceptual objects, which happen to be that for which the words of a statement are used, is sufficient for knowing that if the statement were not true, something would both be and not be what it is.

Among these conceptual objects there are both extramental values like existence and being, that which has existence, and logical relations like negation and alternation. And assertions such as that it is impossible for a thing to be and not be or that a thing either is or is not give us information about being rather than about the words, mental dispositions, or logical relations by means of which we cognize being. That it is either raining or not raining does not tell us anything about the weather

that is not also true of all other modes of being. But it does tell us something that is true of the weather insofar as it shares the status of being with everything else.

It can be said that the necessity of these truths derives from the way they employ the logical relations of negation and alternation. Logical relations, however, become objects of knowledge only as the result of making extralogical things objects of knowledge. And what terminate logical relations are not in the first place other logical relations, but the extralogical things that have become known. For logical relations occur in the process of acquiring linguistically expressible

knowledge. And the primary objects expressed in language are public and, therefore, extramentally existing objects. A proposition of logic can tell us that other propositions of the form "An F is not a non-F" are necessarily true. That logical proposition gives us information about the truth of other propositions. But what do those other propositions give us information about? Still other propositions? To avoid infinite regress, some proposition of that form must not contain knowledge about the truth of other propositions but about extralogical things. The necessity derives from logical relations, but the truth is not about logical relations.

Consequently, the impossibility prohibited by the principle of non-contradiction is primarily the impossibility of something's being and not being and only secondarily the impossibility of a proposition's being both true and false. The goal of forming propositions is conformity with what exists. Contradictory propositions cannot be true because they cannot achieve that goal. They cannot achieve that goal because things cannot both exist and not exist. In other words, the cause of the impossibility of simultaneous truth and falsity is the impossibility of simultaneous being and non-being. For it is conformity with what exists that causes the truth of propositions, not the truth of propositions that causes what exists.

The second difference between the realist and post-Humous accounts of necessity is that realists recognize truths whose necessity derives not from logical relations but from causal relations. Events in nature must be caused to occur, and natural causes must behave in certain ways in certain circumstances. This is where knowledge of essence comes in. When Maritain describes essence as a locus of intelligible necessities,[10] we should read: a locus of necessary causal relations, relations of effects to their necessary causes and of causes to their necessary effects.[11] Causal necessity is the key to what he says about dianoetic and perinoetic understanding of essence because causal necessity is the key to our knowledge of essence in general. In the traditional formula, the natures of things are known from their activities. Why? Because a thing behaves according to the dispositions for behavior that its makes-up gives it; its behavior, in other words, is

determined by its mode of being. The nature of a thing, therefore, is a principle of activity, a locus of dispositions to act in certain ways (relations of a cause to its effects) or to be acted on in certain ways (relations of effects to their causes). That is what a nature is: a transcendental causal relation which is the basis for predicamental causal relations. And as we will see shortly, we learn the natures of things by rising from knowledge of sensible effects to knowledge of what things must be in order to cause those effects through the application to experience of necessarily true causal principles.

This is true of both dianoetic and perinoetic knowledge of natures. The distinction between

them, on the other hand, follows from a third and final difference between the realist and the post-Humous accounts of necessary truth. The post-Humous account makes the necessary co-extensive with the analytic. Analytic truths, truths known from an understanding of terms, include truths realists would call self-evident and truths derivable from the self-evident; for the latter are likewise known from an understanding of terms, not exclusively from an understanding of their own terms, but from an understanding of their own terms plus the terms of the statements from which they are derived. It follows that on the post-Humous view, there can be no such thing as a truth which is incapable of being false but which we are not able to recognize as such solely from an understanding of terms. It would make no sense, for instance, to believe it is a necessary truth that water freezes at 32°F under standard atmospheric pressure unless this can be known merely from understanding its terms or by deduction from other truths so known.

Realists, however, recognize a category of truths they describe as self-evident in themselves but not to us.[12] Actually, it is misleading to describe them in terms of self-evidence rather than in terms of necessity. For the whole point is to distinguish what is incapable of being false, which is ultimately an ontological consideration, from what we are able to recognize as incapable of being false by acquaintance with the meanings of words, an epistemological consideration. When we describe a truth as self-evident or as analytic, we are referring to the causal process by which we come to know its truth. When we describe a truth as necessary, we say something about the truth itself, not about our knowledge of it. We are saying that its opposite would be impossible. And from the first difference between the realist and post-Humous accounts of necessity it follows that impossibility here does not mean that the truth of the opposite would require us to affirm and deny the same thing but that it would require the same thing to be and not be what it is. If necessary truths were concerned only with the logic of our words and thought processes, they would be co-extensive with the analytic, and contradiction would exclusively be a matter of affirming and

denying the same thing. But if necessary truths can be about extralogical things, then the necessary need not be co-extensive with the analytic, for contradiction refers, primarily, to a thing's both being and not being what it is.

In the perspective of causal necessity, for instance, it might well be the case that for heat to exist and yet not have the ability to expand solids, heat would have to both be and not be heat. For the nature of heat on this hypothesis would be a transcendental causal relation such that, in the absence of any interfering cause (which would be such only through the transcendental causal relation which constitutes its nature), heat will produce this effect as long as it is what it is. And if

there are necessary causal relations, it may be the case that water could fail to freeze at 32°F under standard atmospheric pressure if and only if water were not water, atmospheric pressure were not atmospheric pressure or heat were not heat. In general, to say that what a thing is is equivalent to a locus of necessary causal relations is to say that if these relations did not hold for a thing of a certain nature then the thing would also not be of that nature.

But the ontological contradictions that would follow if these causal relations did not hold need not be graspable by us through our understanding of the meanings of words like "heat", "expands", "solids", "water", "freezes", "pressure" or of any other words. In such a case, we could only have what Maritain calls perinoetic knowledge of a locus of necessary causal relations, that is, an essence. As I have argued in a forthcoming work, there follow from self-evident principles necessary truths telling us that events, like the expansion of solids and the freezing of water, must be brought about by the presence of causes sufficient for the events to occur and that if a change has not always been occurring, it can occur only if previous changes have brought sufficient causes for it into existence and that if two successive circumstances are similar with respect to causal factors which were sufficient to cause an event of kind E in the first circumstance, then an event of kind E must occur in the second circumstance provided no interfering causal factors are present. But these truths do not tell us which specific effects in our experience are necessarily related to which specific causes. For our knowledge of these truths is extraneous to our acquaintance with the objects I refer to by words like "heat", "expands", "water", etc.

These principles do, however, license us to look for causal relations between experienced events by noting what changes do or do not follow previous changes. The certitude arising from such investigations is the certitude that it is unreasonable to be1ieve the opposite of some causal hypothesis. For example, derivation from the self-evident does not tell us that it is impossible for there to be a fourth causal factor, in addition to the natures of water, temperature and pressure, in

the freezing of water. But we can know that it is unreasonable to believe in the existence of such a factor since the only reasonable bases for belief in the existence of something are experience and principles concerning things without which what is experienced would not exist, in other words, necessary causal principles. But no amount of varying, the circumstances we experience nor any necessary truth points to another factor in the freezing of water.

On the other hand, experiential investigations regulated by causal principles derivable from the self-evident do make it unreasonable to believe that necessary causal relations do not hold between heat and the expansion of solids, between temperature and pressure and the freezing of water. In

knowing that these necessary causal relations hold, we also know something of what these necessary causal relations are and, hence, something of what these natural essences are. (The nature of water is, among other things, a readiness to freeze in certain specific circumstances.) Ashley is incorrect in suggesting that for Maritain "Perinoetic knowledge ought to be described as an understanding that a nature exists without knowing what it is."[13] As Maritain recognizes,[14] we cannot know that a thing exists without in some manner knowing what it is; otherwise our knowledge would be vacuous.

When I know that there is a necessary causal relation between heat and the expansion of solids, I know something of what heat is, namely, a transcendental relation to the production of this effect, and something of what solids are, namely, a transcendental relation to behave thus as a result of the causality of heat. Natures, again, are sources of activity, and to know them as such is to know them as they are. In discussing perinoetic intellection, Maritain even goes so far as to say that primitive men "have an intellectual discernment... very precise and very exact, of 'what are' the beings of nature with which they have to deal."[15] The difference between dianoetic and perinoetic intellection, as he repeatedly tries to make clear, is not a question of knowing or not knowing essence. What else would there be to know other than bare, unspecified, existence? But there happen to be different ways of knowing essence. One of them he calls dianoetic, the other perinoetic.

What, then, is the difference between these ways of knowing essence? To know that a necessary causal relation holds between the things for which we use the words "A" and "B" is not the same as knowing that necessary causal relation in itself. To know a necessary relation in itself we must know that its opposite is excluded from possibility. That requires knowing from our acquaintance with what are referred to by "A" and "B", and perhaps other words, that if this relation did not hold, something referred to by one of these words would both be and not be what

it is. And when we know that denying a causal relation would require the referent of some word to both be and not be what it is, then our acquaintance with the referent of that word is acquaintance with it precisely as a predicamental or transcendental causal relation. On the other hand, just knowing that it is unreasonable to believe that a necessary causal relation does not hold is not the same as knowing that this relation's not being what it is, is excluded from possibility. (Nor is it understanding the meanings of terms precisely as transcendental or predicamental causal relations, as will be explained in the next section.) In short, to know a necessary causal relation in itself is to be able to verify it by resolution to truths known from an understanding of their terms. That is dianoetic intellection. Knowledge of essence which falls short of that is perinoetic intellection.
Cahalan, Nature, p. 10

Denying that heat expands solids would not force us to deny any self-evident causal principles. But denying that man (meaning a being that performs activities like talking and walking) is a rational animal (meaning a being with the ability to perform activities like talking and walking)[16] would require us to deny that a being which performs a certain activity is a being whose nature gives it the ability to perform that activity. And that is a self-evident causal principle since given that the objective concepts for which we use phrases like "performs an activity" and "ability to perform an activity" are what they are, to deny that something has the ability to perform an activity is to deny that it performs the activity. Another self-evident principle is that nothing becomes an F which does not have the potentiality for becoming an F. As long as the meanings of the phrases "becomes an F" and "potentiality for becoming an F" are what they are, the assertion of the first is contradicted by the denial of the second. Likewise it follows from the self-evident that an extended magnitude cannot be composed (material causality) of extensionless parts. Given that for which we happen to use the phrases "something with no extension" and "add (efficient causality) no extension" it would be contradictory to add no extension to something with no extension and get something with extension. In cases such as these, if the causal principle in question were not true, something would both be and not be what it is.

I have argued that Maritain's distinction between dianoetic and perinoetic intellection follows from the difference between the methods of verification in philosophy and empirical science.[17] But there is more to Maritain's account of these modes of intellection than we have so far discussed. In order to show how the rest follows from the difference in methods of verification, I now turn to a consideration of another distinction, the distinction between ontological and empiriological analysis.

To see the connection between these two distinctions, let us begin by asking why we cannot have dianoetic knowledge of phenomena. Well, what are phenomena? We can define them, consistently with Maritain's definition,[18] as objects which are distinguishable from one another by sense knowledge alone. The senses alone, for example, are able to distinguish the blue color of one piece of litmus paper from the red color of another piece; but it is not by means of sensory operation alone that we distinguish alkalis from acids. Sensory operation alone can distinguish the third mark from the second mark on a calibrated scale; but the senses alone do not reveal the significance of any measurement. Now to the extent that our terms are defined by reference to such sensibly

distinguishable objects, acquaintance with the meanings of our terms is not sufficient for us to know that the opposite of a causal hypothesis is impossible. Why?

For two reasons, one of which is mentioned by Maritain himself, while the other follows from principles he recognizes. First, the occurrence of any event characterized by sensibly distinguishable features will be multiply caused.[19] Any number of causes must cooperate to bring about the event of my seeing a red line coinciding with the third black mark on a white scale. Therefore my understanding of words whose meanings are sensibly distinguishable objects is in no way sufficient for me to assign a cause of a specific nature to a specific effect or an effect of a specific nature to a specific cause. Only considerable experience viewed in the light of general causal principles can license me to do that. The second reason is a consequence of the existence of chance, something Maritain along with the rest of the realist tradition is aware of.[20] It is a necessary truth that, assuming the qualifications mentioned in the last section are kept in mind, similar causes have similar effects. But the converse is not necessarily true. The effects of causes acting according to necessities inscribed in their natures can have chance characteristics not traceable to the natures of the causes taken individually. And among such chance characteristics of the effects of a cause can be the fact that its effects are similar in some way to the effects of another cause. The same litmus paper presently perceived as pink can be perceived as red either as a result of being dipped in acid or as a result of being in a red light. Now human knowledge advances by moving from data the senses are aware of to an understanding of the causes of that data. But the fact that similar effects can have dissimilar causes makes it impossible to assign specific causes to specific sensible effects solely from the acquaintance with those effects that allows me to make them objects of concepts.

Hence dianoetic intellection of necessary causal relations is not possible in the case of sensibly distinguishable objects, the details of phenomena, or in the case of theoretical terms defined by

reference to such objects. No truth known from its terms alone, nor any set of such truths, connects the theory of heat as the energy of moving molecules with such sensible objects as the feeling of warmth or the coincidence of a colored line with one of the series of marks on what we call a thermometer. (By a truth known from its terms alone, incidentally, I do not mean a sentence stipulating how a term is to be used, an entirely contingent matter. Necessity derives from that which a term is used for, not from the contingent fact that a particular term is so used.) But if there is nothing in the intellect that is not first in the senses, how is dianoetic intellection of causal relations in nature ever possible?

My answer will have two parts. First, in dealing with the problem of how our intellectual

knowledge derives from sense experience, realists have failed to grasp the implications of their own doctrine that the genus is only logically distinct from its species. This means that the generic and specific concepts are ways of articulating a datum of experience which differ from one another with respect to their logical properties but not with respect to the extralogical reality which they articulate. Thus from any experience from which we can derive specific concepts like red, green or blue, we can also derive the generic concept color, and anything we can describe as canine, equine or human we can also describe as animal. As these examples illustrate, the difference between generic and specific concepts is only one of such logical characteristics as greater and lesser explicitness and vagueness. Whatever information is conveyed by "color" is conveyed by "red", but "red" conveys more information than does "color". I will describe this logical relation between generic and specific objective concepts as the genus' being logically included in the species. And since the genus and species differ only logically, the same experience from which we derive a specific concept allows us to derive the generic concept.

How does this help us solve the problem of achieving dianoetic intellection of natural causal relations? From the experience of a particular change, for example, litmus paper changing color in solution, we can derive the meanings of many words. Awareness of none of these meanings will be sufficient for us to assign the details of this effect their specific causes; we cannot verify by resolution to the self-evident what causes the change in color. But logically included in, and therefore derivable from the same experience as, the concept of any particular change is the general concept of change. Logically included in the concept of any particular subject of change, here the paper, is the general concept of subject of change or material cause of change. And logically included in the concept of material cause is the general concept of cause which embraces other types of causality as well. Although we cannot verify by resolution to the self-evident what efficient

causes make litmus paper change color, from our acquaintance with more universal objects such as change, subject of change and cause in general, we can verify by resolution to the self-evident that whatever undergoes a change does so only because something other than itself, the efficient cause, exists. In other words, insofar as they make reference to sensibly distinguishable objects, concepts cannot reveal necessary causal relations. But logically included in such concepts are more universal concepts, derived from the same data of experience, which can reveal necessary causal relations, but only very general, not specific, causal relations.

We have already seen why the more specific concepts cannot reveal necessary causal relations; now let us ask what it is that enables more general concepts to do it. The answer to this question is

the second part of the explanation of how dianoetic intellection derives from sense experience. When terms are defined by reference to sensibly distinguishable objects, we have what Maritain calls empiriological analysis. Those general concepts which reveal necessary causal relations are not empiriological but ontological concepts. What does this mean?

From the senses we not only acquire our awareness of sensibly distinguishable objects, we also acquire our awareness of the real, as opposed to merely imagined or conceived, existence of things. Existence is not something the senses can distinguish from other objects in our perceptual fields; nor is it just a less explicit way of articulating one sensibly distinguishable object as opposed to another. But sensibly experiencing an object, as opposed to merely imagining it or conceptualizing it, allows us to judge that the object is in that state which is the ultimate presupposition (on the part of the cause) and ultimate term (on the part of the effect) of all causal relations: real existence. (In particular, it is the status of real existence that gives the objects of sense experience and the primary objects referred to in language causal priority – efficient, formal and final – over our knowledge of them.)

Once existence has entered our intellectual knowledge by means of judgment, we can construct definitions, not by reference to sensibly distinguishable objects, but explicitly in terms of relations of various kinds to the objective value: existence. For example, “being” means that which exists; its meaning is a function of that of “exists”. “Essence” means the answer to the question “What is it?” with respect to that which exists; in other words, it refers to a way of existing, a form which existence can take. “Accident” means that which exists in another (another existent); “substance” means that which does not exist in another. A “necessary causal relation” holds when we have really distinct beings, one of which would not exist without the other. These concepts illustrate what Maritain means by ontological analyses: definitions which distinguish things from one another

by diverse relations to existence.[21] Compare the distinction between substance and accident to that between male and female. As defined above, the distinction between substance and accident pertains to beings as beings, that is, as existents, while the distinction between male and female pertains to beings not as beings but as sexual. Sexuality is itself a mode of being. But when we construct concepts telling us what distinguishes sexual from non-sexual beings we do not do so by reference to existence or concepts derived from it.

Among the concepts logically included in our concepts of sensible objects are ontological concepts. We could not recognize this without the judgment of existence, but once having made existence our object, we are able to see that concepts like something existing, something existing in

another, and even something without which another thing would not exist articulate the same data of experience as do concepts of sensibly distinguishable objects though with less detail. For the same sense experiences that allow us to distinguish sensible objects allow us to make judgments of existence. The senses are able, for example, to distinguish things in motion and rest relative to one another. And when something is observed going from rest to motion, we who are able to conceptualize things in relation to existence can articulate both the motion and the thing undergoing the motion as existents, as other than one another (since the thing was observed to exist without the motion), as related such that the motion exists by existing in that which undergoes it and, therefore, as related such that the thing undergoing the motion is something without which the motion would not exist, a necessary cause of the motion.

Thus the ontological character of these concepts enables them to reveal necessary causal relations. Recall that the impossibility of the opposite in the ontological sense means that the opposite would require the same thing to both be and not be. In other words, the contradictory is impossible because it is excluded from the possibility of existing. And the understanding of ontological terms allows us to recognize this because these terms are “existence” itself or are terms whose meanings are explicit relations to existence. In particular, causality and its cognates are ontological concepts. A thing is a cause only if it provides some other thing either with existence itself or with some condition necessary for existence. To recognize a necessary causal relation as such, therefore, is to employ ontological concepts. That which empiriological science knows are necessary causal relations, but emperiological analysis cannot recognize them as such because the meanings of empirical terms do not reveal them, as we have seen.[22] It is the philosopher of science (and all scientists should also be philosophers of science to this extent) who by means of ontological concepts recognizes that what the scientist knows are necessary causal relations.

That the concepts employed by dianoetic intellection are ontological explains why Maritain can describe its manner of knowing essence as knowing an essence in itself [23] or knowing a quiddity quidditatively.[24] To know an essence in itself is to know it as a capacity for existence, a possible way of existing, since that is what essence is. And that kind of knowledge is achieved by verification through the impossibility of the opposite, dianoetic knowledge. For this manner of verifying reveals that the opposite excludes the possibility of existing by requiring something not to be what it is. In other words, where knowledge verified in this manner concerns essences, we have knowledge of essences precisely as capacities for existence, ontological knowledge.

Cahalan, Nature, p. 15

Perinoetic intellection also gives us knowledge of essences. But since it does not distinguish things from one another by different relations to existence, it does not conceptualize essences precisely as diverse capacities for existence. Thus Maritain is right in saying both that the phenomena in terms of which empiriological analysis distinguishes things are beings[25] and that perinoetic intellection does not attain "differences of being".[26] Perinoetic intellection does not conceptualize by diverse relations to existence because it verifies by means of contingently occurring observable events rather than by the impossibility of the opposite. Therefore it must define its terms by reference to objects the senses are able to distinguish. That is what Maritain means by saying that the possibility of observation takes the place of essence in empiriological definitions:[27] ontological analysis constructs concepts of objects as possible existents in order to verify by the fact that the opposite is excluded from the possibility of existing; empiriological analysis constructs concepts by reference to objects distinguishable by possible observations in order to verify by the contingent occurrence of observable events.

Since we must rely on sense experience for information, about natures other than our own, our ontological and dianoetic knowledge of them is confined to their most general features. We have only empiriological and perinoetic knowledge of their specific differences. So let us return to the example of rational animal as the definition of man; how does it illustrate the ontological character of dianoetic knowledge? As we saw above, the self-evident necessity in question derives from the necessary causal relation between activities, like talking and walking, and the ability to perform them. But the concepts of activity and ability are ontological; their differentiation from other concepts consists of distinctive relations to existence rather than to any sensible object. In the physical sphere, activities are motions, and motion is a sensibly distinguishable object. The concept of activity, however, adds to the concept of motion a relation to the cause(s) of the motion, and we

have already seen that causality is an ontological concept. And an ability is itself a causal relation. An ability is either an ability to bring something into existence, efficient causality, or to become (to come to exist as) something, material causality.

But this does not tell us why rationality makes man a substance of a different kind from irrational animals or why rationality is what Maritain calls a property of man "in the philosophical sense".[28] First, what does it mean to say the difference between rational and irrational animals is substantial while the difference between those humans that can whistle "Dixie" and those that cannot is only accidental? Let us not be satisfied by vague talk about the relative profundity of attributes. Since substance and accident are ontological concepts, the question can be given a

precise meaning in terms of necessary causal relations conceptualized ontologically and makes no sense otherwise. The accidents of a substance must have their ultimate source either in the substance's substantial form or in some efficient cause exterior to the substance, for instance, an efficient cause which disposed the matter that received the substantial form. In saying that the difference between people who are and people who are not able to whistle "Dixie" is only accidental, we are saying that it can be accounted for, not by powers caused by their substantial forms, but by modifications of those powers traceable to exterior agents. Where such a difference is not traceable to an exterior agent, we have different kinds of substantial form. And in saying that the difference between animals that can and cannot reason is substantial, we are saying that behind the differences between the uses we make of reason, differences that may be accounted for by accidents received from exterior sources, there is an underlying ability that cannot be so accounted for.

Thus the concepts needed to make sense of the claim of a substantial difference are ontological, functions of existence. Form is the only one we have not already discussed. Since form is that by which something that potentially exists in a certain way comes to actually exist in that way, its ontological character is apparent. The same conclusion follows from the analysis of dianoetic knowledge of accidental essences, for example, the knowledge that intellect and will are distinct faculties and art and prudence distinct habits rather than just different operations of the same faculties and habits respectively. In each case, the argument appeals to ontological concepts such as the specification, a relation of formal causality, of acts by their objects and of faculties and habits by their acts.

When a difference in abilities is recognizable as a sign of distinct kinds of substantial form, moreover, the ability is a property in the philosophical sense, and it can be said that we know the

substantial nature in itself though through the property. An ability which is caused by the substantial form is a necessary effect of that form, that is, a property. Were it not a necessary effect, the reason why a particular thing has that ability would have to be found outside its substantial form since the form alone would not be sufficient to cause it. And when we know that an ability is a necessary effect of a substantial form we have knowledge of that form in itself since that form is, by its identity with itself, a transcendental causal relation to this effect. On the other hand, since phenomena do not reveal necessary causal relations, they cannot give us knowledge of properties in the strict sense or of the substantial forms from which they emanate. Rather phenomenal regularity, which verifies our empirical knowledge of necessary causal relations, takes the place of knowledge of natures in themselves. In other words, the nature is known not only by its effects, which are signs

Cahalan, Nature, p. 17

of it, but in its effects,[29] in the regularities which make it unreasonable to believe the opposite of a particular causal relation. Such knowledge is "circumferential"[30] to essences as that without which the existence of their effects would not be possible.[31]

The philosophy of nature is a causal account of physical things which analyzes them in relation to existence. And the main problems of empiricist philosophy of science can all be traced to the absence from it of this ontological point of view. Without truths attainable by ontological analysis, in fact, empirical knowledge itself becomes unintelligible. For attempts on the part of empiricists to account for empirical knowledge solely in terms of concepts of sensible objects, on the one hand and logical relations, on the other, make empirical knowledge a foundationless, paradox-ridden enterprise. In particular, the problems raised by empiricism can only be solved by necessary causal relations understood, not in terms of modal logic, but as functions of the ultimate extralogical value, existence. As logically included in the meanings of empirical terms, ontological concepts provide the background for our empirical knowledge, and necessary causal principles employing those concepts provide its foundations. This explains, for example, the incompleteness of empirical definitions of dispositional terms. Dispositions are causal relations. And by hypothesis, an analysis of dispositions in terms of sensible objects and logical relations alone excludes the ontological concepts needed to understand them as causal relations.[32]

333435363738394041424344454647484950515253545556575859606162636465666768697071727374757677778798081828384858687888990919293949 5 Ed. Deely and Raymond J. Nogar (New York: Appleton-Century-Crofts, 1973) pp. 29-74.

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My use of "verify" is, of course, the common one. What Maritain means by it in this context (he uses it in the standard sense elsewhere) is not entirely clear. The situation is complicated by the fact that this use is based on his interpretation of a difficult phrase in Aquinas ("deduci ad", In. Boet. de Trin., q. VI, a. 2) which Aquinas in turn got from Boethius. And although it is related to verification in the ordinary sense, what Aquinas appears to mean by that phrase is not identical with it. He is discussing judgment. Regarding judgment, there are two things to be considered: an ontological aspect which is the conformity with things that makes the proposition we are judging true, and an epistemological aspect which is the way we are made aware of the conformity (verification in the ordinary sense). The question of conformity seems to be what Aquinas had in mind, not simpliciter, but with respect to the sphere in which that to which a proposition conforms is found to exist, the sphere of things knowable by the senses or intellect or representable in the imagination.

For some reason, this reading seems not to have occurred to Maritain, and he is left with the epistemological aspect of judgment. Then, when he comes to discuss methods of demonstrating in such non-experimental sciences as philosophy and mathematics, because he wishes to be consistent with what he has interpreted Aquinas to be saying, he is forced to invent a distinction between the " medium of demonstration" and the method of "verifying the conclusions". (A synonym for verification in the ordinary sense is "control" used on p. 55 to translate "règle" on p. 178 for "réglateur" and on p. 197 for "contrôle".)

I am refraining from entering the realists' dispute about the relative primacy of the principle of non-contradiction vis-à-vis the principle of identity.

In The Philosophy of Physics, ed. Vincent Edward Smith, St. John's University Studies (Jamaica, New York: St. John's University Press, 1961), p.65.

Ashley, p. 74.

Ashley, p. 75.

Ashley, p. 79. The source of his confusion here, in addition to his apparent disinterest in the question of verification, may be Aquinas' remarks about the superior certitude attainable in mathematics than in natural philosophy. But Aquinas in no way means to imply that his repeated statements that science is achieved by demonstrating from self-evidently necessary truths apply only to mathematics. As a matter of fact, in one of the places where he discusses the superior certitude of mathematics, he also affirms explicitly that natural philosophy demonstrates from self-evident principles. (In. Boet. de Trin., q. V, a. 1). One is that the objects of natural philosophy, which do not abstract from sensible matter, are more complex than those of mathematics. Clearly, this reason does not altogether rule out verification by the impossibility of the opposite in our knowledge of nature. Greater complexity only makes the required arguments more difficult and creates more opportunities for per accidens error. Another reason given by Aquinas bears more directly on the dispute between Ashley and Maritain: unlike mathematics, natural philosophy deals with things that happen for the most part but which sometimes happen differently. Aquinas does not mean, however, that natural philosophy deals only

with what is true for the most part to the exclusion of what cannot fail to be true. That interpretation would contradict too many of Aquinas' texts on science and demonstration including the text just cited about demonstrating from the self-evident in natural philosophy. (Many relevant texts are collected by L. M. Regis, O.P. in Epistemology, trans. Imelda Choquette Byrne, Christian Wisdom Series [New York: Macmillan, 1959], pp. 369-465.) Moreover, Aquinas can hardly be accused of holding that it is only for the most part that substantial change requires a featureless subject, that chance presupposes finality, that the soul is in each part of the body, etc. But Aquinas believed that in addition to dealing with necessities, natural philosophy also deals with things that happen for the most part. And that constitutes no objection to Maritain since he is perfectly willing to concede that Aquinas did not make distinctions that need to be made between the philosophical and the empirical ways of knowing nature.

The Philosophy of Nature, trans. Imelda Choquette Byrne (New York: Philosophical Library, 1951) p. 19 (hereafter cited as Nature) cf. Degrees, p. 25.

See Degrees, pp. 23—211, passim; and A Preface to Metaphysics (New York: Sheed and Ward, 1939), pp. 107-125 (hereafter cited as Preface).

See Aquinas, I—I, q. 2, a. 1.

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This constitutes a revision of the common explanation of how we know definitions like "rational animal", namely, that we analyze the concept of man and find the concepts of rationality and animality included therein. That explanation is inconsistent with the fact that we learn the natures of things from their activities. Nor can it escape the Kantian difficulty that analysis of concepts alone cannot advance our knowledge of what is the case. Moving from knowing that a thing performs certain activities to knowing that it has the ability to perform those activities does not advance our kniw1edge very far. But the necessity of such causal relations is the foundation for all the knowledge of the natures of things that further experience and reasoning give us.

One exception must be made to the statement that when necessary causal relations are known by reduction to the self-evident, we have dianoetic intellection, knowledge a locus of necessary causal relations in itself. The existence of God as the first cause of motion can be demonstrated by impossibility of motion's existing in the absence of an uncaused cause of motion. We have dianoetic intellection of the objective concepts making up the self-evident truths employed in the demonstration of God's existence. But we cannot have dianoetic intellection of God as the cause of His effects as we can have dianoetic intellection of a natural agent as the cause of its effects. In each case, a cause is made known through its effects. But here again, we find a difference in the manner in which the nature of the cause is known. The mode of being of natural causes is commensurate with that of their effects since natural causes are, in their own turn, effects of causes prior in being to them. And the necessary causal principles which allow us to move from knowledge of the effect to knowledge of the cause apply just as much to natural causes as they do to natural effects. Therefore the mode of being of natural causes does not exceed our manner of knowing them.

The uncaused cause is not an effect, nor does He come under principles telling us to account for the existence of things in known terms of prior causes. Therefore effects cannot make His nature known to us in a manner commensurate with His mode of being. From necessary causal principles we learn that the objects of certain concepts, like goodness, power, unity, intelligence, do belong intrinsically to God's nature. But this is now knowledge of God's nature in itself since the uncaused manner in which they exist in God exceeds the manner in which we come to know that they exist in God.

"Phenomena are not special things; a phenomenon is not… a certain stratum of knowable reality distinct from something else which is the thing in itself… Phenomena are simply the aspect in the formal object of primary determination, in the sphere of fundamental intelligibility proper to the first degree of abstractive visualization, which meets with a mode of defining and conceptualizing, an objective light that proceeds by resolution into sensory operation." Nature, p.137.

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"Existence is the term as a function of which metaphysics knows everything that it does know." Existence and the Existent, trans. Lewis Galantiere and Gerald B. Phelan (New York: Pantheon Books, 1948), p. 31. What Maritain says here about metaphysics is true of ontological analysis in general.

See Degrees, pp. 25-34, 138-165, passim.

Degrees, p. 33.

Degrees, p. 208.

Degrees, p. 160; Nature, p. 137.

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Ashley uses the word "ontological" but appears to take no notice of the distinctive character of ontological concepts, that of being relations to existence. He even equates the term "ontological" with "dianoetic". (p. 75) Likewise, what he says about "natural units" (p. 66 ff.) can be verified by experience. But whether all such natural units satisfy the ontological concept of substance (that to whose essence it belongs not to exist in another) is a different question.

By the problems whose solution requires an ontological understanding of causal relations, I have in mind everything from Quine's difficulties with necessary truth to the problem of perceiving sense data as opposed to physical things, including the problems of induction, simplicity, contrary-to-fact conditionals, natural kinds, the grue and raven paradoxes, and even the problems of the foundations of empirical knowledge and the linguistic relativity of truth. How causal relations can solved some of these problems is shown in the ground-breaking work of Romano Harré and Edward H. Madden, Causal Powers: A theory of Natural Necessity (Totowa, New Jersey: Rowman and Littlefield, 1975)

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The statement that the sciences are distinguished by diverse ways of abstracting from matter is made without prejudice to the question of separatio in metaphysics, and issue I will not be discussing. There is at least one important way, however, in which metaphysics must be said to abstract from matter even though matter is included in the extension of its definitions and principles. Consider the following argument: All beings are good; cows are beings; therefore cows are good. The subject of the conclusion cannot exist apart from matter, yet the argument is metaphysical. Why? As belonging to a science, the propositions of metaphysics express necessary connections between their subjects and predicates. The necessity of these connections derives either from logical relations or causal relations. But the objects of metaphysics are capable of existing apart from matter. Therefore the necessity of the relations expressed by metaphysics' principles cannot derive from the causality of matter. Nor can the objects of metaphysics' definitions have matter as a necessary condition for their existence; otherwise the principles employing concepts so defined would be necessarily true only of material things.

In other words, the sense in which metaphysics abstracts from matter even though matter and material things fall within its extension is that the causality of matter is only incidental to what metaphysics says about things, including material things, for it is incidental to the existence of the objects of metaphysics' definitions and therefore to the necessary connections expressed by its principles. Although the causality of matter is not incidental to the existence of cows, it is incidental to the necessary connection between the existence of cows and goodness, for the princi1è from which the goodness of cows follows does not require the causality of matter in order to be true. This analysis, consequently, illustrates both how metaphysics abstracts from matter and how the abstraction from matter which characterizes the

[35] See Degrees, pp. 147-148. Being as the formal object of the intellect is what Maritain has in mind when speaking, for example, of "intelligible" necessities or the control of ontological knowledge by the "intelligible" rather than the observable. (p. 178).

[36] See Degrees, pp. 153-154; Nature, pp. 65-66, 79.

[37] See Aquinas, De Ente et Essentia, ed. Baur, chapter 3.

[38] See Nature, p. 89; and cf. Degrees, p. 138 where Maritain describes chapter two as taking "the methodological point of view of the theoretician of the sciences" while on p. x, he says that it is not until chapter three that "we shall cross the threshold of critical metaphysics and thenceforth keep to that point of view."

[39] "Without a prior science of nature we could not be sure of the existence of immaterial beings. Unless these entities actually exist, the need for a science of being qua being, i.e., being common to both material and immaterial entities would vanish." (Flynn. p. 21) "If wholly deprived of its indispensable natural introduction, a metaphysics… has to remain a sheerly dialectical study bearing on possible beings." (p.22) To equate the concepts of being qua being and of being as common to the material and the immaterial is to confuse the ratio formalis objeci ut OBJECTUM. See Maritain, Nature, pp. 109-110, 125-135.

[40] Flynn, p. 39

[41] An introduction to Philosophy, trans. E. I. Watkin (New York: Sheed and Ward, 1935), pp. 159 and 193. Maritain is there referring specifically to the problem of universals. But from the time of The Degrees of Knowledge, the problem of universals is classified under the heading of what pertains to things as objects rather than as things.

[1] [2][3][4][5][6][7][8][9][10][11][12][13][14][15][16][17][18][19][20][21][22][23][24][25][26][27][28][29][30][31] Ed. Deely and Raymond J. Nogar (New York: Appleton-Century-Crofts, 1973) pp. 29-74.

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The Philosophy of Nature, trans. Imelda Choquette Byrne (New York: Philosophical Library, 1951) p. 19 (hereafter cited as Nature) cf. Degrees, p. 25.

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One exception must be made to the statement that when necessary causal relations are known by reduction to the self-evident, we have dianoetic intellection, knowledge a locus of necessary causal relations in itself. The existence of God as the first cause of motion can be demonstrated by impossibility of motion's existing in the absence of an uncaused cause of motion. We have dianoetic intellection of the objective concepts making up the self-evident truths employed in the demonstration of God's existence. But we cannot have dianoetic intellection of God as the cause of His effects as we can have dianoetic intellection of a natural agent as the cause of its effects. In each case, a cause is made known through its effects. But here again, we find a difference in the manner in which the nature of the cause is known. The mode of being of natural causes is commensurate with that of their effects since natural causes are, in their own turn, effects of causes prior in being to them. And the necessary causal principles which allow us to move from knowledge of the effect to knowledge of the cause apply just as much to natural causes as they do to natural effects. Therefore the mode of being of natural causes does not exceed our manner of knowing them.

The uncaused cause is not an effect, nor does He come under principles telling us to account for the existence of things in known terms of prior causes. Therefore effects cannot make His nature known to us in a manner commensurate with His mode of being. From necessary causal principles we learn that the objects of certain concepts, like goodness, power, unity, intelligence, do belong intrinsically to God's nature. But this is now knowledge of God's nature in itself since the uncaused manner in which they exist in God exceeds the manner in which we come to know that they exist in God.

"Phenomena are not special things; a phenomenon is not… a certain stratum of knowable reality distinct from something else which is the thing in itself… Phenomena are simply the aspect in the formal object of primary determination, in the sphere of fundamental intelligibility proper to the first degree of abstractive visualization, which meets with a mode of defining and conceptualizing, an objective light that proceeds by resolution into sensory operation." Nature, p.137.

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"Existence is the term as a function of which metaphysics knows everything that it does know." Existence and the Existent, trans. Lewis Galantiere and Gerald B. Phelan (New York: Pantheon Books, 1948), p. 31. What Maritain says here about metaphysics is true of ontological analysis in general.

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Ashley uses the word “ontological” but appears to take no notice of the distinctive character of ontological concepts, that of being relations to existence. He even equates the term “ontological” with “dianoetic”. (p. 75) Likewise, what he says about “natural units” (p. 66 ff.) can be verified by experience. But whether all such natural units satisfy the ontological concept of substance (that to whose essence it belongs not to exist in another) is a different question.

By the problems whose solution requires an ontological understanding of causal relations, I have in mind everything from Quine’s difficulties with necessary truth to the problem of perceiving sense data as opposed to physical things, including the problems of induction, simplicity, contrary-to-fact conditionals, natural kinds, the grue and raven paradoxes, and even the problems of the foundations of empirical knowledge and the linguistic relativity of truth. How causal relations can solved some of these problems is shown in the ground-breaking work of Romano Harré and Edward H. Madden, Causal Powers: A theory of Natural Necessity (Totowa, New Jersey: Rowman and Littlefield, 1975)

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The statement that the sciences are distinguished by diverse ways of abstracting from matter is made without prejudice to the question of separatio in metaphysics, and issue I will not be discussing. There is at least one important way, however, in which metaphysics must be said to abstract from matter even though matter is included in the extension of its definitions and principles. Consider the following argument: All beings are good; cows are beings; therefore cows are good. The subject of the conclusion cannot exist apart from matter, yet the argument is metaphysical. Why? As belonging to a science, the propositions of metaphysics express necessary connections between their subjects and predicates. The necessity of these connections derives either from logical relations or causal relations. But the objects of metaphysics are capable of existing apart from matter. Therefore the necessity of the relations expressed by metaphysics’ principles cannot derive from the causality of matter. Nor can the objects of metaphysics’ definitions have matter as a necessary condition for their existence; otherwise the principles employing concepts so defined would be necessarily true only of material things.

In other words, the sense in which metaphysics abstracts from matter even though matter and material things fall within its extension is that the causality of matter is only incidental to what metaphysics says about things, including material things, for it is incidental to the existence of the objects of metaphysics’ definitions and therefore to the necessary connections expressed by its principles. Although the causality of matter is not incidental to the existence of cows, it is incidental to the necessary connection between the existence of cows and goodness, for the princi1è from which the goodness of cows follows does not require the causality of matter in order to be true. This analysis, consequently, illustrates both how metaphysics abstracts from matter and how the abstraction from matter which characterizes the

[35] See Degrees, pp. 147-148. Being as the formal object of the intellect is what Maritain has in mind when speaking, for example, of “intelligible” necessities or the control of ontological knowledge by the “intelligible” rather than the observable. (p. 178).

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[8] Ashley, p. 75.
[9] Ashley, p. 79. The source of his confusion here, in addition to his apparent disinterest in the question of verification, may be Aquinas' remarks about the superior certitude attainable in mathematics than in natural philosophy. But Aquinas in no way means to imply that his repeated statements that science is achieved by demonstrating from self-evidently necessary truths apply only to mathematics. As a matter of fact, in one of the places where he discusses the superior certitude of mathematics, he also affirms explicitly that natural philosophy demonstrates from self-evident principles. (In. Boet. de Trin., q. V, a. 1). One is that the objects of natural philosophy, which do not abstract from sensible matter, are more complex than those of mathematics. Clearly, this reason does not altogether rule out verification by the

impossibility of the opposite in our knowledge of nature. Greater complexity only makes the required arguments more difficult and creates more opportunities for per accidens error. Another reason given by Aquinas bears more directly on the dispute between Ashley and Maritain: unlike mathematics, natural philosophy deals with things that happen for the most part but which sometimes happen differently. Aquinas does not mean, however, that natural philosophy deals only with what is true for the most part to the exclusion of what cannot fail to be true. That interpretation would contradict too many of Aquinas' texts on science and demonstration including the text just cited about demonstrating from the self-evident in natural philosophy. (Many relevant texts are collected by L. M. Regis, O.P. in Epistemology, trans. Imelda Choquette Byrne, Christian Wisdom Series [New York: Macmillan, 1959], pp. 369-465.) Moreover, Aquinas can hardly be accused of holding that it is only for the most part that substantial change requires a featureless subject, that chance presupposes finality, that the soul is in each part of the body, etc. But Aquinas believed that in addition to dealing with necessities, natural philosophy also deals with things that happen for the most part. And that constitutes no objection to Maritain since he is perfectly willing to concede that Aquinas did not make distinctions that need to be made between the philosophical and the empirical ways of knowing nature.

[10] The Philosophy of Nature, trans. Imelda Choquette Byrne (New York: Philosophical Library, 1951) p. 19 (hereafter cited as Nature) cf. Degrees, p. 25.

[11] See Degrees, pp. 23—211, passim; and A Preface to Metaphysics (New York: Sheed and Ward, 1939), pp. 107-125 (hereafter cited as Preface).

[12] See Aquinas, I—I, q. 2, a. 1.

[13] Ashley, p. 76.

[14] See Degrees, p. 424, where he is quoting Aquinas, In Boet. de Trin., q. 6, a. 3.

[15] Degrees, p. 208.

[16] This constitutes a revision of the common explanation of how we know definitions like "rational animal", namely, that we analyze the concept of man and find the concepts of rationality and animality included therein. That explanation is inconsistent with the fact that we learn the natures of things from their activities. Nor can it escape the Kantian difficulty that analysis of concepts alone cannot advance our knowledge of what is the case. Moving from knowing that a thing performs certain activities to knowing that it has the ability to perform those activities does not advance our kniw1edge very far. But the necessity of such causal relations is the foundation for all the knowledge of the natures of things that further experience and reasoning give us.

[17] One exception must be made to the statement that when necessary causal relations are known by reduction to the self-evident, we have dianoetic intellection, knowledge a locus of necessary causal relations in itself. The existence of God as the first cause of motion can be demonstrated by impossibility of motion's existing in the absence of an uncaused cause of motion. We have dianoetic intellection of the objective concepts making up the self-evident truths employed in the demonstration of God's existence. But we cannot have dianoetic intellection of God as the cause of His effects as we can have dianoetic intellection of a natural agent as the cause of its effects. In each case, a cause is made known through its effects. But here again, we find a difference in the manner in which the nature of the cause is known. The mode of being of natural causes is commensurate with that of their effects since natural causes are, in their own turn, effects of causes prior in being to them. And the necessary causal principles which allow us to move from knowledge of the effect to knowledge of the cause apply just as much to natural causes as they do to natural effects. Therefore the mode of being of natural causes does not exceed our manner of knowing them.

The uncaused cause is not an effect, nor does He come under principles telling us to account for the existence of things in known terms of prior causes. Therefore effects cannot make His nature known to us in a manner commensurate with His mode of being. From necessary causal principles we learn that the objects of certain concepts, like goodness, power, unity, intelligence, do belong intrinsically to God's nature. But this is now knowledge of God's nature in itself

since the uncaused manner in which they exist in God exceeds the manner in which we come to know that they exist in God.

[18] "Phenomena are not special things; a phenomenon is not… a certain stratum of knowable reality distinct from something else which is the thing in itself… Phenomena are simply the aspect in the formal object of primary determination, in the sphere of fundamental intelligibility proper to the first degree of abstractive visualization, which meets with a mode of defining and conceptualizing, an objective light that proceeds by resolution into sensory operation." Nature, p.137.

[19] See Réflexions, p. 179

[20] See Degrees, pp. 25-30; Preface, pp. 133-141.

[21] "Existence is the term as a function of which metaphysics knows everything that it does know." Existence and the Existent, trans. Lewis Galantiere and Gerald B. Phelan (New York: Pantheon Books, 1948), p. 31. What Maritain says here about metaphysics is true of ontological analysis in general.

[22] See Degrees, pp. 25-34, 138-165, passim.

[23] Degrees, p. 33.

[24] Degrees, p. 208.

[25] Degrees, p. 160; Nature, p. 137.

[26] Degrees, p. 206.

[27] Degrees, p. 149.

[28] Degrees, p. 206.

[29] See Degrees, p. 207.

[30] Degrees, p. 205.

[31] Ashley uses the word "ontological" but appears to take no notice of the distinctive character of ontological concepts, that of being relations to existence. He even equates the term "ontological" with "dianoetic". (p. 75) Likewise, what he says about "natural units" (p. 66 ff.) can be verified by experience. But whether all such natural units satisfy the ontological concept of substance (that to whose essence it belongs not to exist in another) is a different question.

[32] By the problems whose solution requires an ontological understanding of causal relations, I have in mind everything from Quine's difficulties with necessary truth to the problem of perceiving sense data as opposed to physical things, including the problems of induction, simplicity, contrary-to-fact conditionals, natural kinds, the grue and raven paradoxes, and even the problems of the foundations of empirical knowledge and the linguistic relativity of truth. How causal relations can solved some of these problems is shown in the ground-breaking work of Romano Harré and Edward H. Madden, Causal Powers: A theory of Natural Necessity (Totowa, New Jersey: Rowman and Littlefield, 1975)

In. Boet. de Trin. Q. V, a. 1.

The statement that the sciences are distinguished by diverse ways of abstracting from matter is made without prejudice to the question of separatio in metaphysics, and issue I will not be discussing. There is at least one important way, however, in which metaphysics must be said to abstract from matter even though matter is included in the extension of its definitions and principles. Consider the following argument: All beings are good; cows are beings; therefore cows are good. The subject of the conclusion cannot exist apart from matter, yet the argument is metaphysical. Why? As belonging to a science, the propositions of metaphysics express necessary connections between their subjects and predicates. The necessity of these connections derives either from logical relations or causal relations. But the objects of metaphysics are capable of existing apart from matter. Therefore the necessity of the relations expressed by metaphysics' principles cannot derive from the causality of matter. Nor can the objects of metaphysics' definitions have matter as a necessary condition for their existence; otherwise the principles employing concepts so defined would be necessarily true only of material things.

In other words, the sense in which metaphysics abstracts from matter even though matter and material things fall within its extension is that the causality of matter is only incidental to what metaphysics says about things, including material things, for it is incidental to the existence of the objects of metaphysics' definitions and therefore to the necessary

connections expressed by its principles. Although the causality of matter is not incidental to the existence of cows, it is incidental to the necessary connection between the existence of cows and goodness, for the princi1è from which the goodness of cows follows does not require the causality of matter in order to be true. This analysis, consequently, illustrates both how metaphysics abstracts from matter and how the abstraction from matter which characterizes the

[35] See Degrees, pp. 147-148. Being as the formal object of the intellect is what Maritain has in mind when speaking, for example, of "intelligible" necessities or the control of ontological knowledge by the "intelligible" rather than the observable. (p. 178).

[36] See Degrees, pp. 153-154; Nature, pp. 65-66, 79.

[37] See Aquinas, De Ente et Essentia, ed. Baur, chapter 3.

[38] See Nature, p. 89; and cf. Degrees, p. 138 where Maritain describes chapter two as taking "the methodological point of view of the theoretician of the sciences" while on p. x, he says that it is not until chapter three that "we shall cross the threshold of critical metaphysics and thenceforth keep to that point of view."

[39] "Without a prior science of nature we could not be sure of the existence of immaterial beings. Unless these entities actually exist, the need for a science of being qua being, i.e., being common to both material and immaterial entities would vanish." (Flynn. p. 21) "If wholly deprived of its indispensable natural introduction, a metaphysics… has to remain a sheerly dialectical study bearing on possible beings." (p.22) To equate the concepts of being qua being and of being as common to the material and the immaterial is to confuse the ratio formalis objeci ut OBJECTUM. See Maritain, Nature, pp. 109-110, 125-135.

[40] Flynn, p. 39

[41] An introduction to Philosophy, trans. E. I. Watkin (New York: Sheed and Ward, 1935), pp. 159 and 193. Maritain is there referring specifically to the problem of universals. But from the time of The Degrees of Knowledge, the problem of universals is classified under the heading of what pertains to things as objects rather than as things.

IV. The Formal Distinction of the Sciences: Stating the Question

More than one kind of knowledge demonstrates by resolution to the self-evident, and both metaphysics and the philosophy of nature employ ontological analysis. These considerations, then, do not provide the last word on how the sciences are to be distinguished. Here I will explain realism's criterion for the distinction of the sciences. Then I will use this criterion in a demonstration of Maritain's position on the specific distinction between natural philosophy and empirical science.

The aristotelian-thomistic tradition is justifiably referred to as the realist tradition because it recognizes the identity between an object of knowledge (something that is the term of a knowledge relation) and a thing (something that exists extramentally). But this identity does not preclude, instead it calls for, diversity in what is true of a thing considered as an object of knowledge and what is true of it considered as a thing. What is universal as an object of concept, for instance, is individual as an extramental existent. And diverse kinds of knowledge are to be distinguished by differences in their objects considered as objects, as Aquinas pointed out. If the sciences were to

be distinguished just by differences pertaining to things as things, why should we not recognize a different science for every thing or for every distinct truth known about things? To prevent this, it is from the point of view of what pertains to objects of knowledge as objects of knowledge that the

distinction between sciences must be approached.

This is not to imply that no facts about things in their status as things are pertinent to their status as objects. On the contrary, the distinction between thing and object is a logical distinction only, not a separation; otherwise there could be no identity between thing and object. And the goal of intellectual endeavor, truth, is achieved only when there is identity between that which is our object and that which exists extramentally. It cannot be true that something pertaining to objects as objects is the cause of what pertains to them as things; but the converse can be true. And where characteristics of things as things are causal in relation to their aptitude for being known, differences in what belongs to things as things can cause differences in what belongs to them as objects. The fact that some things can and other things cannot exist, as things, apart from matter is decisive for distinguishing metaphysics from the philosophy of nature. But this fact about things as things enters the discussion about the distinction between these disciplines only because it is pertinent, as we will see below, to the objects of these disciplines considered as objects. Mathematics deals with objects that are no more capable of existing apart from matter than are the objects of the philosophy of nature. Yet this fact about the extramental existence of their objects does not reduce these disciplines to unity since differences pertaining to their objects solely as objects of diverse methods of definition render mathematics and natural philosophy essentially distinct types of scientific knowledge.

In agreement with Aquinas, all parties in the realist dispute about natural philosophy and empirical science believed in approaching the distinction of the sciences from the point of view of what pertains to the objects of science considered as objects of science. They were also of one mind on the specific characteristic of the objects of scientific knowledge that diversifies the sciences: immateriality. Diversity between sciences results from diverse ways in which the objects of scientific knowledge are abstracted from sensible matter, that is, from the concrete conditions of physical existence which have their roots in the causality of prime matter. On the one hand, science is causal knowledge, and prime matter is a cause which has no intelligibility of itself. Hence immateriality is essential to the objects of scientific knowledge. On the other hand, sensible characteristics which require the causality of prime matter are the means by which things become objects of our knowledge. Hence diversity in the abstraction of objects from sensible matter

Cahalan, Nature, p. 19

constitutes essentially diverse types of intelligibility and, consequently, essentially diverse kinds of human knowing.

How can we be more specific about the way the immateriality of their objects distinguishes the sciences? The diverse immateriality which distinguishes the objects of various sciences is immateriality characterizing the objects of different modes of defining, different ways of articulating the things we experience by means of concepts. For it is as the objects of concepts that what are given in sense experience become objects of understanding. Different modes of defining, therefore, constitute different ways of making the objects of experience objects of rational knowledge. To put it another way, the premises of our arguments are made up of concepts; and the self-evident causal principles which function as the premises of demonstration are known to be necessary by acquaintance with their concepts. Therefore to different modes of concept-formation or definition there correspond different kinds of principles through which the conclusions of our arguments become objects of knowledge. (For natural philosophy and empirical science, of course, the diversity of principles resulting from diverse modes of concept-formation, ontological and empiriological, is such that one can and the other cannot demonstrate from self-evident truths.)

We will see shortly how it can be said that the objects of diverse modes of defining differ with respect to abstraction from matter. But all parties to our dispute were agreed that, since matter is a principle of unintelligibility, diverse ways of abstracting from matter constituted diverse kinds of intelligibility. And since scientific intellection is achieved through concepts, the sciences are distinguished by the manner of abstracting from matter which characterizes their modes of defining.

The issue is not what kind of materiality or immateriality pertains to the objects known by natural philosophy and empirical science as things existing outside the mind. It was agreed that these disciplines study the same things. The issue is what kind of abstraction from sensible matter pertains to their objects as objects of the definitions by which these sciences cognize them.

V. The Specific Difference Between the Philosophy of Nature and Empirical Science

There was also agreement that the philosophy of nature and empirical science belong to the same genus of knowledge, as do geometry and arithmetic and metaphysics and theology. Both the philosophy of nature and empirical science deal with things that can neither exist apart nor be understood apart from sensible matter. (That is what distinguishes natural philosophy from metaphysics.) But the question is whether there is any specific difference, from the point of view of

abstraction from sensible matter, between their objects considered as objects, in other words, any difference in immateriality between the modes of defining by means of which they make material things objects. To settle this question, let us examine some actual definitions from these disciplines.

First, consider two definitions from the philosophy of nature: the definition of prime matter as the subject of substantial change and of motion as the act of what is in potency insofar as it is in potency. Each of these definitions is a complex concept constructed out of more basic concepts: the concepts of substance, change and subject of change in the first case, the concepts of act and potency in the second case. Although neither prime matter nor motion (as opposed to instantaneous change) can exist apart from matter, the object of each of the more basic concepts out of which these definitions are constructed can exist apart from matter. Substance can exist apart from matter; so can change and subjects of change; so can potency and act. The same is true of other concepts that enter into the philosophy of nature's definitions: form, agent, end, accident, principle, power, operation, quality, relation, privation, etc. In other words, the philosophy of nature makes objects of things which cannot exist apart from sensible matter by means of definitions constructed from concepts whose objects can exist apart from sensible matter.

Now let us consider some definitions from empirical science. Momentum is mass times velocity; mammals are animals whose females secrete milk. Again, we meet complex concepts constructed out of more basic concepts. But here the objects of the more basic concepts, mass, velocity (rate of locomotion), animal, female, secretion, milk cannot exist apart from sensible matter. The list could go on: density is the quotient of the mass divided by the volume; chromatin is the deeply staining material in the nucleus of cells; electrolysis is the decomposition of a compound in solution by the passage through it of an electric current; a hormone is a chemical secretion carried from one gland or organ of the body to other tissues via the blood stream; a geode is a spherical
rock containing a hollow that is crystalline. In each case, a complex concept is constructed out of other concepts whose objects cannot exist apart from sensible matter.

Hence the philosophy of nature and empirical science have modes of defining which differ from each other precisely in their reliance on concepts whose objects can or cannot exist apart from matter. Because natural philosophy defines by concepts which are functions of existence, it defines by concepts whose objects can exist apart from matter; because empirical science defines by concepts of sensibly distinguishable objects, it defines by concepts whose objects cannot exist apart from matter. Both disciplines study things that cannot exist apart from matter. But to objects in the philosophy of nature, considered as made objects by a particular mode of defining, there pertains an

immateriality which does not pertain to objects in empirical science. It cannot be repeated too often that sciences are not distinguished by what characterizes their objects as things, purely and simply,

but as objects, particularly as objects of the definitions of a science. Otherwise the mathematical sciences would not be distinct from the physical. Because of the way they are defined, the objects of mathematics belong to a genus of intelligibility different from that of the objects of natural philosophy and empirical science. And because of the way they are defined, the objects of natural philosophy belong to a species of intelligibility different from that of the objects of empirical science. (Another way to put it would be that the philosophy of nature, unlike empirical science, explains material things by means of causal factors and causal relations that can exist apart from matter, the causal factors and relations with which it constructs its definitions of material things.) Therefore Maritain and his followers were right in believing that according to realism's traditional criterion for distinguishing the sciences, a specific distinction must be recognized between the philosophy of nature and empirical science.

Perhaps it will be objected that the examples I have used amount to too small a sample. Other definitions can be found in both disciplines which do not seem to support my conclusion. Consider definitions from the philosophy of nature like "first principle of life in a potentially living body" for the soul, or "what is potentially divisible to infinity" for a continuum. The objects of concepts like body, division (in the sense of the actual separate existence of what once were existed together) and even life understood as self-actuation with respect to motion cannot exist apart from sensible matter. Next consider some of the basic concepts of empirical science like mass and force. Mass can be defined as a body's resistance to change of state. At least two concepts whose extension exceeds the physical domain are employed here. Resistance is a dispositional concept, and there are non-physical dispositions. There are non-physical changes also. Nor can the concept of change be eliminated by replacing 'resistance to change of state' with 'tendency to remain at rest or in locomotion at the same velocity'. The concepts of rest and locomotion both presuppose the concept of change. Rest presupposes it privatively, and locomotion logically includes it as the concept of a species logically includes the concept of its genus. Similarly, the concept of force as that which changes a body's state of motion or rest logically includes the general concept of efficient causality; and there are non-physical efficient causes. Concepts whose extension exceeds the physical domain can even be formed for objects like time and measurement, each of which are involved in concepts which are basic to empirical science and out of which more complex concepts are formed.

Cahalan, Nature, p. 22

But all of this shows no more than that, as we have already seen, empiriological concepts logically include ontological concepts. That is what Maritain means by saying that being and other ontological values are always present in empiriological analysis but are not disengaged for their own sake. They are there as foundations, for where the formal object of the intellect, being, is not present there can be no intelligibility.[35] This is the reason Maritain believes that, while the advance of empirical science requires it to progressively purify itself of ontological concepts, the purification can never be absolute.[36]

Nor does the presence of philosophical concepts in the background of the definitions of empirical science blur the distinction between empirical science and the philosophy of nature. In the first place, none of the definitions of empirical science can be constructed solely out of concepts whose extension exceeds the physical while we have just seen that some of the most important definitions in the philosophy of nature are so constructed. The reason why empirical science cannot proceed in this way has already been given. Evidence for the assertions of empirical science is not supplied, as it is in the philosophy of nature, by resolution to self-evident principles. Evidence for its assertions is supplied by the occurrence of contingent events detectable by the senses. It must therefore include in its definitions reference to objects the senses are able to discriminate from one another: proper or common sensibles. Among the proper and common sensibles only one, number, is capable of existing apart from matter. And number enters the definitions of empirical science only as the number of something else discriminable by the senses as in 'third mark on a calibrated

scale' or 'fourth mark on a calibrated scale'. Therefore unlike the philosophy of nature, empirical science cannot use definitions constructed solely out of concepts which transcend the physical.

In the second place, when both physical and extraphysical concepts are employed in the construction of a complex definition we can determine whether the definition belongs to philosophy or empirical science by asking whether it is concepts of the physical or extraphysical kind that are used in the definition to distinguish the definiendum from other things. For that which distinguishes the definiendum from other members of its genus is the formal element in a definition.[37] Therefore the immateriality characterizing the way the definitions of a science distinguish its definienda from other things will be formal in relation to that science, and diverse immateriality in the distinguishing of things will constitute specifically distinct sciences. For if the sciences could be sufficiently differentiated by the immateriality of their generic concepts, why should not all sciences belong to metaphysics, since metaphysical concepts are logically included in all others as the more general in the less general? (Recall that the dispute we are considering did not concern whether the philosophy

of nature and empirical science belong to the same generic level of immateriality. That was agreed. But if two modes of defining abstract from matter in ways that are generically the same, (Jack, this seems to be missing a verb.) why should it be incongruous for their definitions to have generic concepts belonging to the same level of immateriality? If we are asking whether the two modes of defining are specifically different, we must look to the immateriality of the concepts used to distinguish definienda from one another.)

Now the objects of definitions in empirical science must be distinguished from one another in ways that can be discriminated by the senses. In other words, they must be distinguished by reference per se sensible objects which cannot exist apart from matter, not by using concepts whose extension exceeds the physical. There are non-physical dispositions (taking disposition in the broad sense of any determination toward activity). But the concept of disposition enters behavioral psychology only to the extent that it can be related to observable, physical behavior. Any other kind of disposition is meaningless to the behavioral psychologist because any other kind of actuation of a disposition is meaningless to him. The definition of heat makes use of the concept of energy which logically includes the general concept of ability to bring about change, another concept whose extension exceeds the physical. But the definition of heat employs this concept exclusively for an ability which belongs to something physical, moving molecules, and which causes changes that are detectable to the senses. The term "potential energy" in physics only gives the appearance of using the concept of potency to distinguish one kind of energy from another. A look at its definition shows that it distinguishes this kind of energy not by reference to something capable of existing apart from sensible matter, potency in the philosophical sense, but by reference to something exclusively physical, the occupation of place.

On the other hand, the philosophy of nature distinguishes things by appropriately combining concepts whose objects are not exclusively physical. Thus the soul is distinguished from other principles of the activities of living bodies by calling it the first principle of life in a potentially living body. The ordinal concept of being first has application beyond the physical sphere, as does the concept of potency, a concept employed again when the philosophy of nature distinguishes continuous quantity from the discontinuous as the potentially from the actually divided. Or think of the way action is distinguished from passion: by reference to the efficient cause and material cause of change, two concepts which have immaterial instances. In other words, to explain differences between physical realities, natural philosophy uses causal concepts whose extension exceeds the physical. (And it is even likely that all the exclusively physical terms in natural philosophy's

definitions can be replaced by defining phrases using only extraphysical terms as I suggested above for "division"; this is certainly the case for "body", "motion" and "life".)

Thus there are at the same generic level of abstraction from matter, two ways of making things objects by means of concepts, ways which are specifically distinct as to immateriality. And to say this is to say there are specifically distinct modes of immateriality characterizing the objects of these diverse ways of defining as objects. (Should there be definitions associated with the philosophy of nature which differentiate their definienda solely by means of concepts whose extension does not exceed the physical, philosophy is there encroaching on a foreign domain. The same criticism would apply to any definitions associated with empirical science which differentiate by means of extraphysical concepts.)

VI. The Philosophy of Nature and Metaphysics

In order to do metaphysics, the science whose objects are capable of existing apart from matter, must one first prove the existence of immaterial beings in the philosophy of nature? Consider that one cannot distinguish natural philosophy from empirical science as we have just done unless he or she already knows that the objects of certain concepts can exist apart from matter. But the distinction between these disciplines, if true, remains true whether one recognizes that truth or not. Therefore it makes no difference to the truth of that distinction when we learn that something exists apart from matter. If I do not yet know that immaterial things exist, I cannot know that these two disciplines are specifically distinct according to the traditional criterion, but my ignorance does not prevent them from being distinct.

Nor does my ignorance of the specific distinction between them prevent me from knowing

truths belonging to either of these disciplines. It only prevents me from knowing that these truths fall into different categories of knowledge. By the traditional criterion, I cannot know that a truth from the philosophy of nature like:

(1) Substances subject to change are composed of prime matter and substantial form.

and a truth from empirical science like

(2) The speed of light in a vacuum is constant whatever the motion of its source.

belong to distinct modes of knowing unless I know the truth of

(3) There are immaterial beings.

But I can know the truth of either (1) or (2) without knowing the truth of (3). (3) is not pertinent to the discussion of how I know the truth of (1) and (2); It is pertinent to the discussion of how I know

whether (1) and (2) belong to disciplines whose objects are characterized, as objects, by diversity in immateriality.

And the same reasoning applies to the relation between our knowledge of the truth of (3) and our knowledge of the truth of metaphysical propositions like:

(4) Whatever exists has unity.

(5) Whatever exists has goodness.

(6) Whatever exists, exists either contingently or necessarily.

(7) Whatever exists is either finite or infinite.

(8) Whatever is composed of potency and act has an efficient cause.

(9) All agents act for an end.

These propositions are true of immaterial beings whether we know it or not. Therefore they belong to a science generically distinct from natural philosophy, and these sciences are distinct whether we recognize it or not. In order to know that propositions (4)-(9) are true, however, must we know that they are true of immaterial beings, know, in other words, that the concepts involved include immaterial beings in their extension? If so, our knowledge of the truth of propositions (4)-(9) would depend on our knowledge of the truth of (3). But knowledge of the truth of (4)-(9) can depend on knowledge of the truth of (3) on one and only one condition: the arguments by which we demonstrate (4)-(9) must make use of (3) as a premise. If any of (4)-(9), or any other metaphysical truth, can be proven without using (3) as a premise, there are truths belonging to metaphysics which are able to be known by us even if we have not et proven the existence of immaterial beings.

The knowledge of some metaphysical truths may require the use of (3) as a premise. But in order to show that this is not the case for every metaphysical truth, one example, out of all that

could be offered, will be sufficient. Recall the demonstration that unity, undividedness, is a property

convertible with being. Whatever exists is either simple or complex. If simple, it is undivided because it has no parts to be divided from other parts. If complex, its parts are either together or not together. If not together, the thing itself does not exist. If together, the thing is undivided. So whether simple or complex, whatever exists is undivided. (3), the assertion of immaterial existence, does not enter the argument. Therefore knowledge of some metaphysical truths does not depend on previous knowledge of an immaterial existent.

But knowing the truth of propositions such as (4)-(9) is one thing. How do we know that such truths belong to a science distinct from the philosophy of nature, the science we call metaphysics? That is a different question. I cannot know whether the traditional criterion requires us to classify

(4)-(9) as belonging to a genus of science distinct from (1) and (2) unless I know the truth of (3). Still, that does not make (3) pertinent to the discussion of how I know the truth of (4)-(9); it only makes it pertinent to the discussion of how I know that propositions like (4)-(9) on the one hand, and (1) and (2), on the other, belong to sciences whose objects are characterized by diverse modes of immateriality. Again, it is not the case that one must know the existence of immaterial things before he or she can know any metaphysical truths. But acquiring metaphysical knowledge and being aware that the knowledge one is then acquiring belongs to a genus of immateriality distinct from that of the philosophy of nature are two different things. (And since we can acquire metaphysical knowledge before we know (3), there is no reason why we cannot first demonstrate (3) in metaphysics rather than in the philosophy of nature.)

Both metaphysics and the philosophy of nature consist of truths about things in their existence as things. Truths about what kinds of science propositions belong to are truths about objects of knowledge as objects of knowledge in other words, truths of logic.[8] (3), the proposition that immaterial things exist, is a truth about things as things. But (3) enters the discussion of the distinction between natural philosophy and metaphysics because it is relevant to the logical distinction of objects of diverse sciences as objects; for immateriality is essential to the objects of rational knowledge considered as such. Therefore knowledge of (3) is necessary for knowledge of a logical truth about the objects of metaphysics considered as objects, namely, that they terminate knowledge relations belonging to a genus of science distinct from the knowledge relations terminated by the objects of the philosophy of nature. Knowledge of (3) is not necessary for the knowledge of many metaphysical truths about things considered as extramental things.

It might be objected that while (3) is not necessary for the verification of many metaphysical truths, it is necessary for their discovery. For unless we know that there are immaterial beings to inquire about, how could we know the need for another science beyond the philosophy of nature? And a science must know the existence of its subject. If we did not know the existence of immaterial beings, how could our metaphysical knowledge be anything but hypothetical?[9] About discovery however, we can say the same things we said about verification. Without knowing the truth of (3) one could not discover the truth of a proposition asserting the existence of metaphysics as a distinct science according to the traditional criterion. But to discover the truth of a proposition asserting the existence of a distinction between sciences is one thing. To discover the truth of propositions belonging to either of the distinct sciences is another. A person might correctly discover the truth of some metaphysical proposition like (4) and yet mistakenly think that this

proposition belongs to the philosophy of nature. His mistake about what science the proposition belonged to would not imply any mistake about the truth of the proposition itself. Likewise, a person might have demonstrative knowledge of (4) and simultaneously believe falsely that every being is material. He would therefore conclude that (4) is a proposition about material things alone. But whether or not there are immaterial beings is not part of what be has demonstrated in demonstrating (4). And the fact that he also thinks (4) is only true of material beings does not bring it about that (4) is only true of material beings.

In other words, in order to know that the answers to many metaphysical questions deserve to be sought, one does not have to know either that there are immaterial beings or that there is a science to be pursued distinct from natural philosophy. The discovery of truths which belong to metaphysics, as opposed to logical truths about metaphysics as a science, need not result from inquiring into immaterial beings considered as such. It can result from inquiring into material beings considered not as material but as beings. The demonstration of (4) revealed the connection between being and unity, not between materiality and unity, and the discovery that all beings were not material would only add to, not alter, that demonstration. (Because we know that freedom of choice is necessarily true of humans, we know that if there are green-haired humans, they have freedom of choice. Likewise we know that if there are immaterial beings, they have unity because we have

demonstrated that unity is necessarily true of whatever exists.) Questions about beings as beings happen to pertain to immaterial beings as well as material, but that is something one need not know in order to ask them and answer them. If a person knows that one being exists, material or

immaterial, he has sufficient knowledge to inquire about things under the aspect of being. And there is nothing hypothetical about this knowledge.

What is hypothetical is not whether beings exist but whether immaterial beings exist and, as a result, whether questions about being, as such, belong to a science distinct from natural philosophy. Flynn holds that until we know the existence of immaterial beings, "we cannot formulate a concept of being common to both material and immaterial beings.[0] How can we even understand phrases like "material beings" or "material and immaterial beings", however, if we do not already have such a concept of being? And before we discover the existence of immaterial things, we can ask questions about their existence. Those questions employ concepts about which we are asking whether they have immaterial instances, concepts which must be understood if the questions themselves are to be understood. If the extension of those concepts did not already include the non-physical, whether we know it or not, the questions could never be answered in the affirmative.
Cahalan, Nature, p. 28

Hence we must have concepts of objects common to the physical and the non-physical before we discover the existence of the non-physical.

When we make that discovery, our knowledge of the extension of those concepts changes, but their intension does not change. Intension can change only by the addition or subtraction of notes. Adding to intension is ruled out since it decreases extension. If intension is subtracted from, we are either left with nothing or left with something that was there all along, that is, there before we discovered the existence of the immaterial. It is the latter, of course, that is actually the case. We cannot think of anything as a material being without simultaneously thinking of it as a being. As Aquinas said, that which the intellect first conceives and that to which it reduces all conceptions is being.

In conclusion, note that both the question of the relation between natural philosophy and empirical science and the question of the need to prove the existence of immaterial beings in the philosophy of nature have turned out to depend on the distinction between things as things and things as objects. Maritain did not invent this distinction, but for all practical purposes it is his. For one thing, he alone has appreciated its full significance, calling it "the first and most important of philosophic problems", not in itself (the relation of essence to existence is the most important in itself), but for us,[1] because our ability to know the answers to other philosophic problems depends on it. The intuition of being is a necessary condition for a sound philosophy (on the side of discovery, not on the side of verification, one does not verify by intuition), but it is not a sufficient condition. Intuitions must be properly conceptualized, that is, their objects must be placed in the

proper causal relations to one another. The greatest impediment to the proper conceptualization of valid philosophic intuitions has been the inability of philosophers to handle the relations between what pertains to things as things and what pertains to things as objects. And as this discussion of the philosophy of nature has tried to illustrate, Maritain alone has achieved an epistemology able to do just that.

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